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One of the saddest parts of my life is when evidence continues to mount up that we are the primary ones obstructing the realization of this dream.

The 2002 Better Business Bureau (BBB) statistics have been released on Dispute Resolution.

Tree care companies were ranked 89th highest in the complaint category out of a possible 1,103 business categories.

Landscape contractors ranked 78. Lawn care ranked 81. Landscape architects and designers ranked 138.

This does not bode well for the green industry, especially when you consider others near us:

- Towing services: 86
- Major appliance service and repair: 87
- Fence contractors: 88
- TV/VCR sales and service: 91
- Credit counseling and management services: 92
- Automobile manufacturers and distributors: 93
- Airlines: 94.

There were a total of 1,572 complaints for tree care companies out of 626,081 total business complaints for 2002. Disputes were resolved at the low rate of 53.5 percent. The average resolution rate for all businesses was 70.9 percent.

There was a very high "no response from company rate" of 34.1 percent. The average was 18.1 percent.

I don't know about you, but it doesn't make me feel too great to have our industry at the bottom of the pile, much less 5 points LOWER than the airlines right now.

Your trade association can do a lot for the industry in getting out the message as the voice of the tree care industry about the great work you do in our communities. However, our job is a whole lot harder when this is the kind of business track record that is being set.

I know. You'll say that this is happening OUTSIDE of the TCIA membership, and I'd love to believe that is true. I also know that you'll say that every industry or profession has bad apples. And you're right.

Whose responsibility is it to deal with these issues? First, your association will help by setting best business practices and working with you to raise standards. Second, you always have a responsibility to bring all of your colleagues into membership in your trade association. Third, you have a job in your own business to make sure that you have complaint resolution procedures in place and that you are following them.

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Cover Photo

Growth rings narrow as drought stresses a tree’s ability to grow. Photo courtesy Dr. Philip M. Wargo
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Drought can have a significant impact on tree health. It slows and reduces growth, both radially and terminally. It reduces carbohydrate production, which significantly lowers the energy reserves, starch in most trees, and production of defense chemicals in the tree. If drought is acute enough or prolonged, it also can cause death to all or portions of the tree. In most situations, drought weakens trees and they become susceptible to pathogenic organisms (diseases and insects) that normally cannot invade a healthy tree. These organisms invade, colonize, and kill all or portions of the tree, depending on how badly the tree is weakened.

Consequences of Long-Term Drought Stress on Tree Health

By Dr. Philip M. Wargo

Trees need water to transpire and move minerals from the roots to the leaves where the minerals are incorporated into the photosynthetic process and subsequent carbohydrate, protein, and lipid production.

Water keeps plant cells moist and turgid. Water keeps leaves fully expanded to capture sunlight for the photosynthetic process. Water acts a solvent for the gases (O₂ and CO₂) of photosynthesis, as well as for the essential elements and nutrients carried from the soil into the roots and up the stems in the xylem pipes to the leaves. Water also carries the products of photosynthesis in the phloem pipes from the leaves to the other tissues of the tree for their energy. Water is part of the chemical reactions in photosynthesis and hydrolysis. Thus lack of water will stop or significantly slow down these processes.

Water is absorbed by the fine nonwoody roots and mycorrhizae and is carried to the fine veins in the leaves through a system of xylem pipes. Pipes of the root system converge at the root stem base and move water up the tree in the outermost ring or rings of xylem. Water and dissolved mineral elements move up the pipes by osmosis and also are pulled up trunk pipes to leaf pipes by suction pressure (tension) from transpiring leaves. Thus, water loss from the leaves is an important process in moving water and minerals through the trees. However, too much or too fast water loss from the leaves during hot and dry conditions results in closure of the stomates (pores on the bottom of the leaves through which water is lost). The leaves become flaccid and photosynthesis slows or shuts down.

Drought stress and strain

Elastic strain: Drought stress on trees causes strain which may be elastic; i.e., trees can respond and then recover from drought. For example, drought can reduce photosynthesis and lower the level of carbohydrate production and the amount of starch stored in the stems and roots. However, these levels can return to normal later in the growing season or the following season if the drought abates.

Plastic strain: Drought stress may cause strain on the tree
that is plastic; i.e., the response of all or part of the tree to stress is permanent. There is no recovery. This usually happens when drought is acute or continues for several growing seasons. For example:

- Leaves wilt and die;
- Next year's terminal buds die and twigs die back to the next living bud;
- Starch levels are not restored after leaf expansion or are depleted after prolonged drought and some parts of the stem and root system die or become susceptible to disease organisms and are killed.

Whether a strain from drought is elastic or plastic depends on:

1. How severe the drought is and when during the growing season it occurs;
2. Whether drought continues through the growing season or is repeated for several growing seasons;
3. How vigorous (genetically drought tolerant) the tree is;
4. How vital the tree is, which depends on growing conditions, site and vigor. Thus long-term drought will likely result in more plastic than elastic strain; i.e., more death of parts of trees or whole trees.

**Effects of drought on tree physiology/chemistry**

There is no major impact of reduced mineral translocation during drought stress. Cellular metabolism slows and lessens the requirement for minerals. However, photosynthesis is reduced: stomata close and there is less CO$_2$ absorption, less enzyme activity because of dehydration of cellular contents, and thus less food production because of less carbon sequestration. Translocation of the photosynthetic products is reduced, resulting in less food available for growth and storage, and hence in smaller growth rings and less terminal growth. Also, less reserve food energy is stored (as starch) and less energy goes into defense chemical production. Sugar and amino acid (nitrogen compounds for building proteins) concentrations are altered. Some increase and others decrease. Changes in these compounds make trees susceptible and vulnerable to insects and pathogens.

**Effects of drought on tree growth**

Drought early in the growing season reduces the size of the leaf and rate of leaf expansion in the current year. It also reduces the rate and amount of radial growth and length of shoot growth on determinate-growth species. Drought later in the season reduces terminal growth on indeterminate-growth species and radial growth. Drought also reduces the rate of root elongation and radial growth, replacement of root tips in the current year, and reduces the number and size of leaves in buds for next year. A prolonged drought of several seasons would produce and exacerbate all of these effects.

**Predisposition to insects and diseases**

Prolonged drought can make trees susceptible to...
infestation and colonization by insects and pathogens that trees normally resist. Changes in the tree’s growth rate, energy production, defense chemicals, and “attraction” chemicals are involved.

Insects involved are those that live and reproduce normally on weakened parts of trees (shaded or injured branches) or whole trees (overturned trees) that have been weakened by unfavorable growing conditions, such as too much shade, nutrient poor soil, compacted soil, and defoliation by other insects.

Attack by borers is the most common insect event associated with drought stress. Twolined chestnut borer (Agrilus bilineatus) is very common and damaging to oaks. The bronze birch borer (Agrilus anxius) can be very damaging to white birch, especially European white birch. Borers are attracted to drought-stressed trees by several mechanisms, including chemical and acoustical. Drought-stressed trees are growing slower than normal and cannot exclude the initial attack by the small first larval stage of the borer. Because the rings of inner phloem (inner bark food-conducting pipes) and the xylem growth ring (water-conducting pipes) are narrower than normal, damage to transport systems is much greater than if the tree were growing normally. The damage becomes even greater when the larvae increase in size as they proceed through their several growth stages.

Attacks by the Asian long-horned beetle (Anoplophora glabripennis), a recent non-native invasive species, may be related to drought stress, which is especially common in urban settings. There is also some anecdotal information that suggests sugars are important in adult beetle feeding, oviposition and growth of beetle larvae. Drought stress changes the carbohydrate production and storage processes, at least in sugar maple, with increases in reducing sugars and reductions in starch content in twig and root tissues. Nitrogen content and specific amino acids also increase in tissues of drought-stressed sugar maples.

Some evidence suggests that hemlock mortality related to infestation by the hemlock woolly adelgid (Adelges tsugae), another non-native insect, occurs earlier in drought stressed trees.

**Pathogenic organisms**

Usually the organisms involved in attacking trees predisposed by drought are facultative necrotrophic organisms; i.e., organisms that can survive on dead tissue but can colonize and kill trees weakened by stress. Prolonged drought predisposes trees to a variety of these organisms.

Damage by leaf scorch bacteria (Xylemella fastidiosum) that colonize the vascular system of tree leaves is accentuated by drought. These bacteria are obligate parasites; i.e., they require living tissues to complete their growth and life cycle.

Canker fungi (Diaporthe, Phomopsis, Botryosphaeria, Botryodiaphlia, Leucostoma, Valsa, Cytospora, and Nectria) species are commonly induced to attack drought-weakened stem tissue on trees. Some form annual cankers
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while others form perennial or target-like cankers.

Some evidence suggests that tree susceptibility to these organisms is related to bark-moisture content, as well as chemical composition and concentration.

Armillaria root disease (shoe-string root rot), caused by a number of Armillaria species, is a major colonizer and killer of drought-stressed trees. The resistance mechanisms of the tree are compromised, and roots are colonized and killed. Sometimes the fungus reaches the root-stem base and girdles it, killing the entire tree. Changes in enzymes that can counter-attack the fungus, sugars that stimulate growth of the fungus and fungal growth inhibitors, occur in drought-stressed trees and enable the fungus to penetrate, colonize, and kill tissues. The fungus is easily recognized by its black root-like rhizomorphs that are present in the soil, grow from tree to tree, and colonize the surface of the roots. The fungus essentially sits on the tree waiting for stressors, like drought and defoliation, to change the tree and allow the fungus to gain entrance.

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TREE CARE INDUSTRY - JULY 2003
Drought and other stressors

Sometimes drought occurs simultaneously with other stressors. For example, populations of defoliating insects can increase coincidentally with drought. The gypsy moth (*Lymantria dispar*) is an example. Historically, outbreaks of this voracious defoliator of oaks and other associated species have been linked with drought. The dramatic increases of this insect in association with drought may be related to the drought-induced changes of the food quality that increases egg production by the female moth and hence the number of defoliating larvae the next year. Or it may be related to the reduction in larval diseases associated with the dry conditions accompanying the drought. Both factors are most likely involved. The combination of drought and defoliation can be devastating to tree health and commonly results in total tree death.

The combination of wounding and drought also can have dire consequences for trees. Wounding trees during construction or pruning in the midst of a drought can result in larger wounds because of the greater potential for dieback. Larger wounds disrupt transport of food and water during a time when water transport is especially important. Finally, because drought slows and reduces radial growth of the tree, the wounds close more slowly, resulting in a longer exposure of wood to the establishment of decay organisms and the conditions that enhance their development and damage.

Drought "control"

Obviously we cannot prevent drought. If you know how to do this, you should share your secret with the rest of the tree care industry, probably for a very nice price!! However, there are some measures we can take to make trees drought-resistant or tolerant, if not drought proof. When the opportunity presents itself, we can select when saving — and choose when planting — drought-resistant/tolerant species. Choosing the proper location for new trees to maintain an adequate rooting zone...
and avoiding competition from man-made structures is very important. When saving trees, as much of the natural rooting zone should be saved and protected from disturbance, especially compaction. This can be done by creating no-trespass islands around all saved trees. Where possible, save numbers of trees in islands that can be treated later to select the tree(s) of choice for the area. This lessens root disturbance and prevents wounding of the trunks and branches during construction.

For existing trees, protect the root stem base, especially of young trees, from damage from string trimmers, lawn mowers and other lawn maintenance equipment. Preventing damage to the bark and wood at the base of the tree maintains a continuous ring of healthy water and food transporting tissues that keeps the whole crown moist and all of the roots "fed." This is especially important during drought.

Where possible, reduce root competition for water. Keep natural areas around trees; maintain a natural leaf mulch and limit understory plants. Establish groundcovers under trees rather than grass. Most groundcover vegetation is less competitive for water and restrictive to its percolation into the soil than grass. Mulch is better than groundcover if extended to the end of the drip line. However, don’t mulch too deeply. Mulch greater than about 3 inches can restrict the percolation of water into the soil, creating anaerobic (low oxygen) conditions that can damage the roots and mycorrhizae. Piling mulch too high around the trunk (volcano mulching) also is not good for proper root stem base development. Towers can create favorable conditions for Armillaria to colonize and kill the trunk.

Where soil compaction is a problem, remove the compacted areas from around the tree. Where compaction is a continuous problem, replace the compacted soil with a coarse material to provide a surface that will not compact as much as soil and will provide adequate aeration of the root zone.

There is a greater potential for dieback around wounds during drought conditions.

Water trees if possible whenever rainfall is insufficient for extended periods. Provide about an inch of water every week or so to keep leaves turgid. Prolonged irrigation with water from sources with excess minerals and or chlorine in the water can cause damage directly to the roots or to the fungi that form mycorrhizal partners with the roots. Mycorrhizae are very important during drought conditions because they increase the surface area of soil contact and increase the water absorbing ability of the tree.

Dr. Philip Wargo is a retired forest pathologist from USDA Forest Service in Hamden, Conn.
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Costs of Personnel Management

By Mary McVicker

"Doesn't apply" is an automatic response in very small businesses when the subject of personnel management comes up—and with good reason. Personnel management or worse, HR (Human Resources) is a corporate term with all that implies.

If you have a business with a single employee, you engage in personnel management. As the number of employees increases, the level of involvement with personnel management multiplies exponentially.

As businesses grow, policies regarding employees tend to evolve, often in a less-than-systematic fashion. Sooner or later, someone needs to take a hard look at the business’ handling of personnel matters.

Personnel management is a cost, whether it’s done as part of an office manager’s job or as something the owner handles on his own. Questions arise: is it a cost-effective function, regardless of how it gets done? What’s the cost of the business making the assumption that various elements of personnel management don’t apply to them?

At least two very real needs are inherent in every business:

1. Complying with the many legal requirements of being an employer, which requires specialized knowledge and expertise.

2. Recruiting and retaining employees who are productive, which is an ongoing effort.

Developing an awareness of the relationships between costs and personnel management becomes essential—and it has practical aspects as well. Several broad factors emerge:

- Personnel management is a cost center, not a profit center.
- There’s a link between personnel management efforts and profitability.
- The benefits of personnel management tend to be indirect. Because the link between efforts and benefits is so elusive, it’s difficult to assess the cost effectiveness of personnel management.

Not only are the links between efforts and results difficult to identify, personnel management can involve a wide variety of tasks and responsibilities in even the smallest business. Personnel work includes record keeping, training, recruiting, consulting and problem solving. The personnel manager is expected to have the answers to an array of questions.

A personnel person is on call for a range of expertise. Employee X is increasingly dissatisfied and unproductive. Employee Y, who is marrying and acquiring an "instant" family, needs to coordinate his benefits with those of his spouse, and so on. Employee Z wants more training and responsibility or will probably leave.

The tasks involved in managing personnel shouldn’t have to justify themselves on the basis of the dollars they bring into the business. Most of them don’t generate dollars directly but have a beneficial effect that pays off in other ways. Instead, you can make your business a better place to

Consider the Time

As businesses grow, various jobs tend to evolve, so that eventually those jobs may have more historical than practical significance. In a small business, personnel management is a top candidate for jobs that carry a certain amount of "that’s how we’ve always done it" types of baggage.

Consider payroll, for example. The historical lineup of tasks involved in that is considerable: collecting time cards, computing the time, calculating the wage, calculating deductions, requisitioning the checks, writing the checks, making the bookkeeping entries, compiling payroll tax reports, and so on. Many owners are reluctant to give up this job, even it takes time away from work that actually brings money into the business.

Investigate other options. Talk with other small business owners. A computerized system might be more efficient—and it could give you useful information. A well-designed system can help you match costs with revenues, so you can track the efficiency of crews. If it costs you $2,500 a week to keep a crew in the field and they’re only billing $3,000, you need to investigate.

Your immediate reaction may be that personnel management isn’t that time consuming—and you may be right. Then again, it just might open up a valuable new perspective.
work, which increases retention. Content employees will also recruit friends, which cuts down on your recruiting costs. You can avoid or root out disgruntled employees, who tend to be less productive and can sour an entire crew on your company.

Such an intangible can be a major asset of the business, and it would be a serious mistake to tinker with it on the basis of trying to make efforts more cost effective. Personnel efforts can be classified according to those that are:

- Legally required
- Very desirable
- Moderately desirable
- Marginal but desirable
- Not worthwhile

Paying employees, for example, comes under the heading of "legally required." The goal here, then, is to get it done efficiently and cheaply, with a minimum of headaches.

Cost and productivity

You can estimate the costs of various personnel efforts, but you can't approximate the effect on profit. The expense of even a minimal personnel "department" can be astonishing. The realization that this expense comes out of profit sometimes leads management to wonder why they need any personnel programs at all – beyond those that are legally required. A more useful question would be directed at productivity in the personnel area.

For example, who is doing the clerical tasks associated with payroll and record keeping? Too often it's someone in management, who is paid a management-level salary. The beleaguered manager (or owner) may be so busy trying to keep up with the essential record keeping that there's never time to do the work of managing. Part-time help or outsourcing may be a solution. Obviously this increases the payroll, but it may be the best use of management time. If the owner is spending so much time on paperwork he can't bid jobs or return customer phone calls, then the cost of a payroll service makes sense.

In addition to meeting essential payroll and record-keeping needs personnel management should focus on tracking absenteeism, reducing overtime costs, saving on benefits costs, or looking for low-cost benefits to offer employees, and expanding health and safety programs.

Personnel management will never be a profit center. It does, however, have a strong effect on the profitability of a business. Efforts that help employees be more productive and feel positive about their work and the business are cost effective. Poor personnel management almost invariably reduces the bottom line.

Mary McVicker was a tax attorney before leaving to teach and write. She has been a small-business consultant for more than 19 years in Oak Park, Ill.
**Mauget Names National Sales Manager**

J. J. Mauget Company announces the appointment of Paul Brown to the position of national sales manager, a new position within the organization. In this position he will be taking on responsibilities for market development in the western states and the development of national sales and marketing programs.

Brown has over 28 years experience in the industry. He most recently held a position with Bayer Corporation covering nine western states for sales to the turf and ornamental markets. He is a graduate of Missouri State University, achieving a B.S. in Biology.

**ProStar Fungicide**

ProStar 70WP fungicide is now available for control of foliar rhizoctonia and rust in ornamental plants. Widely used for control of fairy ring, brown patch and other diseases in turf for many years, this systemic fungicide contains the active ingredient flutolanil. ProStar may be used in greenhouses, saran and shade houses, and on outdoor container and field-grown ornamental nursery stock. Available in water-soluble bags, ProStar provides preventive and curative activity in the management of foliar, soilborne, and propagative diseases caused by rusts, species of *Rhizoctonia* and *Sclerotium rolfsii*. Although ProStar has curative activity, application is suggested on a preventive basis when conditions are optimum for disease development. ProStar may be used as a foliar spray or soil drench or through irrigation equipment for chemigation purposes. In addition, the product may be used as a cutting and bulb dip.

**Canadian Standards Association Names Award of Merit Winner**

The Canadian Standards Association honoured Arvin Hille at a special awards ceremony during their Annual General Meeting. Hille resides in Oregon where he is the Technical Director for the Oregon Cutting Systems Division of Blount Inc.

Hille receives the CSA Award of Merit for his exceptional leadership and devotion to the development of chain saw safety standards in both Canada and the United States. He has been involved in the design and development of chain saw related products for nearly 35 years.

"The Award of Merit is our way of recognizing the outstanding contribution our volunteers make to CSA every year," says Pat Keindel, president, standards, Canadian Standards Association. "Their commitment and leadership are the backbone of this organization. They help develop each and every one of our standards and we are very thankful for their hard work and dedication."

Hille exemplifies his instrumental leadership through his work as the principal investigator that created methods to determine the hazard potential resulting from the kickback of chain saws. He has been a leading member of the Z62 committee and, under his outstanding direction, standards were developed (Z62.1 & Z62.3) that resulted in safer products for consumers. He has offered his valuable expertise serving as chairperson for the CSA Z62 committees for the past six years and has served as a committee member since the early 1980's.

The Canadian Standards Association (CSA) is a membership association serving industry, government, consumers and other interested parties in Canada and the global marketplace.
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The patent pending Morbark Dry Colorant Processing System offers several advantages. Anyone with a Morbark tub grinder can color mulch by adding a Morbark dispenser attachment. Premium colored mulch is produced at a fraction of the cost of conventional methods. The Morbark process uses less water, and messy liquid dyes are replaced with dry powder. With a Morbark grinder, traditional coloring machines are not required. The process meters and applies dry colorant in the discharge area of the grinder during a primary grind. Material can then be stockpiled or processed immediately. During a final grind, water is added in the grinder and the hammermill action drives the color into the wood, resulting in a brilliant colored product at production rates limited only by the capacity of the grinder. For more information and a free video, contact Morbark at 800-233-6065 or visit their Web site at www.morbark.com.

EvapCool Hat

Whether you're on a construction site, directing traffic, or working at home, Gorgonz Performance Work Gear keeps you protected from extreme weather conditions. Utilizing patented technologies developed for the sports markets, Gorgonz brings innovative functionality to work-wear. The EvapCool Hat is a smart decision while working in the heat. It keeps the sun out of your face, and does not trap heat against your head. The EvapCool hat uses a special fabric called Hydroweave, that when activated, helps keeps you cool. For more information, contact Gorgonz, 720 S. Montford Ave., Baltimore, MD 21224. Phone: (410) 534-6320 or on the Web at www.Gorgonz.com.

Fog Light Rocker Switch

Cole Hersee Company announces the availability of its durable Fog Light Rocker Switch for on-road vehicles. This SPST Off-On switch is imprinted with the SAE fog light symbol. Part of Cole Hersee's extensive line of weather-resistant rocker switches, these rocker switches contain silver contacts to provide superior conduction compared to standard brass and copper contacts. A rugged internal gasket seal protects against adverse weather conditions and contaminants, such as salt, dirt, and grease. The switch easily snaps into place into standard holes on the dash. For more information about Cole Hersee Company and its products, contact Cole Hersee Company, 20 Old Colony Avenue, Boston, MA, 02127-2467; 617-268-2100, ext. 416. Information is also available on the company's Web site at www.colehersee.com.

13-Inch Pony Saws

Sherrill introduces the new ARS saw to their lineup of 13-inch pony saws. This new saw has a unique U-shaped handle, so you can hold it upside down, for ergonomically comfortable cutting of even the biggest branches. ARS nickel-plated blades resist the buildup of sticky, friction-creating sap, and are easily cleaned with mineral spirits. The new ARS pony saw joins the Fanno and Corona pony saws already offered by Sherrill Arborist Supply. For more information, please call Sherrill Arborist Supply at 1-800-525-8873, or visit them online at www.sherrillinc.com.
Root Barrier Panels
These barrier panels are scientifically designed to prevent tree roots from cracking and uplifting sidewalks, curbs, paths and paving. Made of durable and flexible polypropylene with added ultraviolet inhibitors. Available in 18-inch panels or 24-inch panels. Both models can be used for either surround or linear applications. The 18” panels assemble in seconds with the included, easy-to-install joiner strips and are widely used in street tree applications with trees that will reach up to an 18-inch trunk caliper at maturity. The 24-inch panels feature a zipper joining system that provides for instant assembly, without the use of a joiner strip and are used in conjunction with curb and gutter, parkways and other street tree applications with trees that will reach up to a 24-inch trunk caliper at maturity. To learn more visit Forestry Suppliers on the Web at www.forestry-suppliers.com or call for their catalog: 1-800-360-7788.

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Vermeer Manufacturing Company introduces the stationary HG365E electric-powered horizontal grinder. The HG365E serves the needs of customers who require on-site grinding indoors or outdoors. The organic waste reduction option eliminates fuel emission compliance issues, and it can function as a stand-alone waste reduction machine or it may operate as one component of a larger system. The Smart-Grind system monitors mill load rates to optimize machine production—and momentarily reverses feeding in the case of a jam. It also features an exclusive thrown object deflector system that reduces the quantity and distance of thrown objects. Vermeer’s patented Duplex Drum Rotor offers a 35 percent increase in inertia with a 10 percent weight reduction and allows operators to change any single hammer in minutes without removing other hammers. Vermeer Manufacturing Company of Pella, Iowa, U.S.A. offers worldwide sales, support, service and parts through an independent, authorized dealer network. Visit them on the Web at: www.vermeer.com to find a dealer in your area.

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Please circle 7 on Reader Service Card
Compaction of soils is generally considered harmful to tree health. Tree care professionals have used dozens of methods to deal with compacted soils (see the 1930s Davey training manual for "trees and dynamite" for example). The value ascribed to soil compaction is relative to the user. What is not necessarily desirable for the arborist is very important to the engineer. Compact soil is preferred by builders on construction sites.

Focusing strictly on the physical characteristics of the soil material, soils can be broken down into solid, liquid and air-filled portions (see Fig. 1). When a soil is compacted, the solids can break into smaller pieces, stay in place, or reconfigure into some new geometry. On any given site, soils are a shared resource serving multiple needs during development, use and maintenance. Understanding compaction and dealing with compaction in site management are keys to preservation, planting or management success. Compaction of soil meant to support landscape plants is certainly problematic, but effective site management of the problem requires more than an emotional response in the advocacy of trees.

**What is compaction?**

A working definition for soil compaction could be the change in soil volume or particle orientation resulting in an increase of soil solids per unit volume, or an increase in density. The term compaction has also been used as the active process during construction resulting in the increase of soil density.

Focusing strictly on the physical characteristics of the soil material, soils can be broken down into solid, liquid and air-filled portions (see Fig. 1). When a soil is compacted, the solids can break into smaller pieces, stay in place, or reconfigure into some new geometry. The liquid in the system is incompressible, so it either moves within the changing matrix of solids, or it has to be forced out of the system. Water can be forced out as the mud pumps and forms ruts. (In most desirable situations, water would have drained away before compaction began).

Air is compressible, will occupy the largest pores in any soil system, and easily escapes during compaction. Those largest pores are the easiest to crush under some load or compaction effort. So while we might state that compaction increases soil density (weight per unit volume), what is really happening is the decrease of air-filled porosity. Water-filled pores are still water filled, but the dimension or drainage capacity of those pores may be greatly diminished, and residual air-filled pores, once filled after the next irrigation event, may not drain.
The loss of air-filled pores is really problematic for the plant-minded person, since many of the mineral compounds acquired by the plant and the needed chemical reactions for availability rely on air-filled pores. Disruption of nutrient cycling, and many times a negative change in nutrient status of the system, occurs from a change in the aeration status of the compacted soil. The living components in soil also respond poorly, since most of the beneficial and symbiotic relationships between trees and soil microbes are dependant on an aerobic environment, as is normal root activity. A good number of detrimental organisms and chemical reactions can occur in the now poorly drained system.

Additionally, the soil solids are closer together; thus, the soil cannot be displaced as easily by an enlarging or penetrating root, impeding root growth. Of course, the severity of the impact depends on the amount of compaction and the soil type (since soil type is typically defined by the nature, size and shape of the soil solids you’re jiggling around). Sands and gravelly soils do not respond the same as clays and loams, which implies the consequences of compaction are different as well.

The loss of air-filled pores is advantageous for the building/construction/engineering-minded person, since compaction often results in a more uniform behavior and an increase in bearing capacity. In fact, properly tested or treated to a standard compaction regime, the behavior of the compacted soil is sufficiently predictable to allow for pavement or foundation design to known parameters. Of course, as it becomes standardized, so, too, does the rubber-stamp nature of compacting everything and ignoring important design issues. Thus, a sophisticated knowledge and practice become standard operating procedure without regard to site realities.

However, there is no use arguing the necessity of compaction as the most cost-effective method of increasing the strength and design utility of most soil materials through the reduction of bulk porosity and the sizing distribution of those remaining pores.

The table shows the fraction percentage by volume of air, water, soil solids in non-compacted and compacted soil, and the dry density values for each.

<table>
<thead>
<tr>
<th>Fraction percentage by volume</th>
<th>Non-compacted Soil</th>
<th>Compacted Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>25% Air</td>
<td>25% Water</td>
<td>6% Water</td>
</tr>
<tr>
<td>25% Water</td>
<td>25% Soil Solids</td>
<td>28% Soil Solids</td>
</tr>
<tr>
<td>50% Soil Solids</td>
<td></td>
<td>61% Soil Solids</td>
</tr>
</tbody>
</table>

Dry Density 1.34 g/cm³               Dry Density 1.77 g/cm³

Assumed particle density of 2.7 g/cm³

Moisture level held constant

Figure 1
Soil compaction results in an increase of bulk density (increase of mass per unit volume). It is important to remember that you are not gaining weight by compaction. You are losing air-filled porosity to the detriment of landscape plant root systems.

Water and compaction effectiveness (damage intensity)

If you ever packed a mud ball (my brother had deadly aim), thrown pottery in ceramics class, or just liked to play in mud as a kid, you probably have an intuitive feel for the role moisture has on soil. Engineers test and describe these properties in varied ways, but the mois-
ture-density relationship in response to controlled compaction efforts is particularly relevant. One of the most familiar test specifications in compaction is some percentage of proctor density, which is a particular moisture density relationship testing protocol.

The testing describes a relationship between soil moisture content (Fig. 2 – X axis) and the resultant density from a standardized compaction effort (Fig. 2 – Y axis). The test identifies the optimal soil moisture condition for effective compaction (saving labor) and the peak density to be expected from that effort (Fig. 2, label A). From this known compacted condition, empirical design or testing can define material behavior to better design a safe and durable pavement section. Moisture acts as a lubricant to achieve greater degrees of compaction for a given effort. Thus, going from a dry to moist soil yields a higher final dry density for a given compaction effort. There is a peak to this effect, after which the water literally holds the soil solids apart, and thus the final dry density drops with additional water. Now you have the best moisture content for a given effort to get the most compaction, and you have a density to test from in the field to see if compaction is adequate.

More effort can get to that density if the moisture level is off, but given a “standard treatment,” you have a good idea of what ought to happen.

I would like to clarify a common misunderstanding (seen in print more often than I care to count) regarding the level of compaction specified on many construction sites. Articles report that a soil was compacted to a density of 95 percent, which is indeed a normal (although abbreviated) specification for pavement section details. The sentence which follows will report that the result was a 5 percent soil pore volume. It seems like good math, but it is an inaccurate description of the soil. The problem is in the abbreviated specification language, which more correctly could read: compacted to within 95 percent peak density as per AASHTO T-99 soil moisture-density relationship. The specified test can change depending on the situation and the testing standard cited in the documentation. Essentially the 95 percent density is relative to some known compaction effort, chosen to reflect the compaction equipment, compaction effort and soil material on a given site. You can have materials compacted to 100 percent peak density and still have 30 percent porosity in some cases. The 95 percent level is often used as a mechanism for realistic rejection criteria in field verification. In most cases, this level of compaction is still problematic for plants. What is important to remember is that the reaction to compaction varies by soil type and that when a soil is compacted, what is lost is air-filled pores. We use density of the solids (or solids and liquid) to communicate compaction levels for the ease of measurement and interpretation from experience. What is really of interest are the pores (air-water-filled), which adds to some intuitive confusion. Penetration resistance is also used, but since it varies with soil type and moisture during the test, interpretation in the field is a bit more difficult. Misunderstandings are complicated by the use of different soil classification systems in agriculture vs. engineering professionals; thus “sand” means different things to each party. Several strategies have been devised and tested, demonstrating the ability to support various wearing surfaces from turf to concrete under varied use intensities.

**But it happened so fast**

There is a variety of compaction equipment for various soil types, levels of compaction, depth of compaction influence and site application dimension. Given the proper tool selection and the correct moisture level (associated with the peak density on the curve), you should hit the level of acceptance (around 95 percent) in three passes. On a given soil, at a given moisture level, you’ll do the majority of the possible damage in the first three passes, whether it is a skid-steer, bucket truck or wheelbarrow. Poorly monitored landscape activity can wipe out a greatly executed construction project, since most of the landscape work is in sensitive areas without restriction. The level of the damage is based on the load, moisture level at the time, and soil character. Tree-soil pro-
So what do you do?

In a perfect world, educating the client and advocating for soil preservation for the long-term success of the site at the concept design stage would be the standard course of action. Often the tree-soil resource is considered much later in the process, but this can change. While the cost of development increases by establishing protection zones, the cost of retrofitting a degraded system (or living with an unsuccessful landscape) is usually more, and thus total cost effectiveness of a successful project can accommodate preservation depending on the client’s perspective.

- Define the soil and tree resource and figure what is worth saving and where to cluster construction impacts. Soil tests and definition are needed, as are tree-plant inventory and evaluation to back your claims.
- Assigning protection zones must go beyond the tree individual to soil preservation zones, either for an individual tree or a section of landscape. Preservation is the key, when possible, but it must be feasible for the other members of the project team.

Tection zones that are breached only once time for a back-and-forth trip with heavy equipment can actually be rendered useless in some cases.

Compaction on a site reduces to three types: needed for proper construction, cost of doing business (staging and movement on site), and needless compaction from poor site management. While there is too much of the needless compaction, sensitivity to the success of the total project means negotiation and communication to keep losses to a minimum. Staging materials on future parking lots is a way of minimizing losses to the footprint of construction activity. Sites have a history, and previous activity may already have compromised a site to require some level of remediation, so consolidate activity and remediation costs can drop. Setting any protection zone really requires the presence of something worth preserving, or a definable compensation for expending limited site resources (time-labor-money-materials) in zone delineation if the site is problematic before activity begins. There are times when the project success or total cost is more important than the tree, and boundaries need to be changed mid-project.

The value decision is made in the planning stage, not on-site for contractor convenience. Since the bidding process and specification-penalty involved in the project were agreed to prior to project start, there does have to be a way to get project players together and negotiate mutually reasonable work-arounds to serve the client’s best interest, rather than a contractor or consultant’s desire.

Figure 2
A moisture density relationship curve. These curves are generated from nationally recognized standard tests, but often only hinted at when specifying “compact to 95 percent density.” The arrow labeled A shows the best moisture content for efficient compaction using the testing effort. The peak of the curve is the target density specified in the compaction details.
Work with the other players to create plans to avoid disruption of resources by design and in the field during construction. A pot of coffee and a box of doughnuts will save the world in this manner, both prior to project start during design and on tailgates for the equipment operators. It seems there is always someone with a cell phone on site; just get that person to call with questions and issues. And be reasonable, since you're all trying to make a living from this project and everyone can learn from each other. Coffee is a cheap way to get the calls coming to you rather than babysitting, and can be built into overhead if you get a reputation and see this as a real cost. You bought the coffee; now take the time to educate the operators to save time, trees and effort in the future.

In most cases, if you need to go over the site, it is much better to go over it dry, since it will incur less damage. If you go over it wet, while the density is similar, the loss of soil structure is still a problem not mentioned above. Moisture impacts and total sensitivity are very different if you are on sand or clay, so management of the site protection zones can be negotiated or defended differently. The size of the equipment is going to make a difference, as does the staging of operations. If portions of the site are already in a poor condition, focus preservation of the better zones and negotiate off of the pre-compromised areas. Remember that multiple small trips over time can exceed two large trips (well timed to minimize impact), but could be less if the timing is lousy. There are several methods and strategies to minimize the impact of limited travel over a site.

Several methods of bridging over, or blanketing over, areas of impact have been variously tested and adopted in many areas. This avoidance technique counts on spreading the load over larger land surfaces to minimize impact. Track machinery or tire selection can also help in this regard. Data from different studies are often contradictory, and anecdotal evidence abounds in “case studies” of success. Usually a similar case study in failure is not on the presentation schedule since few voluntarily apply to say “see my failure?” Definition of the soil, the moisture, the type and level of loading, and other factors (like say, the tree species) can play into the differences in findings. Note also that the simple addition of a protective layer — while changing the distribution of load — does give unlimited protection to repetitive loading but is not a silver bullet to unlimited access. The layer also changes moisture and air regimes in the root zone, and adds an overburden to the root zone which could ultimately figure into the total compaction level of the site after removal. Getting stuff on and off the site can do a good job in erasing any benefit of the layer on a large scale with machinery, potentially limiting the cost-effectiveness of hand operations.

One promising method uses a durable geo-textile (weed fabric) under the mulch/stone layer. If this is done, remember that the advantage is not in placement or removal, but in the ability of the fabric to stretch, thus widely distributing the load after some minor initial pushing down into the soil. It requires the edges of the fabric to be firmly anchored on all sides to avoid the sides from pulling in rather than the load pulling out. It also presumably requires a large enough zone to allow this method to be effective, with the textile extending well beyond the actual loading spots to allow the load to be spread.

Amelioration is beyond the space for this article, but rest assured the differences in the research data and the effectiveness of any technique in the field (including a simple shovel loosening of soil) rests on soil type, moisture level, and level of compaction.

Jason Grabosky is an assistant professor in the Department of Ecology, Evolution, and Natural Resources at Rutgers University in New Brunswick, N.J.
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OSHA Targets High-Hazard Worksites

The Occupational Safety and Health Administration announced June 9 their new site-specific targeting (SST) plan that will target approximately 3,200 high-hazard worksites for unannounced comprehensive safety and health inspections over the coming year.

"The purpose of our targeted inspection program is to more effectively allocate our inspection resources to those workplaces of highest safety and health risk," said OSHA Administrator John Henshaw. "This program gives us the opportunity to focus our enforcement where it will have the most benefit to workers and employers."

For five successive years, OSHA has used a site-specific targeting inspection program based on injury and illness data. This year's program stems from OSHA's Data Initiative for 2002, which surveyed approximately 95,000 employers to attain their injury and illness data for 2001.

This year's program became effective June 16 and will initially cover about 3,200 individual worksites on the primary list that reported 14.0 or more injuries or illnesses resulting in lost work days or restricted activity for every 100 full-time workers - known as the LWDII rate. For the first time, sites will also be targeted based on a "Days Away from Work Injury and Illness" (DAFWII) rate of nine or higher - nine or more cases that involve days away from work per 100 full-time employees. Employers that reported LWDII rates of between 8.0 and 14.0, or DAFWII rates of between 4.0 and 9.0, will be placed on a secondary list for possible inspection.

The average LWDII rate in 2001 for private industry in the nation was 2.8; the average DAFWII rate was 1.7.

Finally, the agency will again randomly select and inspect about 200 workplaces across the nation that reported low injury and illness rates for the purpose of reviewing the actual degree of compliance with OSHA requirements. These establishments are selected from those industries with above average LWDII and DAFWII rates. For more information, visit www.osha.gov.

In the States...

California - CalOSHA standards require the second person on a tree crew working near electrical conductors to be able to, "...render immediate assistance" to the person aloft. The Agency recently issued an interpretation of that requirement, stipulating that the second person could not be engaged in brush chipping, brush clearing or similar activities. In dialogue with its affected members in California, the Tree Care Industry Association (TCIA) challenged the interpretation. The challenge prompted CalOSHA to schedule a meeting with the affected parties to resolve the issue.

New Jersey - the State's legislature is considering a bill that would license crane operators. TCIA supports the measure to help ensure greater safety in crane operations, just as long as appropriate standards are applied to tree care companies and others using cranes for tree removal. The Association will submit a written position statement and have a representative present oral testimony in front of the NJ Assembly sub-committee reviewing the bill.

Peter Gerstenberger is vice president of business management, safety and education for the Tree Care Industry Association.
In the real world, one requirement that never changes is finding ways to help your crews work more safely. That's why Altec tree care equipment is built rugged, reliable and designed with integral safety features. Our complete line of aerial devices and wood chippers is highlighted by our newest machine - the Altec LRV60-E70. It will help your crews work smarter and more efficiently. This unit combines 75 feet of working height and smooth maneuverability with the lowest cost of equipment ownership in the industry and unmatched financing options. For tree care units that help you work safer and smarter, call the company that builds them - Altec.
Increasing Regulations on Hand-Held Outdoor Power Equipment and How They Affect You

State and federal regulatory agencies are turning their sights, with increasing focus, on the hand-held power tools arborists typically use in their work. These regulations impact how manufacturers make these tools, and this, in turn, affects you. How are manufacturers coping with these regulations? How should you cope?

First of all, what are the regulators unhappy about? Their primary concern has been exhaust emissions in two-stroke engines. Targeted are unburned hydrocarbons (HC), oxides of nitrogen (NOx), and carbon monoxide (CO). The main culprits are hydrocarbons, which are mostly responsible for the formation of ozone in the atmosphere and are considered to be the primary pollutants in the emissions created by small hand-held engines.

California, through its California Air Resources Board (CARB), has been the leader in this arena. Before 1995, there were virtually no restrictions on emissions. However, since then increasingly stringent regulations have reduced the allowable amount of unburned fuel to 54 grams per horsepower and hour. Meanwhile, the federal Environmental Protection Agency (EPA) has gotten involved, so that the regulations are nationwide. Its standard has been 184 grams of unburned fuel per horsepower and hour, but in 2003 that level dropped to 110, and, through a steady progression, will eventually get down to 37 in 2005, thus superseding the California standard.

Where are manufacturers in terms of meeting these regulations?

“We are all now facing what the auto industry was challenged with nearly three decades ago,” explains Martin Maass, manager, engineering/quality reliability, at Stihl in Virginia Beach, Va.
Manufacturers face continuing challenges. This is not to say that they haven't been aware of these challenges, or have failed to comply with the regulations to date – at least those who have stayed in the business. If they don't comply, manufacturers would not be able to sell their products.

"Manufacturers have incurred millions of dollars in costs to set up emission test labs," says John Foster, regulatory compliance manager at Shindaiwa, in Tualatin, Ore. "So far most of us have absorbed the costs, but some have paid the highest price of all by being forced to merge with another company, or simply going out of business."

"Over the years, all of our members have done a lot of things to make their machines cleaner than they were before," insists Patrick Curtiss, vice president of the Outdoor Power Equipment Institute in Alexandria, Va. "And they haven't stopped. It's a work in progress."

If the only issue was building a machine to meet the standards, there would not be a problem. But, notes
Mark Michaels, business unit manager with Husqvarna in Charlotte, N.C., “The trend for the past 10-15 years or more has been for less weight, more power, and better performance. The drive to lower emission standards is somewhat in opposition to that right now. There are ways emissions can be met that result in adding weight to the chain saw, which is not very good for the arborist. We don’t want to compromise performance just for emissions. We believe we can maintain the dynamics of lighter weight, power and performance through better ergonomics, design and speed.”

Solutions are being sought through engine changes, as well as other parts of the package. “Fuel can permeate through the tank material,” relates Curtis, “so manufacturers are looking at barrier coating and ways to reduce emissions through gas caps, fuel lines, and carburetors.”

CARB does not cover chain saws over 45 cubic centimeters (cc), so some manufacturers who were not able to meet the standards at 40 cc, go up to the 45 cc version. When asked just what the technologies are which will allow the making of chain saws that will meet emission standards without sacrificing performance, the manufacturers’ responses are somewhat vague – perhaps owing to competitive trade secrets.

“We introduced the first catalytic converter to hand-held tools in the United States in 1996,” says Michaels. Variations of the technology, adapted from the automotive industry, are used by a number of different manufacturers. Basically a platinum iridium catalyst mixes air with exhaust gases and hydrocarbon pollutants are oxidized to carbon dioxide and water.

The traditional two-stroke engine has evolved in the past as the most suitable for chain saws because of its power. But, stresses Foster, “The two-stroke is inherently dirty because of its design, so there are now some variations in the design. For example, there’s a stratified charge to induce fresh air between the fresh fuel/air mix and the exhaust that reduces emissions.”

Tom Parpart, product manager for Echo, in Lake Zurich, Ill., points out that there are some hybrids between two-stroke and four-stroke engines. Straight four-stroke has not been suitable for chain saws, Parpart says, “since they involve 13-15 moving parts and don’t have the high power of 12,000 to 15,000 rpms that chain saws require.”

Foster adds that the four-stroke technology used in automobiles has a very clean combustion, but he also notes that automotive engines are much bigger, so they can encompass more moving parts.

“Four-stroke,” adds Maass, “are a good option for trimmers and edgers, and are currently being employed by several manufacturers for this purpose. However, we found too many compromises involved in trying to use four-strokes in a chain saw. The power-to-weight ratio was never right, and the balance would not be right for an arborist climbing trees. We found that two-
strokes are a better option for chain saws.”

One technology that Echo has developed which is a positive step forward is called Power Boost, recently updated to Power Tornado. Parpart explains that this engine has four asymmetrical ports of different sizes, encased in solid walls, through which the oil and gas move up. But instead of having the ports go through the top, the oil and gas emissions are forced toward the back and out the exhaust.

“What this essentially does is burn the oil and gas more thoroughly, which minimizes emissions,” Parpart explains. “The good thing about this is that, unlike most emission improvements, this one actually maximizes performance. It gets as good or better speed and horsepower as in the past, and there are only three moving parts.”

Maass points out that improvements in engine performance are not the only way to approach the issue. He says that a company like Stihl, which manufacturers both the chain saws and the chains, is better able to have the two work in sync. “You want not just engine performance and low engine emissions, but high cutting performance,” Maass says. “This results in less strain on the engine, completing the job faster, with less running time and therefore fewer emissions.”

Maass also cautions that, “There is not a single low-emission type system that can be applied to all engines. All engines are different and each requires a special approach.”

All of this dovetails back to what Maass said earlier, namely that the mowing machines are now in a place comparable to auto makers 30 years ago. Even though many have been working on the problem of emissions for many years (with some success), they are still just getting started addressing some regulations that are escalating in stringency.

Where does this leave arborists, and what do they have to do?

The bad news is that, since manufacturers may have to sacrifice performance and/or increase prices to meet regulation, this will ultimately affect the arborist’s performance and budget.

The good news is that the arborist is not under the regulators’ guns himself. “Arborists are not under a lot of scrutiny to stay in compliance, and there is no testing in the field,” Michaels says.

All the arborist has to do is what he has always done, maintain his equipment, but do it even more conscientiously. “Use good clean air filters, good quality fuel, and good quality two-cycle oil, usually the one recommended by the manufacturer,” says Michaels.

“Air filters need particular attention,” adds Foster. “Everybody knows that, but it’s easily neglected. But now you can’t afford to neglect it. And make sure you use the factory-recommended spark plugs. The more complicated emission-efficient machines become, the smaller the margin of error becomes. We’re squeezing all we can out of our machines to make both pollution control and performance possible. But the user has to develop a stronger focus on maintenance to ensure the reliability and longevity of the product.”

Parpart agrees that “a good filtration system and a clean engine are now more important than ever. When working in trees, filters protect the engine from the intake of chips, dust and debris. Newer machines will be a lot leaner, running on less gas and oil. Also, use oil that meets the ISO-LEG-D and JASO-FC standards. These will provide lubricity and cleaning, protect from rust and corrosion, and extend the life of engines that will be running hotter and leaner.”

Will the changes in the machines increase prices?

The manufacturers all respond that they are struggling to absorb the costs and will try to keep the price from going up much, if at all. But, as Curtiss says, “A regulator has never come up with a regulation that can be implemented for free. The equipment will cost more.”
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The Knife Saver is a unique and inexpensive hand-held knife sharpening device that easily touches up chipper knives while they are still in the machine. This device will restore a sharp edge to a dull blade in minutes with just one pass. This diamond-honed, tungsten carbide tool has a preset angle that centers itself for easy sharpening. Simply lay the Knife Saver against your chipper knife and it automatically adjusts to the blade. This handy tool greatly reduces knife sharpening costs and increases chipper performance, chipper productivity and chip uniformity. Severely nicked or damaged knives must be removed and replaced. The Knife Saver kit comes complete with protective gloves and a mill file in a handy, compact storage box. Submitted by Cherry Valley Tractor Sales, (856) 983-0111. Manufactured by Bandit Industries, Inc., www.banditchippers.com.

$54.95

Plant Stress Detection Glasses
Ideal for growers, consultants, field scouts, etc., these special glasses allow you to identify stressed plants or turf while there is still time to react and correct problems caused by drought, pests, disease and other harmful conditions. The purple lenses block the green color reflected from chlorophyll found in vegetation and cause healthy plants and turf to look black or gray, while stressed plants and turf appear as yellowish-brown or pink. Glasses work best on sunny days with plenty of light. Available in glasses with a hard case or clip-on lens with a plastic protector. Submitted by Forestry Suppliers Inc., 1-800-360-7788; www.forestry-suppliers.com.

Plant Stress Detection Glasses, $29.95
Plant Stress Detection Clip-On Glasses, $26.95

Harrison Rocket
The Harrison Rocket from New Zealand is one of the greatest throw bags we have ever thrown! The quality of construction ensures that lead dust is a thing of the past and installing a rope has never been easier. Be the first in your forest to have one! Weight: 8 ounces, #10515, or 10 ounces, #10516. Submitted by Fresco, Inc., (763) 559-7071; www.frescoarborist.com.

$20.00

Skymate Wind Meter
The high-visibility Skymate measures current and maximum windspeed, average windspeed over 5, 10, or 13 seconds, and current temperature and wind chill. Features include a water-resistant housing, data hold to freeze most recent display, a replaceable 400-hour lithium battery, a replaceable plastic impeller, a lanyard, and threads for mounting on a tripod. It reads in tenths for any measurement unit you choose. Accuracy: ±3 percent when aligned with wind's axis. Wind Range: 5 - 89 mph. Temperature Range: 5°F - 122°F (-5°C to 50°C). Submitted by Forestry Suppliers Inc., 1-800-360-7788; www.forestry-suppliers.com.

$89.00
Splitting Maul
Here’s a Splitting Maul that makes regular mauls look like toys. Total weight is 12 pounds. The all-steel handle is 33 inches long overall. Dimensions of maul head are 2-3/4 inches high and 7 inches in length, with a width at the base of 3-1/4 inches. Submitted by Karl Kuemmerling Inc., 1-888-222-6166; www.karlkuemmerling.com.
$32.30

WaterRing
The WaterRing effectively disperses water, root stimulator and nutrients directly to the root system. By doing so, it greatly reduces water usage and eliminates wasteful runoff. To use, simply dig a trough the size and depth of the WaterRing around the base of the tree or plant and line the bottom of the trough with about 1 inch of organic mulch. Place the WaterRing in the trough and fill around it with soil leaving the top and spout exposed—cover this part with organic mulch, straw, leaves, etc. Then, fill at the spout and replace the cap. The WaterRing should be filled about once every two weeks, depending on conditions (new plantings may need more), and is recommended for trees and plants in 3-, 5-, 7- or 10-gallon containers, small ball and burlap, and bare-root stock. Submitted by Forestry Suppliers Inc., 1-800-360-7788; www.forestry-suppliers.com.
$12.50

Tree-Mate-O
Adjustable and durable, the Tree-Mate-O provides protective, flexible support, allowing a newly planted tree to gently sway while improving the form, taper, and root strength of the tree. To use, simply drive a “T” or “U” post into the ground 10 inches from the tree, remove the 3-inch snap-out section, and secure it to the post. Position the tree in the ring, replace the snap-out section, wrap the EPDM band around the tree below the Tree-Mate-O ring, and hook band ends up, over the side tabs. The Tree-Mate-O can be used with all types of trees and other similar tall plants, plus it is reusable. Fits both green “T” type fence and light duty “U” posts. Comes with one EPDM rubber band. Made in the USA. Submitted by Forestry Suppliers Inc., 1-800-360-7788; www.forestry-suppliers.com.
$6.90

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"California Special"
Interested in a powerful tree saw? Look no further! The 335XPT "California Special" boasts a 45cc engine (not the 35cc displacement found standard on 335XP models) giving you even more horsepower than ever. Other features include the Air Injection™ air filtration system and an Oregon® Intenz bar with side mounted chain tensioner.

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<tr>
<th>Item No.</th>
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<td>335XPT with 14&quot; bar &amp; chain (91VG-52)</td>
<td>$377</td>
</tr>
<tr>
<td>HU 335C 16</td>
<td>335XPT with 16&quot; bar &amp; chain (91VG-58)</td>
<td>$379</td>
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Berkshire Earthwings

This tree staking system is available in three sizes: #3C for trees up to 3-inch caliper, #5C for trees up to 5-inch caliper and #1OC for trees up to 10-inch caliper. They are particularly useful for trees planted in sandy soil or in windy locations. Made of steel with a pre-attached galvanized cable, Earthwings give a professional looking, securely anchored tree at an economical price, and are easier to use than other types of tree anchors. A patented design makes them easy to install in three steps: drive anchor, pull to lock in place, attach to tree. Trial Pack includes two dozen #3C with 20-inch cable, 1 #3C kit, 3/8 inch x 24 inch Drive. Submitted by Berkshire Products Inc., 1-413-229-7919; www.BerkshireEarthwings.com.

$50.12

Extra Long Augers

Here are some extra long 42-inch augers with 24-inch twist for drilling through huge limbs or large tree trunks. These extra long shank augers come in the following sizes: 9/16 inches, 11/16 inches, 13/16 inches & 15/16 inches. Submitted by Karl Kuemmerling Inc., 1-888-222-6166; www.karlkuemmerling.com.

$89.00 to $110.00

First Aid Blood Stopper Pouch

The new First Aid Blood Stopper Pouch quickly attaches to any Buckingham saddle and contains one large blood stopper to control bleeding until the victim can be administered First Aid on the ground. Secures to any saddle using either an attachment snap or 3/4-inch steel dee ring. Submitted by Buckingham Manufacturing Co., Inc., 1-800-937-2825; www.buckinghnmfg.com.

$15.55

Petzl Ball Locks

The Petzl Ball Lock AM D is still the best, only these come in high visibility red! The Petzl Ball Lock has become a standard in personal safety. Automatically locking. A carabiner for the vertical world. 28 kN. The Williams is Petzl’s pear-shaped Ball Lock. Great for sliding bridges, redirects and allows for more room as a main attachment point. Perfect when using a modern friction hitch, pulley and the climbing line splice all on a single carabiner. Automatically locking. 25 kN. Manufactured by Petzl. Submitted by Fresco, Inc., (763) 559-7071; www.frescoarborist.com.

AM D, $16.50
Williams, $18.50
Saddle Emergency Kit

This emergency kit is a MUST for all members of your crew. It contains one large compression bandage, a pair of latex gloves, and a one-way valve resuscitation mask. If you need a band-aid, go to the truck. If you need this stuff, the truck will be too far away. This kit allows you to provide help to an injured crew member while limiting your exposure. The kit also has a convenient connection point for attaching to your saddle, chaps, or belt. Manufactured by Buckingham. Submitted by Fresco, Inc., (763) 559-7071; www.frescoarborist.com.

$25.00

Multi Saw Lanyard

This three-piece multi chain saw lanyard set may be the last saw lanyard you ever own. Includes the lanyard and two saw connections. Additional saw connections may be added to every saw in your box, and they won’t get in the way during operations on the ground. The lanyard is longer than what you may be accustomed to – no need to disconnect for the long reaches. The large eye allows many connection options and the elastic keeps it out of your feet. The clips make it easy to switch rapidly between saws during removal operations and have strength enough to handle even the big saws. Manufactured by Bashlin. Submitted by Fresco, Inc., (763) 559-7071; www.frescoarborist.com.

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The Bucket Pump

Dielectrically safe manual bucket pump eliminates standing in water. Water in a bucket truck bucket has been a significant problem for linemen and tree trimmers since bucket trucks were first used. The Bucket Pump is a simple solution that mounts to the bucket. A tube extends from the pump to the bottom of the bucket. The pump removes water at one pound per stroke. It can pump an accumulation of 2 inches of water out of a two-man bucket in less than 3 minutes. Because the pump system is so small, it can be pushed out of the way and left on the bucket when not in use, or stored in the truck. Submitted by Midwest Arborist Supplies, 1-800-423-3789; www.treecaresupplies.com.

$44.95
Spyderco Delica Knife

The Spyderco Delica blade is a formulation of high-grade carbon and steel that holds a razor-sharp edge. Titanium Carbonitride is bonded to the steel, giving it high rust and scratch resistance, while providing a Rockwell hardness of RC-90. Note the Spyderco trademark thumb hole that allows the user to open the blade one-handed, even in the dark. The Zytel handle combines strength with light weight. Zytel is a nylon composite reinforced with 33 percent glass fiber. The patented “volcano grip” handle offers sure grip and maximum control, and is fashioned with a lanyard hole. Only finest exotic production stainless steel is used in the handle hardware, for years of rust-free use. Submitted by Sherrill Arborist Supply, 1-800-525-8873; www.sherrillinc.com. $59.00

Tear Away Bungee Chain Saw Lanyard

Despite its overbearing name, this saw lanyard should be standard equipment for anyone running a saw in the tree. It is constructed with a tear away safety pack that activates when 200 pounds of force is applied. This feature eliminates the possibility of the user being pulled out of a tree if the saw gets hung up on a falling limb. It measures up to 50 inches when fully extended to provide ample reach when cutting, but relaxes to 32 inches, which greatly reduces the possibility of getting tangled when climbing or working aloft. The saw, if dropped, will fall below the user’s feet without falling to the ground. (Not to be used with saws exceeding 15 pounds in weight.) Submitted by Bailey’s, 1-800-322-4539; www.baileys-online.com. $19.95

Hose Barb Pusher

This tool takes the headache out of the often difficult job of inserting hose fittings into PVC hose, especially in the field. Just slide hose fitting onto mandrel and insert assembly into hose. Use vise grip to hold mandrel within hose. Turning crank easily pushes fitting into place. Submitted by Minnesota Wanner, 1-800-247-4998; www.minnesotawanner.com. Tool for 1/2-inch hose, $64.00. Extra mandrel for 3/4-inch hose, $21.50

Power Planter Earth Augers

Power Planter builds a complete line of earth augers operated by portable power heads (battery, electric or gas) from 2 inches in diameter to 9 inches in diameter with different type drives. For arborists, the 2-inch and 3-inch diameters with carbide cutting tips are great for vertical mulching and deep fertilization of large, established trees. Carbide cutters extend the life of the auger bits, especially in rocky conditions. The 7-inch auger is ideal for planting live goods merchandised in gallon pots. Model #224HC is 2 inches in diameter with 18-inch flighting, 24-inch length, 1/2-inch hex drive, and a carbide cutter. Model #324HC is 3 inches in diameter with 12-inch flighting, 24-inch length, 1/2 inch hex drive, and a carbide cutter. Model #716 is 7 inches in diameter with 12-inch flighting, 1/2-inch hex drive and 16-inch length. Submitted by Power Planter, Inc., (217) 379-2614; www.powerplanter.com.

Model #224HC, $86.75
Model #324HC, $67.37
Model #716, $94.55

Bear Claw Saddle Knife

The Bear Claw is the perfect way to cut rope, webbing and leather quickly. The Zytel handle and finger hole make for comfort and sure grip. The dull point version is an incredible aerial rescue knife. It cuts through a climbing line in a single pass and allows you to remove a saddle in seconds without the chance of cutting or moving the injured climber. The sharp point version is one of the most aggressive cutting knives we have ever seen! Manufactured by Columbia River Knife & Tool. Submitted by Fresco, Inc., (763) 559-7071; www.frescoarborist.com. $28.50
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Canvas bags collapse, buckets are bulky, rope tarps are limited to one or two lines, and none of them handle layers of line well. Fold & Hold cubes are not only inexpensive and light, but they twist into the ultimate multiliner stacker! Untwisted, Fold & Hold stands on its own and has a large, easy-to-load mouth. You can keep several folded cubes (with line inside) nested inside an open cube with room for additional gear. The manufacturer rates capacity at 40 pounds, but we recommend 30. Made of water-shedding, translucent mesh nylon—not heavy, opaque cotton or canvas. Submitted by Sherrill Arborist Supply, 1-800-525-8873; www.sherrillinc.com.

12-inch Storage Cube, $12.00
14-inch Storage Cube, $13.00

**PhoneCenter Software**

You can get rid of all the paper phone memos! This software will organize all your incoming phone messages and schedule all your appointments. The appointment calendar has drag and drop functionality with day, week and month views. Print or email organized reports for each employee or salesperson. The software interfaces with MS MapPoint to route all your appointments on a geographical map. The software also synchronizes with QuickBooks to eliminate double entry of customer information. With this software you’ll never forget to call a customer back or lose another phone message. Submitted by Tree Management Systems, Inc., 1-800-933-1955; www.phonecentersoftware.com.

$99.00

**Ground Auger**

This 2-inch diameter Ground Auger is for fertilizing trees. Overall length is 29 inches. It has a ¾-inch shank turned down at the end to fit a 1½-inch chuck. Recommend using gas or electric drill with reverse (just in case bit gets hung up on roots or rocks). Submitted by Karl Kuemmerling Inc., 1-888-222-6166; www.karlkuemmerling.com.

$119.35

**Dica Outrigger Pads**

DICA pads come in a variety of sizes and are lightweight, strong, non-conductive and moisture resistant. Composed of solid (UHMW) material, their non-metallic surfaces are stronger than typical wood, plywood, or cast metal. This solid poly construction prevents delamination or moisture damage and is resistant to chemicals, solvents and oils. They clean up fast and easily with a quick scrape or wash. Flat black finish with ½-inch nylon rope handle. Flexible enough to return to original shape once load is removed, DICA pads reduce breakage associated with other types of pads. Wide temperature range, 24 month limited warranty for materials and workmanship. Two popular pads for arborists are the Model D1818 and D2224. The Model D1818 has a vertical load capacity of 55,000 pounds, yet at 1 inch x 18 inches x 18 inches weighs only 11 pounds. The Model D2224 supports up to 60,000 pounds vertical, 35,000 pounds at 45 degrees and measures 1 inch x 22 inches x 24 inches. Submitted by DICA Marketing Company, 1-800-610-DICA (3422); www.dicausa.com

Model D1818 $84.00
Model D2224 $112.00

**Equipment Storage Pouch**

The Equipment Storage Pouch quickly attaches to your Buckingham Pro Series saddle allowing you to safely store equipment such as web and rope slings, rigging or cabling equipment, water bottles, or miscellaneous tools while working aloft. An elastic retainer prevents equipment from falling out while allowing easy access into the bag. Uses two attachment snaps to secure to any Buckingham Pro Series saddle. Also available with one attachment snap or ¼-inch steel dee ring to secure to any other Buckingham saddle. Measures 9 inches long x 10 inches high x 3 inches wide. Submitted by Buckingham Manufacturing Co., Inc., 1-800-937-2825; www.buckinghammfg.com.

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### Events & Seminars

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<td>Tree Autopsy &amp; Dissection Lab Dr. Alex Shigo</td>
<td>Portsmouth, NH</td>
<td>1-800-841-2498</td>
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<tr>
<td>July 18, 2003</td>
<td>Longwood Gardens 2003 Conference on Woody Plants</td>
<td>Swarthmore, PA</td>
<td>(610) 388-1000, Ext. 507</td>
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<tr>
<td>July 23-25, 2003</td>
<td>Turfgrass Producers International Summer Convention and Field Days</td>
<td>Dayton, OH</td>
<td>1-800-841-2498</td>
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<tr>
<td>July 24, 2003</td>
<td>Greens Industry Professional Field Day</td>
<td>Washington, DC</td>
<td>(703) 250-1368</td>
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<tr>
<td>July 29-31, 2003</td>
<td>Penn Allied Nursery Trade Show (PANTS)</td>
<td>Fort Washington, PA</td>
<td>PANTS Trade Show Manager Sally O'Shea, CMP, (810) 544-5775 or <a href="http://www.pina.com">www.pina.com</a></td>
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<tr>
<td>August 9-13, 2003</td>
<td>American Phytopathological Society Annual Meeting - 2003</td>
<td>Charlotte, NC</td>
<td>Kathy Arro, (651) 454-7250, <a href="mailto:karo@scisoc.org">karo@scisoc.org</a> or <a href="http://www.apsnet.org">www.apsnet.org</a></td>
</tr>
<tr>
<td>August 27, 2003</td>
<td>Tree Care Workshop Oklahoma State University, Stillwater, OK</td>
<td>Mike Schnelle, (405) 744-7361 or <a href="mailto:mas@okstate.edu">mas@okstate.edu</a></td>
<td></td>
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<tr>
<td>September 17-20, 2003</td>
<td>2003 National Urban Forest Conference American Forests</td>
<td>San Antonio, TX</td>
<td>Donna Tschiffely, (703) 904-6932; <a href="http://www.americanforests.org">www.americanforests.org</a></td>
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<td>Plant Materials Conference Oklahoma State University, Stillwater, OK</td>
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<tr>
<td>October 5-8, 2003</td>
<td>Annual Conference and Trade Show Society of Municipal Arborists</td>
<td>Four Points Sheraton, Santa Monica, CA</td>
<td><a href="mailto:urbanforestry@prodigy.net">urbanforestry@prodigy.net</a></td>
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**Business Managers’ Workshop**

**Estimating Workshop for Tree Care/Landscaping Contractors** – Jim Huston

**The Guiding Principles of Tree Care** – Dr. Jim Clark

**When to Call the Landscaper/Arborist Panel** – Scott Jamieson, Eric Schultz, Trent Sible, Tom Tolkacz

**Forces, Physics, Trees & Arborists** – Erk Brudi and Ken Palmer

**Managing Your Hispanic/Latino Workforce** – Mauricio Velasquez

**Staying on the Road: DOT Driver/Vehicle Compliance** – Stephen M. Frisch

**Effective Leadership Skills** – Jeff Stokes

**Pest Management Update: Merit & Mites** – Dr. Michael Raupp

**Sales & Marketing Strategies that Work** – Jeff Stokes

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**Power Selling: What Makes a Top Salesperson** – Hal Becker

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If you have the right tools, growing gourmet mushrooms on urban wood waste is easy—and if you're a tree guy, chances are you have the right tools.

This article is a continuation of the techniques discussed in Recycling Urban Tree Waste with Gourmet Mushrooms: Part One (TCI May 2003), where I demonstrated how to use hand saws and drills to cultivate mushrooms without using gas powered tools—easy, small-scale and inexpensive. The focus of this article is growing gourmet fungus on urban tree waste using gas powered and other industrial arborist tools.

I have no intention of encouraging you to become commercial mushroom growers. I just enjoy sharing my pictures, techniques, and Web site for informational and enjoyment purposes. I'll show you some advanced methods, but be aware that there are a variety of ways to introduce fungus to wood. I believe many of the techniques shown here are original, and many have never been published before. As a trained commercial mycologist and a scientist who happened to become a residential arborist, I have developed these methods over a five-year period. Using fungus, arborist tools and urban tree waste, I've experimented and taken dozens of pictures to share with you.

Let's start with a review of some basic terminology.

**Growing mushrooms on spawn blocks**

*Spawn* is a single specie of pure, edible fungus which, in the clean lab, has been put on sterilized sawdust and allowed to grow completely through it. This fungus-permeated sawdust is commonly referred to as a "block," because it no longer resembles sawdust. When you get a bag of spawn, the sawdust is held tenaciously together in the bag and will be totally white with the fungus covering every part of every sawdust particle. Your mission is to open this bag and move the fungus onto new, fresh wood in order to promote continued growth off the spawn into the wood. Getting the spawn into the wood is the objective. I encourage you to start with white oyster mushrooms (*Pleurotus ostreatus*). They are very easy to grow, will grow on any hardwood, and are a fine edible mushroom. As shown in the photo above, you can harvest a crop off your spawn block. Enjoy them in the frying pan and then use the block to inoculate a log.
A spawn block, ripped in half. Outer tissue will be scraped off and the inner block crumbled so it can be spread on the fresh-cut wood surface.

Using spawn blocks to inoculate a log

*Inoculate* means to introduce the fungus from where it was (the spawn block) to where you want it to be (in the log or stump). A five-pound block of spawn costs around $25, and you can mix the spawn with fresh sawdust fourfold so you can create 20 to 25 pounds of spawn to work with (see the band mill section at right). For a spawn supplier, see the end of this article. I hope these pictures will inspire you to grow mushrooms, too.

Handling the spawn

When you receive your spawn block(s), understand that it is living material. If you mishandle it, you could damage it, and it will go bad. Keep away from heat sources and direct sunlight, and transport it as gently as you would an infant child. Only when you introduce it to the fresh-cut wood surface will you rip the block in half, scrape off the outer rind and crumble the insides into what once again resembles sawdust.

Using a chain saw to open up logs

Here is a series of images showing a few ways to use a chain saw to open up the inside of a fresh piece of hardwood. Once the fresh cuts have been made, spread the spawn into contact with the freshly cut surfaces. It is vitally important that the spawn does not dry out. Once the log is inoculated, it must rest in full shade.

Spawn blocks fruiting gourmet oyster mushrooms.

Freehand ripping of a V-shaped slab. The log is then opened up.

Plunge-cutting slots into a maple to introduce blue oyster (*Pleurotus columbinus*) spawn. Spawn packed in, cheese wax melted to seal in moisture.

Mycelium from sawdust spawn running across the surface of sawn wood.

A mini Alaskan mill used to slab a log to expose fresh-cut surfaces.

A shiitake (*Lentinula edodes*) spawn block crumbled on the fresh-cut face of a fresh elm log.

Spawn is spread evenly, and the log put back together and left in full shade.

This simple log bench has been spawned with King oyster (*Pleurotus eryngii*).
Using the wood splitter to produce firewood gardens

This is a very simple technique if you have a hydraulic splitter, axe, or even a wedge and sledge. The key here is to not split the wood apart completely. Simply crack it open in five or six places so one end is apart and the other end remains intact. You will pack the spawn into these cracks. If you’re using a wedge and sledge, pack the spawn in while the wedge is still in the wood. Pulling the wedge out will then close the split wood and compress the spawn. Then simply stack the logs in the shade like you would rounds of firewood to season. Give them at least a month of incubation and check them after rains, especially in the spring and fall. This technique is one of the easiest I have ever experimented with and no matter how sloppy you are, it always seems to work.

Not every trunk is worthy of milling into lumber, but with a bag or two of spawn, you can mill yourself a mushroom garden that could fruit gourmet edibles for years (or provide you with exotically spalted lumber next season). It is very important to start with a healthy, live, fresh log. The bark must be intact with no evidence of another fungus growing on the wood. Infestation by ants, or cavities in the trunk are also not favorable. Your choice of logs must be relatively clean and of a hardwood species, not from a conifer. It can be a flaring buttress section, crotch section or a curved log, but it must be fresh.

1. Crack each log in five or six places.
2. Pack the cracks full of spawn.
3. Stack your spawned lengths where they will always be in the shade.
4. Young Andrew holding a Lion’s Mane fruit body, the delicious Hericium erinaceus from cottonwood rounds spawned with this “firewood” technique.

Using a band mill to spawn large grade-B logs

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cheap, easy, and keeps the ends of your hard-earned garden from drying out, which would kill the spawn along the ends. Give this garden a month or two after a rain. The timing of when mushrooms fruit depends on a number of factors, such as:
- overall size of the log;
- vigorousness of the spawn;
- species and density of the wood;
- strain of mushroom;
- average temperatures;
- amount of rainfall.

Having your log resting in the shade is absolutely essential. If your region suffers through a drought, fill up six one-gallon milk jugs with water and screw the caps on tightly. Set them on top of the log and make a small puncture hole on both sides of each jug at the bottom to make a low-tech, low-cost, slow-drip irrigation system.

Sometimes what you don’t see is what it’s all about. The photo below is of mycelium. The wispy, filament-like growth you see here in this close-up is growing from only two single pieces of sawdust spawn. In our logs, we put down thousands of pieces of these fungal growth particles. Inside a band mill cut log, you disperse spawn throughout; top to bottom, side to side, end to end, completely. That’s what makes the band mill such an effective method.

There’s a lot of really good mushroom cultivation information out there, but what you’re seeing here is different. It’s written by a tree care professional for tree care professionals.

Mushrooms such as these delicious Blue Oysters (Pleurotus columbinus) can be induced to grow out the ends of your logs using the Frisbee technique.

**Spawning logs using the Frisbee technique**

Allow me to describe this fine method through the captions on the photos.

1. Get yourself a fresh hunk of live, non-diseased hardwood limb that is of the same diameter as a Frisbee you’re willing to sacrifice. Bore holes into the end-grain. Scrape the new sawdust onto the Frisbee.

2. To bore holes into the end-grain of a log, I use a hydraulic impact wrench running off a hydraulic circuit from my chipper.

3. After boring the holes, crumble up the spawn and mix it with the sawdust. Once mixed, pack the holes full of spawn. I use the non-drilling end of the drill bit to pack the holes tightly. Pack until all the holes are filled. Hopefully there is still plenty of spawn left on the Frisbee. In fine, omlette-flipping fashion, slap the spawn-filled Frisbee directly onto the end of the log. Screw or nail it in place, and set the log to rest in the shade. Ignore it for at least a month.

4. This is why I call it the Frisbee technique. The Frisbee seals in moisture and mushrooms will fruit out the edges of the log.

**Spawning rounds using the plastic sheeting technique**

As always, your wood must be from a live tree and free of visible disease, bug infestation or cavities. The plastic sheeting technique is almost the same as the Frisbee technique, except you use plastic sheeting instead of a Frisbee and big rounds instead of Frisbee-diameter ones. These are among my best and longest-producing gardens. While this technique is made efficient by the power of a hydraulic impact wrench and a 29-inch auger bit, it still requires some physical work.

1. Dig a shallow hole, bigger around than the round, only a few inches deep.
2. Place plastic sheeting across the freshly dug hole.
3. Sprinkle a layer of spawn on the sheeting.
4. Flop the big round directly onto the layer of spawn. You have just spawned the underside of this round.
5. I used the hydraulic impact wrench to plow 30 holes into the end-grain of this massive oak trunk in just a few minutes. Packing the holes with spawn can take well over an hour.
6. Once the holes are packed, cover the entire top surface of the round with spawn, and cover that with the plastic sheet. Secure the plastic to the wood with a staple gun. Let rest in the shade. You’re finished.

Using the stump grinder to inoculate a stump

Talk about easy! Easy, that is, if you have a stump grinder. The only real downside to this method is that you can’t move this one into the shade. Often the tree that was above it was its only source of shade. The advantages to stump culture using a stump grinder, besides being the easiest of all the techniques shown here, is that the mycelium will colonize the root system underground, where it is perpetually cool and moist, just the way mushrooms like it. Since there’s an immense food and water source all nicely packaged together down there, mushrooms can grow to immense sizes, seemingly right out of the ground. Here’s how it’s done:

1. Grind the stump.
2. During the grind, throw fist-sized chunks of spawn right into the area of action until the spawn block is gone, and the stump is a pile of mulch. Pack the mound firmly. You’re done. These sites fruit mushrooms sooner than most, possibly within a month, depending on the environmental factors discussed earlier.

Being a scientist who owns a tree care company has allowed me to share with you methods of growing gourmet mushrooms on tree parts quite unlike normal commercial or research growing methods. All the work was done in the name of recycling and reutilization of urban tree waste. This is my personal effort toward keeping the planet green, and of course, I thoroughly enjoy cooking with mushrooms and eating them. Good luck and Bon Appétit!

To buy spawn and mushroom cultivation supplies, visit: www.mushroompeople.com or call 1-800-692-6329 to request their catalog.

Visit www.treeguy.info for more techniques, such as reating a miniature log cabin spawned with shiitake, growing white morels indoors, growing black morels outdoors, and how one single tree guy recycles over 100 tons of tree waste a year.
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Aerial Lift Training, Competence Building and Proficiency Development

By Ken Palmer and Juan Torres

For the purpose of this article we’ll define an aerial lift as a bucket or operating platform often mounted on a fully articulated set of booms that are in turn attached to a motor vehicle designed to give stability to the whole unit during operation. Aerial lifts can be operated by controls at the bucket or platform and on the turret for elevation, extension and rotation.

Aerial lifts can dramatically increase safety and productivity in many tree care and removal operations. However, aerial lift devices have the potential of delivering an unprepared tree worker into an environment that can repeatedly test the very edge of their knowledge and/or competence level. This can be a recipe for disastrous experiences.

General care and maintenance

Routine inspections can save costly mistakes. Be sure that:

- A daily, visual inspection and operational check of the entire unit is performed.
- A pre-trip and between job road-readiness inspection has been done for proper storage of the unit and anything in tow.
- All daily, weekly, monthly and yearly inspections are completed as outlined in the operating manual and according to company regulations.
- The aerial lift unit is current with regularly scheduled dielectric testing and maintenance.
- All D.O.T. licensing requirements, registration and necessary company paperwork is completed.

A fall-arrest system.
Too often, tree workers make decisions based on personal experiences or a mixed bag of experiences of co-workers. Every company owner has heard this line: "I've done it before and it worked out OK." There are at least two problems with this type of decision making.

1. Though experience is an essential part of skill development, it can also be a very dangerous teacher. People sometimes experience way too much pain and suffering just to "chalk one up for experience."

2. It is not correct to base our critical decisions on what we have gotten away with before. That would be flirting with disaster, because everything from the trees to the equipment changes from job to job—often from one cut to the next!

Think about it

Arborists have to be able to think on their feet and adjust to their surroundings. Accidents can be reduced dramatically and productivity increased dramatically when tree workers have the information and knowledge to think first in order to make good sound decisions. The more they have developed the skill sets required to carry out challenging tree jobs safely and productively, the more successful they will be.

Safe, productive aerial lift operations require the operator to have thorough knowledge of its operational capabilities, limitations, restrictions and safety features.

Emergency preparedness and self-rescue

Though routine inspection and maintenance go a long way toward keeping equipment running properly, it is still very possible for a lift operator to become stranded or stuck while working aloft! Because of this potential, many

Hispanic workers

Along with a huge growth in the number of Spanish speaking workers in the tree care industry, there has been a large increase in the number of injuries and deaths among the non-English speaking workforce. Manuals, fact sheets, procedural information, warning decals etc. should be provided in Spanish and English. Check with manufacturers for help with Spanish manuals and warning decals. Also, Check with the Tree Care Industry Association about their broad array of Spanish-language training products at www.treecareindustry.org/content/buysell/prodsandsvcs.htm.

Deploying a bucket evacuation system.
professional operators believe that a "self-rescue" or "evacuation kit" is as important to emergency preparedness as a well-stocked first aid kit.

Emergency preparedness on the job means being prepared to deal with emergency situations to the best of everyone's ability. Training, preparation and planning ahead, are all necessary in order to be ready to handle the unexpected. Safety is everyone's responsibility.

Managing fall hazards

Professional tree climbers wear a climbing saddle that is designed to protect them in two very specific ways. The lower part of the saddle is designed to suspend the climber with an arborist climbing line when sitting (Suspension System). The upper part or waist belt typically has two or more D-rings for use with a work-positioning lanyard similar to a lineman's belt (Work-Positioning System).

Some professional lift operators wear a full-body harness with a dorsal attachment and a shock-absorbing lanyard that is connected to the upper boom and designed to bring a person to a gradual stop should they fall or be launched from the bucket or platform (Fall-Arrest System). An operator may wear a body belt and connect to the upper boom with a very short lanyard designed to prevent the operator from being able to fall from the bucket or platform at all (Fall-Restraint System).

All four forms of fall protection must be used correctly in order to function properly and each will have advantages and disadvantages. Though the fall-restraint system is relatively simple and inexpensive, it will restrict body movement when working. However, if we were to lengthen the lanyard it would no longer be able to prevent a fall from occurring. Even with a shock-absorbing lanyard, a fall in a body belt could be catastrophic. This is why a fall-arrest system is often preferred.

Each system is designed to function in a very specific way and must be inspected daily and used properly!

Pruning, rigging and removal

Pruning a large tree from an aerial device may require multiple set-ups in order to do the job properly. In some cases, pruning without climbing is really not practical. There are also times when the lift cannot get close enough to the tree to be used at all, or the lift cannot reach high enough to remove the top of a tree safely or far enough to rig a large limb safely. As with all things, aerial lifts have their limitations.

However, since the operator is not attached to the tree, risks can be mitigated and productivity increased in many situations. It is important to remember that
the trees and rigging equipment are still impacted by the decisions and actions of the tree worker. The whole tree or parts of a tree can still fail if the operator cuts a piece that is too big. The equipment can fail if it is pushed beyond its limits or if the rigging line is not allowed to run in order to decelerate the load and minimize the forces. Every time we overload rigging equipment, residual strength can be significantly reduced!

Until ten or 12 years ago, arborists utilized natural crotches for rigging points almost exclusively. Though this method has worked for many years and requires only basic equipment, it must be done properly. It also has its limitations. We have fewer choices of rigging points, which not only limits the workflow, it can also force us to cut a bigger piece than we want. In many ways, arborist rigging blocks (heavy rigging pulleys) can make rigging operations safer, easier and more efficient.

The use of friction points that are attached to the lift truck are very tempting to many people. There are at least two problems with this technique:

1. Because the rigging line is run away at an angle over to the truck, a bending moment (or sideways pulling force) can be added to the tree. In some situations, this could cause the tree to fail during the rigging operation.

2. If a large enough branch or piece of wood is dumped into the rigging line, it could move the whole truck. Not a good idea – especially if the aerial lift is attached to the truck!

There are a number of friction devices that can be attached easily to the base of a tree, eliminating the hazards above yet adding superior control and performance.

It’s always important to have a “boom position strategy.” In other words, have a plan to keep the booms clear of rigging/removal operations. When in doubt stop, think again, move the booms or move the truck!

In most situations it’s best to have the lift truck as level as possible for stability of the whole unit, as well as to manage stresses to rotation gears, turret and booms.

Outriggers must be firmly planted on solid ground with appropriate outrigger pads to spread the load when necessary.

When safer more efficient methods and skills are developed and adhered to, incredible results can be achieved.
Training and professional development

In the tree care industry the arborist/lift operator must have a good working knowledge of trees and tree care or removal operations. Training must be an ongoing process in order to succeed.

Opportunities for professional development can yield huge results in employee development and retention. Most professional arborists want to help your company to grow, and they need opportunities to grow with the vision of a prosperous future.

Sometimes we have to step off of the treadmill hustle and bustle to see the big picture. If we truly want to attract and keep responsible, productive people – and gain the respect of the general public for the truly important and valuable work that we do – then it’s up to each of us to develop and build our industry and our respective companies from the ground up.

See you at the top!

Ken Palmer is the president & CEO and Juan Torres is an aerial lift expert and bilingual instructor with ArborMaster® Training, Inc., www.ArborMaster.com, which offers courses in the requirements and skills necessary to safely carry out aerial lift operations.

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Standard Practices

(Management of trees and shrubs during site planning, site development, and construction)

1. ANSI A300 standards scope, purpose, application, and implementation

50. Part 5 – Management of trees and shrubs during site planning, site development, and construction standards

51. Normative references

52. Definitions

53. Management of trees and shrubs during site planning, site development, and construction practices

Annex A: Management information

Annex B: Reference publications

Forward (This foreword will not be part of American National Standard A300 - Part 5)

An industry-consensus standard must have the input of the industry that it is intended to affect. The Accredited Standards Committee A300 was approved June 28, 1991. The committee includes representatives from the residential and commercial tree care industry, the utility, municipal, and federal sectors, the landscape and nursery industries, and other interested organizations. Representatives from varied geographic areas with broad knowledge and technical expertise contributed.

The A300 standards can be best placed in proper context if one reads the Scope, Purpose, and Application. If approved after the public comment period, this document will present performance standards for the care and maintenance of trees, shrubs, and other woody plants. If approved after the public comment period, this document will be used as a guide in the drafting of maintenance specifications for federal, state, municipal, and private authorities including property owners, property managers, and utilities.

The A300 standards stipulate that specifications for tree work should be written and administered by a professional possessing the technical competence to provide for, or supervise, the management of woody landscape plants. Users of these standards must first interpret wording, then apply their knowledge of growth habits of certain plant species in a given environment. In this manner, the user ultimately develops his or her own specifications for plant maintenance.

When approved, ANSI A300 Part 5 - Management, will be used in conjunction with the rest of the A300 standards when writing specifications for tree care operations.

There will be at least one public review period, scheduled for Summer 2003, after which the Part 5 draft may be submitted to ANSI by Accredited Standards Committee on Tree, Shrub, and Other Woody Plant Maintenance Operations - Standard Practices A300 (ASC A300). Committee approval of the standard will not necessarily imply that all committee members voted for its approval. At the time it distributed this draft, the ASC A300 had the following members:

Tim Johnson, Chair (Artistic Arborist, Inc.)
Bob Rouse, Secretary (Tree Care Industry Association)

Organizations Represented

American Nursery and Landscape Association: Craig J. Regelbrugge
American Society of Consulting Arborists: Tom Mugridge; Donald Zimar (Alt.)
American Society of Landscape Architects: Ron Leighton
Asplundh Tree Experts: Geoff Kemper; Peter Fenger (Alt.)
Associated Landscape Contractors of America: Preston Leyshon; Debra Holder (Alt.)
Davey Tree Experts: Joseph Tommasi; Dick Jones (Alt.)
Bartlett Tree Experts: Peter Becker; Dr. Thomas Smiley (Alt.)
International Society of Arboriculture: Ed Brennan; John Hall (Alt.)
National Park Service: Robert DeFeo; Dr. James Sherald (Alt.)
Professional Grounds Management Society: Jennifer Gulick
Society of Municipal Arborists: Andrew Hillman; Mike Dirksen (Alt.)
Tree Care Industry Association: James McGuire
U.S. Forest Service: Ed Macie; Lisa Burban (Alt.); Mike Galvin (Alt.)
Utility Arborist Association: Jeffrey Smith; Matthew Simons (Alt.)

Additional organizations and individuals:

American Forests (Observer)
Beth Palys (Observer)
Fred Deneke (Observer)
Peter Gerstenberger (Observer)
Professor Charles Moore (NFPA-780 Liaison)
Richard Rathjens (Observer)
Sharon Lilly (Observer)

Contact for ANSI A300 Standards: Bob Rouse, Tree Care Industry Association, 3 Perimeter Rd. – Unit 1, Manchester, NH 03103, USA. Email: Rouse@treecareindustry.org. ANSI A300 web: www.treecareindustry.org/default.asp?main=content/laws/a-300.htm
50 Part 5 - Management of trees and shrubs during site planning, site development, and construction standards

50.1 Purpose
The purpose of this clause is to provide standards for developing specifications for the management of trees and shrubs during site planning, site development, and construction.

50.2 Reasons for management of trees and shrubs during site planning, site development, and construction
Trees are preserved during site planning and property development for a variety of reasons. Motivations for preserving trees are influenced by economic, social, environmental, and cultural factors. Trees are preserved for individuals or communities wishing to make the best use of its tree resources to further its ends. Managing trees during site planning, site development, and construction should maximize the benefits of trees.

50.3 Safety
50.3.1 Tree maintenance shall be performed only by arborists or arborist trainees.
50.3.4 Consulting arborists working on construction sites shall follow appropriate safe work practices.
50.3.2 This standard shall not take precedence over arboricultural safe work practices.
50.3.3 Operations shall comply with applicable Occupational Safety and Health Administration (OSHA) standards, ANSI Z133.1, as well as state and local regulations.

51 Normative references
The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. All standards are subject to revision, and parties to agreements based on this American National Standard shall apply the most recent edition of the standards indicated below.

ANSI Z133.1, for Arboricultural Operations -Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and Cutting Brush -Safety Requirements
29 CFR 1910, General industry
29 CFR 1910.268, Telecommunications
29 CFR 1910.269, Electric power generation, transmission and distribution
29 CFR 1910.331 - 335, Electrical safety-related work practices

52 Definitions
52.1 arborist: An individual engaged in the profession of arboriculture who through experience, education and related training, possesses the competence to provide for or supervise the management of trees and other woody ornamentals.
52.2 arborist trainee: An individual undergoing on the job training to obtain the experience and the competence required to provide for or supervise the management of trees and woody ornamentals. Such trainees shall be under the direct supervision of an arborist.
52.3 consulting arborist: An individual with advanced technical skills in arboriculture and a broad understanding of related fields such as legal, business, and regulatory, allowing him/her to act as an independent observer and/or expert.
52.4 critical root zone: The minimum area of retained roots necessary for adequate tree survival.
52.5 development impacts: Construction related actions that damage trees directly, such as severing roots or branches, or indirectly, such as soil compaction.
52.6 dripline: A boundary on the soil surface delineated by the branch spread of a single plant or group of plants.
52.7 factors: Issues that may affect the management plan for a particular site and affected areas.
52.7.1 cultural: Ethnic, historic and socio-economic issues related to human interactions.
52.7.2 economic: Monetary issues related to costs and benefits.

52.7.3 environmental: Impact issues related to the management plans.
52.8 plans: Written documents that provide various forms of information and instructions relating to the site.

52.8.1 construction: Project documentation on land disturbing activities for the purpose of: Constructing buildings; Constructing roads and installing utilities; installing other permanent man-made improvements.
52.8.2 demolition: Project documentation on the act or process of destroying structures, trees, or other site features during development.
52.8.3 erosion: Project documentation on the process by which the land surface is worn away by the action of wind, water, ice, or gravity.
52.8.4 grading: Project documentation on the disturbance of the earth. This shall include but not be limited to any excavating, filling, stockpiling of earth materials, grubbing, root mat or top soil disturbance, or any combination of them.
52.8.5 landscape: Project documentation on the area dominated by plants that are installed, as opposed to plants naturally occurring.
52.8.6 sediment: Project documentation relating to soils or other surficial materials transported or deposited by the action of wind, water, ice, gravity, or by other artificial means.
52.8.7 sediment and erosion control: Project documentation on erosion and sediment control strategies or plans to minimize erosion and prevent off-site sedimentation, by containing sediment on-site or passing sediment laden runoff through a sediment control measure prepared and approved in accordance with the specific requirements of an approval authority.
52.8.8 site development: Project documentation on grading or construction activities that will alter land cover and/or land use by the installation of permanent man-made improvements.
52.8.9 utility: Project documentation on entities that delivers a public service, such as electricity or communications.
52.9 preservation (retention): The deliberate holding and protecting of existing or planted forest, trees, shrubs, or plants during the development process
52.10 removal (demolition): The cutting or removing of tree stems from a site, leaving the root mass intact.
52.11 root zone: The soil area around the base of a landscape plant believed to contain the majority of a plants roots.
52.12 site survey: A map delineating the existing natural features and vegetation on a site proposed for development, taking into account the environmental elements that shape or influence the structure or makeup of a plant community, and including a comprehensive listing of all specimen and non-forest trees.

52.13 suitability for preservation: A rating that takes into account the factors listed in

52.13.1 good: Trees in good condition of tolerant species; trees with special functions (screening roadways or unwanted views); historically important trees.

52.13.2 moderate: Trees in fair condition of tolerant species; trees in good condition of intolerant species; overly mature trees; young trees that could be replaced with nursery stock.

52.13.3 poor: Trees in poor condition; trees in fair condition of intolerant species; trees with significant structural defects (decay, leaning, poorly attached trunks or branches).

52.14 tree: A woody perennial plant having a single usually elongate main stem generally with few or no branches on its lower part.

52.15 tree inventory: A document providing descriptive information of the trees within all or a portion of the project area based on a comprehensive listing of individual trees.

52.16 tree location: The spatial location of a tree.

52.17 tree protection zone: An area measured outward from a tree trunk representing the area of the roots that must be maintained or protected for the tree's survival and vitality.

52.18 tree protection zone devices: Structural measures, such as fencing or berms, installed prior to construction for the purpose of preventing access to tree protection zones during construction.

52.19 tree survey: A document providing descriptive information of the trees within all or a portion of the project area based on representative sampling.

53 Management of trees and shrubs during site planning, site development, and construction practices

53.1 Management of trees and shrubs during site planning, site development, and construction objectives

The objective of tree management should be to evaluate and manage tree and shrub resources during site planning, construction, and post-construction maintenance phases of development so that these resources integrate with land use and development.

53.2 General

53.2.1 Tree maintenance should be performed by an arborist.

53.2.2 Tree management plans shall be in compliance with applicable ordinances, rules, and regulations.

53.3 Planning phase

53.3.1 Tree resource evaluation

53.3.1.1 An arborist or other qualified person shall complete the tree resource evaluation.

53.3.1.2 The scope of the tree resource evaluation shall be established.

53.3.1.3 If a condition is observed requiring attention beyond the original scope of work, the condition shall be reported to an immediate supervisor, the owner, or the person responsible for authorizing the work.

53.3.1.4 A tree resource evaluation should include one or more of the following:

A. Trees (species, size, class, condition, etc.)
B. Plant community (structure, health, etc.)
C. Spatial location
D. Population estimate or inventory

53.3.2 Suitability for preservation

Suitability ratings should be assigned to the tree included in the inventory/survey (See Annex A-2):

A. Good
B. Moderate
C. Poor

53.4 Design phase

53.4.1 A written tree management plan should include one or more of the following:

A. tree locations shown on the land survey;
B. description of the applicable tree population (for example, species and condition distribution);
C. suitability for preservation ratings (Good, Moderate, Poor);
D. limits of construction, including demolition, grading and drainage, site and utility construction and landscape plan;
E. evaluation of effects to trees;
F. notes on the proximity of trees to existing and proposed structures, roads, utilities, etc.;
G. recommendations for retention/removal (see 53.4.2);
53.4.2 Tree preservation recommendations

53.4.2.1 Tree maintenance should be performed by an arborist.

53.4.2.2 Tree preservation plans should be documented in the site development plans. Documentation should include:

A. all trees to be preserved denoted by inventory/survey number or symbol;
B. tree protection zone of trees to be preserved (not represented by generic circle); and,
C. tree protection zone device location;
D. location of soil erosion control practices;
E. location of staging areas for demolition and grading equipment, field offices, material storage, and debris processing.

53.4.2.3 The tree preservation recommendations should be implemented. Consequences for non-compliance should be specified.

53.4.2.4 Demolition plans should detail all relevant site features.

53.4.2.5 Demolition plans should denote all trees to be preserved and removed.

53.5 On site pre-construction phase

53.5.1 Tree protection specifications and goals shall be communicated to those implementing the plans.

53.5.2 Tree protection zone device(s) should be installed prior to site work.

53.5.3 The tree removal contractor should not damage trees scheduled for preservation.

53.6 On-site construction phase

53.6.1 Implementation of the recommendations should be monitored by an arborist.

53.6.2 Compliance should be documented and reported.

53.6.3 Tree health should be monitored.

53.7 Post-construction phase

53.7.1 Tree preservation recommendations should be revised if the construction activity has significantly altered tree health and maintenance needs.

53.7.2 Tree health should be monitored.

53.7.3 Long-term tree maintenance specifications should be implemented.

Annex A – Management information

A-1: Some factors to consider when evaluating suitability for preservation

A-1.1 Tree health

Healthy, vigorous trees are better able to tolerate impacts such as root injury, demolition of existing structures, changes in soil grade and moisture, and soil compaction than are non-vigorous trees.

A-1.2 Structural integrity

Trees with significant amounts of wood decay and other structural defects that cannot be corrected are likely to fail. Such trees should not be preserved in areas where damage to people or property is likely.

A-1.3 Species response

There is a wide variation in the response of individual species to construction impacts and changes in the environment. Example: Walnuts are sensitive to construction impacts, while coast live oak is tolerant of site disturbance.

A-1.4 Tree age and longevity

Old trees, while having significant emotional and aesthetic appeal, have limited physiological capacity to adjust to an altered environment. Young trees are better able to generate new tissue and respond to change. Example: The potential longevity of the Monterey pine is low because of the mature age and infection with pitch canker.

A-2 Explanation of suitability ratings

A-2.1 Good: These are trees with good health and structural stability that have the potential for longevity at the site.

A-2.2 Moderate: Trees in this category have fair health and/or structural defects that may be abated with treatment. Trees in this category require more intense management and monitoring, and may have shorter life-spans than those in the Good category.

A-2.3 Poor: Trees in this category are in poor health or have significant defects in structure that cannot be abated with treatment. These trees can be expected to decline regardless of management. The species or individual tree may possess either characteristics that are undesirable in landscape settings or be unsuited for use areas.

Annex B – Reference publications

Las Vegas Resort Shreds Disposal Expenses

According to an environmental study conducted by the University of Nevada Las Vegas, the Las Vegas hotel and restaurant industries generate 27 percent of the total waste produced in Clarke County, Nevada. Just by the nature of the hospitality business, one might speculate that the amount of green waste included in that percentage is relatively small. But, when a resort hotel in the Southwest covers almost 40 acres, there tends to be a lot of foliage. That foliage needs regular upkeep and trimming; suddenly, the green waste going to the landfill is substantial.

Mandalay Bay Resort and Casino, near one end of the famed Las Vegas strip, covers 38 acres. They have approximately 2,000 trees onsite, including sumac, and oak, as well as an assortment of palms — Washingtonia, Date, Mediterranean, and Canary. The vast landscape requires daily attention from the in-house grounds-maintenance professionals.

This added up to quite an expense. Rate structures for hauling waste in Las Vegas are a bit different than those in other parts of the country. Fees in Clarke County are determined by the size of the container and the frequency of pick-up – not the volume of material being transported. So obviously, waste reduction is as important as controlling the volume that goes into dumpsters. Mandalay Bay recognized an opportunity to manage both with the purchase of a commercial-strength brush chipper.

Ed Hoffman, landscape horticulturist at Mandalay Bay, he has more than 25 years of experience in the green industry. He believes the investment in the machine was worth it.

Upon purchasing the Vermeer BC935 brush chipper, the resort no-
ticed immediate savings. “We were running through about three dumpsters a week, costing us $250 per dumpster,” Hoffman notes. “Now we only use one dumpster a month. Over time the machine paid for itself.”

Hoffman estimates that they can save up to $32,000 per year.

In addition to reducing the material headed to the dumpster, the resort realized the benefits of recycling some material and reusing it as mulch on various projects around the resort.

“The chipped palm waste still goes into the dumpster,” Hoffman says. “But I can use sumac and oak mulch in my outer planters.”

The chipper does an excellent job with the organic debris, according to Hoffman. “Some of the palms get a little stringy, but we always have an extra set of blades so when the blades start to dull up, we change them out.”

In addition to reducing material and creating a usable end-product, the machine also creates time efficiencies.

Hoffman estimates the unit saves at least 16 man-hours per week. Crews used to load the branches into trucks, take them to the dumpster site, unload them, and go back. Now, they take it all to one site and chip everything up at the end of the week.

Each day, the landscaping crew at the resort prunes dead palm fronds and tree branches, which will eventually be chipped into landscaping mulch or dumpster waste. Once the crew has cut down these branches, they are transported with a utility vehicle to a location onsite where they will stay until the end of the week. On Fridays the chipper is utilized for up to six hours.

Hoffman has two workers assigned to wash the machine after every use to check the fluid levels and sharpness of the blades.

Hotels and resorts aren’t the most common customer for brush chippers, but the machines are meant to solve challenges faced by professionals like Hoffman every day. It’s just a matter of penciling out the investment and realizing that money and time can be saved very quickly with the purchase of reliable, productive equipment.

Hoffman figured that out. His hunch—and his investment—paid back fast.

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Most

The following points are not the only most important things to remember about your saw operations, but should definitely be in your top ten.

In my travels and training, I often see what appear to be dangerous oversights by chain saw operators. Some of them tell me they didn’t realize the situation could be so critical; that they were unaware that rules and regulations exist regarding their work or the work of their employees regarding chain saw operation.

I’m not going to delve into rules and regulations with this article. Instead, I want you to think with me about common sense, not rules ...

Many times I hear that safety regulations complicate things. Protective equipment is heavy, it gets in the way, and it’s hot. “I can’t get my work done with these ... “ is a common complaint. But common sense tells me, and hopefully you, that in the long run working without these precautions increases the risk of injury and reduces productivity and profitability.

PPE

No matter what type or size of chain saw you use for any application, personal protective equipment (PPE) should be worn. I hear many stories each year involving professionals who are performing a job and an accident takes place. You don’t have to be an occasional user to have an accident. Professionals are subject to accidental injuries, too.

When it comes to chain saw operation, it is important (and in many cases the law) to use PPE to limit accidental injuries and their severity. Head, eyes, face, ears, hands, legs and feet should be adorned with PPE for certain operations. In the case of groundwork with saws, all the above items should be included.

Check local and federal OSHA requirements for chain saw operators and be an informed employer or operator. Employees have no other choice but to use employer-supplied PPE. We can all make excuses as to why we don’t use helmets, safety glasses, face screens, earplugs, gloves, saw chaps and heavy-duty footwear, but is it really common sense not to?

Saw safety features

Make sure you use up-to-date saws, especially if you provide saws for employees to use. Saws should be equipped with at least a chain brake, a throttle safety interlock, and a chain catch device. Older saws without these features should be replaced, updated or discarded from your saw fleet. It’s also a good idea to use reduced reactive force bars and saw chains whenever possible — especially in tasks where employees do not use saws on a regular basis and have minimal saw use time or technique training. Workers who only use saws occasionally can tire quickly and fatigue is a huge factor in operator safety. Never scrip on features that can reduce the chances of injury.

Training and manuals

Operators should be familiar with the owner’s manual of the saw and have specific instruction in the controls and basic safety concerns of saw applications to complete a given job task.

Reactive forces

The operator should have a clear understanding of the reactive forces related to chain saw operation. Pushback, kickback and pull-in are forces that can overpower the operator if he or she doesn’t understand them and plan accordingly. Proper stance and control of the saw during the task should be understood before operating a chain saw.

Saw run check

An operator must be familiar with how the saw should run. I suggest a five-point understanding of its run adjustment.

First, the air filter of the saw should be clean and properly maintained. This is the operator’s responsibility.

Second, once filled with proper fuels and oil, start the saw. Allow it to warm up and then check full throttle operation. A flutter or four-stroke sound should be present at full speed. The saw shouldn’t over-rev or sound as if it is running out of fuel. Top rpm should stabilize within the design specs of the saw as the throttle is held in the wide-open position.

Third, let the saw idle. The saw chain should never turn or even creep consistently at idle. Never operate a saw that dies when you release the throttle or if the saw chain continues to turn when idling.

Fourth, place the saw on the ground or hold it in a level position (at idle) for about a minute. With the chain brake on, roll the saw from side to side. The saw should idle at a consistent rpm. If the idle changes drastically, or the engine dies, the idle mixture is most likely too rich. The saw should continue to idle until it runs out of fuel, if need be. Proper idle settings are important. If the saw doesn’t idle, you will have to restart continuously, which is dangerous on the ground or in the tree. Restarting takes your mind off controlling the saw for the task.

Fifth, if all other steps are OK, disengage the chain brake and depress the throttle quickly. Quick acceleration without hesitation should take place. Hesitation is a good sign the carburetor is lean. It takes fuel to accelerate in this situation and hesitation means it needs more fuel.

If these five steps are followed and things check out OK, the operator is ready to work. If not, locate a dealer or your mechanic to get things adjusted properly. A saw should not be used for the task if it’s not tuned correctly.

The saw chain sharpness and tension adjustments should also be within specs before beginning a cutting task. Using an
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Tim Ard is president of Forest Applications Training, Inc., in Hiram, Ga., and an independent chain saw safety trainer and consultant. He may be reached at: www.forestapps.com or email info@forestapps.com.
Meetings & Conferences

Modern Arboriculture Institute: A Forum for Thinkers

By Alex L. Shigo

Cynthia Mills, president of the Tree Care Industry Association, and I agreed that we should get together and talk. But when? And where? Would you believe we did get to talk? Where? In Varese, Italy. Cynthia, Dr. Kevin Smith, Ken Palmer, Dr. Jim Clark and I were the American speakers on the modern arboriculture program developed by Dr. Daniele Zanzi in Varese, Italy, May 7-9, 2003. Also from the United States was Tobe Sherrill, owner of Sherrill Arborist Supply, Inc. in Greensboro, N.C. Toby serves the equipment needs of many arborists.

Here are a few comments on the meeting

Participants came from 14 countries, as far away as Australia. It was a REAL international meeting with over 400 people.

Cynthia gave her usual excellent presentation on the role of tree associations in a newly emerging world of modern arboriculture. She stressed the point that tree associations are needed. She also pointed out that the new name of the National Arborist Association is now the Tree Care Industry Association (TCIA). This new name change, Cynthia stated, more accurately defined the group. She was the meeting’s anchor speaker. She was very well received by a full house. I had good opportunities to discuss many subjects with Cynthia, and what a discussion it was. TCIA is very fortunate to have her.

Ken Palmer had climbing training sessions before and during the meeting. His helper for one session was Luis Moreno from Spain. I was very impressed by the people attending the climbing sessions. It was great to talk with many of them. They really love their work and they love the trees they work on and in.

Nelda Metheny was not able to attend, so Jim Clark took on a double role as speaker and gave her message also. He did a fine job, and drove home many points about trees and developers. Jim continues his passion for trees. You could feel it when he talked to a group, or when he talked with you. I have known Jim since he taught at Washington State University in Seattle. It was good to talk about old times.

Dr. Kevin Smith from the U.S. Forest Service discussed correct pruning and the importance of energy flow in trees. He stressed how energy and defense are related. Kevin is a powerful speaker.

Because our Modern Arboriculture books will soon be out of print again, Kevin will be cooperating with me on a modern arboriculture guidebook. The guide will be part of a Modern Arboriculture package I have developed. An increasing number of arborists, students, and teachers want much more chemistry. Chemistry is a part of arboriculture. We will give it to them. Stay tuned!

Think!

My message can be stated in one word. THINK! Too many people in this world are moving so fast that they do not take time to think. I tried, with many examples, to bring the message of thinking to the group.

History tells us in gruesome ways what power groups did to people who wanted to think. The best way to disturb the “axiom
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### Vermeer

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<td>Single Edge 16&quot; x 3&quot; x 3/8&quot;</td>
<td>$23.25</td>
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</table>

### Mitts & Merrill

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Part No.</th>
<th>Knife Description &amp; Size</th>
<th>SALE Price</th>
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<tr>
<td>Drum Style</td>
<td>KCH60001</td>
<td>Double Edge 4-1/4&quot; x 2-3/8&quot; x 1/2&quot;</td>
<td>$11.50</td>
</tr>
</tbody>
</table>

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people” is to get others to think. I think Galileo has been forgiven. It took time.

The tree autopsy workshop I had went from 20 to over 150 people. We did end the workshop by “suddenly” making a tree dragon. We are born curious. Thinking is limited only by our curiosity and imaginations.

The other speakers all came with strong messages. They told and showed many examples to drive home their points. They made people think. Of all the meetings I have been to for over 40 years, this meeting was the best. Dr. Zanzi and associates did a wonderful job!

I think the real value of any meeting comes from the discussions that take place in between sessions, and after sessions. I believe a speaker’s role should be to introduce topics and to stimulate participants to think about their message. All speakers did an excellent job of doing this. Discussions were intense.

The beginning of the meeting in Germany

At this point, I need to regress for a few moments. This meeting started in Osnabruck, Germany in September, 2002, where I talked about modern arboriculture and later had over 25 key people, mostly Germans, for an all-day tree autopsy workshop. Daniele and I met during this meeting and talked, and talked, and talked. I said I would go to a meeting in Varese to continue the theme of modern arboriculture only if the other members of the “Rot Pack” who also believe in the concepts of modern arboriculture were invited to be there: Niels Hvass – Denmark, Klaus Vollbrecht – Sweden, Luis Moreno – Spain, Pius Floris and Henk Slootjes – The Netherlands, and Glen Read – Norway. Even Emeritus “Rot Pack” member William Matthews – England, who recently received the O.B.E. (Order of the British Empire, the highest civilian honor), from the Queen of England, came. What a time! With these people there, there would be no doubt about getting concepts of modern arboriculture to all. They came. It was grand.

Modern arboriculture on a roll

Old friends smiled and connected again. New friendships were made. The talk was constant and everyone had to interrupt to get thoughts heard.

Daniele had stimulated all of Varese about trees and the new Modern Arboriculture Institute, from the Mayor’s office to every bookstore, to all in between! I signed the “City’s Big Book” and wrote, “Conditions of your people and conditions of your trees are the same. And, your trees are wonderful.” I also had a TV interview and made the newspapers with the message about the Modern Arboriculture Institute. It was a celebration, not for, but with trees! Modern arboriculture was on a roll.

Trees and tree issues were discussed openly in every group, even after, I think, too much good Italian food and wine. Trees, tree issues, and the Modern Arboriculture Institute dominated the conversations.

Education and old times

Even when some fine, thinking arborists know what is best for trees, it is not so easy to get new ideas into practice. We, as tree people, may have the solutions, but if our customers do not understand trees, we are all in trouble. This point was repeated and repeated that we must educate customers as well as ourselves. All agreed, it will happen.

It was wonderful to see and talk with many old friends. We reminisced about old times together. No doubt about it; tree people are warm, wonderful people. It was good to see my good friend Dieter Kusche from Berlin, Germany. He is now publishing a fourth edition of his popular book. The theme of modern arboriculture is indeed catching on. Old arboriculture is dying.

Many friends told me that they do understand the concepts of modern arboriculture, but it will take time to educate customers to accept the new concepts. This theme was repeated many times. Tree people must make honest profits to stay in business. They must earn and learn.

Stay healthy!

While in Varese I had my birthday, 73 years old. I feel I am not really old, but just beginning to mature. What happened the evening of May 8, you will never believe, and I still find it difficult to believe. A group of 150 people or more entered a magnificent old ornate hall as the musicians played “When the saints go marching in.” The cake, in the shape of a tree was about five feet tall! (I did not top it!)

The best, for me, was yet to come. It just so happened that the musician there had a clarinet exactly like mine, with a perfect reed. He invited me to play. I had not been able to touch a clarinet for over two years because of my cancer treatments. I picked up and played the clarinet. I’m sure what happened was a miracle!

Being over 70, and retiring at least four times, I think I have a prerogativ” to say a few things that I could not say before. For the last several years I have not been a member of several organizations. I cannot belong to any group that I cannot support. Many agree with me. The new Modern Arboriculture Institute brings new hope to all.

No new wheels needed

Smiles and discussions are the best ways to summarize the meeting in Varese. I hope, as many others do, that changes will come. There is nothing to be gained by reinventing a new wheel. Modern arboriculture will follow the ways of modern medicine, which started also in Italy at Padua University. Modern medicine started when Andrea Vesalio wanted to be free to think and began dissecting human bodies and recording with high accuracy what he saw and touched. The good news and bad news was that at Padua, Copernicus published his book on the earth’s rotation around the sun at the same time that Vesalio published his book on human dissections. Not so different from the time much later when Robert Hartig and Paul Sorauer published at the same time. Hartig wrote about tree decay and Paul Sorauer wrote about plant problems due to predisposition. In time, more people
Hallo, Dr Shigo!

A postcard printed by Fito Consult for the conference. In Italy, do the trees talk back?

As modern arboriculture follows the ways of modern medicine, it will become evident that layers of responsibilities and titles will be needed. When you go to a hospital for some treatment (as I have gone many times), you will pass through many layers, or people, with different titles and responsibilities. It would be ludicrous to call all of them doctors! Yet, every tree person is called by one name. When you study the salary charts you will see that the layers are already there. Old arboriculture will die.

The meeting was a continuum of miracles. Tree books, and short tree poems and stories were in every bookstore. Discussions about tree issues exploded in every group. There was excitement about the new Modern Arboriculture Institute. Tree people are tired of the same old stuff. Talk to Cynthia, she knows. Meanwhile, go out and connect with nature.

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Dr. Alex Shigo is the owner of Shigo & Trees, Associates in Durham, N.H.
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We've taken the next step! The new TCIA logo was unveiled at the June 18 meeting of the Board of Directors. You will now start to see this logo in our products, our ads and any printed materials put out by your association. This will be a gradual evolution, as you will see the old logo on products sent to you for some time to come. As we evolve, TCIA members will be receiving information in their monthly TCIA newsletters: Reporter Online, The TreeWorker Online and Tree Care Manager e-newsletter.

Members will be sent hard copies of the new logo for their use, and they will also be able to download copies from our Web site. Stay tuned for more details.

Be with us at TCI EXPO 2003

November is NOT that far away! It's closer than we imagine and there are new and exciting things promised at this year's TCI EXPO ... the world's largest tree care show!

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Watch for more information on the Educational Sessions in the August issue!
Sending a positive message in difficult times ...

Many employers are struggling to cope with an economic slowdown. Employees are aware of this, and many of them have concerns about their job, their company's "staying power" through the hard times, and the impact it will have on them personally. This affects employee attitude and performance. Even if you think your employees are OK, you are unlikely to know what is said in the most private of discussions they share among themselves.

At times like this, a positive message from management can be very reassuring. They know that money is tight, and are unlikely to expect a boost in the one area that is a measurement of how much a company cares about them—employee benefits.

The truth is that employers spend more than 40 percent over and above total salary on employee benefits. For most employers this amounts to over $15,000 annually per employee. However, when employees are asked to estimate what their employers are spending on them for benefits, they are aware of only 10 percent to 25 percent of what is actually spent on them. This means that typically more than 75 percent of the employer's investment in benefits is essentially wasted!

Communication is the answer. Providing a review of each benefit component, and then totaling it, shows employees their "hidden paycheck." Adding that to salary shows "Total Compensation." This is an impressive figure for most workers. Making them aware of this has proven to increase loyalty and lower employee turnover.

Many of the benefit dollars go to insurance, such as medical, life, disability, unemployment insurance, and workers' compensation coverage. These coverages are important, but there are gaps that need to be filled for most workers, such as additional life insurance, medical gap coverage, cancer, critical condition coverage, accident coverage and the like. An employer should not be expected to provide an employee's total financial planning package.

Fortunately, employees are willing to shoulder the load, if provided sensible alternatives. This is where introducing voluntary benefits can send a positive message to employees during these difficult times. Voluntary benefits fill the gaps, and employees appreciate the ease of obtaining them at work and the convenience of payroll deduction.

Worksite Solutions is a provider of these voluntary benefits, and is an affinity partner of TCIA. Their "U-Select" program of voluntary benefits combines the employee benefit education and voluntary benefits into one great package—and they have found a way to deliver it at no cost to the employer!

In a five-year study, these results regarding employee retention were realized:

- The employer’s overall annual employee retention was 75 percent;
- For the employees who did not receive total compensation education, the retention was 71 percent;
- For the employees who received benefit explanation, the retention was 87 percent;
- For the employees who purchased voluntary benefit insurance, and received benefit explanation, the employer realized a 96 percent annual employee retention!

Imagine the cost savings of having 96 percent annual employee retention! Typically the cost to replace an employee is equal to three to six months’ salary when lost work, acquisition, and retraining costs are added up.

We highly recommend utilizing the Worksite Solutions “U-Select” program, which can have a positive impact on your business. Lower turnover, increased morale and productivity are the result, and there is no cost to your business, only an increase in profitability. This is a great way to show employees you care about them and send a positive message during these difficult times. For more information, find them online at: aonworksitesolutions.com, or call Worksite Solutions at 1-800-704-0195 and ask for Paul Trottier, their National Implementation manager. Have a representative in your area provide this valuable TCIA member service to help your business thrive!

Day of Service on hold

TCIA’s National Day of Service, which had been tentatively scheduled in October in New York City, has been postponed. Regrettably, potential sponsors and partners in the city have been unable to commit to this worthwhile endeavor at this time. TCIA is looking at alternative dates, sites and partners. We will keep you informed of developments.

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Participate in Student Career Days at TCI EXPO

Mentor the industry’s “new talent”

Wouldn’t your company be a “valuable mentor” to the industry’s new talent? Share your vision and values with fresh, enthusiastic students! Participate in the seventh annual TCIA Student Career Days at TCI EXPO.

Participate in Baltimore, MD on Friday and Saturday, Nov. 14-15, 2003. This is your opportunity to present “your company’s positive image” to the newest members of the tree care industry—Job Corp, two-year and four-year students!

Call Sachin Mohan at (516) 625-1613 to see how your company can participate as a Career Days Partner! Call Bob Rouse at (800) 733-2622, ext. 117 to find out more about the student events.

This is your chance to discover new employees as well!

Q: Some of my employees compete in the Tree Climbing Competitions. While I was watching some of the other competitors, I noticed some unfamiliar equipment and was wondering if it is allowed at the TCC’s does it meet the current Z standard?

A: Not necessarily. The International Tree Climbing Competition deals with climbers from around the world so they must deal with safety standards from all of the other countries. You may see all kinds of gear there; saddles, helmets, mechanical devices, etc. So just because something is allowed at a competition it doesn’t mean that it meets ANSI Z133.1-2000.

Looking forward to project displays at TCI EXPO

Excellence in Arboriculture

We’re looking forward with great anticipation! Some fabulous entrees are a sure thing in this year’s Excellence in Arboriculture program!

With such valued media attention for winners and such respected recognition to be gained from this prestigious award, we are awaiting some rich, rewarding projects. The display of these projects promises to be exciting for Excellence participants and TCI EXPO attendees who will view this impressive work!
Media Alert!

Trees lower energy use by shading buildings in summer and reducing winds in winter. According to the Department of Energy, adding three trees in the proper spots west, north and east of your house can save the average household up to $250 a year. This month’s release, “Nature’s Air Conditioners,” is timed for the onset of hot, humid weather. Take this information – adapt it for your area with your contact information on your stationery – and drop it off at your local paper. It will be hard for an editor to resist. TCIA members may download a copy at www.treecareindustry.org.

WMC 2004 Island Hopping

WMC is moving...

...to St. Thomas. Marriott's new golf course on St. Kitts will not be ready in time for WMC 2004. Because we know how important golf is to the Winter Management Conference experience, & our support of The Tree Fund, we are moving WMC to Frenchman's Reef on St. Thomas.

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Wound Dressings and Cavities

Old arboriculture was based on flush cuts, wound dressings, and cavity treatments. The flush cuts were covered with lots of dressings that assured that a cavity would be there in several years. We have previously discussed flush cutting. So we will focus on wound dressings and cavities this month.

Wound dressings never seem to go away. Many of the materials used to cover wounds actually speed the processes of decay. The dressings were first used to cover flush cuts.

People who use wound dressings just do not understand trees. Trees are not animals. When trees are wounded, the wounds will be infected. Animals resist infections, and heal wounds. All trees will be infected after wounding, but trees also have boundaries that resist the spread of infections. While the pathogens are invading the tree, the tree is growing new parts in new spatial positions. So long as new parts forming in new positions exceed the amount of wood being invaded in old positions, the tree will live on and on.

Cavities are hollows in trees where the wood on the inner side of a barrier zone has been digested. Cavities result when the reaction zones fail completely and only the barrier zone remains to define the hollow from sound wood. Cavities form only because trees are compartmented plants, and that barrier zones limit the spread of infections into wood that forms after injury and infections.

Some of the graphics files on this CD are taken through the microscope. Many are text and cover basic concepts or Shigo's philosophy on tree care. Other files are photographs of trees, insects, fungi, or damage to trees – plus a separate folder on people.
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Firesafe Landscaping

With fire season officially open in California, the San Mateo County Times hopes its efforts to educate homeowners about firesafe planting and landscaping practices will pay off. Fire-safe landscaping means good design and maintenance.

The California Department of Forestry and Fire Protection educates homeowners on firesafe landscaping and home design.

Homeowners should pick plants with firesafe characteristics. These include low-growing plants that won't ignite tree branches, plants with broad, fleshy leaves that have little surface area to catch fire, deep-rooted plants that maintain moisture, and plants that do not extract volatile oils. Eventually all plants burn, so it's a matter of putting them in the safest places in relationship to each other and to the house.

Experts explain that there are three zones in fire-safe landscaping. The first is the critical zone – within six feet of the home, where homeowners want zero or very low-growing vegetation. The second zone is within 30 feet of the home, an area that homeowners generally are able to defend from fire. The third zone is between 30 and 100 feet of the home, called the fuel modification zone. In this area, thin out vegetation, mow grasses and space out trees. This zone is expanded to 150 feet for houses on hillsides, because heat rises and fire climbs. Here, homeowners should clear all dry grass, brush and dead leaves.

Wye Not a Desk?

Ignoring advice from an official committee regarding the fate of a 460-year-old fallen Wye Oak tree, Maryland Gov. Robert Ehrlich Jr. announced he will have a desk made for his office from some of the timber. According to the Baltimore Sun, the desk will cost $25,000 to construct and will remain the property of the state after he leaves office.

A 19-member committee under former Gov. Parris N. Glendening suggested that the remains of the tree be preserved and made available to the public. The committee asked specifically that no part of the tree end up in the hands of elected officials.

Ehrlich's office is off-limits to anyone who does not have an appointment.

The 96-foot-tall Wye Oak, originating in the 16th century, was widely considered to be the largest white oak tree in the United States. It stood surrounded by a fence at Wye State Park until a strong thunderstorm knocked it down last June.

Dick Orrell, a 72-year-old resident of Wye Mills who was on the original committee, recalled that several gavels were made more than a decade ago from a Wye Oak limb that fell during a storm. Many of those gavels were given to judges and are unaccounted for today, he said.

Orrell summed up his objections to the desk plan succinctly. "The way politicians are, the governor may take it with him when he leaves office," he said.

Sycamore Secret: Fungus Hates Heat After This Rainy Season

The Lawrence Journal-World (Kansas) recently reported that many gardeners in the Lawrence area considered the falling leaves in their yards this spring more appropriate for fall.

As tree canopies thinned and leaves dropped to the ground copiously, tree owners feared for the worst. Then, as if by magic, seemingly dead shoots bloomed with new life as early summer heat came.

While these folks may have been happy about ample rains for gardening, the precipitation had also created an environment that contribute to many tree diseases, including anthracnose.

Anthracnose is a fungal disease causing shoot blight common in sycamore trees. The fungus can girdle new stems and causes emerging leaves to wilt and die. Up to 90 percent of the developing shoots can be killed, and while the damage looks devastating, sycamores can make remarkable recoveries.

The key to salvation? Warmer weather, which is not favorable for anthracnose development. By mid- to late June, trees should be fully leafed out, and in most cases, most people will not know the tree ever had a problem.

Sycamores are not the only victims of this disease. Ash, maple and elm can suffer this seasonal disease too. Fungicides may be applied to new shoots in spring, which is difficult on large trees and rarely done. For the most part, these diseases will subside with the onset of hotter weather.

Clean up the fallen leaves and watch the new, healthy, leaves begin to emerge.

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TREE CARE INDUSTRY MAGAZINE
August 2003

Vanishing palms
Scheduling work crews

TREE CARE INDUSTRY - JULY 2003 79
I remember as if it were yesterday. It was a warm July morning, 1990. My younger sister and I, 15 and 12, were inside our home watching television. I heard my father hollering my name from back at the woodpile in our backyard. I opened the back door to see him walking towards me, with his hand wrapped around his neck, a work glove still on it. He announced that he had cut himself with the chain saw and needed a band-aid or something. When I inquired as to how bad the cut was, he removed his hand and I could see his windpipe. In shock, I ran inside and called 911.

Then, I grabbed bath towels to help slow the blood that was squirting from his neck. My sister ran next door to get our neighbor.

My father had been in the backyard cutting up a load of firewood. A log had rolled into the one in which he was cutting, causing the chain saw to bounce up toward his head. He pulled his head sideways, and the chain saw caught the left side of his neck.

The ambulance arrived and rushed him to the local hospital. The result was 97 external stitches and 53 internal stitches. A drain had to be installed in his neck to aid with the internal bleeding. The doctors told us that he had missed his jugular vein by a mere ¼ inch. He was very lucky to be alive, but the scar it would leave would remind him forever.

My father was a very experienced arborist of 18 years when this accident occurred. He must have cut thousands of logs on the job, but this little project at home was almost his last. It definitely goes to show that no matter how comfortable you are operating a chain saw (or any other machinery), hazards exist with even the most routine job. Safety is always of the essence.

Amy Becker lives in Fayetteville, Penn. Her father, Thomas Becker, worked for Allen Becker & Sons Tree Service & Landscaping in Westminster, Md.
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B) M8D-0044 - Plow Bolt Pocket
Patented holder design for use with the Plow Bolt Bit. Leading edges are angled and have a radius to reduce impact on the tooling system. It has a slim profile "in the cut" which further reduces force and drag on this tooling system.

C) R1MK-1942-0575 - 765RST Tool
Patented design that is an integral part of the DURA Disk Cutting System. "Keys" on the shank keep it from rotating. Flat carbide tip provides the best results for cutting stumps. Spring steel retainer provides positive retention which is easy to install and remove from the holder.

D) B9AK-1943-4500 - 765RST Block
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Conduct safety training with limited time disruption using TCIA’s Tailgate Safety Program. Tailgate is a brief, informal and informative lesson given at a job site. It generally involves some simple props and may be geared to the job of the day. Tailgate training has proven to be highly effective. Additionally, because OSHA requires employers to document that they provide safety training, the TCIA Tailgate Safety Program provides training documentation. The latest edition features 70 sessions covering workplace scenarios likely to cause harm. Use the test results for OSHA safety training documentation. Tree Care Industry Association, 3 Perimeter Road, Unit 1, Manchester NH 03103, Phone: 1-800-733-2622, Fax: (603) 314-5386; Web: www.treecareindustry.org.

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ArborLearn.org specializes in online arborist education. Courses include Plant Appraisal Workshop, Intro to Crew Leader Training, and Best Management Practices for Pruning. The Plant Appraisal Workshop is based on material from the CTLA Guide for Plant Appraisal and was developed by the ASCA, with assistance from ISA and TCIA. Intro to Crew Leader Training helps employees transition from labor to supervisory positions. Based on the "Crew Leader" manual of the TCIA's Home Study Program, it features additional materials and online testing. Best Management Practices for Pruning is based on the Best Management Practices for Pruning guide from the ISA and teaches how to prune according to ANSI A300 standards. Visit us at www.arborlearn.org.

The International Society of Arboriculture keeps its members informed of the latest practical and scientific information through the Journal of Arboriculture and Arborist News. Members receive each publication six times per year. In addition, members are entitled to discounts on more than 100 different publications, videos, and other membership items. To become a member, call ISA; annual membership is $105. International Society of Arboriculture, P.O. Box 3129, Champaign, IL 61826-3129. Phone: 1-888-ISA-TREE (472-8733) or (217) 355-9411; Fax: (217) 355-9516; E-mail: isa@isa-arbor.com; Web: www.isa-arbor.com.

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The Tree Care Academy offers courses that can be administered at your company and/or taken online for credentialing according to industry standards. Each course teaches and tests for critical skills and core knowledge tree care employees need to work safely and professionally. Employees: Holding tree care industry credentials will help you show your skill and value to your employer. Employers: Having employees credentialed according to industry standards gives you a way to verify that OSHA-required training has been performed. It is also a great way to identify motivated employees for future promotions. 1-800-733-2622 (U.S.), (603) 314-5380; E-mail: tcia@treecareindustry.org; Web: www.treecareindustry.org.
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The Tree Care Industry Association (TCIA) assists in enhancing the viability and increasing the success of tree care companies of all sizes. TCIA (formerly NAA) concentrates on what matters most to you—building a skilled workforce, creating a safe workplace environment, developing new business, employing sound business management practices, and translating regulatory issues. Contact TCIA... "the Voice of Tree Care." Find out how to affiliate YOUR company with the premier commercial tree care trade association, TCIA, 3 Perimeter Road, Unit 1, Manchester, NH 03103. Phone: 1-800-733-2622 or (603) 314-5380; Fax: (603) 314-5386; E-mail: tcia@treeindustry.org; Web: www.treeindustry.org.

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BIOPESTICIDES

American Arborist Supplies
ESSCO Distributors Inc.
Professional Tree Surgeon Supplies
Sherrill Arborist Supply

BLOWERS/DEBRIS

American Arborist Supplies
Arborist Supply Co., Inc.
Bishop Company
Blue Ridge Arborist Supply
Cherry Valley Tractor Sales
Cleaves Company, Inc.
ESSCO Distributors Inc.
J. P. Fuller Inc.
Stuart Brown Landscape and Arborist Supplies
Tree Tools
Western Tree Equipment & Repair

CABLES & BRACING

Alexander Equipment Co. Inc.
American Arborist Supplies
American Chainsaws & 2 Cycle, Inc
Bailey’s
Bartlett Manufacturing Company
Berkshire Products, Inc.
Bishop Company
Blue Ridge Arborist Supply
Cleaves Company, Inc.
ESSCO Distributors Inc.
Fehr Bros. Industries, Inc.
Fresco Arborist Supplies
Growtech, Inc.
J. P. Fuller Inc.
Karl Kuemmerling, Inc.
Labonville Inc.
Northeastern Arborist Supply
Professional Tree Surgeon Supplies
Shelter Tree, Inc./Tree Care Products
Sherrill Arborist Supply
Stuart Brown Landscape and Arborist Supplies
Tilton Equipment Company
Tree Tools
Western Tree Equipment & Repair

CHEMICAL ABSORBANTS

ESSCO Distributors Inc.
Professional Tree Surgeon Supplies

CHIPPER/SCHREDDER/VAC

Alexander Equipment Co. Inc.
Cherry Valley Tractor Sales
Forestry Equipment of Virginia
G & A Equipment, Inc.
Stuart Brown Landscape and Arborist Supplies
Tree Tools
Vermeer Sales & Service
WesSpur, LLC
Western Tree Equipment & Repair

CHIPPERS

Aerial Equipment, LLC
Alexer Equipment Co. Inc.
Arborist Supply Co., Inc.
Arborlink
Blue Ridge Arborist Supply
Cherry Valley Tractor Sales
Cleaves Company, Inc.
Crane & Shovel Sales Corp.
Droege Equipment Inc.
ESSCO Distributors Inc.
Forestry Equipment of Virginia
G & A Equipment, Inc.

CLOTHING

American Arborist Supplies
American Chainsaws & 2 Cycle, Inc
Bailey's Bartlett Manufacturing Company
Bishop Company
Blue Ridge Arborist Supply
Cleaves Company, Inc.
Commercial Cutters Direct
Fresco Arborist Supplies
Growtech, Inc.
Karl Kuemmerling, Inc.
Labonville Inc.
Midwest Arborist Supplies
Professional Tree Surgeon Supplies
Sherrill Arborist Supply
Stuart Brown Landscape and Arborist Supplies
Tree Tools
Vermeer Sales & Service
WesSpur, LLC

COMMUNICATION SYSTEMS
Arbor Computer Systems
Sherrill Arborist Supply
Tree Tools

COMPOSTING EQUIPMENT
Cherry Valley Tractor Sales
Cleaves Company, Inc.

COMPUTER HARDWARE/SOFTWARE
Arbor Computer Systems
ArborSoftWorx
Tree Management Systems, Inc./ Arbor Gold Software

CRANES
Crane & Shovel Sales Corp.
Mickey’s Truck & Equipment Sales, Inc.
MIRK, Inc./Toombs Truck & Equip. Co.
Royal Truck & Equipment, Inc.
Southco Industries, Inc.
Southeastern Equipment Company

DIAGNOSTIC TOOLS
Air-Spade (R)/ Concept Engineering Group, Inc.
American Arborist Supplies
Bishop Company
IML - Instrument Mechanic Labor, Inc.
Tree Tools
WesSpur, LLC

EDUCATION/WORKSHOP/REFERENCE
American Arborist Supplies
Arbor Supply Co., Inc.
Fresco Arborist Supplies
Rainbow Treecare Scientific Advancements (SciVance)

ENGINES & ENGINE PARTS
Aerial Equipment, LLC
Capital Engine Co.
Cherry Valley Tractor Sales
Cleaves Company, Inc.
Commercial Cutters Direct
Cummins Bridgeway, LLC
Engine Center
ESSCO Distributors Inc.
McDonald Equipment Company (MECO)
Sherrill Arborist Supply
Southeastern Equipment Company
Superior Diesel Inc.
Tree Tools
Western Tree Equipment & Repair

EXCAVATORS
Cleaves Company, Inc.
MIRK, Inc./Toombs Truck & Equip. Co.
Payeur Distributions Inc.
Rayco Manufacturing, Inc.

FERTILIZATION SUPPLIES
American Arborist Supplies
Bishop Company
Cleaves Company, Inc.
Horticultural Alliance, Inc.
Midwest Arborist Supplies
Northeast Shade Tree
Professional Tree Surgeon Supplies
Sherrill Arborist Supply
Western Tree Equipment & Repair

GROWTH RETARDANTS/REGULATORS
Horticultural Alliance, Inc.
Sherrill Arborist Supply

HERBICIDES
American Arborist Supplies
Forestry Suppliers, Inc.

HYDRAULIC TOOLS & EQUIPMENT
Aerial Lift, Inc.
Alexander Equipment Co. Inc.

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FOOTWEAR
Bailey's
Bishop Company
Blue Ridge Arborist Supply
Commercial Cutters Direct
Forestry Suppliers, Inc.
Growtech, Inc.
Karl Kuemmerling, Inc.
Labonville Inc.
Sherrill Arborist Supply
Tilton Equipment Company

FUNGICIDES
American Arborist Supplies
ESSCO Distributors Inc.
Professional Tree Surgeon Supplies
Rainbow Treecare Scientific Advancements (SciVance)
Sherrill Arborist Supply

GENERATORS
Capital Engine Co.
Cleaves Company, Inc.
J. P. Fuller Inc.
McDonald Equipment Company (MECO)
Northeastern Arborist Supply
Tree Tools

GRAPPLES/LOADERS
Cherry Valley Tractor Sales
Crane & Shovel Sales Corp.
Growtech, Inc.
MIRK, Inc./Toombs Truck & Equip. Co.
Payeur Distributions Inc.
Royal Truck & Equipment, Inc.
Southeastern Equipment Company

HARVESTING SUPPLIES

IML - Instrument Mechanic Labor, Inc.
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<td>Tilton Equipment Company</td>
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</table>
Tree Tools
Vermeer Sales & Service
WesSpur, LLC
Western Tree Equipment & Repair

PNEUMATIC TOOLS

American Arborist Supplies
Karl Kuemmerling, Inc.
Sherrill Arborist Supply

POISON IVY PROTECTION

American Arborist Supplies
Bailey's
Bishop Company
Cleaves Company, Inc.
ESSCO Distributors Inc.
Forestry Suppliers, Inc.
Growtech, Inc.
Midwest Arborist Supplies
Professional Tree Surgeon Supplies
SelfHEAL, Inc.
Sherrill Arborist Supply
Tree Tools
Western Tree Equipment & Repair

POWER PRUNING EQUIPMENT

Alexander Equipment Co. Inc.
American Arborist Supplies
Bailey's
Bishop Company
Blue Ridge Arborist Supply
Cleaves Company, Inc.
ESSCO Distributors Inc.
Growtech, Inc.
J. P. Fuller Inc.
Karl Kuemmerling, Inc.
Northeastern Arborist Supply
Professional Tree Surgeon Supplies
Shelter Tree, Inc./Tree Care Products
Sherrill Arborist Supply
Southeastern Equipment Company
Stuart Brown Landscape and Arborist Supplies
Tree Tools
Vermeer Sales & Service
WesSpur, LLC
Western Tree Equipment & Repair

PRUNING SUPPLIES

Aerial Equipment, LLC
Alexander Equipment Co. Inc.
American Arborist Supplies
American Chainsaws & 2 Cycle, Inc
Arborist Supply Co., Inc.
Bailey's
Bishop Company
Blue Ridge Arborist Supply
Cherry Valley Tractor Sales
Commercial Cutters Direct
Cutter's Choice
Droege Equipment Inc.
ESSCO Distributors Inc.
Forestry Suppliers, Inc.
Fresco Arborist Supplies
Growtech, Inc.
Karl Kuemmerling, Inc.
Kramer Equipment Co., Inc.
Labonville Inc.
Midwest Arborist Supplies
Northeastern Arborist Supply
Professional Tree Surgeon Supplies
Shelter Tree, Inc./Tree Care Products
Sherrill Arborist Supply
Stuart Brown Landscape and Arborist Supplies
Tree Tools
Vermeer Sales & Service
WesSpur, LLC
Western Tree Equipment & Repair

ROPE

American Arborist Supplies
Capital Engine Co.
Cherry Valley Tractor Sales
ESSCO Distributors Inc.
Minnesota Wanner Company
Northeastern Arborist Supply
Rainbow Treecare Scientific Advancements (SciVance)

REPELLENTS

American Arborist Supplies
ESSCO Distributors Inc.
Forestry Suppliers, Inc.
Sherrill Arborist Supply

RIGHT OF WAY/LAND CLEARING EQUIPMENT

Alexander Equipment Co. Inc.
Cherry Valley Tractor Sales
Cleaves Company, Inc.
MIRK, Inc./Toombs Truck & Equip. Co.
Rayco Manufacturing, Inc.
Southeastern Equipment Company

ROOT BARRIERS

American Arborist Supplies
Bishop Company
Horticultural Alliance, Inc.
Shelter Tree, Inc./Tree Care Products

SHERRILL Arborist Supply
Tree Tools
Western Tree Equipment & Repair

ROPE

Tree Tools
Western Tree Equipment & Repair

SOIL AMENDMENTS

ESSCO Distributors Inc.
Horticultural Alliance, Inc.
### Distributors

<table>
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<th>Distributors</th>
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<tr>
<td>Midwest Arborist Supplies</td>
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<td>Northeast Shade Tree</td>
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<tr>
<td>Professional Tree Surgeon Supplies</td>
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<tr>
<td>Shelter Tree, Inc./Tree Care Products</td>
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</table>

### Sprayers & Accessories

| American Arborist Supplies   |
| Cherry Valley Tractor Sales  |
| ESSCO Distributors Inc.      |
| Forestry Suppliers, Inc.     |
| J. P. Fuller Inc.            |
| Karl Kuehmerling, Inc.       |
| Minnesota Wanner Company     |
| Northern Arborist Supply     |
| Professional Tree Surgeon Supplies |
| Shelter Tree, Inc./Tree Care Products |
| Sherrill Arborist Supply     |
| Tree Tools                   |

### Stump Cutters/PTO

| Blue Ridge Arborist Supply   |
| Cherry Valley Tractor Sales  |
| Droege Equipment Inc.        |
| Karl Kuehmerling, Inc.       |
| Professional Tree Surgeon Supplies |
| Vermeer Sales & Service     |

### Tree Spade

| Alexander Equipment Co. Inc. |
| Cherry Valley Tractor Sales  |
| Opdyke, Inc.                 |
| Vermeer Sales & Service      |

### Sweepers

| Cherry Valley Tractor Sales  |
| Cleaves Company, Inc.        |
| J. P. Fuller Inc.            |

### Traffic Safety

| American Arborist Supplies   |
| Bishop Company               |
| Cleaves Company, Inc.        |
| ESSCO Distributors Inc.      |
| Forestry Suppliers, Inc.     |
| Karl Kuehmerling, Inc.       |
| Kramer Equipment Co., Inc.   |
| Midwest Arborist Supplies    |
| Northeast Arborist Supply    |
| Professional Tree Surgeon Supplies |
| Shelter Tree, Inc./Tree Care Products |
| Sherrill Arborist Supply     |
| Stuart Brown Landscape and Arborist Supplies |
| Tree Tools                   |
| Western Tree Equipment & Repair |

### Trenchers

| Air-Spade® Concept Engineering Group, Inc. |
| Vermeer Sales & Service                  |

### Tub Grinders

| Alexander Equipment Co. Inc. |
| Cherry Valley Tractor Sales   |
| Opdyke, Inc.                 |
| Rotochopper, Inc.            |
| Vermeer Sales & Service      |
| Western Tree Equipment & Repair |

### Used Equipment

| Aerial Equipment, LLC        |
| Aerial Lift, Inc.            |
| Alexander Equipment Co. Inc. |
| American Arborist Supplies   |
| Cherry Valley Tractor Sales  |
| Cleaves Company, Inc.        |
| Crane & Shovel Sales Corp.   |
| Droege Equipment Inc.        |
| ESSCO Distributors Inc.      |
| Mickey's Truck & Equipment Sales, Inc. |
| Mills Truck Sales            |
| MIRK, Inc./Toombs Truck & Equip. Co. |
| Opdyke, Inc.                 |
| Pete Mainka Enterprises, Inc. |
| Professional Tree Surgeon Supplies |
| Rayco Manufacturing, Inc.    |
| Royal Truck & Equipment, Inc. |
| Shelter Tree, Inc./Tree Care Products |
| Southeastern Equipment Company |
| Stuart Brown Landscape and Arborist Supplies |
| Thayer Chevrolet Toyota Great Lakes Ford Nissan |
| Trueco, Inc.                 |

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**TCI Buyer's Guide**

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### DISTRIBUTORS

<table>
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<th>Kramer Equipment Co., Inc.</th>
<th>Rayco Manufacturing, Inc.</th>
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<th>Cleaves Company, Inc.</th>
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### TREE PROTECTORS

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### MANUFACTURER

### ADJUVANTS/MISCELLANEOUS CHEMICALS

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### AERIAL LIFTS

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<th>American Truck &amp; Trailer Body Co.</th>
<th>MAT-3, Inc.</th>
<th>MTI Insulated Products Inc.</th>
<th>NiftyLift, Inc</th>
<th>Terex Telelect, Inc.</th>
<th>VERSALIFT, TIME Manufacturing</th>
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### AUGERS - EARTH & BITS

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<th>Karl Kuemmerling, Inc.</th>
<th>Power Planter, Inc.</th>
<th>Redmax-Komatsu Zenoah America</th>
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### BLOWERS/DEBRIS

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### CABLEING & BRACING

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### CHAIN SAWS & ACCESSORIES

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### CHEMICAL ABSORBANTS

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### CHIPPER/SHREDDER/VAC

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<th>Wood/Chuck Chipper Corporation</th>
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### CHIPPERS

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### CLIMBING GEAR

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### CLOTHING

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**Buyer's Guide**

29 [ICI]**

**JULY 2003**
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<td>Rotochopper, Inc.</td>
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<td>Shelter Tree, Inc./Tree Care Products</td>
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<td>Air-Spade®/ Concept Engineering Group, Inc.</td>
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