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Theoretical IPM concepts are giving way to practical pest management and plant health maintenance techniques. Photo courtesy of the F.A. Bartlett Tree Expert Company.

CONTENTS

Features

4 BIOLOGICAL CONTROL
Select insects and pathogens are the arborist's allies, according to this report from two noted experts.

14 IPM STRATEGIES
An overview of practical Integrated Pest Management.

22 NINE DEADLY SINS
Avoiding them can save trees.

27 LANDSCAPE MULCHING

Departments

2 OUTLOOK

16 INDUSTRY INPUT

18 MANAGEMENT EXCHANGE

20 WASHINGTON IN REVIEW

25 LABOR AND LAW UPDATE

26 INDUSTRY ALMANAC

28 CUTTING EDGE

31 CLASSIFIED

32 FROM THE FIELD

COVER PHOTO:
IPM being practiced. Photo courtesy of the F.A. Bartlett Tree Expert Company.
Congress dropped the ball with the federal budget, and the administration let it happen. Now, once again, the American people get to pay the bill with higher taxes. It amazes me that neither the savings and loan bailout nor Operation Desert Shield was included in the budget. Maybe the feds think they are going to win the Irish sweepstakes and we won’t have to shoulder that burden.

As usual, we contributed to the perpetuation of the problem by returning almost all of the incumbent representatives and senators to Congress in November.

In the face of increased taxes, the media tells us that we are headed for a major recession. Perhaps we are. How long will it last? Who knows? I don’t think anyone has a clear picture of what is in store for us. If the media reported on the positive things that are taking place in the economy, perhaps consumer confidence would improve.

Most arborists are “tree men” first and businessmen last. When economic conditions are good, they make money in spite of themselves. When economic conditions are poor, only those who pay attention to the business side of their company survive.

When economic conditions are off, two things happen. First, every unemployed owner of a chainsaw and a pickup truck becomes an uninsured, no-overhead tree expert giving prices that a bona fide tree company can’t compete with. This syndrome has greater impact on younger, smaller companies than haven’t established a strong client base. Second, established companies find that their existing clients carefully guard their disposable income and only buy what they must. Reports that I receive from many quarters say that arborists are working twice as hard to sell half as much.

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Biological Control
A Promising Strategy For Controlling Insect Pests

By Michael J. Raupp and Roy G. Van Driesche

Traditionally, there has been a great reliance on the use of chemical pesticides to reduce pest populations below a damaging level, but ecological considerations are playing a greater role in shaping landscape management decisions and practices. As increased public concern and economic constraints continue to limit our reliance on pesticides, alternative control tactics must be developed and implemented. One of the most promising strategies is the use of biological control.

Biological control is part of a broader approach to pest management known as Integrated Pest Management. This approach uses a variety of tactics, including resistant plants and mechanical, physical, cultural, genetic and chemical methods to reduce and maintain pest populations.

In implementing an IPM program, landscape managers must understand that eradication of a pest is generally an unrealistic objective. Attempts to do so may result in applying excessive quantities of pesticides, causing several adverse effects and greatly reducing the opportunities for effective biological control.

Biological control involves the use of predators, parasites (parasitoids) and pathogens to reduce, and in some cases maintain, pest populations below damaging levels. Since it is unrealistic to believe that control actions totally remove pests from plants, this approach emphasizes management of pest populations rather than their eradication.

Many biological control agents found or released in landscapes require a minimum level of pests that serve as their source of food. Thus, low, non-damaging levels of pests may actually be desirable.

There are several advantages to minimizing pesticide use. First, some pests can build up a resistance to pesticides. For instance, several species of scale insects and mite pests of ornamental trees are known to be resistant to one or more type of pesticide in orchards.

Pesticides also can have unexpected and unwanted effects when they are applied in sublethal doses. For example, some pests such as mites multiply more rapidly when exposed to sublethal doses of insecticides.

There are several ways in which pesticide applications indirectly alter ecological relationships between pests, plants, and natural enemies to the benefit of the pest. The unwise use of pesticides in landscapes can adversely affect beneficial natural enemies and may contribute to outbreaks of pests. Pests that are able to escape the effects of the treatment either through resistance or nonexposure to the pesticide are then able to increase.

Disrupting the activity of beneficial organisms also can lead to increased
pest problems through a phenomenon known as secondary pest outbreaks. These outbreaks occur when pesticides are applied to control a primary pest and the pesticides inadvertently remove beneficial natural enemies. While the primary pest may be controlled, organisms that are not usually considered pests, called secondary pests, increase rapidly in the absence of their natural enemies. These types of outbreaks have been observed in communities where flying fly sprays were used on a wide-scale basis. In such areas, scale insects become serious pests of street and landscape trees.

Types of control agents

Biological control agents can be separated into three general categories: predators, parasites (or parasitoids) and pathogens. Predators are often larger than their prey and consume more than one individual or prey during their development. Parasites or parasitoids are usually smaller than their prey and often complete their entire growth and development within a single prey individual. Pathogens cause disease in a pest and include viruses, bacteria, fungi and other microorganisms. Biological control agents occur naturally in landscape systems and many are produced or harvested commercially for use by landscape managers.

1. Predators—Many types of vertebrates such as birds, rodents, and reptiles help to control insect and mite pests in the landscape. These are not discussed here. Instead, we focus on invertebrate predators, specifically predaceous insects and mites. The categories represent individual families or groups of families of insects and mites. They are arranged into general categories called orders. Some common orders are described below.

a. Orthoptera—This group contains many insect pests such as grasshoppers, walking sticks and tree crickets. However, several orthopterans such as the praying mantis and katydids are predators. They have chewing mouthparts and consume soft-bodied prey such as aphids and beetle eggs. Their ability to reduce populations of key landscape plant pests such as scales, aphids and mites is doubtful.

b. Thysanoptera—These insects are commonly known as thrips. Many thrips are serious pests of ornamental plants. However, one large group, the Phlaeothripidae, contains many predaceous species that feed on a wide variety of prey including the eggs, immature, and adult stages of mites, scale insects, aphids and other thrips. Some predaceous thrips are distinguished from phytophagous ones by a tubular segment at the tip of their abdomen.

c. Hemiptera—Hemiptera are the insects commonly called true bugs. Like the previous orders, the hemiptera is comprised of herbivorous and predaceous groups. Unlike the other orders, Hemipterans are characterized by piercing, sucking mouthparts. They consume prey by inserting a hollow hypodermic-like structure into their victims and removing the blood. This structure is called proboscis or beak and is usually carried beneath the predator but is extended forward or downward during attacks and feeding.

Hemiptera is comprised of many families that are sufficiently common and distinct to permit separate treatment. The minute pirate bugs or Anthocoridae are small (less than 5 mm) usually black bugs found in leaf litter and on flowers, leaves, bark and grass where they eat many soft-bodied insects including aphids, thrips, caterpillars, insect eggs and mites. The plant bugs or Miridae are largely plant feeders and include pests such as the tarnished plant bug. However, some Mirids are predators of other Hemiptera, Homoptera (aphids, scales), caterpillars, beetles and mites.

The damsel bugs or Nabidae are common predators in the landscape. The most common are light brown and about 10 mm long. They feed on other bugs, caterpillars and mites. Assassin bugs, Reduviidae, are fairly large bugs that eat a wide variety of prey. Some, like the wheel bug, are brightly colored (red) when immature. Most have narrow bodies and long, slender legs and antennae. Stink bugs or Pentatomidae contain herbivorous and predatory members. These robust bugs can be quite large and are often brightly colored. The spined soldier bug is commonly found on landscape plants where it feeds on caterpillars and beetles.

d. Neuroptera—This group contains the common lacewings or Chrysopidae. Lacewings eat many soft-bodied insects including thrips, aphids, lace bugs, caterpillars, larvae of beetles, insect eggs and mites. Adults of many species are also predaceous. Common lacewings are available from several commercial sources and regularly occur in the landscape.

Parasitized aphid “mummy” surrounded by healthy aphids indicates the presence of an endoparasite.
Gypsy moth caterpillars killed by a naturally occurring pathogen.

e. Coleoptera (beetles)—This group contains the largest number of species of living things on Earth. Therefore, beetles have diverse feeding habits and live in a wide variety of habitats. More than 40 families of beetles are known to attack insect pests found in landscapes.

Soldier beetles or Cantharidae are brightly colored—often yellow and black—and are commonly found on the leaves, bark and flowers of plants. Adults consume soft-bodied insects such as aphids.

Checkered beetles are robust, hairy, cylindrical beetles. Larvae are important predators of many wood and shoot boring beetles and caterpillars.

The lady beetles, ladybugs or ladybird beetles belong to a family of mostly predaceous beetles known as the Coccinellidae. The adults of this family are generally recognized as beneficial natural enemies, but the larvae are often misidentified as pests. This is especially true in many of the smaller species that are covered with wax or spines. Ladybugs feed on many different kinds of pests including mites, scales, aphids, caterpillars and other beetles. They are often found grazing on clusters of small soft-bodied insects on leaves or bark. Many are brightly colored with spots or patches of red, orange or yellow and all move rather quickly on the substrate compared to their prey. Several species are commercially available.

Besides these examples of preda-
tory insects, other close relatives of insects such as mites and spiders play an important role in controlling pest populations. Spiders are common on trees, shrubs, herbaceous plants and on the ground in landscapes. Although there has been limited study of spiders, there is a growing belief that spiders play a major role in reducing numbers of a wide variety of pests.

Perhaps the most well known non-insect predators are the predatory mites in the family Phytoseiidae. Predatory mites occur naturally in landscapes and are effective in reducing populations of pests such as spider mites and Eriophyids. Predatory mites also attack scale insects, whiteflies, thrips and insect eggs. Several species of Phytoseiids are commercially available.

2. Parasitoids—Two orders of insects—the flies (Diptera) and bees and wasps (Hymenoptera)—are preeminent in the number of parasitic species they contain. Parasitoids attack all of the major orders of insect pests affecting landscape plants. The pest stages most commonly attacked by parasitoids are the eggs, nymphs or larvae, and pupae. Parasitism of adult insects is relatively rare. Many adult parasitoids kill numerous hosts during their feeding activities.

Parasitoids can be grouped in two general categories, ectoparasites and endoparasites. Ectoparasites begin development when the female parasitoid deposits an egg on the surface of the host. The egg hatches and the immature feeding stage, a larva, attaches itself to its host with its mouthparts. The parasitoid grows and develops externally on the surface of its host while consuming the host’s tissues.

Endoparasites differ from ectoparasites in several important ways. First, the female parasitoid often deposits her egg directly inside the host via an ovipositor. Sometimes the egg is laid on the surface of the host and the parasitoid larva bores into the host after hatching. In other cases, the adult parasitoid deposits an egg on a food source of the host, such as a leaf, and the parasitoid gains entry to its host by being ingested. Once inside the host’s gut, the egg hatches and the parasitoid larva enters the host’s body to feed. Endoparasitoids may complete their entire larval development inside their host or they may exit to pupate on the host’s surface or off the host entirely.

Evidence of the activities of parasitoids is often overlooked in the field. Colonies of sucking insects such as aphids or scale insects should always be inspected for signs of parasitoid activity before pesticide applications are made. Tiny wasps in the family Eulophidae are common parasites of aphids. When parasitized, aphids that are normally plump and green or yellow in color become hard in texture and tan. These are called aphid mummies and indicate the presence of endoparasites. In a similar way, the covers of armored scales should be inspected for the presence of emergence holes of parasitoids. A large proportion of scale covers bearing holes may indicate successful biological control and lack of a need to spray.

Some parasitoids are commercially available for use in ornamental plant systems. The best known example is the endoparasitoid Encarsia formosa which has been successfully used in greenhouses to control whiteflies.

3. Pathogens—A variety of microorganisms produce diseases in the insect pests of landscape plants. These include several different and diverse groups of organisms, including viruses, bacteria, fungi, protozoa and nematodes. Many of these disease-causing agents occur naturally and are responsible for spectacular collapses in pest populations. An outstanding example is the nuclear polyhedrosis virus (NPV) that is responsible for widespread reductions of gypsy moth populations in the northeastern United States.

Many pathogens occur naturally but do not cause dramatic reductions in pest populations unless improved through formulation. Perhaps the best known example of a bacterial pathogen useful in controlling landscape pests is Bacillus thuringiensis. This naturally occurring soil microbe does not usually infect foliar-feeding insects. However, commercial for-
mulation of this bacterium and its toxic crystal have created a useful tool for controlling foliar-feeding caterpillars and beetle larvae in landscapes. Similar improvements have been made for viruses attacking sawflies, fungi-attacking sucking insects, bacteria-attacking white grubs, and nematodes attacking a variety of soil-inhabiting and boring insects. Many of these pathogens are commercially available.

**Approaches to control**

Biological control can be implemented in a variety of ways. Traditionally, four approaches are recognized: conservation, augmentation, formulation, and importation of biological control agents. A sound management plan for pests in landscapes will include attempts to conserve natural enemies, augment their activities, and reduce pest abundance through the use of formulated products and perhaps even the release of imported control agents.

1. **Conservation**—Conservation is the deliberate attempt to protect and maintain beneficial organisms in the landscape through specific management activities. For example, certain classes of compounds such as the pyrethroids are known to be toxic to some groups of beneficial organisms such as parasitic wasps. Avoiding the use of these materials when wasps are abundant can prevent them from being killed unnecessarily. In a similar way, when beneficial organisms are abundant and active at predictable times, as is the case with many
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parasitoids of scale insects, scheduling pesticide sprays for another time may help to conserve active beneficial organisms. The use of pesticides with short residual activity such as horticultural oil and soap are believed to help conserve natural enemies. Non-chemical control actions such as the hand removal or pruning out of pests clearly can help to conserve beneficial organisms.

2. Augmentation—Augmentation is in many ways similar to conservation. The objective is to manipulate the system to foster the increase of beneficial organisms or enhance their beneficial effect. For example, adding artificial honeydew and pollen to agricultural crops can stimulate the reproduction of lacewings and lady beetles. Planting certain ornamentals such as azaleas in shaded habitats may help limit outbreaks of pests such as lacebugs since predators are more active and more abundant in shady than in sunny, exposed habitats.

The control activities of naturally occurring agents can be augmented by releasing additional agents into the management system. Many commercial firms presently release large numbers of predators such as lacewings and lady beetles to augment the activities of those already present. This use of a biological control agent in large numbers is called inundative release. For other pests such as the euonymus scale, releases of just a few specialized predatory lady beetles (Chilocorus kuwanae) have been sufficient to establish con-
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control over time. This type of release using a relatively small number of agents is called an inoculative release.

3. Formulation—Many microorganisms play major roles in limiting insect populations under natural conditions. Technological advances in the production and formulation of microbes provide opportunities for the use of microbes in management programs.

The bacterium Bacillus thuringiensis (B.t) occurs naturally in the soil but it does not cause epizootics of plant-feeding insects in nature. Recent improvements in technology have enabled manufacturers to produce large amounts of B.t. formulated for a variety of uses in landscape systems. At present, a variety of B.t formulations are available for controlling larvae of some foliar-feeding caterpillars and beetles. Similar improvements are underway for viral pathogens of the gypsy moth (NPV), milky spore disease (Bacillus popilliae) of beetle grubs in turf, entomogenous nematodes attacking primarily insect larvae in soil and boring in plants, and fungal pathogens of insect pests in greenhouses.

4. Importation—Many of the key pests of woody landscape plants are not native to North America but come from abroad. Pests such as the gypsy moth, Japanese beetle, azalea lacebug, hemlock woolly adelgid, and euonymus scale were imported to this country, often leaving behind important natural enemies.

Importing those natural enemies has proven exceptionally cost effective in many cases. Importation involves several steps including exploration for control agents in the native region. Various ecological attributes of potential control agents such as their host range and control potential must be evaluated. Methods for propagating and shipping healthy, viable control agents must be developed. Exotic agents must pass through stringent quarantine procedures to ensure that they pose no risk to man, animals, crops or other beneficials before they are released in this country.

Several attributes of a pest are generally believed to favorably affect the chances for success in importation attempts. First, the pest should be introduced from a different geographic area. Second, exposed stages of development should be present during the life cycle of the pest. Pests that are immobile or nearly immobile such as scales and aphids lend themselves well to biological control. Many of the most problematic landscape pests in the Northeast, such as hemlock woolly adelgid, birch leafminer and euonymus scale, are potentially good candidates for importation projects.

Dr. Michael J. Raupp is a professor in the College of Life Sciences, Department of Entomology, at the University of Maryland at College Park, and Dr. Roy Van Driesche is a professor at the University of Massachusetts at Amherst, Department of Entomology. They plan to publish a comprehensive version of the above article in an upcoming Cooperative Extension Service Bulletin.
Integrated Pest Management, better known as IPM, may become a significant profit center for the '90s and beyond. Any organization wishing to develop a successful IPM program will probably make a sizable investment in highly specialized, trained personnel and information management systems. On the other hand, many aspects of IPM are easy to incorporate into more traditional tree care.

What is IPM?
Practical IPM acknowledges the importance of total plant health care. Dr. Bruce Fraedrich, plant pathologist for the F.A. Bartlett Tree Expert Company, and Paul Marsan, president of Carpenter-Costin Company, in Swampscott, Massachusetts, feel that practical IPM contains the following components:

The monitor—Accurate identification of plant pests, diseases and non-infectious disorders by a knowledgeable person is critical to the success of the rest of the program. Most programs employ a monitor, or plant health care specialist. This person need not necessarily be a salesperson or have an arborist background. Most monitors who work for Carpenter-Costin are graduates of 4-year colleges. Their strong technical expertise helps them determine major plant problems and characterize the symptoms. Fraedrich feels that graduates of 2-year technical schools also can fill such positions. In either case, the client is paying for the knowledge and expertise of the person performing regular plant inspections.

Threshold determination—IPM means deciding when treatment is warranted and what to use. Traditional IPM in agriculture uses the concept of the threshold—that point at which the economic loss will exceed the cost of treatment. It is more difficult to establish thresholds for aesthetic loss. As a rule of thumb, Bartlett’s threshold is that level of pest activity that the monitor can detect.

Equipment—The capital outlay for IPM equipment should be minimal, but will depend upon the scope of the program. Some companies use specialized spray rigs with separate fresh water and mixing tanks for treatment flexibility. Carpenter-Costin’s specialists use hand-held computers, soil testing equipment, Shigometers and other lab equipment.

Evaluation and record-keeping—IPM is information-intensive so computerized data storage is justified for large-scale programs. Records are kept so that the arborist can analyze trends in individual tree health and problem development. This enables him to identify recurring problems, develop effective treatments and accurately predict outbreaks.

Symptoms and causes
Carpenter-Costin has found that most plant problems in its area are symptomatic of a larger problem related to the growing environment, so the monitor’s first task on the client’s property is to assess overall tree vitality. The monitor gives the tree a visual vitality rating and measures incremental growth. Shigometer readings and a root starch analysis are done if they seem warranted. A separate growing environment report keeps track of soil moisture, bulk density, texture, pH, macro and micronutrients and salinity.

Bartlett research has led to a similar conclusion—that poor cultural practices contribute significantly to tree problems. Fraedrich cites such problems as miscalculating the amount of water a plant needs, excess mulch and poor planting practices. Bartlett IPM technicians typically spend one or two visits in a 4- or 5-visit program to uncover and treat these specific problems. New plantings are automatically inspected.

Public interest
Before developing an IPM program, the commercial tree company should identify a market niche for it. A study undertaken by the Illinois Natural History Survey (INHS) as part of an ongoing IPM project sponsored by the National Arborist Association and the International Society of Arboriculture obtained information from 257 arborists, 465 property...
owners and 87 real estate property managers across the United States.

According to the survey results, arborists ranked their clients' interest in learning about more integrated methods of pest management at 3.36 out of a possible 7. They also believe that clients who are attracted to IPM are more concerned about the potentially negative consequences related to control chemicals. Arborists perceive that these clients would find the following aspects of IPM most attractive: less harm to the environment, enhanced safety to all parties, the increased attention that IPM requires and long-term benefits to tree health at reduced costs.

The survey of property owners/managers found that clients appreciate the potential environmental benefits of IPM, but are more attracted to fast-acting methods and view the effects of integrated methods as taking far longer than traditional methods.

Successful IPM programs attempt to educate and involve the client to some extent, and the INHS study found that customers want information consistent with IPM strategies. They are most interested in knowing about specific pests and problems and the health and maintenance requirements for individual trees.

Carpenter-Costin found its customers wanted enough information to make decisions. The average customer in the company's program has 100 plants, so property mapping is crucial. The firm's computer-generated reports work "by exception," identifying for the client only plants with problems. Reports are based on symptoms because clients relate better to what they can see. For Carpenter-Costin, customer education consists of relating a symptom to a problem, and in turn relating the problem to a treatment recommendation.

**Management methods in use**

One of the primary objectives of an IPM program is reduced reliance on chemical pesticides. Fraedrich is quick to point out that, even with a 90% reduction in some cases, pesticides are still valuable weapons in the IPM arsenal.

Central to the IPM philosophy is the idea of applying specific control materials that are low toxicity with little residual effect. Working with a diverse population of plants and pests, the arborist will probably need to use a variety of materials. In addition to conventional chemicals, he may use insecticidal soaps, insecticide/soap mixtures, refined oils, biological agents and pyrethroids.

The INHS study found that the most frequently employed technique was spot spraying at times or intervals most harmful to pests. In fact, spot spraying is used to control insects and pests 80% of the time, according to the survey. The responses for other techniques were: selective planting of resistant tree varieties, 57%; insecticidal oils and soaps, 46%; tree injection of insecticide, 46%; and blanket spraying of insecticides and related chemicals, 31%. Only a small segment of the arborists used pheromone trapping (13%) or predator insects in localized areas (8%).

Arborists also employ the "integrated" cultural tactics of fertilization, pruning and mulching, as well as mechanical control tactics of high velocity watering and hand removal of insect-infested or diseased plant parts.

Landscape IPM is still not an exact science, but it works and a handful of arborists have found it profitable as well as practical to start full-fledged IPM services. Working together, practitioners and researchers are quickly filling voids in the technology.
Super!
Super, terrific, fantastic. These are just a few words to describe Tree Care Industry magazine. I can see why it is sure to become the handbook of all tree care trade publications.

It is a great pleasure to read articles written by other tree care professionals and the wide range of topics that are discussed. The information is solid and can be applied to improve daily operations, safety and profitability.

Keep up the good work.
Robert J. Klemm, president
Bob Klemm Co.
Westlake, Ohio

Keep up the good work!
The latest issue of TCI reached my desk last week. The covers have all been extremely colorful and eye-catching. I particularly like the central theme for all of the feature articles for one issue. The mix of management and technical topics has been well balanced, and the “Departments” articles have been very informative. I look forward to each issue, and eagerly read it, cover to cover.

Keep up the good work!
Rusty Girouard, office manager
Madison Tree Service Inc.
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Congratulations
Congratulations for a really nice magazine. We have enjoyed the interesting articles and have picked up the names and addresses of a few new suppliers.

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By Jim Perrone and Larry Ambrose

The Coaching Meeting is an informal meeting that is performance-focused. As such, it should review progress and plan future performance expectations.

The Coaching Meeting is an effective way for supervisors to review the employee's progress on an ongoing, but informal, basis and to provide necessary feedback on his/her performance. The Coaching Meeting should concentrate on assisting the employee to improve performance, and is an excellent forum in which the supervisor can act as a "coach" or helper.

For the employee, the meeting should be used as an opportunity to keep the supervisor informed of progress and problems. The meeting will present an opportunity to concentrate on problems not dealt with during daily business.

Ongoing coaching is the most important ingredient in developing a genuine partnership between supervisor and employee. If coaching meetings are held on an ongoing basis, both supervisor and employee become much more comfortable with the planning and review process and use it in a much more creative manner. Using these meetings to review objectives at the point of their completion allows for timely feedback and for relevant updating of expectations during the year. In addition, they are an opportunity for "fine-tuning"—helpful corrections to the employee at a time when he/she can use such feedback most beneficially.

It may be important to hold coaching meetings more often for some employees than others. It is strongly suggested that several such meetings be held during the year. The performance assessment process is made much easier for both employee and supervisor if they have been actively meeting and discussing performance during the year. If they review performance only once a year, employee and supervisor alike will look upon the experience as a difficult, distasteful chore, rather than a positive helpful process aimed at making the employee successful.

The employee and supervisor should jointly decide how frequently the meetings should be held and for how long. Coaching meetings can be initiated by either the supervisor or the employee.

Conducting the meeting
1. Either subordinate or supervisor can initiate a Coaching Meeting—both have responsibility for making sure that feedback and updating take place. You may want to consider setting a date for the first Coaching Meeting before you leave a performance planning or review meeting.

2. The meeting should begin with the subordinate's review of progress. Following the employee's report, the supervisor should give his/her reaction.

3. When problems are discussed, the supervisor should listen intently to the employee's ideas for solutions, and then suggest his/her own ideas. The skill of building or enhancing the ideas of others is crucial for effective problem-solving. Building not only leads to better solutions, but also increases the employee's feeling of ownership for implementing the solution.

4. At the end of the meeting, the supervisor and employee should agree on the major results that the employee intends to accomplish before the next meeting. If needed, the date for the next Coaching Meeting should then be set.

Jim Perrone and Larry Ambrose are the principals of Perrone-Ambrose Associates, a Chicago-based management and training consulting firm with a wide range of experience in the green industry.
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Pesticide Rules
EPA Proposing Revisions For Applicator Certification

The Environmental Protection Agency (EPA) is proposing the revision of the rules governing pesticide applicator certification. The proposed revision is intended to upgrade the provisions of certification programs and will more fully ensure protection of man and the environment from the potential adverse effects of pesticides. March 8, 1991, is the deadline set by EPA for submitting comments on this proposed rule.

Currently, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires pesticides to be classified for either general use or restricted use. Restricted use pesticides can only be applied by or under the direct supervision of a certified applicator. Certification means the recognition by a certifying agency that a person is competent and thus authorized to use or supervise the use of restricted use pesticides. EPA has approved state-administered certification programs for both private and commercial applicators in every state except Colorado and Nebraska.

In 1985, a task force was appointed by EPA to review existing certification programs and policies to determine what actions should be taken to improve the certification program. Several proposed changes would affect the tree care industry. Some examples include revised standards of competency, establishment of various levels of supervision and training requirements of noncertified applicators, and recertification requirements for commercial applicators.

The need to upgrade requirements allowing certified applicators to supervise noncertified applicators was a major recommendation of the 1985 task force report. The existing requirements result in some instances of supervision from locations far removed from the application site. Many states have imposed more stringent supervision requirements.

Three levels proposed
EPA is proposing to establish three levels of supervision that will be incorporated in the future labeling of restricted use pesticides. Those three levels are: use only by a certified applicator; direct supervision by a certified applicator who is required to be on site at all times and available at the point of use within five minutes; and direct supervision by a certified applicator who is not required to be on site. These levels, although similar to current regulations, have more detailed requirements to assist certified applicators in understanding their specific responsibilities.

Two-tier levels of supervision were also considered by EPA. One plan consisted of either use only by a certified applicator or direct supervision from off-site as is currently required. The second approach consisted of either use only by a certified applicator or direct supervision where the certified applicator is at the point of use. Both two-tier plans were determined insufficient. EPA feels that some restricted use pesticides warrant closer supervision than might be provided from off-site. If a two-level approach with off-site supervision is used, many products that could be used by an uncertified person under closer supervision would ultimately be
placed into the higher category to ensure their safe and proper use.

The proposed revision addresses record-keeping for noncertified applicator training. Current rules require commercial applicators to keep records of restricted use pesticide applications. Proposed provisions are expanded to include record-keeping of the training provided to noncertified applicators using restricted use pesticides under the supervision of a certified commercial applicator. Records of training could be minimal in states with an EPA-approved noncertified applicator training program.

Although there is no federal requirement, most states require recertification every three to five years. EPA has decided to propose a 5-year rather than a 3-year recertification period. It is concerned that a shorter recertification period would put an unnecessary burden on applicators and limited state resources without a corresponding return in improved applicator competency.

The proposed rules would permit the certification of private and commercial applicators who are non-English readers. However, the proposed rules would limit the non-English reader certification to products that had labels in the language the applicator could read. EPA believes that understanding of the label is critical to the safe use of restricted use pesticides. Labels are increasingly relied upon to transmit product-specific information on such subjects as worker protection, groundwater, endangered species, and human exposure.

Specialty categories and subcategories may be adopted for standards of competency. One specialized use operation is loading and mixing. Some applicators involved in the loading and mixing of restricted use pesticides may not perform any other pesticide related activities and therefore do not need certification in a broader category. The specialty category provision will generally be used in those instances where the pesticide applicator is not concerned about pest identification or alternative means of control.
The Floating Beam Footing

In cold climates, footings must typically extend 4 feet below the soil line. But in the Portland area, Dick Proudfoot's company has been working with builders using floating beam footings to preserve trees. The concept is illustrated above. Proudfoot reports seeing the technique used to preserve a 180 year-old white oak nestled in a new housing development, and again when an 8 foot stone wall was constructed next to mature trees.

The beam is pre-stressed concrete. Obviously, it takes special expertise and equipment to install, but it may be a viable alternative to removing a valuable tree or providing remedial care for a tree with a damaged root system.

The Nine Deadly Sins

Avoiding Them Will Save Trees

By Dick Proudfoot

Storms break off tree limbs. Lightning sets trees on fire. And the eruption of Mount St. Helens knocked down an entire forest in seconds.

But the fact remains that 80% of all injuries to trees are caused by man, particularly when the trees are on a building site. Here are nine ways in which trees are harmed in building or construction situations. They are preventable, however. All it takes is some foresight and an ounce of prevention.

1. Soil compaction. This is the largest single killer of trees in urban areas. On the building site, it happens every time a truck is driven over the tree's roots, or lumber is stacked around it.

Trees have two kinds of roots: anchoring roots that grow horizontally, and feeder roots—properly called absorbing roots—which grow vertically. The top few inches of soil where the absorbing roots do their work is rich with oxygen and moisture. Compact the soil through normal building activity, and you can cut this oxygen supply in half without even thinking about it.

Not only is the tree gasping for air, but it is also harmed in two other ways. A fungus known as mycorrhiza that grows on the roots and converts nutrients into a form the tree can absorb is killed because its own oxygen supply is cut off. Meanwhile, anaerobic organisms, which require very little oxygen, multiply. They produce carbon dioxide, which is toxic to the tree's roots.

The tree is dying. The evidence may not show for months or even years, but damage is extensive.

2. Grade changes. Adding soil to a tree's root zone compacts the soil underneath, starving the roots of water. It can also do the opposite by raising the water table and promoting the growth of anaerobic organisms that can kill the tree. A tree's roots simply cannot send new absorbing roots to the surface fast enough, and it can't do it at all if the soil is compacted.

Taking soil away is equally harmful. It tears the absorbing roots and removes the topsoil, which is the tree's food source. If a builder digs deep enough, he can also harm the tree's anchoring roots.

Deep cuts within the root zone are also dangerous. Builders need to know that if they need to build next to a tree, they should call a professional arborist to prune the roots instead of amputating them with a backhoe.

3. Other root damage. Cutting or tearing roots while installing underground utilities, sewer drains or culverts will traumatize the tree and put it into a quick state of decline. It opens the root system to any opportunistic decay organism and causes rot. This impacts the tree's ability to feed itself and can hurt its structural integrity, resulting in an immediate standing hazard.

4. Mechanical injury above the surface. Any time a builder penetrates or exposes a tree's cambial layer—the layer underneath the bark—he injures the tree. It is easy to do: simply scrape off a section of bark with a backhoe, bump the tree with a truck or other heavy equipment or nail something into it.

The cambial layer is where the tree's cell growth occurs. When the cambial layer is injured, the tree re-
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sponds by walling it off with a chemical barrier. The injured portion is then no longer living, but the barrier keeps the effects of the injury from spreading. Take away enough of the cambial layer and the whole tree dies because it does not have enough stored energy to sustain life. Couple this injury with root damage or soil compaction, and the tree's ability to survive is severely limited.

5. **Soil contamination.** This happens when a member of the construction crew rinses out a paint bucket near a tree, or dumps excess concrete, or stores a leaky gas can, or does anything that introduces any substance into the soil that doesn't belong there. This will poison the tree. Contamination also can happen when gas-powered equipment is placed close to the tree; the exhaust can go directly into the ground.

There is almost nothing the builder or property owner can do in some cases to combat the damage. It requires removing the contaminated soil, which causes damage to the absorbing roots.

6. **Preserving trees that should be removed.** This means trees in advanced stages of decline. It means trees growing so close to a house that the stability of the tree and the safety of the foundation are both compromised. It means leaving trees that are not normally considered a landscape amenity—trees that grow fast, die young, leave a lot of deadwood, have lots of surface roots that tend to sucker, are susceptible to storm damage, and so on.

Builders should be encouraged to use a qualified arborist to help choose the ones that need to go.

7. **Removing trees that could be preserved.** Some trees are of particular value because of their beauty, age, size or species. They can be retained on site with proper pre-construction planning and care, such as the use of root aeration systems, floating beam footings, and proper root pruning.

An arborist can help builders find ways to save trees on a job site that otherwise may look unsalvageable.

8. **Failure to protect trees that are to be preserved.** Precautions are easy: erect a simple barrier around the trees you want to save. This can be done with steel fence posts with chicken wire, or the new kind of reusable bright plastic fencing.

9. **Getting tree advice from unqualified sources.** No self-respecting builder would go to a painting contractor to get advice on wiring a home, but builders commonly seek tree advice from people other than tree experts. Members of the tree care profession should encourage the building industry to talk to a qualified arborist. These builders may be surprised at how simple it can be to avoid tree problems. It gets complicated—and expensive—when they try to take care of the problem after the fact.

Dick Proudfoot is the manager at Pruett Tree Service, a full-service tree care firm in Lake Oswego, Oregon, offering pruning, removal, fertilization, insect and disease control, and arboricultural consulting.

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Fines & Enforcement

By Steven R. Semler

With all of the drum beating since the establishment of the Occupational Safety and Health Administration 20 years ago, carnage still continues in the workplace. There are about 7,000 workplace deaths yearly and approximately seven times as many permanent disabilities from workplace injuries annually.

Congress apparently feels it can reverse this by increasing OSHA fines. It recently enacted an increase in maximum OSHA fines from $1,000 to $7,000 for a “serious” violation. Similarly, OSHA has increased fines for “willful” or “repeat” violations from $10,000 to $70,000. This is the maximum per citation; multiple citations could be in the hundreds of thousands of dollars.

In addition, state prosecutors, dissatisfied with the deterrent effect of OSHA, are looking toward putting executives in jail for safety violations involving workplace fatalities. In Los Angeles, for instance, assistant district attorneys are part of a team that promptly responds to workplace fatalities. Their aim is to gather evidence while it is hot, and to evaluate criminal prosecution of the managers—if their omission or commission is responsible for the fatality. In fact, a California tree company owner already has been criminally prosecuted in relation to a workplace fatality.

Merely having a safety program on paper is not sufficient to keep executives out of jail. The executive must show that he or she aggressively compels adherence to and vigorous enforcement of the company’s safety program. Merely treating job place safety as overhead risks not only the employees’ lives but also the executive’s freedom.

Harassment award

A company had a written policy against sexual harassment. A male employee made repeated explicit and unwelcomed advances to a female employee. The employee repeatedly complained to her supervisors who, in violation of the company policy, neither reported the complaints to higher management nor took any action against the perpetrator. The jury found, in essence, that it was the employer’s job to force its supervisors to comply with the company’s sexual harassment policy, and awarded the plaintiff $90,000.

Lock-out disallowed

Members of “Justice for Janitors”—the name for a Washington, D.C., Service Employees Union organizational campaign—were barred by building owners from entering office buildings in order to insulate tenants from disruption from the Union’s appeals to janitors who worked in the buildings. The union filed a complaint with the Office of Human Rights, contending that the prohibition violated the District’s requirement of equal access to places of public accommodation, such as the buildings’ restaurants and theaters. The court agreed with the union and nullified the building owners’ prohibition.

Steven R. Semler is a partner in the Washington, D.C. law firm of Semler and Pritzker, which represents the National Arborist Association and corporations with respect to labor law matters. This article should not be taken as legal advice in dealing with particular situations, which only can be given by the employer’s own corporate labor counsel.
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Contact: Lana Ahlum, 614-876-3694

Jan. 20-22
Empire State Tree Conference
New York State Arborists Association
Syracuse, N.Y.

Jan. 20
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Columbus, Ohio
Contact: Lana Ahlum, 614-876-3694

Jan. 25
"Tree Care for the 21st Century"
Presented by Dr. Alex Shigo
St. Louis Park, Minn.
Contact: Tom Prosser, 612-922-3810

Jan. 27-29
ISA—Wisconsin Chapter
Oshkosh, Wisc.
Contact: Dick Haas, 414-471-8420

Jan. 30—Feb. 1
ISA—Midwestern Chapter
Oklahoma City, Okla.
Contact: Susan Givens, 518-783-1322

Jan. 31
Connecticut Tree Protective Association
Plantsville, Conn.
Contact: Alan Carey, 203-257-8971

Feb. 12-17
National Arborist Association, Inc.
Annual Meeting & Management Conference
Sheraton Grand Hotel
Tampa, Fla.
Contact: NAA, 603-673-3311

Feb. 21
Ohio Foreman Training Meeting
Columbus, Ohio
Contact: Lana Ahlum, 614-876-5622

Feb. 25-26
ISA—Penn/Del Chapter
Hershey, Penn.
Contact: Elizabeth Wertz, 215-795-2096

March 3-5
ISA—Southern Chapter
Raleigh, N.C.
Contact: Ernie Mitchell, 803-234-4033

March 6-7
ISA—Michigan Chapter
Kellogg Center, MSU
East Lansing, Mich.
Contact: Bob Cool, 517-485-4245

May 4-7
Menninger Sun Belt Tree Conference
West Palm Beach, Fla.
Contact: Carol Smith, 813-446-3356

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Mulching beneath ornamental plants is an established practice in today's landscapes. It is even used as an ornamental feature by itself without the addition of plants. In that situation, there are few, if any, guidelines necessary for the application and use of mulch. But there are specific rules to follow when mulching plants to maximize their growth and health.

Mulching around ornamental plants involves covering a portion or all of the root zone with shredded hardwood bark, bark nuggets, wood chips or other materials. Select a material that features consistent color and texture, compaction resistance, wind and water erosion resistance, fire resistance, slow rate of decomposition and ability to reduce weed growth. The mulch that you select has to do more than just cover the bare soil.

From the plant's standpoint, mulch must allow for an exchange of gases (oxygen into the soil, carbon dioxide out of the soil) and the penetration and the slow evaporation of water. If mulch slows or stops these processes, plants will decline and eventually die.

The most important benefit of mulching plants is the conservation of soil moisture. When mulching is done correctly, soil water evaporates slowly and provides plants with a consistent source of water. Over a few years, as organic mulches decompose, the underlying soil's ability to hold water may be improved. In most cases, mulched trees and shrubs survived the drought of 1988 better than those that did not have mulch.

Mulch can actually improve water infiltration into the soil. Raindrops falling on bare soil not only cause erosion but also cause soil surface compaction. Mulch reduces or eliminates erosion and cushions the impact of raindrops. Water can then penetrate to a greater depth, as can plant roots.

Common mistakes

Two common mistakes in using mulch are applying it too thick and mounding it up against tree and shrub trunks. Most mulches should be only two to four inches deep; use the low range for heavy, clay soils and the high range for lighter, sandy soils. It is not unusual to find landscapes with mulches that are six to eight inches deep or more. Air and water exchange are dramatically reduced and the soil becomes an inhospitable environment for roots. Mulch that buries the base of a trunk encourages the development of decay fungi.

The annual re-application of mulch to a planting bed certainly improves the initial appearance of the landscape, but it can also lead to unattractive, sick plants. Annual mulching causes a build-up that exceeds the maximum recommended depth. One to two inches of mulch applied every two to three years is adequate to maintain the beneficial aspects of the mulch. New mulch should not be applied until the existing mulch is nearly decomposed and has been lightly incorporated into the soil. To renew the appearance of mulch in the intervening years, consider using one of the new mulch colorant sprays. Simply raking the existing mulch can be a dramatic improvement.

Mulches will not eliminate the headaches of weed competition, but can reduce the density of undesirable grasses and broadleaf weeds. Maximum weed control can be achieved by applying a preemergent herbicide and/or landscape fabric (not sheet plastic) before spreading the mulch.

Mulches are an integral part of landscaping. Use them the wrong way and expensive plants will die. Use them correctly and your plants will reward you with years of beauty.

David Whitworth is a horticulturist at the Davey Tree Expert Company, Human and Technical Resources Center, Kent, Ohio.
Consulting Arborists Complete Annual Conference

The American Society of Consulting Arborists enjoyed a full educational and social program at Innisbrook Resort, Tarpon Springs, Florida, in late October. With perfect weather and a larger attendance than usual, the many members and guests were able to enjoy the many presentations by professionals in tree consulting and related disciplines.

Elected to office for 1991 are the following: Kenneth D. Meyer, San Mateo, California, president; John M. McNeary, Charlotte, North Carolina, president-elect; John S. Miller, Richmond Hill, Ontario, vice president; Sam Knapp, Riverside, California, secretary-treasurer. Laurence R. Hall, Wheeling, Illinois, becomes immediate past president.


The 1991 annual meeting will be held October 17-19 at the Sheraton Old Town Hotel in Albuquerque, New Mexico. Detailed announcements will be made in advance and all interested consultants are invited to attend.

ASCA Executive Director Jack Siebenthaler will retire from the office on December 31. His position will be filled by John T. Duke, Wheat Ridge, Colorado.

Industry Pioneer Ross Farrens Dies

Ross Farrens, who founded Farrens Tree Surgeons, Inc., in Jacksonville, Florida, in 1928, died in October at his home in Reno, Nevada. He had been married for 60 years to the late Nora Kathryn "Teddy" Farrens.

Mr. Farrens was born in Decatur, Nebraska, in 1905. He had been a 50-year member of the Masonic Lodge, a Shriner and a supporter of Boy Scouts. In 1946, the American Forestry Association elected him Honorary Vice President and Life Member. That same year, he served as president of the National Arborist Association. In 1985, he was honored by Jacksonville Mayor Jake Godbold, who proclaimed Farrens' birthday as Ross Farrens Day. In 1988, he was recognized as a pioneer in the industry by the National Arborist Association, International Society of Arboriculture, and the American Society of Consulting Arborists. He was also a charter member of the River Club.

He is survived by a brother, Dell and sister-in-law, Lorraine, of Dubois, Wyoming; a sister, Alice Stroup of Schenectady, New York; a sister-in-law, Mrs. Ivan Farrens, of Deland, Florida; and numerous nieces and nephews.

The family suggests memorial contributions be made to Hospice Northeast or the American Cancer Society.

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The Flow Master electronic digital flowmeter offers accurate, compact flow measurement for tree sprayers and chemical applications. Housed in a rugged one-piece body, the 9-volt battery-powered unit provides flow rate as well as total application quantity at the operator end. The Flow Master features solid state electronic, LCD display and membrane keypad operation. For more information contact Technology Management Inc., 3103 S. Westnedge Ave., Kalamazoo, Mich. 49008. 616-388-8300.

Bandit Industries recently introduced two models of drum chippers, both a 12-inch and 16-inch drum. The Drum Bandits feature 50,000-hour, heavy-duty, pillow-block bearings, and hinged covers that provide easy access to the rotor knives and cutter wheel. The units are available with a variety of gasoline and diesel power options. The frames are constructed with 2-by-6-inch tubular steel. For more information, contact your local Bandit dealer or Bandit Industries, Inc., 6750 Millbrook Road, Remus, Mich. 49340 517-561-2270.

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A new line of portable brush chippers, called “E-Z Beevers” joins the team of wood chipping equipment offered by Beever Sales Corp. of Winn, Michigan, which also markets the Eeger Beever and Busy Beever disc-style chippers. The new chippers are not disc-style, nor do they resemble conventional drum style chippers. The revolutionary chip pockets found on the E-Z Beever actually throw chips rather than blowing them. Changing knives and chip size can be accomplished in minutes. The E-Z Beever is ideal for tree services, line maintenance companies and others with brush disposal needs. For more information, contact Beever Sales Corp., P.O. Box 800, Winn, Mich. 48896.

Weighing only 11.1 pounds, the new McCulloch TITAN GPD 22 gas drill combines power with portability. Built with a 21.2 cc, 2-cycle, air-cooled engine, the TITAN GPD 22 can be used in construction/building, planting bulbs, fertilizing trees, tapping maple trees and more. The TITAN GPD 22 has an electronic ignition system and is equipped with a large volume muffler. An all-position carburetor with primer fuels the drill at any angle, and a centrifugal clutch allows the engine to idle while the drill is not engaged. The TITAN GPD 22 also features a ball-bearing transmission and a reversible handle. For more information, contact the McCulloch distributor in your area.

Bandit Industries has recently introduced a 17-inch capacity whole tree chipper called the Model 1700 Tree Bandit. The 1700 is equipped with a powerful hydraulic feed system for crushing limbs and tops. The unit is powered by a 250-hp diesel engine and features a powerful hydraulic knuckleboom loader for feeding material into the chipper. The model 1700 with a waste wood conveyor provides an economical means of converting brush and logs into recyclable wood chips. The standard 1700 is ideal for land clearing and harvesting wood. For more information contact Bandit Industries, Inc., 6750 Millbrook Road, Remus, Mich. 49340. 517-561-2270.
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A Young Arborist Gains Appreciation For The Urban Forest

By Brian Barnard

After my junior year of college and a summer of fighting forest fires in the Rocky Mountains, I was still undecided how to apply my degree in forestry from Michigan State University. The outlook for forest ranger employment was very poor, so I broadened my horizons to arboriculture. I needed to find out what “Urban Forestry” was all about, so I inquired about employment with Hendricksen, the Care of Trees, in Chicago. I had no idea what I was getting into.

For a small-town, rural Michigan native, moving to Chicago knowing nobody in the area was a little intimidating, to say the least. My vision of the bright lights and big city quickly turned to never-ending traffic and toll booths soon after my arrival. This, compounded by my knack of taking wrong turns, made the first weeks challenging. It’s only for the summer, and I will learn the trade, I kept telling myself.

After being taught the basic knots and safety aspects of arboriculture, I was ready to start climbing. I never imagined climbing a tree could be so difficult. Hanging from a rope 60 feet up in the air soon made me realize why Chicago is called “The Windy City”—the whole tree was swaying in the breeze. I couldn’t move. My pole saw fell from the branch it was hanging on and cut my boot. The employee with me was in the bucket truck working on the other side of the tree. He was an experienced climber, and just shook his head when my saw fell.

It wasn’t until I reached the top of the tree, more than 100 feet in the air, that I realized what arboriculture is all about. I was on top of the world.

It was time for me to get my feet back on Mother Earth. I slowly lowered myself down, but about four feet from the ground the tail end of my rope was inches from my taut-line hitch. I was tired and frustrated, besides, it was only four feet. I jerked the end of the rope through the knot and gravity took over. As I crashed to the ground, my ankles jammed into my armpits. The expected 4-foot drop instantly turned into an unexpected 8-foot drop.

Slowly I learned. The 23-mile trip to work through the suburbs could indeed be made without getting lost. Using a chipper could be done without getting beat up by brush. Stump grinders, with all of their levers and handles, turned out to be quite simple to use. Climbing actually became enjoyable.

My most vivid memory of that summer is the view from the top of the largest American elm in Park Ridge, Illinois. Summer was coming to an end, and school was just around the corner. It was a sunny day, with a healthy dose of Midwest humidity that made every type of airborne particle stick to your skin. Of course, the breeze was steady. The first crotch of the tree was 50 feet up, so in turn we were all raised to that point with an aerial lift. Only halfway to the top, I slowly maneuvered myself upward.

It wasn’t until I reached the top of the tree, more than 100 feet in the air, that I realized what arboriculture is all about. I was on top of the world. No tree in the area was as large, and five miles to the east was the distinct outline of downtown Chicago. The entire city softened by a blanket of trees gave clear meaning to the term “Urban Forest.” I still try to imagine what that view would have been like if there were no other trees around me.

Editor’s Note: Brian Barnard graduated from Michigan State University in June and is employed by the National Arborist Association as an administrative assistant.

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