dressing into the deep tine 4 x 4-hole pattern. We have matched the topdressing material to existing field specifications adhering to a sand particle size greater than .5 mm. This has greatly improved the drainage."

Thatch levels in the Vamont Bermudagrass are effectively controlled by aggressive mowing practices and by maintaining a small layer of topdressing sand in the immediate blade layer. The field is overseeded with perennial ryegrass in September to facilitate late fall and early spring play. Lanigan Field has an infield turf area surrounded by an artificial surface track. It serves as a public use field for the University and the Charlottesville general community. The football team also may use the infield for conditioning programs in the summer. Activity is nearly year-round, with someone using the turf or track whenever weather permits.

The inner track area has a native soil profile with no internal drainage system. It has no crowning for surface drainage to prevent water accumulation on the track surface. It is the only non-irrigated athletic turf on campus. The grasses are a combination of turf type tall fescue and bluegrass, with a bit of common Bermudagrass infiltrating in some areas. The turf area bears the brunt of the most damaging throw events as the training and competition site for hammer, discus, and javelin. Shot put pits and jump pits also are located within this facility.

Rodgers says, "The only down time for our practice fields occurs from mid-December to mid-January. Spring sport practice may start as early as January 20 and summer camps run throughout most of the summer. The real key to keeping our practice fields under grass cover is to keep compaction to a minimum and keep our fields draining as well as we possible can."

Core aeration at 3 to 4 inch depth; screen drag cores and additional topdressing

Slice aerify early August

Deep solid tine aerification in September before onset of cold weather

Fertilization/nutrient application program for Bermudagrass generally 6 to 8 lbs. of slow and quick release N per spring and summer growth period. Slow release combines balanced levels of N and K.

An application of 13-24-12 at the rate of 1 lb. of P per 1,000 sq. ft. precedes overseeding.

Sulfates of Potash applied throughout fall and early winter based on soil test analysis.

Weed, disease and insect control conducted on an as needed basis following IPM guidelines

Soccer/Lacrosse Practice Fields: Upper Grass Practice Field
Football Practice Fields: McCue Football Practice Fields

Prepare fields for renovation in early May

In late May, core aerate, topdress and fertilize per specifications; 1 to 1.5 lb. of N/K monthly during active growing season

For soccer/lacrosse: late May or early June: sprig Bermudagrass in moderate wear areas; resod heavy wear areas

For football: sprig between hash marks, spot resod in heavy wear areas

Deep tine or core aerate in fall combined with topdressing and overseeding

Weed, disease and insect control conducted on an as needed basis following IPM guidelines

Public Use/Track and Field facility:

Fertilization program for mixed turf-type fescue and bluegrass turf includes N applications from late August through December, light N application at spring green-up, K applications during summer

Spring and fall core aeration followed by topdressing with blend of native topsoil and sand matched to existing soil profile

Turf maintained with rotary mower

Weed, disease and insect control conducted on an as needed basis following IPM guidelines

Jump pits and Shot Put pits maintained to competition level standards

Track surface maintained to competition level standards

Cambridge drainage systems have been installed on both of these native soil fields. Both fields now will perk at a specified 5 inches per hour. The Tifsport Bermudagrass is overseeded in the fall with applications generally beginning around September 15 and running through mid-October at the rate of 10-15 pounds of perennial ryegrass per 1,000 square feet. Rodgers shoots for overseeding on Tuesday mornings to allow the players to cleat in the seed during the two heaviest practice days. The lighter activity on Thursday and Friday, and off days on Saturday and Sunday, provide a time frame for fertilizer and biostimulant applications along with controlled irrigation to get the seed up and going. Rodgers says, "These are the hardest used fields on the complex and, as such, can receive excessive wear. They often are used at least six days per week from late July until the football season ends, which could be Christmas if the team is going to a Bowl game. Team conditioning drills begin in early February. Spring brings a total of 20 practices as mandated by NCAA and it is in full pads, with full contact, going full bore. Coach Groh understands all this and does everything possible to encourage his coaches to rotate drills and practice locations to preserve turf condition."

The Upper Grass Practice Field and the other two Olympic-sport sized practice fields are used for soccer and lacrosse. These fields have a native soil profile that has been augmented by topdressing with sand. Each has a .75 to 1% crown for surface drainage. The goal is to keep full turf coverage on the fields year-round. The Vamont base is overseeded with perennial ryegrass primarily to provide this turf coverage for lacrosse in the spring. The NCAA soccer season for both men and women is in the fall, the NCAA lacrosse season for both in the spring. For the sport in their competition season, either soccer or lacrosse, one practice field is dedicated to the women's team, one to the men's team. The third practice field is shared by the men's and women's teams of the other sport. During the summer months the fields are shared by all four teams for camps and conditioning.

The UVA Turf Field is a synthetic playing surface. It was originally built on an old practice football field in 1995, a gift from a former football alum to help the team prepare for late season and bowl games. While the football team still has use priority, they have opened this field to other teams and it cur- **(continued on page 33)**

Annual bluegrass and rough bluegrass in sportsturf

BY **ZAC REICHER**

Annual bluegrass (Poa annua) and rough bluegrass (Poa trivialis) are common on golf courses, but they are now becoming a problem on cool-season athletic turf. Both of these grasses are considered weeds because they are lighter colored than Kentucky bluegrass or perennial ryegrass. Plus the weeds are highly susceptible to diseases, and thin and die out during the heat of summer. More importantly, both of these grasses are very shallow rooted and quickly tear up with athletic play. Control of Poa annua and Poa trivialis in sports turf is difficult, and relies on both cultural and chemical control. However, control might not be economically feasible or practical, and it might be better to attempt to manage these weeds to keep them alive during the summer.

Poa annua is often an apple green and forms seedheads almost throughout the year.

Which one do I have?

Poa annua is especially noticeable in May and June because of its prolific seedhead production. Poa trivialis, on the other hand, rarely produces a seedhead when mowed. Poa annua tends to be a lighter, more of an apple green. Poa trivialis is a darker, shiny green (like the gloss when you spill gasoline on turf). It's difficult to tell these grasses apart under a magnifying glass as they both have boat-shaped leaf tips and folded vernation, but Poa annua's ligule is much taller than that on Poa trivialis. Also Poa trivialis produces many stolons whereas Poa annua has few if any stolons.

Poa annua is a winter annual that germinates in the late summer/early fall once soil temperatures fall below 70 degrees. Seedlings mature in the fall, overwinter in a vegetative state, and produce seed in late spring and early summer. Annual bluegrass is a prolific seed producer with each plant capable of producing more than 360 viable seeds. Annual bluegrass produces seed over several months and at any mowing height. Poa annua will out-compete all other turf species during late fall and early spring. Poa often dies in late summer in the warmer climates, but can also succumb to winterkill in the north. There are also perennial types of Poa annua that will live throughout the year, primarily in northern parts of the country.

Cultural control of Poa annua in a cool-season turf is almost impossible because some practices required to keep the desired turf healthy will also favor Poa annua. Constant aerification and mowing as high as allowable are two ways to minimize Poa annua infestation. Aerifying during the summer months when Poa annua is not germinating will be most beneficial. Allowing the field to dry out and undergo the first stages of drought stress (bluish green color or footprints that don't spring back immediately) will help minimize Poa annua. However, almost year-round reseeding essential to maintain quality athletic fields requires light frequent irrigation, which also favors Poa annua. A fertilization program where most of the nitrogen is applied in the fall is a must on cool-season athletic fields, but this also favors Poa annua.

Chemical control of annual bluegrass can be attempted with either preemergence herbicides and/or with a postemergence herbicide called ethofumesate (Prograss). Three applications of ethofumesate applied four weeks apart between September and December are recommended per year. Or two applications in the fall followed by an April application can also work. Ethofumesate reduces cuticle formation on Poa annua, so it is most effective during open, windy winters that will desiccate the Poa. Because of this, ethofumesate may not have maximum effect in protected stadiums.

Most preemergence herbicides on the market can be used in Poa annua control programs, but this is restricted to spring-use only fields. The most effective method is to allow the field to go dormant from drought, followed by application of a preemergence herbicide. The drought will kill the annual bluegrass and the

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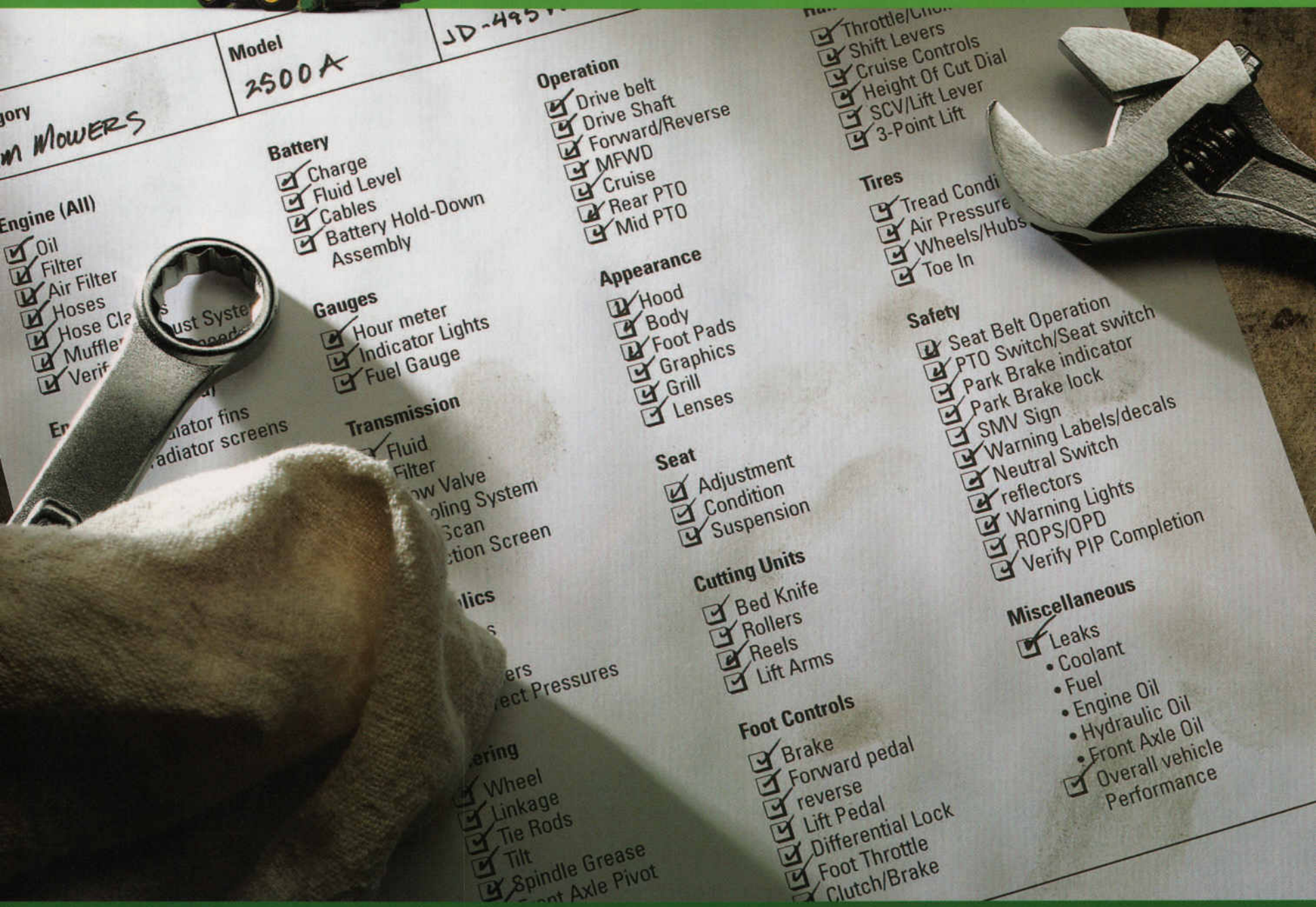

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Poa trivialis (left side of picture) is a darker green than Poa annua, and has a glossy texture compared to most other grasses.

preemergence herbicide will prevent it from germinating, but it will not prevent the desired turf from greening-up again. Application timing is important and herbicides must be applied before Poa annua germination (usually in August depending on your location). A second application may be needed in the late fall or early spring to control spring-germinating Poa annua. This technique may take many years to reduce the Poa annua populations and it will not be effective on the perennial type of Poa annua.

There are a number of other postemergence herbicides currently under investigation for controlling Poa annua, but unfortunately none are currently available. Bispyribac-sodium (Valent's Velocity) appears to have the most potential for Poa annua control, but we do not currently understand how this herbicide may affect overseeding and other cultural practices required on sports turf. Growth regulators are sometimes considered for Poa annua control on golf courses, but these have not proven effective in athletic fields.

Poa trivialis biology

Poa trivialis is a perennial that spreads by stolons forming light green patches in the turf. It is best adapted to shady, moist, or overwatered sites. In the heat of late summer, Poa trivialis thins and goes dormant resulting in brown patches of turf. When cool temperatures return in September, Poa trivialis regrows from crowns and stolons. Two theories persist about how Poa trivialis is introduced to a turf stand. Some believe that Poa trivialis grows naturally over most of the world and Poa trivialis seeds or stolons can germinate after lying dormant for many years, thus contaminating a turf stand. Most experts now believe that it is introduced as a contaminant in turf seed, with its occurrence increasing with the popularity of Poa trivialis for overseeding Bermudagrass greens and fairways. Seed producers have since self-imposed Poa trivialis growing and handling restrictions to help prevent this.

There are no good cultural methods to minimize Poa trivialis, other than by limiting its introduction when overseeding. Independent testing of 50 to 100 grams per seed lot is necessary to identify contamination of Poa trivialis in a lot. Since most states require testing only one gram of seed per lot, you will have to locate an independent testing lab to test your seed and be prepared to pay $200 or more to have the lot tested (a small cost compared to Poa trivialis contamination).

Currently, nonselective control with glyphosate followed by reseeding may offer the best chance for control of Poa trivialis. Since Poa trivialis spreads by stolons, multiple applications are required for maximum control. This should be done immediately after the season ends, on fields used only during part of the year, but this is impractical on most athletic fields. Sulfosufuron is a herbicide currently being developed by Monsanto with the hopes of controlling Poa trivialis selectively. We have worked with this product at Purdue and multiple applications during the summer holds tremendous potential for Poa trivialis control, while being safe on Kentucky bluegrass and perennial ryegrass. We have also found that reseeding can occur within three or four weeks after application. However, there is still more work to be done to fully understand how this product will work in athletic fields and it will likely be commercially available in 2005 or 2006. The previously mentioned bispyribac-sodium may also selectively control Poa trivialis, but data are still preliminary.

In many cases, control of these weeds is not practical outside of completely renovating a field. Thus, understanding how to maintain these grasses is important to maximize their performance. Light, frequent irrigation will benefit these relatively shallow rooted grasses. Reduce all unnecessary traffic on these grasses whenever possible. Preventative fungicide applications for dollar spot, pythium, anthracnose, brown patch, and summer patch will also help extend the life of these grasses. Heavy fall fertilization will benefit these grasses much like it benefits our desirable cool-season grasses. Finally, regular overseeding with Kentucky bluegrass and perennial ryegrass prior to and during the playing season will help maintain turf cover and footing in case the Poa annua or Poa trivialis thins or divots. **ST**

Zac Reicher is an Associate Professor and Turfgrass Extension Specialist at Purdue University. More information on professional turf management is available at www.agry.purdue.edu/turf/.

Poa trivialis can dominate a football field over time, spreading naturally by stolons and mechanically through aerification spreading stolons.

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Originally a male-dominated sport in Europe, Asia and the Middle East, field hockey has been popular with women since the game was introduced in the U.S. in the early 1900s. Over time, field hockey has gained in popularity and become a scholarship sport at the collegiate level. As field hockey programs continue to gain momentum, turf managers may need to consider and incorporate its needs when contemplating the switch to a multi-sport synthetic field.

Currently, the preferred surface for collegiate field hockey is AstroTurf, which provides players with the optimum playing surface, as its tightly knitted short pile surface allows for the quickest and truest ball movement. While AstroTurf is the ultimate synthetic surface option for field hockey players, particularly at the highest levels of competition, many institutions are beginning to convert their multi-sport surfaces to newer infilled polyethylene turf systems. The primary reason behind this shift is due to the infilled systems more closely mimicking the favorable attributes of well-maintained natural grass. Infilled turf can however be designed to accommodate and benefit field hockey without compromising the requirements of other sports.

Typical multi-sport fields are infilled to a depth which leaves approximately 3/4-inch of exposed fiber. Infill mix ratios range from 25-50 percent sand by volume. This composition does not provide a surface conducive to competitive field hockey as players prefer a harder, flatter surface to best showcase their talents. Raising the infill height and increasing the percentage of sand creates the effect of (continued on page 24)

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Tree treatment technology

Use and benefits of chemical delivery methods

There are several tree treatment systems available for delivering chemicals to trees. We asked several providers of chemical delivery methods to discuss the inner workings of their company's technology and methods.

Arborjet Inc.

Arborjet Inc. has developed tree and plant injection systems designed to preserve and protect the natural and urban forest with minimally invasive methods, environmentally friendly products, and accuracy in product delivery. Arborjet methodology decreases the amount of injection sites to a tree. Arborjet devices and formulations can effectively inject a 30-inch diameter tree with only 6 to 8 injection sites.

Arborjet features three different portable tools and a full line of products to cover a broad range of arboricultural applications.

Arborjet's air/hydraulic system, powered by compressed air is for high production, and allows the introduction of high volumes of medicaments into the tree. It works best with deciduous and ornamental trees, but is also effective on evergreens. The hand-operated system is used in situations where there are a minimal number of trees to be treated. The Tree I.V. system is a high-volume, low-pressure micro infusion system, and is ideal for evergreens and difficult-to-treat trees. Each Arborjet system comes with all necessary accessories. All devices increase injection speed and efficacy, and the milliliter accuracy won't leave you guessing about product uptake.

Arborplug technology is common to all three Arborjet delivery devices. Arborplugs are plastic plugs that are set only 5/8-inch into the active sapwood of the tree. The needles of the devices pierce the rubber septum inside the plug and deliver the product. Arborplugs are important in keeping injectable products "in the tree and not on the tree." They are left in the tree after injection and help protect the wound from possible infection or infestation. Trees can quickly respond to wound closure by producing a callous. Arborplugs allow higher volume, pressurized injections, which decrease injection time, with no leakage, no bark separation, and no open wound after injection.

Arborjet performs its own research to improve the trunk injection delivery methods and product formulations. All Arborjet

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product formulations have a neutral pH (buffered) and a low viscosity to promote fast, effective, and non-phytotoxic injections. Arborjet formulates mixable products <dash> pesticides, fungicides and elicitors <dash> that include bridging agents with nutrition. Arborjet's formulations allow for quick uptake and ensure product movement to the target. By providing plant health and pest control, future problems are warded off. In addition, Arborjet products can provide up to three years residual.

ArborSystems, LLC

ArborSystems' Wedgle Direct-Inject tree treatment system is a trunk injection chemical delivery method that does not require drilling. Instead, the Wedgle Direct-Inject system injects chemical directly through the bark into a tree's cambial zone. Chemical is placed in the tree's active layer where it can be quickly and completely absorbed. This turnkey system provides everything an applicator needs to treat trees in four simple steps.

1. The number of injections required is determined by measuring the circumference of the tree just above the flare and referring to the label for injection requirements.

2. The WedgeChek Punch is used to remove a small bark plug at each injection site.

3. A WedgeChek is inserted into each plug hole.

4. Insert the Wedgle Tip (attached to the Wedgle injection unit) through the WedgeChek and dispense a preset chemical dose. As the Wedgle Tip is withdrawn, the self-sealing WedgeChek keeps the chemical in the tree and prevents air or pests from entering the tree.

With the Wedgle Direct-Inject Tree Treatment System, almost any tree can be treated in less than five minutes. With the new Wedgle Direct-Inject Forestry Pack system, a single operator can treat hundreds of trees in just a few hours without changing or refilling chemical bottles.

With the Wedgle system, chemicals are injected directly into the tree's cambial zone. There is no waiting for uptake, and injections can be made in sunny or overcast conditions at any time of day. Since the system requires no drills or compressors, there are no power requirements. Everything needed to treat trees can be carried in a single, lightweight case or backpack.

The Wedgle Direct-Inject system is completed with ArborSystems line of Direct-Inject chemicals, which includes insecticides, fungicides, nutrients, and plant growth regulators. These chemicals are bottled exclusively for use with the Wedgle Direct-Inject system. The Wedgle is preset to release a precise 1-ml dose (or can be adjusted to deliver a 0.5-ml dose). Because chemical is injected precisely where the tree will use it, less chemical is required, reducing overall chemical costs. Immediate uptake provides control in two to five days, and a single application generally provides season-long control.

J.J. Mauget Co.

Mauget's system is a passive, non-impacting, simple and safe micro-injection system requiring minimal capital investment for equipment. It is an efficient utilization of a tree's natural transport system for introducing and moving therapeutic and protective chemicals.

Trees that can utilize this technology include ring porous (i.e. elms), diffuse porous (i.e. maple), semi porous (i.e. walnut), non porous (i.e. conifers and cycads) and monocots (i.e. palms). Trees and woody shrubs benefit from this technology. Materials such as pesticides, fertilizers and micronutrients are introduced into the active xylem of an adequately watered and actively transpiring tree or shrub.

The dosage generally is determined by measuring the tree at DBH and calculating one capsule for every 2 inches of diameter.

An 11/64-inch hole (7/64-inch for shrubs and thin barked trees or shrubs) is drilled with a Hi Helix drill bit (supplied) using a portable drill at slow speed (600 to 800 rpm). Injection sites should be drilled into the trunk of the tree at the flare and tops of buttress roots at a slight angle above level or at a right angle to the trunk tissue. The hole is drilled through the bark and cambium into healthy xylem tissue about 1/4-inch to 3/8-inch depending on tree size and species.

A plastic feeder tube is inserted into the pre-drilled hole, hand tight, and a capsule of the chosen product is fitted onto the tube. The capsule membrane is ruptured with the use of a soft-headed mallet, the material then flows into the feeder tube and into the active xylem and moves systemically up the tree within a few hours to 3-7 days, some materials are effective within 24 hours.

The effects are rapid. Most insecticides are working within three days or less, fungicide effects may be slightly slower, and fertilizer effects can be seen in three to four weeks.

Most importantly, Mauget's system in the hands of a trained <dash> Mauget trains all applicators <dash> and responsible professional applicator does no harm to the tree or the environment.

Mauget's technology requires making a small shallow surgical wound. The wound commences compartmentalization within hours and in most cases is completely callused over that season.

Mauget's chemistry of more than nine pesticides and five fertilizers are each formulated and tested to move rapidly through the tree, causing no harm to the plant or the environment.

Rainbow Treecare Scientific Advancements

Rainbow Treecare Scientific Advancements provides technical support, training, and education for Arbotect and Alamo fungicides and the tree growth regulator Cambistat. Arbotect and Alamo are applied by a process called macro-infusion while Cambistat can be applied as a basal drench or soil injection at the base of the tree.

Arbotect is a systemic fungicide that protects healthy elms from beetle transmission of Dutch elm disease for three growing seasons. Success rates of 99.5 percent over the three-year period of protection can be achieved when Rainbow Treecare's protocol is followed. Arbotect also minimizes the symptoms of sycamore anthracnose for three years.

Alamo is a fungicide used primarily for the control of oak wilt. In the red oak family, treat only those trees not showing symptoms of oak wilt but within root graft distance to a diseased tree. If a red oak is showing symptoms of oak wilt, a therapeutic treatment of Alamo will not save the tree. Success for Alamo treatments when applied preventively is about 90 percent. White oaks and live oaks can be treated both preventively and therapeutically, although live oaks respond best to preventive treatments. Macro-infusion is a tree care tool that enables an arborist to deliver a large volume of dilute fungicide solution directly into the water-conducting tissues of a tree through the root flares. The goal of the process is to obtain even and complete distribution of the chemical throughout the crown. The process is performed on the root flares for three reasons:

1. Root flare tissue allows for good lateral movement of the solution, which provides for complete distribution of the chemical throughout the canopy.

2. There is greater surface area on the root flares, which provides for better tee placement.

3. Root flare tissue seals over faster than trunk tissue ST