



Working with Builders to Save Trees

Typical Protective Measures

- Erect protective fencing around root zone prior to clearing.
- Do not change the grade around trees.
- Use pavement materials that allow air and water to pass.
- Run all utilities in a single raceway or trench.
- Eliminate or minimize traffic in the protected areas. Build boardwalks.
- Prohibit the storage of building materials and soil in protected areas.
- Keep heavy equipment out of the protected zones.
- Control storm water runoff.

By H. Dennis P. Ryan, Paul Fisette and David V. Bloniarz

Saving trees makes sense. It's good for the environment. It improves profit margins, builder reputation and house sales. Careful planning, solid communication and a basic understanding of what keeps trees growing will make customers happy for a lifetime. In order to save trees, arborists need to become proactive and establish a professional working relationship with landscape architects, builders and developers. We need to establish a working relationship with the builder and the design team before the project commences. In many cases, the arborist will need to educate the contractor on how to save trees, thereby increasing profit margins.

Smart landscaping is the easiest way to increase value and speed the sale of a home. Bank America Mortgage found 84 percent of the real estate agents that they surveyed think that naturally wooded lots are 20 percent more salable. NAHB researchers report 89 percent of the homeowners they polled want builders to leave as many trees as possible on their house lots. In another study, NAHB learned that 43 percent of the homeowners queried actually paid up to \$3,000 more for the treed lots they built on, and 27 percent spent over \$5,000 more for a naturally wooded site. Trees have market appeal and improve a home's performance.

Benefits

Trees can reduce a home's energy bill. Strategically placed trees keep homes cooler during summer and warmer in winter. For example, we measured the temperature of a brown-colored roof on a hot July afternoon. Its sun-struck surface was 140 degrees. The surface in the shade of a leafy oak was 50 degrees cooler! Leaves give off water vapor, cooling the surrounding air as it evaporates. The combination of shading and evapotranspiration greatly improve a home's natural ability to stay cool.

The EPA calculates that it is possible to reduce mechanical cooling by up to 50 percent with a thoughtful landscaping plan. It is important to shade the east and west sides of a home, since the sun angle is lower and more direct on these sides. Shade the cooling equipment, too. Air conditioners run more efficiently when they are cool. This single detail can save 10 percent on your cooling bill. As an extra bonus, shading a structure improves durability. Direct sun bleaches color from painted surfaces and ages building materials such as plastics, wood, and asphalt roof shingles.



The area in the foreground has been leveled for a lawn, but the trees beyond have been left untouched and will survive. If necessary, the area can be thinned later by hand, minimizing the risk of mechanical damage and soil compaction.

Lowering a home's energy requirement reduces the amount of pollutants exhausted up your chimney and utility smokestacks.



Although the root zone of this tree was defined with snow fencing, lack of adequate site supervision made that a wasted effort (left). The broken limb and damaged bark on the tree above are the most visible injuries, but the excavated material piled beneath it will soon suffocate the roots.

A carefully positioned wind-break lowers the winter heating load by up to 20 percent. Early settlers apparently knew this, but the concept seems lost on a generation of builders who control the winter chill with blankets of insulation and the force of central heating. A screen of evergreens can passively reduce air infiltration and protect walls from heat-scrubbing winds. Don't block south-facing windows that provide solar gain. Even deciduous trees that shed their leaves block 50 percent of the solar gain with their branches. Tree plantings provide an environmental bonus.

Lowering a home's energy requirement reduces the amount of pollutants exhausted up your chimney and utility smokestacks. Preserving native plantings reflects an environmentally sensitive approach to development. Trees and the underlying vegetation intercept and absorb runoff from storm water, reducing erosion and siltation. They filter pollutants such as lawn fertilizers, pesticides and other chemicals present in the landscape. Tree plantings buffer road noise and mask sounds from neighbors. They improve privacy and screen unsightly views. Builders that preserve trees are regarded as environmental stewards. Potential

homeowners, regulators, municipal officials, and the media recognize the effort. These projects sell faster because they are set apart from the competition as healthy and friendly. In a recent study of 1,200 households, more than 70 percent of the respondents said, "Trees make you feel good!"

The evidence supporting tree preservation is overwhelming, yet builders continue to strip the vegetation from the sites they build on. Many builders like working with a clean slate. They want unrestricted access to all parts of the site and prefer to plant new trees later in the project. Sadly, the few builders who try to save trees end up losing them to a slow but predictable death. Trees often look perfectly healthy three or four years after construction, however, unintentional construction damage has them marked for the chipper. When a tree finally looks sick, it's too late.

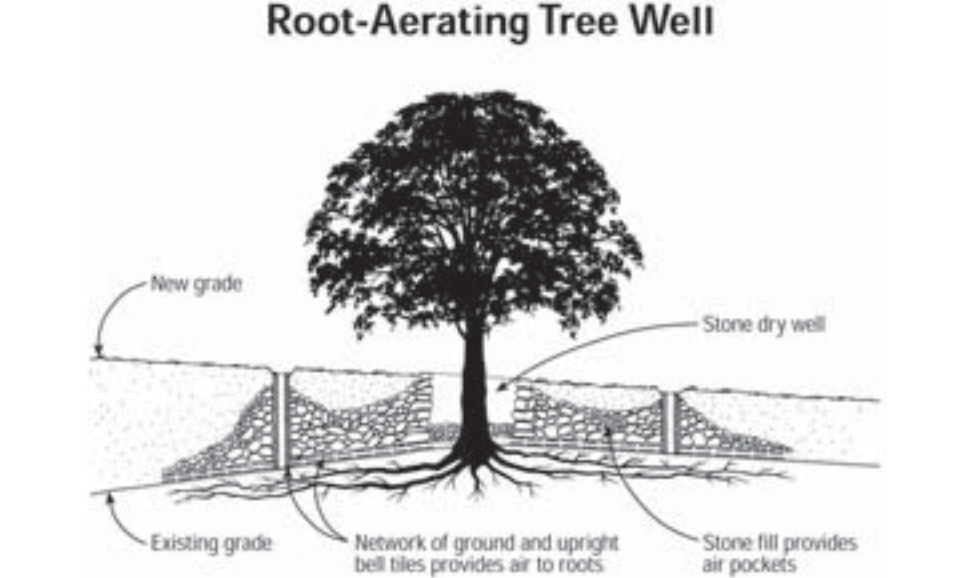
Tree preservation has to be included in the construction master plan, and this is where the arborist can play a critical role in tree preservation. It pays huge dividends through improved curb ap-

peal, enhanced reputation, and wider profit margins. Site development that preserves trees requires careful planning and thoughtful communication between all the members of the construction team. First, arborists, the landscape architect and the builder must understand what a tree needs in order to remain healthy.

The problem

The most obvious injuries to trees are made to trunks and branches. Broken and dangling branches can be pruned and bark injury can be repaired with a limited degree of success, but damage to roots is lethal. The resulting death is unsuspected. Valuable trees often die several years after the project is complete. Homeowners often mistakenly think their favorite tree has a disease or other pest problem. There is no association made between a thinning crown and the long-forgotten construction project that took place years ago.

There's a stiff penalty for unintended damage. It costs 10 times more to remove



If there's no way to avoid raising the grade around a tree, it might be saved by constructing a root-aerating tree well around it. This is an expensive option and one that is best left to an experienced arborist.

a tree near a house compared to the same tree on an open lot. As an example, a recent project outlines this scenario: A builder in Denver was asked to preserve a

50-year-old Chinese elm. His clients loved the tree. The tree stood 25 feet from the new home's southwest corner. Its wide-sweeping branches had provided the

homeowners with free air conditioning and a beautiful landscape environment for four years! The tree died, became a hazard, and cost \$2,500 to remove from the congested urban lot. The homeowners replanted a 15-foot tree at an installed cost of \$500. The case was arbitrated and the parties split the cost. But the process was painful and the damage was completely avoidable with careful planning during the construction phase. Tree preservation programs must be thoughtful, involve a certified arborist and be a central element in the original design process.

Serious construction damage almost always occurs in the root zone. People don't understand where root systems are located or how sensitive they are to construction activity. Most root networks are shallow,



Don't try to save trees that can't be saved. The oaks at the edge of this foundation have lost too many of their roots to survive for more than a few years. It would have been cheaper and much less troublesome to remove them before starting to build.

limited to the top 18 inches of soil, and provide the nutrients and moisture required by the plant. Roots extend well beyond the dripline of a tree. They extend in a radius that equals two times the height of the tree.

So feeder roots for a 20-foot tree extend 40 feet from the tree stem. The very fine feeder roots grow like branches. They extend farther every year. As the crown of a tree grows and expands, the roots must grow to supply the extra food and water required to support new growth.

Construction threats

There are three main construction activities that kill most trees: cut roots, soil compaction and grade changes. Builders cut roots

when they trench or dig near the dripline of a tree. Digging cellar holes, septic systems or even grading a lot will cut roots and kill trees. When roots are eliminated, the tree is not able to draw the water and

nutrients it needs. The tree becomes dehydrated and starts to die at the top of the tree crown.

Soil is compacted when trucks and heavy equipment drive over the root zone. Stockpiling lumber, building materials, loam, or excavated soil over the root zone also compacts the soil, smothering the roots. Many people think that trees breathe in carbon dioxide and give off oxygen. The only parts of the tree that actually do that are the green leaves during photosynthesis. All other living cells take in oxygen for respiration to convert stored sugars and starches into energy (food). The byproduct is carbon dioxide. So if you compact the soil or install a driveway over the roots, you cut the supply of oxygen reaching the roots and carbon dioxide cannot escape. It's just like putting a plastic bag over your head.

When you change the soil grade around a tree, you affect the root system, add soil, remove soil, or undermine part of a tree's anchoring system. Excavation fill is often spread over the site. This raises the grade

and smothers the roots. If you lower the grade, you expose roots. A good guide is to maintain the root flare at the base of the tree. Do not bury the trunk flare. Some professionals claim you can add 2 or 3 inches of well-draining topsoil to an older, well-established tree and get away with it, however our experience shows it's best not to add any soil around trees.

Solutions

Arborists and landscape architects interested in preserving trees on construction sites need to introduce themselves to local contractors or the local building association and demonstrate how they can assist the builders in saving trees and increasing the builder's profits. Effective tree preservation must be integrated during the project design and land development process. The contractor needs to hire an arborist that has experience with residential construction projects and knows what issues builders face.

A construction project is no place for an

idealistic theorist. The arborist must be familiar with the roles played by members of the project team and become a central member of the team. As an arborist, you must understand the design concept and walk the site before any plans are drawn. The arborist should help to lay out the site and communicate appropriate information at critical times during the project to both the landscape architect and the building contractor.

As a professional arborist, you should be ready to supply the following information for the project:

- ◆ What trees are healthy, need pruning or need removal;
- ◆ What trees will survive proposed changes in the landscape;
- ◆ How to accomplish development goals while minimizing injury;
- ◆ What trees will pose a hazard due to weak root systems;
- ◆ What trees have invasive roots that threaten pipes, utilities and foundations;
- ◆ What trees are pest- and disease-re-

sistant;

- ◆ How to protect trees that are valued;
- ◆ Where to plant new trees, and how and where to transplant existing trees.

Master plan

Successful development requires careful planning. Tree preservation should be an important part of a project's master plan. It should be contemplated at the very first stage of the process, before any work is done on the site. There are several key elements that guide an effective tree preservation plan:

Identify trees suitable for preservation

This step provides the most critical information. Here, the arborist creates a tree inventory that describes the quantity and quality of existing trees on the site. Key team members inspect and analyze the property during this phase. Brainstorming and visualization is encouraged to stir the imagination and build enthusiasm for the project. Valuable trees are identified, tagged, numbered and referenced on the site plan. This should be done when there is a general understanding of the project goals, but before a conceptual plan is completed.

This allows the delineation to influence the placement of roads, driveways, buildings, drainage, scenic vistas, wildlife corridors, and guide the very ambiance of the development. Only trees that have a strong potential for sustained long-term growth and survival are selected for preservation. Remember, the site these trees are growing on is about to be drastically changed, so a projected view of the landscape must be considered.

Characteristics such as species, size and health of the trees are noted. Any work that must be done before the lot is

cleared and graded is planned at this time.

Define tree protection zones

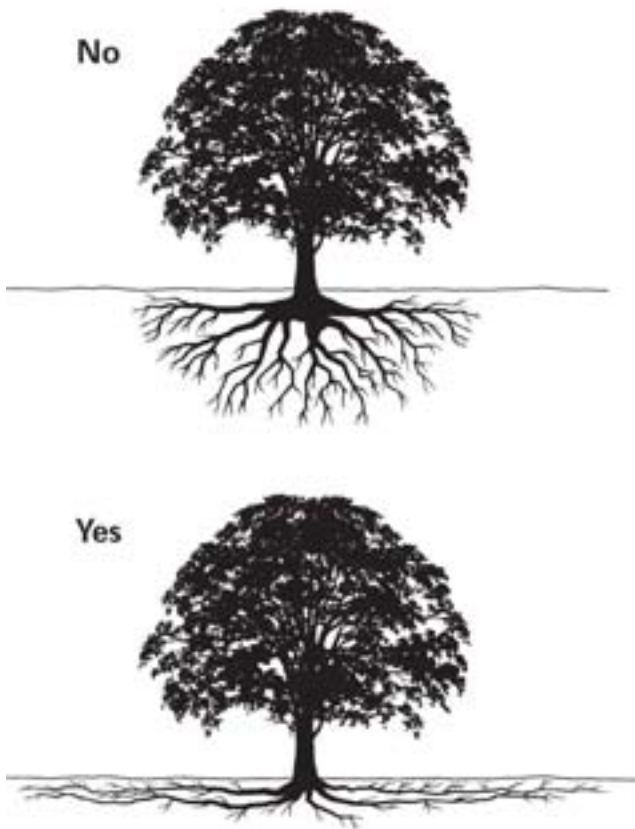
Tree protection zones are the areas located directly around the trees you want to save. Root zones are critical areas. Root zones are depicted as designated circular areas around each tree shown on the landscape plan or site map. These areas are off limits! No construction activity can occur in these zones. That means grading, digging, storing of materials and all traffic is prohibited in these areas. The size of the zone depends on the health, age and species of the trees you are trying to protect. The rule of thumb is to hold all work outside a tree's dripline. However, some trees need more protection. As the professional arborist, remember, protect as much of the root



No.	Species	DBH	Health	Canopy	Roots	Recommendation
01.	White Oak	48"	Good	Good	Good	Save
02.	Red Oak	50"	Fair	Excellent	Good	Save
03.	Red Oak	34"	Fair	Good	Good	Save
04.	Red Oak	26"	Poor	Poor	Poor	Remove
05.	Black Cherry	18"	Fair	Good	Fair	Remove, near end of life
06.	Black Locust	34"	Fair	Poor	Poor	Remove, poor canopy shape
07.	Red Oak	40"	Fair	Fair	Good	Save
08.	Red Maple	34"	Fair	Fair	Good	Save
09.	Red Oak	24"	Fair	Fair	Good	Save
10.	Red Maple	18"	Excellent	Good	Good	Save, root zone in proposed drive
11.	Red Maple	30"	Fair	Good	Fair	Remove, root zone in proposed drive
12.	White Oak	48"	Good	Excellent	Good	Save
13.	Red Oak	20"	Good	Good	Good	Save, adjust house position
14.	Red Oak	30"	Good	Good	Good	Save
15.	White Oak	30"	Good	Excellent	Good	Save
16.	Red Oak	22"	Poor	Poor	Poor	Remove
17.	Black Locust	18"	Fair	Fair	Fair	Remove

The initial site survey of a wooded lot should note the locations of all trees to be saved and delineate root protection zones. Planning well in advance of construction makes it possible to adjust the position of the house to accommodate desirable trees.

How a Tree Grows



While tree roots are often assumed to reach deep underground and extend outward to the drip line (top), they are actually shallower and much wider reaching (bottom). As a result, they are far more vulnerable to surface disturbances than many builders and homeowners realize.

system as you can. The more the better.

It is the arborist's job to minimize damage to valuable trees. All construction activity is referenced on the working drawings and specifications. The trees that could be affected are included in the con-

struction documents and discussed at project meetings. Details regarding the impact should be included in each section of the design plan.

Outline protective measures and develop specifications

With the relevant information delineated on the site map, designers can now locate the building, driveway and utilities, and develop the grading plan. This layer of the plan can be colored to show where construction will affect protected zones. If destructive site development cannot be modified, these overlay warnings may indicate which trees must be removed. It is far better to do removals at the beginning than after the building is constructed. A good site plan will show permitted parking, storage, equipment washouts

and other locations critical to the preservation plan.

Materials and methods required to control damage must be clearly described in the construction documents. Include an enforcement or penalty clause in the speci-

fications. Complicated details should be illustrated on the working drawings. Prescriptions are part of the construction documents that are forwarded to the Conservation Commission, building department and subcontractors who will bid on any part of the project. During the pre-construction stage, hold a meeting with the owner, landscape architect, construction foremen, subcontractors, and others who will work on the site. Make it clear that preservation is important on this job, requiring everyone to work together.

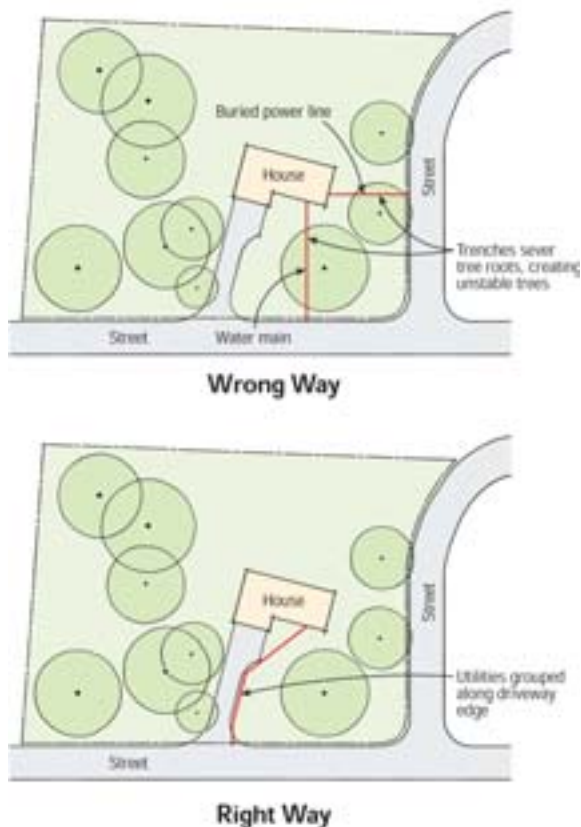
Field inspection and administration

Critical decisions are made during the design phase, but follow-through will make or break even the finest project. You must verify that field workers are following the preservation plan. Tree preservation is unusual for many workers. Some may think the extra care required is a bunch of baloney. Keep a watchful eye.

Surveyors, well drillers, excavators and truck drivers are usually first to arrive on site. Meet them as they arrive on the job site. Instruct them not to wash down equipment near desired trees. Trees are sensitive to chemicals and washing out a concrete truck affects the pH of the soil. Petroleum washed from equipment also hurts. Calcium chloride is often used to reduce dust on the site. Be careful, since salt is toxic.

Verify that all workers understand their roles. And be sure the required protective measures are implemented at the appropriate time during the work schedule. The arborist can be hired to oversee field imple-

Laying Out Utility Trenches



Running buried utilities in a series of radiating or parallel trenches creates isolated strips or islands of trees with damaged root systems (top). Bundling utilities in a single trench along the edge of the driveway keeps damage to a minimum and reduces the risk of wind throw (bottom).

Additional Information

National Arborist Association, 3 Perimeter Rd., Unit 1, Manchester, NH 03103; 800-733-2622; www.natlarb.com

American Society of Consulting Arborists, 15245 Shady Grove Rd., Suite 130, Rockville, MD; 301-947-0483; www.ascaconsultants.org

International Society of Arboriculture, PO Box 3129, Champaign, IL 61826; 217-355-9411; www.isa-arbor.com

National Association of Home Builders, 1201 15th St. NW, Washington, DC; 800-368-5242; www.nahb.com

Trees and Development: A Technical Guide to Preservation of Trees During Land Development
By Nelda Matheny & James Clark

Trees & Building Sites
By Gary Watson and Dan Neely

Building Greener Neighborhoods: Trees as Part of the Plan
By Jack Petit, Debra L. Bassert, and Cheryl Kollin

mentation, but the most effective policy is to have the arborist advise a fully invested site supervisor.

The site supervisor should clearly mark the location of each tree being saved on the site. Erect signs that mark storage and clean-out areas. Install protective fencing before any work begins. It should be rugged, like an anchor fence or one built using 2x4s. The fence must be conspicuous. It must be high enough to be seen by operators of heavy equipment, so those workers won't run over it. Snow fencing is not good enough. Hay bales should be used to protect wooded areas and individual root zones from silt and run off.



Lowering the grade around this oak has left it with practically no root system. The thin and discolored foliage shows that it's already dying. The inhabitants of the blue house at right might want to sleep in the basement on windy nights.

As the professional arborist you should be hired to perform some important tree-care work before building begins. Tree-care duties:

- ◆ Remove unwanted trees;
- ◆ Prune and improve saved trees;
- ◆ Fertilize, water and aerate where needed;
- ◆ Root prune outside of protected root zone;
- ◆ Mulch where needed.

Many handbooks recommend tree wells as a system used to change the grade around an existing tree. They should be avoided if at all possible. You can build a stone wall and hold an elevated level of soil back away from the tree trunk, but the rest of the root zone is buried and suffocated. To do it right you must construct a radiating network that provides air and water to the entire root system. Proper tree well construction can be incredibly expensive and impractical in many cases. You are better off working with the existing contour of the land if at all possible.

Building contractors need to know that the cost of hiring an arborist depends on the house and scope of project. The service can run from a couple hundred dollars for a plan review and site visit to a couple thousand for a full consulting service. Given the numerous benefits afforded by professional tree preservation, hiring an arborist is a sound investment that can benefit the entire community. It is also a professional service that the arborist can offer the community year-round. The key to long-term tree health is for the arborist to be involved from the very beginning.

H. Dennis P. Ryan is director of the Arboriculture and Community Forestry Program; Paul Fisette is director of the Building Materials and Wood Technology Program; and David V. Bloniarz is the USDA Forest Service Urban Forester at the University of Massachusetts in Amherst, Mass. Modified with permission from an article originally published in the Journal of Light Construction. For subscription information, call 1-800-375-5981 or visit www.jlconline.com.

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