

Trees, People, & Ecosystems

Practicing Plant Health Care

By Guy Meilleur



LEARNING OBJECTIVES

The arborist will be able to

- understand Plant Health Care (PHC) and its relation to Integrated Pest Management (IPM).
- use a simple diagnostic process to monitor plant health conditions.
- apply the elements of the PHC management system.
- understand tree management strategies and their advantages and limitations.

History and Background

Imagine getting drenched with lead arsenate, DDT, and other chemicals as part of your regular job. In the video *The Legends of Arboriculture*, arborists of the 1950s and 1960s tell some very scary war stories about the amount of heavy (blanket, cover) pesticide spraying designed to kill everything around the tree. This was the norm in agriculture during that era as well. Then people started noticing that overdosing the system with pesticides caused collateral damage. Some insects that were not a problem before multiplied rapidly because their natural enemies fell victim to pesticides. There were higher cancer rates in people. Connecting these environmental effects to their causes was a long, strange trip through the ecological web in which we live.

This trip led to a new understanding of the persistent effect of chemical compounds and other human actions on interconnected organisms and systems. DDT was found to cause a thinning of the shells around the eggs of bald eagles, and the image of the emblem of the United States innocently crushing its embryonic young was powerful. Humans started making the appropriate response, eliminating DDT in 1972 and applying other chemicals as part of a more comprehensive process of Integrated Pest Management (IPM). Instead of timing pesticide applications strictly to the calendar, they are scheduled according to fluctuating pest cycles in time to avoid economic injury, and applied along with other management measures.

This IPM approach spread to the landscape in the 1970s, with the goal of getting people trained to look at the landscape closely enough to read ongoing and potential plant problems before treating them. “Nature, to be commanded, must be obeyed,” as Francis Bacon said 400 years ago. “Pests can be managed, not controlled,” is a modern version of that statement.

Performing regular and systematic inspections and keeping a close watch is called “monitoring.” Monitoring leads to prescriptions for cultural and chemical treatments to meet IPM’s goal of managing pests and avoiding economic injury. In the landscape, economic injury is measured by the loss of aesthetic benefits, which can be perceived by any of the senses, not just sight. (In the terminology used in the appraisal of the dollar value of plants, these benefits are a form of “income” for the client, which is gained by investing in arboriculture.) Benefits include cleaner air and water, climate moderation, wildlife, beauty, and other values.

Compared to agricultural crops, trees take a long time growing and a long time responding to treatments. Their roots and branches grow far and wide, and they interact with everything they contact. Arborists have limited options and limited success when treating problems after they develop, so the emphasis must be on maintaining plant “fitness.” Our focus must be not on causing the death of pests, but instead on caring for the health of plants by manipulating the ecosystem of which the plants and their owners are a part. The green industry cannot eliminate pest problems but must proactively maintain and improve plant health and value by improving the landscape environment. Applying biological and chemical products is still a key step toward plant health, after the cultural needs of the plant have been addressed. IPM is both the precursor and a component of Plant Health Care (PHC) management.

Trees: Diagnosing Plant Health

PHC is the management of plant structure, aesthetics, and vitality. Structure is the critical characteristic of trees, which Alex Shigo once defined as large, woody objects that can

fall down and kill you. Aesthetics can be as obvious as a glossy, green leaf or as subtle as the suggestive, rich scent of biological activity in the soil. Vitality is defined as an individual plant's capability to constructively adapt to stress. This adaptation relies on stored resources, such as starch that stores the energy synthesized from sunlight. If a plant is poorly adapted to a site, and nothing can be done to increase vitality, removal and replacement may be the only practical solution. This ultimate action, however, cannot be credibly recommended until a detailed diagnosis is done.

The trunk, branches, and leaves are the most obvious parts of the plants to examine, but the landscape below ground is equally important. Armed with \$100 in tools and following a few basic principles, arborists can learn a lot about how the earth surrounding a tree's roots is affecting tree vitality.

A pH meter is a very useful soil-measuring tool for reading the soil's reaction (pH), as described in the December 2006 CEU article in *Arborist News*. A soil probe is a simple, T-shaped tool that is pressed or twisted into the earth and extracts a core of soil. This core of soil typically contains an A horizon below the mulch, turf, or ground cover; a B horizon below that where the organic matter blends into the native soil; and a C layer of less permeable subsoil, the parent material from which the soil was formed. Many of the non-woody roots are typically found in the A horizon. White roots extending into the B horizon indicates a high level of oxygen there, where the tree can harvest enough resources to fuel its various functions.



The soil profile is displayed in a soil probe. The A horizon at the top has accumulated organic matter from decomposing litter, while the C horizon of parent material at the bottom of the probe is dense and unweathered. The B horizon in between is where sand, silt, and clay particles aggregate into soil structure with pore space.

Urban soils are often disturbed, with a jumble of material from different horizons interspersed. Touching the soil also can reveal much about its properties. For example, if moist soil is rolled into a cylinder and it crumbles easily, it may be low in clay. A sour smell indicates low-oxygen conditions hostile to root growth, while a sweet smell can signify that beneficial, aerobic bacteria and fungi are at work.



These white and sulfur-colored strands are mycorrhizae, found growing into a blanket of mulch. Applying a layer of organic mulch above tree roots is often the best way to maintain health.

A hand lens is useful in finding fine roots, mycorrhizal strands, and other interesting things, such as soil insects.

Earthworms, arthropods, and other organisms aerate the soil and convert organic matter and minerals into forms more available to the tree. A number of references have reported that one cup of undisturbed native soil may contain the following: 200 billion bacteria, 20 billion protozoa, 100,000 meters of fungi, 100,000 nematodes, and 50,000 arthropods. There are ways to encourage beneficial soil organisms:

- Use organic mulches for weed control, and amend the soil with composted organic material to provide a food source for soil organisms.
- Avoid overirrigation and excessive use of fertilizers, so the organisms do not drown or burn.
- Irrigate during periods of drought. Soil organism activity may be reduced due to dry soil conditions that are common at certain times of the year.
- Avoid unwarranted pesticide applications. Some fungicides, insecticides, and herbicides are harmful to various types of soil organisms.
- Use organic mulches to reduce soil compaction forces, moderate temperature, and maintain soil oxygen levels needed by beneficial soil organisms and roots.

Uncompacted soils have less root rot because they have better drainage, thanks to more pore space that air and water travel through. This pore space helps define the soil's structure.

Above the ground, tree structure is relatively easy to assess. Finding the trunk flare is first—make sure that the trunk swells normally to form a visible flare. If there are irregularities in the shape of the trunk, tapping with a



Inspection involves finding the trunk flare, where the trunk expands into the structural roots. Removing soil and mulch often reveals stem-girdling roots, which cause many problems for trees.

rubber mallet and listening for a hollow sound may indicate the need for a risk analysis. Branch angle and location are usually visible from the ground, but sometimes an area of concern high in the crown is identified that cannot be assessed with binoculars. A climber with a camera can resolve these concerns, and proper pruning or support may be prescribed as corrective measures. After structure, arborists assess vitality. The success of various treatments and practices has traditionally been measured by increased growth in height, trunk diameter, or total leaf area. In the temperate zone, twig elongation is the distance between where the terminal bud sets, from one season to another. One way of assessing vitality is measuring twig elongation, but, to be reliable, twigs from different sides of the tree must be measured. Rapid growth from an abundance of elements can be a positive indicator of plant health, but it can also lead to pest problems. Some of these pests can escape the naked eye, so a hand lens is essential for detecting them.

Keep in mind that strong growth is not necessarily an indicator of good health. As we have gained a better understanding of plant physiology and resource allocation, it is apparent that increased storage is more important than increased size. Inspecting the callus growth around wounds can reveal a great deal about plant vitality.

Many arborists are familiar with the concept of trees putting on tissue to increase stem thickness in response to stimuli such as wind. Similarly, other mild stressors increase resistance to pests and failure. But while mild stress can stimulate positive reactions, multiple and severe stresses can drain a tree's resources and strain the tree system, bringing about a state of decline. Trees undergoing strain are more likely to succumb to a combination of drought, defoliation, borers, bark beetles, fungal decay, and diseases. When a pattern of the signs and symptoms of these biotic and abiotic stressors persists, the tree is in a decline spiral. Aggressive



Knowing which trees are highly susceptible to decay, such as this willow (*Salix* spp.), can help focus the inspector's attention. When significant decay is found, the arborist must assess strength loss.

and expensive actions are needed to reverse this spiral (if the decline is reversible at all), so the emphasis must logically be placed on managing stress at constructive levels.

People: Turning Customers into Clients

Tree care customers are likely to be older and more educated than average, and have owned their homes for more than five years. Unfortunately, the public image of a tree service provider may be that of a machinery-operating construction worker who is inexperienced, impersonal, and inconsistent. To effectively target that audience, a more professional image must be portrayed.

A telephone call for an estimate to remove a tree is often the first contact arborists have with potential clients. To sell more than that single service, more information is needed—about the trees, the caller, and the ecosystems they are a part of. This information is best obtained on site. The business cost can be high—the estimator's time, along with vehicle, material, and administrative costs, should be factored in. If the business has certified employees and also displays professionalism on the initial contact, the caller may well agree to an inventory and a full management plan.

The first service involved in professional landscape management is an inventory. An hour or half-hour walking the site with the owner or manager allows time to determine the person's motivation as well as identify the key plants and prioritize their management.

A bare-bones inventory yields a handwritten list of arboricultural steps toward a safe, healthy, and beautiful

landscape. An inventory is an essential service for several reasons. It creates a reference point for client communication. It provides a starting point for recording treatments. It costs little to integrate digital images, which will allow clients to review their landscapes at their leisure. By placing all their arboreal assets in front of the owner, the inventory documents the increase in value through arboriculture.

That value grows over time, as the trees increase in vitality, volume, and contributions with the proper care and treatments. An inventory should be objective and rendered in a form that can be implemented by any knowledgeable arborist. Even if the goal is for the same company to do the work, the inventory should be a distinct product. When the owner has the option to contract with other companies, there will be less perception of bias and more trust.



Inventories often begin with trees near buildings. Newly exposed “edge” trees grow toward the recently cleared area and over the house. This beech (*Fagus grandifolia*) may need reduction pruning to meet client needs for safety.

If the caller still doesn't want to pay for an inventory, the next step is to find out his or her reasons for wanting the tree removed. These descriptions may provide openings for information from the arborist, leading to more trust by the owner.

If the customer is not receptive to any service aside from removal, the door to selling PHC should not be closed. While pricing the removal, the estimator can keep an eye out for other plant needs. A brief note can be made on the bid sheet, and information attached. The ISA consumer information series of brochures (available at www.treesaregood.com) has an economical and effective format that enables consumers to gain familiarity with the basic needs of their landscape.

Once they are sold on the service, PHC clients aren't likely to be shopping for the lowest price. They want contact with the provider, information about the trees and the treatments, and results that they can appreciate on a sensory level—aesthetics. Cost is based on value delivered, which depends on what services the arborist's business offers. PHC marketing focuses on growing tree benefits for the buyer.

A landscape drawing can be made in the field. A grid field for such a drawing can be found on ISA's tree appraisal field notes form. A computer-generated drawing using software can be updated over time. A more thorough report can be generated in the office based on field notes and images. This allows time to research and report on treatment options that may not have occurred to the arborist in the field. When the caller with complex landscape issues asks for a free estimate, remind him or her of the time and training it takes to effectively address the needs of such a landscape. With a free estimate for tree work, as with many other services, it is often true that consumers get what they pay for. An arborist who has made the investment to gain and retain certification should not be expected to work for free. An ISA Board-Certified Master Arborist can consult on inventories, monitoring, and treatments.

If certain treatments are essential, they can be bundled as “Priority #1,” and other treatments should not be selected until those critical steps are scheduled.

A maintenance plan grows out of the inventory, and it has three ingredients: monitoring, treatments, and reports. A contract for regular monitoring (re-inventorying, in a sense) is the basis for Plant Health Care. Customers turn into clients when they agree to regular and comprehensive care. Customers will often settle for a workman to get a specific job done. Clients expect a long-term relationship with a professional who is experienced, consistent, and personable.

Basic information about treatments is included in the invoice, and more detailed information can be attached, so that the client understands the service being done. Periodic reports are a way to summarize the treatments and their results and set goals for future development of the landscape. Occasional walks with clients help develop an appreciation of their needs. In return, it helps clients develop an appreciation of the improvements in their living environment.



To assess client needs, the arborist should learn about all family members. Trees can be managed in unusual ways to meet these needs.



CHIP HILDRETH

Diagnosing the condition and assessing the risk of trees near the home is a top priority in an inventory. After seeing the signs and symptoms of trouble in this tree and hearing about the implications, the client can make an informed decision.



CHIP HILDRETH

Clients can provide valuable information about plant and site history when given the opportunity. Walking the site together fosters two-way communication, allowing both arborist and client to learn from each other while appreciating the results of PHC.

Ecosystems: Analyzing and Altering Landscapes

“Eco” is Greek for “house,” which is how the ancient Greeks considered the natural environment and the systems that trees and people interact in. Houses for humans have electrical systems and plumbing systems and ventilation systems and other systems. The “house” that contains our environment also has many systems. This environment is continuous,

connecting everything within it. It is interactive, because all these systems influence each other. It is ubiquitous, everywhere on our planet. It is living, constantly changing as each system reacts to the others.

If we want to care for the health of plants by managing their environment, we must understand the systems that make up that environment. Plants also have distinct systems—hormonal, chemical, structural, hydraulic—constantly interacting. Analyzing these varied systems calls for a varied approach, drawing from experience in the field, research and other science, and other sources of information.

Universities, as well as private laboratories and government agencies, can provide very reliable information from closely interpreted academic research. Regarding pest problems, the first reference off the shelf is often a pesticide manual. PHC considers cultural treatments along with chemicals, because together they provide more effective management. Commercial sources can sometimes be biased, though many provide objective information. Searching the Internet can instantly convey invaluable information—and a lot of less-useful material. Personal and anecdotal experience is often worth following, but as *The Legends of Arboriculture* admits, practitioners can take pride in doing things the same way for 20 years, not knowing they are wrong. Information anywhere can become inbred, as ideas are repeated back and forth like an echo chamber within an isolated group of people. Only by cross-checking your facts among a range of sources, experience, and references can you confirm their reliability.

Describing the future value of trees by providing an appraisal of the economic value of trees and landscapes can be an effective way to sell PHC. Appraisal methodology can mirror the real-world process of growing a tree over time, so if arborists clearly communicate value, owners may appreciate trees all the more. When visions of dollar signs go dancing through their heads, owners are far more likely to spend a little money to grow and save their assets. However, within every asset lies a maintenance responsibility and a liability. Through regular monitoring and professional management, owners can have an assurance of a steady stream of aesthetic income and avoid being exposed in the event of tree failure. By professionally practicing PHC principles, arborists can achieve a steady income and a growing relationship with trees, people, and ecosystems.

References

- Craul, Philip J. 1999. *Urban Soils: Applications and Practices*. Wiley and Sons, New York, NY.
- International Society of Arboriculture. 2006. *Introduction to Arboriculture—Diagnosis & Disorders*. CD-ROM. International Society of Arboriculture, Champaign, IL.
- International Society of Arboriculture. 1999. *The Legends of Arboriculture*. Video (VHS). International Society of Arboriculture, Champaign, IL. 57 min.
- Lanphear, Lauren. 2006. Practicing Plant Health Care. Presentation at ISA's Mid-Atlantic Chapter meeting.
- Lloyd, John (Editor). 1997. *Plant Health Care for Woody Ornamentals: A Practitioner's Guide to Preventing and*

Managing Environmental Stresses and Pests. International Society of Arboriculture, Champaign, IL, and University of Illinois Extension, Urbana, IL. 2213 pp.

Lloyd, John (Editor). 2002. *A Guide to the Plant Health Care Management System*, 3rd edition. International Society of Arboriculture, Champaign, IL. 150 pp.

Neely, Dan, and Gary W. Watson (Editors). 1998. *The Landscape Below Ground II: Proceedings of an International Workshop on Tree Root Development in Urban Soils*. International Society of Arboriculture, Champaign, IL. 265 pp.

Guy Meilleur is a practicing and consulting arborist for Better Tree Care in Apex, North Carolina. He is a former staff arborist at the University of North Carolina and instructor at Duke University.

He currently is a curator and lecturer at North Carolina State University. Guy is an ISA Board-Certified Master Arborist and Municipal Specialist. His current research projects include managing wood decay, pruning girdling roots, and restoring storm-damaged trees.



CEU TEST QUESTIONS

To receive continuing education unit (CEU) credit (1.0 CEU) for home study of this article, after you have read it, darken the appropriate circles on the answer form of the insert card in this issue of *Arborist News*. (A photocopy of the answer form is **not** acceptable.) A passing score for this test is 16 correct answers.

Next, complete the registration information, **including your certification number**, on the answer form and send it to ISA, P.O. Box 3129, Champaign, IL 61826-3129. Answer forms for this test, **Trees, People, and Ecosystems**, may be sent for the next 12 months.

You will be notified only if you do not pass. If you do not pass, ISA gives you the option of re-taking the quiz until you do achieve a passing score.

1. IPM means
 - a. Innovative Pest Management
 - b. Integrated Plant Management
 - c. Integrated Pest Management
 - d. Integrated Plant Maintenance
2. Monitoring is
 - a. traffic control in a hallway
 - b. water and nutrient management
 - c. performing regular and systematic inspections
 - d. capturing and storing images
3. Pesticides should be applied according to
 - a. material availability
 - b. pest levels and life cycles
 - c. time of the season
 - d. the zombies
4. Monitoring leads to
 - a. inscriptions
 - b. prescriptions
 - c. conniptions
 - d. descriptions
5. Aesthetic benefits are perceived by
 - a. sight
 - b. the client
 - c. hearing, smell, taste, and touch
 - d. all of the above
6. A maintenance plan has
 - a. sales, services, and collections
 - b. scouting, monitoring, and results
 - c. monitoring, treatments, and reports
 - d. spraying, pruning, and fertilizing
7. "Eco" means
 - a. environment
 - b. house
 - c. home
 - d. landscape
8. Appraisal is
 - a. putting an aesthetic value on a plant
 - b. pointing out good things
 - c. putting an economic value on something
 - d. appreciating benefits
9. The environment is
 - a. trees, people, plants, and animals
 - b. continuous, interactive, ubiquitous, and living
 - c. continuous, proactive, ubiquitous, and static
 - d. earth, air, fire, and water
10. Conclusions drawn from scientific research are always valid
 - a. true
 - b. false
11. Total length of fungi in one cup of soil can be
 - a. 100,000 meters
 - b. 10,000 meters
 - c. 50,000 meters
 - d. 25,000 meters
12. Anecdotal experience is
 - a. always worth following
 - b. sometimes worth following
 - c. never worth following
 - d. never supported by research
13. Plant systems include
 - a. hydraulic and hormonal
 - b. hormonal and structural
 - c. chemical and hydraulic
 - d. all the above
14. An inventory creates
 - a. a reference point for client communication
 - b. a starting point for recording treatments
 - c. a basis for appreciating value
 - d. all of the above
15. If the customer is not receptive to any service aside from removal,
 - a. PHC should be set aside
 - b. the lowest price possible should be bid
 - c. the highest price possible should be bid
 - d. PHC can still be sold
16. PHC stands for
 - a. Pest Health Control
 - b. Plant Health Control
 - c. Plant Health Care
 - d. Pests Have Control
17. The best diagnoses are done
 - a. over the telephone
 - b. on site
 - c. on-line
 - d. all of the above
18. DDT caused bald eagles to form
 - a. tumors
 - b. thin eggshells
 - c. cataracts
 - d. calcification
19. Roots extending into the B horizon indicate
 - a. a decline spiral
 - b. infrastructure damage
 - c. sufficient oxygen
 - d. stem girdling
20. An ISA Board-Certified Master Arborist can consult on
 - a. treatments
 - b. inventories
 - c. monitoring
 - d. all of the above