The Care and Management of Native Oaks in Northern Illinois

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The oak forests of northern Illinois have taken centuries to develop, and deserve to be regarded as an irreplaceable landscape legacy distinctly characteristic of our region. They not only provide favorable conditions for our common oaks and other trees, but they also support a multitude of living things: mammals, birds, insects, fungi, herbaceous plants, and other forms of life.

If we are to keep the oak trees which we value, we must begin by understanding that the oaks are integral parts of a system made up of living and non-living things which have developed together over a long period of time. Certain conditions provided by the forest community as a whole have become vital to the life of these oak trees, and we must either preserve these conditions or provide a successfully functioning simulation of these conditions. Indeed, some evidence suggests that, in the long run, we may not be able to have the trees without the forest.

In northern Illinois it is especially important to understand the interrelationships between the forest trees and the forest soils. Here the oaks, over hundreds of years, have had a part in producing the soils on which they are found. Oak trees thrive in acid soils, and their fallen leaves help create and maintain acidic surface layers that differ significantly from the alkaline glacial material from which our regional soils are derived. In northern Illinois there often is also an impermeable layer with high clay content about two feet below the surface, which limits the depth to which tree roots readily penetrate. Under these conditions, oak trees have developed shallow root systems with an immensely proliferative mat of fine roots in the upper few inches of the soil. Because they are so near the surface, these fine roots — important to the proper functioning and health of oak trees — are exceedingly vulnerable to modifications of the surface layers of the soil.

The common oaks of northern Illinois are white oak (**Quercus alba**), red oak (**Quercus rubra**), and bur oak (**Quercus macrocarpa**). All three are found in oak forests, with bur oak also being found in open groves and in open parts of forests. All three oaks are harmed by soil surface modification, but bur oak seems to be the least sensitive.

There are many causes of soil surface modification, but one of the most severe is the construction of houses and other buildings in wooded areas. Oak trees that remain after construction of buildings in a forest are subjected to a multitude of conditions markedly different from those under which the trees developed. Most of the changes are detrimental to the oaks and may result in stress, decline, and often death of the trees.

Presumably one of the primary reasons for building in a forest is the desirability of the existing trees, yet little attention is given to the requirements of the trees and to the maintenance of the forest. Perhaps there is a tendency to think of tree roots as coarse underground branches or "pipes" descending deeply into the ground; thus the possibility that the life of the tree might be threatened by events at or near the surface just never enters one's thinking until it is too late.

The following list of "do's" and "don'ts" is provided with the hope that it will offer a better understanding of why oaks are sufffering, what they require for health, and ways in which planning and care can help prevent needless loss.

Some Things that can Damage Oak Trees ("Don'ts")

Physical Changes Detrimental to Oaks

General Changes:

Soil compaction usually results from the use of heavy equipment. Compacted soils, especially where clay is present, cannot provide suitable conditions for water insoak, aeration, nutrient uptake, and root growth by trees.

Cutting, filling, or changing the soil surface affects the surface root systems of trees adversely or may even destroy them.

Impeding drainage, even temporarily, can damage the surface root system. Favorable aeration of the surface soil is an important factor in the maintenance of a proliferative fine root system; water-saturated soils greatly reduce oxygen availability.

Thick sod around oaks affects the trees adversely because of the keen competition between the grass and the oaks' fine roots for moisture and nutrients.

Adding Things:

Raising the soil level usually has a serious effect on the soil/air interface. The fine-root system is sensitively attuned to the long-existing surface soil, and when buried, may undergo rapid deterioration.

Storage of soil near trees during construction, such as temporarily piling topsoil for later distribution, may affect the fine surface roots of trees in the same way as soil fill. This is especially true during the spring when great numbers of new fine roots are normally added.

Use of gravel, cobblestones, and limestone blocks for landscape effects around trees may change surface conditions abruptly and detrimentally.

Removing Things:

Removing soil from around a tree to lower the grade cannot be done without also removing the surface layer of fine roots. If the area of removal is extensive, the tree actually may be deprived of so much of its surface root system that it may not be able to survive.

Removing leaves year after year has an impoverishing effect on the soil, in that mineral nutrients are discarded with the leaves. Nutrients contained in the leaves have been selectively "pumped" from the soil. Commercial fertilizers do not replace all of the kinds of nutrients that are lost in the discarded leaves.

Removing neighboring trees may permit soil temperature fluctation and drying far greater than under previous woodland conditions.

Constructing Things:

Paved surfaces such as patios, walks, and driveways that are located too close to trees will destroy surface roots and detrimentally affect deeper roots on the sides of the tree adjacent to the paving.

Circular "wells" built around trees to keep soil fill away from the base of the trunk are seldom effective in preserving oaks. The soil fill around the outside of the well covers the most extensive part of the fine surface root system.

Septic tank field lines may produce a great lateral water movement because of the impermeable subsurface layer of clay so prevalent in our region. Consequently, soil some distance from the line itself may become saturated, and the wetness may adversely affect oak root systems.

Installation of underground utility lines may destroy large segments of the fine root system if the trenches for the lines are under the canopies of oaks. Trenches should be located midway between widely spaced trees.

Footings for garden walls, pools, etc. may have the same effect as trenches for utility lines. Curbing for streets and driveways also presents problems.

Chemical Changes Affecting the Condition of Oaks

Certain herbicides seem to be taken up by the fine root system, causing curling and disfiguration of the foliage.

Fertilizing of lawns or trees on warm days in summer may dehydrate oak roots and foliage, sometimes causing wilting, browning, or loss of foliage and even loss of trees. Water loss (transpiration) from the foliage is especially great on hot summer days, and fertilizers going readily into solution may seriously interfere with water uptake mechanisms.

Watering with hard water and use of lime-based fertilizers both may raise the pH of soils, i.e., lessen their acidity. Oaks thrive best in acid soils.

Limestone gravel mulches also may raise the pH of soils around oak trees.

Some Things that may Help Save Oak Trees ("Do's")

Handling Natural Woodland During and After Construction

Leave the forest intact wherever possible.

Place buildings adjacent to the forest rather than within the forest.

Prevent disturbance of the natural woodland soil surface within the areas circumscribed by the outer branches of oak trees, since their vital but fragile root systems extend at least this far. It is imperative that these areas be considered especially sacrosanct during construction if the oaks' chances of survival following construction are to be enhanced.

Retain natural conditions of the forest floor wherever possible. Organic matter is an integral part of the natural forest floor and should not be removed, since an acid surface layer of soil owes its development largely to decomposition of fallen leaves.

Simulate natural conditions with ground cover under oaks, if preservation of the natural woodland floor is not practical. Ground covers collect fallen leaves which become incorporated into the soil as organic matter. Mulches of organic materials, such as wood chips or leaves, are good media in which to plant ground cover. Hardy and shade-tolerant plants appropriate for this type of ground cover include purple wintercreeper (**Euonymus fortunei coloratus**), English ivy (**Hedera helix**), periwinkle (**Vinca minor**), and Japanese pachysandra (**Pachysandra terminalis**).

Retain "mini-forests" by creating development plans in which groups of trees are preserved as tiny forests, if the whole forest cannot be preserved.

Progressive selective thinning, done over a period of years, may improve the situation for the remaining oaks in thick forest stands where all the trees are in a highly competitive situation. However, this must be done gradually inasmuch as abrupt removal of too many trees radically changes the environment of the remaining trees. On construction sites, oaks with long trunks and small crowns are especially hard to save.

Remember that saplings are the future forest and that complete clearing of all plants except mature trees means that when the trees eventually die, all semblance of the former forest will be gone. Smaller trees, saplings, and seedlings are important, too. The clearing away of everything but the large trees constitutes a terminal use for this generation — and perhaps the next — of what in nature is an endlessly renewing resource.

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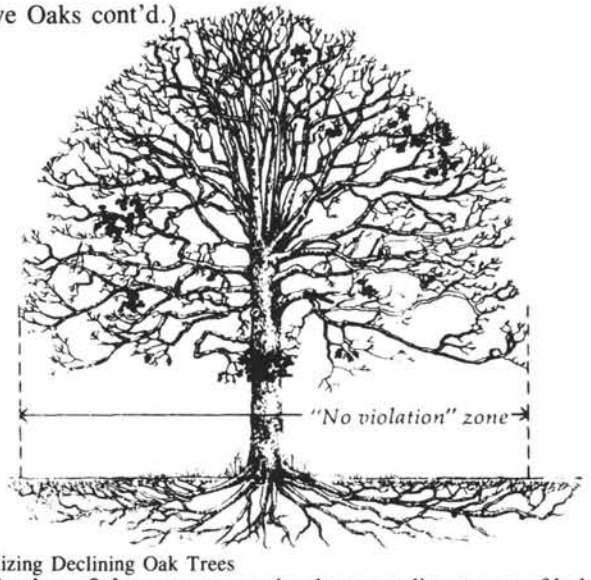

Revitalizing Declining Oak Trees

Thinning of the crown may be the most direct way of helping an oak in decline, for the decline seems to be related to an imbalance in the crown/root ratio. Stresses in the soil environment bring about a reduction in the number of healthy functional roots, and a deliberate reduction in number of branches by thinning lesses the demand placed on the remaining roots for water uptake, which seems to be critical on hot, dry summer days.

Mulching with wood, leaves, or other organic material around oak trees, provides a simulation of forest floor environment. Mulching encourages the growth of fine roots and the beneficial fungal partners of fine roots that are found abundantly in healthy, intact forest soils.

Fertilizing may appear to invigorate oak trees, producing more luxuriant foliage. However, for overall benefit, there must also be stimulation of fine root growth providing greater absorptive surface for taking up nutrients, water, and oxygen. In difficult soil situations, significant root proliferation may occur slowly following fertilizing. Mulching and other means of soil improvement may also be necessary.

Special Problems of Oaks

Die-back of branches of oak trees is a visible sign of stress, usually traceable to root/soil problems. Such trees may be subject to infestation and further damage by insects, or to rot and decay.

Defoliation — the loss of all leaves on oaks because of chewing insects, fungi, bacteria, drought, etc. — is a serious matter, since re-leafing depletes the tree's food reserves. Repeated defoliation may bring about decline and death of oaks.

Chlorosis or leaf-yellowing is often attributable to nutrient deficiencies. Especially common in northern Illinois is chlorosis of pin oak (**Quercus palustris**), a species commonly planted as a street and lawn tree. The alkalinity of most lawn soils in this region hinders the uptake of iron in pin oaks, producing chlorosis. Chlorosis of the foliage of large white, red, and bur oaks is seen increasingly in older neighborhoods in the Chicago region, but this chlorosis may involve a multiplicity of factors.

Leaf diseases may be serious, but there are many disfiguring leaf diseases with which oaks co-exist without serious detrimental effect.

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