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TREES IN THE CITY

Trees are a romantic subject for city planners and architects as well as for poets who wish to pay tribute to nature.

A pleasant measure interposed between our hearts and eyes and the eventual geometries of our hard constructions. A precious instrument in the hands of a city planner. The most concentrated expression of the forces of nature.

The planting of large shade trees must become a paramount objective of all those who would improve the appearance of cities, and it is the main hope for any redemption of the lost character of American cities.¹

Trees have become symbols of the goodness and wholesomeness of the natural environment. They are expected to beautify, purify, and, one often suspects, sanctify the urban or suburban atmosphere. Because trees have these symbolic and sentimental attributes, their destruction can provoke strong emotion. He who chops down trees (or more realistically, bulldozes them away) is often characterized by preservationists as a sinful heathen who should either be set right in his ways or punished for his wrongdoing.

It is difficult to write about tree preservation and protection and not seem biased. In this report, however, we will seek a more dispassionate viewpoint.

Trees have very definite value to us, but we cannot mourn the passing of every tree unless we are to become professional mourners instead of planners. The spread and intensification of urban development makes it inevitable that some

¹First quote from Le Corbusier, When the Cathedrals Were White (New York, 1947), p. 71. Second quote from Frederick Gutheim, Beauty for America: Proceedings of the White House Conference on Natural Beauty (Washington, D.C.: 1965), p. 88.

trees will be felled. Yet if a community has sufficient foresight and interest in doing so, mature trees can be preserved and precaution taken to have new trees planted.

The desire to protect trees is not unique to this country or this time. The French Forest Ordinance of 1669, regulating the manner of exploitation of Louis XIV's royal forests and private forests as well, gave this warning:

The ordinary fine for depredations by private persons . . . in our forests woods and warrens, committed between sunrise and sunset, without saw and without fire, shall be for the first offence, a fine of four livres for each foot of oak, and of all fruit trees, without distinction and the same for chestnuts If the depredations be found to have been committed between sunset and sunrise, by saw or by fire, . . . the fine shall be double.²

In this country's development, tree preservation has been largely, though not exclusively, keyed to forest conservation at federal and state level. At city and metropolitan scale, tree preservation and the planting of new trees has accompanied the establishment of large public parks. An example is the judicious combination of seabent grass and such trees as cypress and eucalyptus which helped reclaim sand dunes and wild mustard fields to make San Francisco's Golden Gate Park.

Since 1856 the Commonwealth of Massachusetts has been in the business of protecting shade trees, and the powers and duties of a tree warden have been spelled out in state laws. Justice Braley defined the spirit of the law in 1915:

The legislation concerning public shade trees has been enacted from time to time not merely to satisfy the desire of cities and towns for the conservation in their thoroughfares of shade and ornamental trees, in many instances a legacy from the past or the gift of public-spirited citizens, but for the benefit and enjoyment of all the inhabitants of the Commonwealth having occasion to use the public ways.³

New Jersey, Pennsylvania, Maryland, Michigan, New York, and California followed with shade tree legislation in subsequent years.⁴

²French Forest Ordinance of 1669. Compiled and transcribed by John Croumbie Brown, Edinburgh: 1883, p. 174.

³Whiting v. Board of Public Works of Holyoke, 222 Mass. 22, 26 (1915) Quoted from Shade Tree Law in Massachusetts by Edward T. Simoneau, Massachusetts Agricultural Experiment Station, Bulletin No. 349, (February 1938), p. 9.

⁴Charles A. Young, "The Cultural, Aesthetic and Historic Background of Tree Use Along Roadsides," Proceedings of the First Street Tree and Utility Conference, (Cleveland, Ohio: 1955), pp. 8-12.

At the local level, many cities have enacted tree ordinances to provide, protect, and maintain shade trees on public streets and in public parks and grounds. It is also common for some cities to recommend or require the planting of street trees in new subdivisions.⁵ Trees on private property, especially trees on land about to be subdivided, are not so well protected or regulated. Although devices such as planned unit development, cluster subdivisions, or grading ordinances may indirectly foster tree preservation on private property, programs to encourage, or regulations to require, tree preservation are not yet commonplace.

Ecology and aesthetics justify tree preservation and protection. A variety of tree characteristics must be understood if tree preservation or planting is to succeed as some trees are more appropriate and amenable to preservation than others. And there are a number of ways to protect and preserve trees aside from regulations. It is these matters which are the concern of this report.

RATIONALES FOR TREE PROTECTION

Trees moderate the effects of sun, wind, and rain; buffer and screen out noise or air pollution; and improve the appearance of individual lots, neighborhoods, and communities. The principal reasons for tree preservation, and the planting of trees where there are none, are ecological or aesthetic.

Ecological Factors

The two ecological reasons most frequently cited for tree preservation are the removal of carbon dioxide from the urban atmosphere and the cleansing and filtering of physical contaminants in the air.

Man and all animals depend upon the capacity of green plants to absorb carbon dioxide from the atmosphere and supply it with oxygen through the process of photosynthesis. Following this line of reasoning, trees, as the largest and most striking form of green plant, are commonly credited with purifying the urban atmosphere, but this is not a wholly accurate conclusion. Trees do supply oxygen to the air, but at the city scale this effect is negligible in comparison to atmospheric diffusion and the action of air currents which replenish the oxygen in the air:

Even very large areas of greenery are not capable of purifying the air by any chemical conversion, for in order to do this parks and gardens and so on would have to be able to dispose of the excess of carbon dioxide produced by heating installations, exhaust, human breathing and so on. Yet the actual effectiveness of green areas in this connection is so slight that it is scarcely worth

⁵International City Managers Association. Municipal Street Tree Programs, Report No. 236, September 1963. Also see ASPO, Land Development Ordinances, Report No. 86, May 1956.

calculating. Camillo Sitte long ago pointed out that a wooded area of three acres can absorb only as much carbon dioxide as four human beings would produce in the course of cooking, heating, breathing. Martin Wagner showed later that to improve the air of Berlin to any marked degree a green area of three million acres would be needed. It has also been estimated that the Tiergarten (which, before its destruction was half planted to trees) could assimilate no more than one and one-half per cent of the carbon dioxide produced every day in the central district of Berlin. So we are not justified in assuming that green areas, even of considerable size, can do much in the way of this kind of air purification.⁶

For many trees, accumulation on the leaves of soot or oils from polluted air can even retard photosynthesis by screening out sunlight necessary to the process. Some trees cannot survive in polluted air.

Those that do grow well in urban areas, however, act as natural "air conditioners" or filters.⁷ Dust particles are caught on leaves and washed away with the rain instead of being carried away in the air. Moisture held in and around leaves acts as a wash for polluted air as well. Trees trap the wind and serve as a settling chamber for dust and other contaminants. Tree belts, large enough to alter prevailing wind patterns and create updrafts, can be planted around manufacturing districts to cut down the concentration of pollutants in the air. For the city, then, the reduction of air contaminants by trees is much more significant than the oxygen they release into the air.

Trees serve as windbreaks or shelterbelts by acting as a brake on air movement. Their ability to protect crops and farmsteads from exposure to extremes of temperature and wind damage to ripening fruit is perhaps best appreciated in the West and the Great Plains. But farmers are not the only ones to reap this benefit. Designers of an English new town, Peterlee, have given priority to windbreaks in their landscaping in order to shelter the housing areas from the characteristic "fresh" wind which blows throughout the year. Fremont and Ridgecrest, California, whose tree ordinances will be discussed more fully later, have made protection from high winds the rationale for tree preservation. A thick belt of trees can reduce wind velocity 50 per cent for a distance leeward of the trees equal to 10 times their height, but even a thin belt of one or two rows can be effective. Because a tree's height and mass can diminish the severity of winds and because its roots bind the soil, it is also an effective agent in retarding the wind's erosion of topsoil.

Leaf litter and humus (the product of decaying and decayed leaves) act as a blotter to soak up rainfall or melting snow. Thus trees reduce the erosion and flood hazard caused by unchecked surface runoff. The problem has been stated drastically for the Rock Creek area of metropolitan Washington, D.C.:

⁶Erich Kuhn, "Planning the City's Climate," Landscape 8:3 (Spring 1959), p. 21.

⁷Gary Robinette, "Plants, the Natural Air Conditioner," Landscape Design and Construction, March 1968.

The principles of soil conservation, understood or not, have little to do with what happens when a developer unleashes his bulldozers to subjugate a tract of suburban land for construction. Typically all vegetation is knocked down and jammed into piles for burning, and during the ensuing weeks or months, even years, while the land awaits the attention of the mass homebuilders; it sits there bare and loosened under such rains as may fall, with results that are bitterly predictable.⁸

The sediment control program of Montgomery County, Maryland, represents a significant step in alleviating the problems of erosion damage. In addition to temporary slope stabilization with mulches or fast-growing grasses and provision of mechanical structures to divert runoff, preservation of natural vegetation and the sparing of trees from the bulldozer are crucial to the success of the program.⁹

It is at the intimate scale of the lot or the neighborhood that an individual most appreciates the shade and cooling which trees provide. While the tree itself provides a sunshade, the cooling effect is largely due to the tree's transpiration, i.e., evaporation of water pulled from the soil off the surface of leaves. The combined effects of direct blocking and evaporative cooling can often reduce heat and glare more efficiently than mechanical shading devices.¹⁰ Deciduous trees not only make good shade canopies in the summer, but they allow the sun to shine through in winter.

To sum up then, trees are ecologically important to man. We have discussed some of the desirable effects they can produce in urban and suburban areas. We must note, however, that trees are intricately bound up with the soils, the rivers, the streams, the fauna, and other vegetation--i.e., the whole landscape. Ecologically speaking, conservation in the total landscape and an understanding of nature's dynamic equilibrium are more appropriate focuses than tree preservation by itself.

Aesthetic Factors

Ecological benefits can provide an underlying rationale for tree preservation, but the most significant benefits of tree preservation in burgeoning suburbs and in cities are aesthetic. Trees can be looked upon as leafy screens to hide the ugly or the dull scene, or as attractive and pleasurable forms to be appreciated for the beauty and delight they offer. As screens, trees have a very functional purpose--they form visual barriers and to a limited extent they are

⁸U.S. Department of Interior, The Creek and the City (U.S. Government Printing Office: Washington, D.C., c. 1966).

⁹Maryland-National Capital Park and Planning Commission, Sediment Control Program for Montgomery County, Maryland (March 1967).

¹⁰For more information about proper orientation of trees, to achieve greatest shading effects, see Victor Olgyay's Design with Climate (Princeton: 1963), pp. 74-77.

sound attenuators. Visual screening for highways, factories, junkyards and the like is fairly typical today. For noise reduction, trees are most successful in softening sounds of high frequency, over 10,000 cycles per second. Measurements of sound attenuation at lower frequency levels, however, reveal that trees are not very efficient sound reducers and that the prime advantage is psychological: By making the source of sound less visible, the noise seems less threatening and thus less annoying.¹¹

Other positive qualities of trees are more difficult to describe without seeming trite or overly sentimental. Without elaborating on the principles of landscape design, we can at least remind ourselves of some of those qualities of trees which make people appreciate them:

- Trees provide a variety of color, shape, and pattern in the landscape.
- Trees soften architectural lines and accentuate building details.
- Trees form vistas, frame views, provide focal points, and define spaces.
- Trees relieve the monotony of pavement and masonry.
- Trees make enticing play areas.
- Trees offer a cooling canopy of shade, pleasant fragrances, and a serene background.
- Trees create the impression of a well-established place in new residential areas and take away the "raw" unfinished look.

The aesthetic value of trees can be measured directly in terms of the sales values added to a home where part of the lot is wooded. Developers can charge \$200-300 more for fairly low-priced houses and upward of \$500 more for more expensive homes, if a number of mature trees are preserved. In some cases the cost of saving trees is no more or little more than the cost of buying and planting good-sized saplings. Trees help sell houses.

TREE CHARACTERISTICS

Given aesthetics as the fundamental reason for tree preservation and planting, certain characteristics of trees -- how they grow, how easy they are to care for--become quite significant. In this section we will explore some characteristics of trees relevant to making decisions about what to preserve or what to plant in cities and suburbs. Because the choice of specific species and

¹¹Urban Land Institute, Community Builders Handbook (Washington, D.C.: 1968), p. 53. Also see Kevin Lynch, Site Planning (Cambridge: 1962), pp. 99-100.

varieties of trees can vary so much with climate, soil, topography, water-table, exposure of the site, and so forth, we will concentrate here on some general principles and illustrative examples. For more specific information the reader is referred to the bibliography in which we have listed a number of source books containing both guidelines and illustrations of what, where, and how to plant trees.

Size and Maturity

A mature tree in the ground is worth at least two saplings in the nursery. Trees become more valuable aesthetically (and cost more to buy or replant) the larger they are. The size of trees is, of course, dependent upon age--for which a generation may be a relevant time span. It takes 25 years for a four-foot sweet gum to reach maturity, 20 years for fast-growing silver maple planted when it is four feet high, 20 years for a six- to eight-foot pin oak, and 10 to 20 years for the live oak. (Some relatively fast-growing types are listed in Chart 1.)

For this reason, tree preservation at the time land is prepared for development is especially important. Developers are not ignorant of the potential. The Community Builders Handbook recommends:

Existing tree growth on any site is desirable. It is possible to build economically on wooded land by selective clearing, even for lower-priced housing. Too many times handsomely wooded acreage has been deliberately bulldozed to bare earth before construction. Such denuding destroys for years the increment in value that a stand of trees gives to a residential community.¹²

The Home Builders Manual states:

The developer who finds it possible to retain a substantial portion of good existing specimen trees already on the land is fortunate, both in the money he can save and the immediate effect obtained¹³

Adaptability to the Urban Environment

Trees come in many sizes, shapes, and forms, which vary not only with species but with conditions under which they grow. All trees are not per se good or desirable. The desirability of a tree depends upon its appropriateness for a site and the quality (shade, flowers, color) one expects from it. Trees are not artifacts. They are living organisms with special requirements. Trees are sensitive to their environment. Some will grow in wet soil, others in dry. Some are tolerant to salt spray; others are tolerant to smog and dirt.

¹²Community Builders Handbook, p. 43.

¹³National Association of Homebuilders, Home Builders Manual (Washington, D.C.: 1958), p. 198.

Among the ecological factors to consider in selecting trees are the physical and chemical composition of the soil, the amount and seasonality of moisture, extremes of temperature, available light, air circulation, wind conditions, topographic variation, and drainage.

The city tree is particularly affected by its environment which by comparison with a forest setting is basically hostile to tree growth. It must withstand air pollutants clogging its leaf pores; the concentration of harmful chemical residues in the soil; and a diminished supply of water and oxygen to the soil because its roots are covered with pavement. Protective metal gratings or tree wells and often the installation of mechanical devices, e.g., perforated pipes, may be necessary to allow proper aeration and moisture penetration.

Additionally, trees planted in the city, especially street trees, must meet conditions imposed by man. Their roots must not grow into sewers or cause sidewalks to heave. Damage to foundations or to underground structures frequently results from a quick-growing horizontal or lateral root system. The poplar or willow, for instance, takes moisture from the soil so quickly as its roots grow, that in clayey soil subsidence can occur. Trees with such extensive root systems will flourish wherever there is moisture, and their roots can completely fill small sewers. (Sewer lines are more susceptible to clogging than water mains whose joints are tight and not porous.) The heaving of sidewalks by trees often results when the planting strip is too narrow to accommodate the trees which are planted. Although a five-foot-wide planting strip is often considered standard, some authorities recommend at least seven feet or more, depending upon the species of tree selected.¹⁴ If possible, trees should be planted not adjacent to the curb (in back of the sidewalk) to give the roots more freedom to grow, and certain trees should be avoided where roots are likely to cause problems.

Trees which drop pods, seeds, fruits, and flowers can pose maintenance problems by making sidewalks slippery and by clogging gutters. The avoidance of insect- and disease-susceptible trees is also wise; for this reason the American elm is no longer planted in certain sections of the country. Trees should also be properly chosen and planted in proper locations so that they will not interfere with light standards, telephone lines, and electric lines, nor screen traffic signs or obstruct vision on the highway. One can set the planting strip behind the sidewalk, choose trees whose height does not interfere with utility structures, and in some cases perform selective pruning and trimming. Additionally, trees should not interfere with driveways, building entrances, or greatly obscure the passage of light into building windows.

Special Purposes

Many of these requirements pertain mostly to trees in the public right-of-way. In parks or public squares and plazas, around homes, and as landscaping for gas stations, manufacturing concerns, or office buildings, there is considerably more flexibility in the choice of trees. In these cases the positive qualities of trees can and should influence the selection of new trees to

¹⁴Community Builders Handbook, p. 157.

plant or old ones to preserve. One might choose trees because they screen out one's neighbors, attract birds, or make good climbing trees for children. While we cannot possibly include here all the variations of trees which the landscape designer might consider, we can list a few reminders:

- Ultimate size
- Seasonal character
- Shape or form of shade canopy
- Foliage and bark
- Fruit and flowers
- Habit of growth
- Length of life
- Hardiness

Chart I summarizes and describes some additional characteristics of trees especially important in urban and suburban areas. The list of trees is only a guide. It is not exhaustive. There are many little-known types of trees appropriate for different climatic regions of the U.S. which are not mentioned here. The bibliography contains suggested references on tree selection.

Because we take trees out of a favorable environment (e.g., the woods) or change that environment substantially (e.g., cutting away and thinning the woods substantially to accommodate development), trees do need care. Especially in their early years they need to be watered, mulched, braced, pruned and fertilized, kept free of diseases, and cared for when bark is damaged by bumps or cuts from mowers or vehicles.

FOSTERING TREE PLANTING AND PRESERVATION

Although there are many factors to consider when one decides to preserve or plant trees and many precautions to take in order to ensure that trees survive and thrive, tree preservation and protection is worthwhile. Few people would argue the point. Everybody likes trees. This comforting fact, however, does not mean that trees will automatically be planted or preserved and cared for. "If in public we worship the tree, in practice we often destroy it. Planting is considered an extra in site development, the first item to be cut when the budget pinches."¹⁵

There are three ways to preserve and protect trees: (1) planning to include and encourage trees in the community; (2) active promotion of tree planting

¹⁵Kevin Lynch, op. cit., 73.

CHART I: TREE SELECTION

Characteristics	Tree Types
Fast Growth	Red maple, gray bark, white ash, ginkgo, green ash, honey locust, European larch, cucumber tree, pin oak, black locust, mountain ash, American linden, Chinese elm, pitch pine, red pine, white pine, scots pine
Attract Birds	Trees and shrubs with edible fruits and berries: cotton-easters, flowering crab apple firethorn, sapphire berry, spreading juniper, hawthorn, sumacs, hollies
Sweet Scents	Silver wattle (<u>acacia</u>), amur maple, silk tree, english hawthorn, laurel or sweet bay, sorrel or sourwood, magnolias, citrus, pines and balsams
Privacy and Protection	Evergreens or mixtures of evergreens and deciduous trees, eunonymus, firethorn, lilacs, mock oranges
Flowers and Color	Dogwood, english hawthorn, honey locust, golden rain, tulip, cucumber, sweet bay magnolia, beach plum, Japanese cherry, black locust, fringe-tree, flowering fruit trees
Resistant to Disease or Insect	Russian olive, ginkgo, honey locust, Kentucky coffee tree, golden rain, sweet gum, cucumber, sweet bay magnolia, sour gum, sourwood and cork
Resistant to Ice Damage	Beech, catalpa, ginkgo, golden rain, hawthorn, hop hornbeam, horse chestnut, locust, oaks, yellow birch
Resistant to Smoke and Soot	Birch, catalpa, elms, ginkgo, hawthorns, London plane, magnolia tree of heaven, English oak, tulip tree
Prone to Clog Drains & Sewers	Willow, poplar, silver maple, catalpa, elms, some locusts, lindens, black walnut, horse chestnut
Weak-wooded (Break in Storms)	Chinese elm, silver maple, mountain ash
Prone to Drip on Cars	Birches, elms, lindens
For Most City Conditions	Norway maple, horse chestnut, green ash, hawthorn, ginkgo, London plane, honey locust, red oak, linden basswood, European hornbeam
For Extreme City Conditions	Tree of heaven, box elder, white mulberry [grow where nothing else will, but are not generally desirable]

and preservation by business and civic groups and community officials; and (3) regulations to ensure provision of public trees, to prevent excessive cutting of trees on private property, and to spell out the means of planting and caring for trees. Typically one method of protection leads to the next. In a community where trees are considered an asset and where their protection is encouraged and their destruction bemoaned, one is likely to encounter protective tree ordinances which give credence to established community sentiment.

Planning for Trees

Community Planning. A community can take a first step toward preserving and protecting trees by including in its general plan freeway and thoroughfare landscaping, significant areas of natural vegetation to be preserved, and special provision for hill area development. A part of the Fremont, California, general plan, includes a citywide tree planting plan which indicates screen planting (informal in rows), freeway planting (informal in clusters), and thoroughfare planting (formal in rows) and appropriate species for each. Among the objectives and principles for development recently adopted by the city council were:

The protection and enhancement of special features of Fremont's natural environment . . . through [among others] the preservation whenever possible of mature trees.

The preservation and development of a character and identity for the city which will separate it from and positively distinguish it from other rapidly growing cities . . . through [among others] the preservation of and planting of appropriate trees on both public and private lands.¹⁶

The Plan for the Valleys (Green Spring and Worthington Valley, Maryland) and the general plan proposal for Portola Valley, California, are two examples of plans keyed to the preservation of natural vegetation:

All forests and major stands of trees should be retained. Development in forest areas should be restricted to low densities, except for low coverage, high intensity development on major promontories.

All forests, woodlands, copses and full-standing trees above 4" caliper should be surveyed and subject to preservation regulations.¹⁷

The dominant features of the planning area are the natural land forms and vegetation. Structures should be subordinated thereto and only in the confines of individual sites should structures be allowed to be dominant.

¹⁶Fremont, California. "Objectives and Principles," adopted January 16, 1968.

¹⁷Plan for the Valleys, Prepared for Green Spring and Worthington Valley Planning Council, Inc. by Wallace-McHarg Associates, Philadelphia, Pennsylvania. p. 38, 57.

Tree covered buildable slopes should be maintained as wooded conservation areas in which trees should be preserved to the maximum extent possible.¹⁸

Tree planning for public areas is the more common approach taken by communities. The city of Mountainview, California, has prepared a landscape plan for all its public areas in which trees are "a fundamental landscape ingredient."¹⁹ The proposed plan analyzes the economics of trees--planting costs, maintenance costs, and replacement costs, and it poses alternative tree programs (an intense approach, a gaining approach, and a holding policy).

The street tree program per se guides communities in the specifics of selecting, planting, and maintaining trees. The typical steps or phases necessary to preparing such a plan are shown in the accompanying box.

TYPICAL STEPS IN PREPARING A STREET TREE PLAN

- Tree Census -- Location, species, size, number, and condition of trees.
- Approved street tree list -- Trees adaptable to local climate, suitable to community's character, and unlikely to pose maintenance problems.
- Master plan of trees for streets, parkways, etc.
- Ordinance controlling street trees and/or establishing an official agency to provide and/or care for trees.
- Financing program.
- Acquisition of plant stock.
- Planting program.
- Maintenance program.

While street tree programs should be tailored to individual communities, general guidelines for the program can be prepared for a county or state. The New Jersey Federation of Shade Tree Commissions, the International Shade Tree

¹⁸Portola Valley Area, California, General Plan Proposal. September 1964, p. 5, 11.

¹⁹City of Mountain View, California. Proposed City-wide Landscape Plan for Public Areas.

Conference, and the municipal leagues in Washington, Oregon, Michigan, and Wisconsin have published reports and model ordinances (see bibliography).

Santa Clara County is finding it helpful to utilize a county soils survey in order to assist its towns and cities in tailoring trees to their purposes. They are establishing a color slide and photograph library of trees in the Bay Area which should give cities a good basis for street and parkway tree selection.

Especially handy for describing the relevant characteristics of trees and designating their suitability for street, park, and roadside plantings is the preparation of a tree chart. Chart 2 is adopted from the Palo Alto tree chart.

Site Planning. For developers, tree preservation can be a first consideration in site planning. Some have made considerable efforts to preserve trees in recent years.

Tree preservation must proceed with more of a view to the practical than to the sentimental. Even the best intentions fall by the wayside if trees slated for preservation are damaged (roots cut or bark scarred) by earth-moving equipment. Apropos of this, builders recommend that only the best (largest and most healthy) trees be saved and that they be marked with a white rag. If trees are likely to be in the path of construction equipment or near dumping spots, scrap or used lumber guards should be erected to shield them from mutilation. In addition, the builder should designate clearly marked rights-of-way for the equipment.

Tree preservation efforts must be closely keyed to grading plans and road alignment. Fill higher than a few inches around a trunk and over roots can kill trees by suffocation. Dogwood, tulip, beech, and most conifers are especially intolerant of fill. For some trees the construction of dry wells as deep as the original ground level and two feet or more from the trunk can help prevent rotting. A layer of coarse sand or stone gravel should also be placed over tree roots before filling proceeds to allow air to reach them. Dry wells with a tile aerating system above the feeder roots are the best protection; cost, however, makes this procedure prohibitive in most development. If trees are especially valuable as specimens or as historic landmarks, they may be saved by being moved to a new site or by construction of properly aerated dry wells. If the grade of a site is lowered, trees are not likely to survive unless left on gradually sloping mounds of soil as large in diameter as the spread of their branches. A change in the water table or simply exposing a tree by clearing away its fellow trees can sometimes kill a tree. For these reasons, assistance from a landscape architect or tree expert is frequently necessary.

(Text continued on page 16)

CHART II: TREES SUITABLE FOR STREET, PARK, AND ROADSIDE
PLANTING (ADAPTED FROM PALO ALTO, CALIFORNIA)*

Botanical Name	(1) Acer rubrum	(2) Aesculus carnea
Common Name	Red Maple	Horse Chestnut
Easement Street Back	x x	x x
Type of Tree Evergreen Half Deciduous Deciduous Conifer Palm	x	x
Habit of Growth Spreading Spherical Pyramidal Slender Compact Sparse	x	x
Stature of Tree 10-20 feet 30-40 feet 50-60 feet 70 feet plus	x	x
Type of Foliage Large Medium Small Elongated Oval Needle Fern-Like	x	x
Color of Flower White Cream Yellow Pink Red Orange	x	x x

*Additional columns should be added to chart to include a representative selection of trees.

CHART II (Cont'd)

Rapidity of Growth Slow Moderate Fast Very Fast	x	x
Adaptability Section of City Foothill Bayland Soil Sand Light Loam Heavy Loam Adobe-Clay Frost Tender Resistant Hardy Moisture Heavy Moderate Light	x x x x x x x x 	x x x x x x
Useful Life Short Average Prolonged Posterity	x	x
Width of Parkway 2-4 Feet 4-6 Feet 6-8 Feet 8-10 Feet 10-15 Feet 15 Feet plus	x	x
Distance Apart 25 Feet 30 Feet 40 Feet 50 Feet 60 Feet 75 Feet	x	x
Cost to Maintain High Moderate Low Very Low	x	x

Before the developer embarks on tree preservation, he should consider the factors listed in the accompanying box.

SITE DEVELOPMENT CONSIDERATIONS FOR TREE PRESERVATION

1. Density of development. The smaller the distance between homes, the more difficult the preservation of trees.
2. Topography. The more excavating and grading necessary, the greater the potential damage to trees and the less likelihood of their survival.
3. Location of utility trenches. Another potential for tree damage.
4. Needs for cut and fill to improve drainage. Saving high ground around existing trees can cause drainage problems.
5. The kind and type of excavation method. In more expensive developments, more expensive excavation methods and more caution in excavating can be justified in order to save trees.
6. Kind of activity occurring near the foundation. Excavation, maneuvering space for equipment, storage for excavated earth, access ways for trucks, all of which can damage roots and bark of trees in close proximity to the activity.

While such a list of precautions and warnings is awesome, it does not mean trees are doomed. Even in low-cost subdivisions, developers can and do retain existing trees. A popular method is to clear the front of the lots for construction access and leave a rectangular panel of trees in the middle of each block. Where distance between houses is great enough, trees can extend down the lot lines to form a screen between houses. Saving trees in the front of the lot requires more careful engineering, a setback of 40 to 45 feet from the street, and considerable attention to grade changes and the respective location of the trees. If municipalities require that the entire right-of-way in front of the house be cleared and graded, then builders will not even attempt to save trees there.

The accompanying pictures illustrate tree preservation in subdivisions. Levitt and Sons has found that in a New Jersey development, where houses average \$20,000 on lots averaging 70 by 100 feet, 10 to 20 feet of trees at the back of the lot and 10 feet at the front can be preserved. For houses averaging \$30,000 on lots averaging 100 by 120 feet, 20 to 25 feet of trees at the back and 15 feet in the front are retained. The cost of saving trees selectively as opposed to clearing them all can range between \$100 to \$500 per lot. This cost includes the process of selective clearing, pruning and feeding, removal of damaged trees, thinning during the next season, and grubbing out of dead-wood.²⁰

²⁰Saving trees in the back of the lot necessitates putting all utilities in the street.



Garfield Park East by Levitt and Sons, Inc. in Willingboro, N.J.

Five hundred to a thousand dollars more is the premium reflected in the selling price for a house on a wooded lot. In large developments, not all sites can remain wooded. For one reason, not all are eligible for tree-saving, because of the problems of grading and access; for another, not all buyers are willing to pay a little more for trees. The key to success, Levitt and Sons finds, is phasing development so that the wooded lots are continuously available to those who prefer them.

The preservation of trees on lots one-half acre or larger is not an issue. The market for such homes makes tree saving essential; the difficulties, physical and economic, become less significant. Construction of dry wells as a means of saving more trees becomes feasible only for houses costing \$40,000 or more.²¹

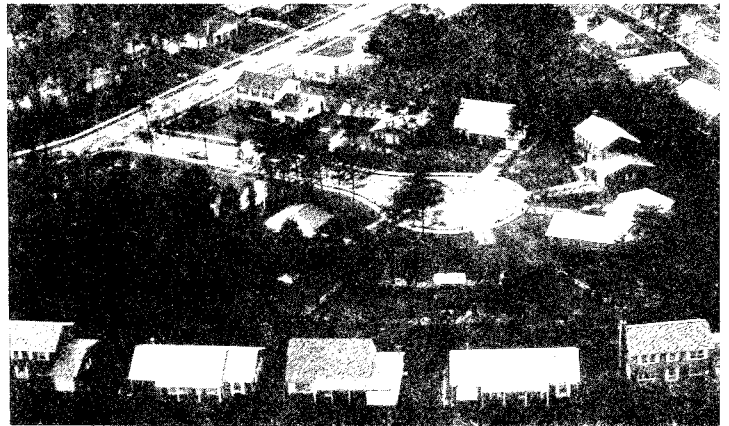
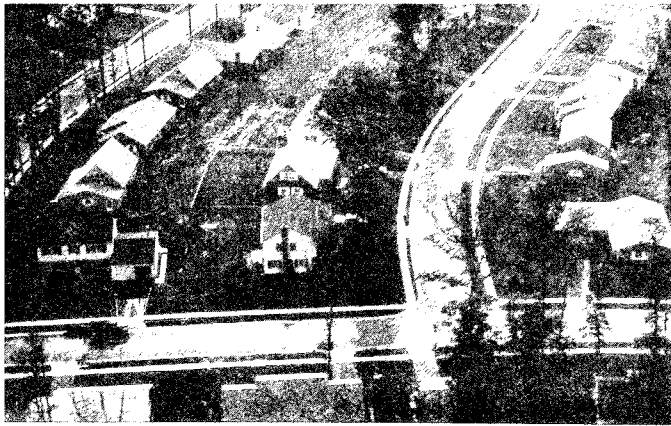
To some extent, the value of added trees is reflected in a higher over-all mortgage appraisal for the home, although trees specifically have not been considered mortgageable by FHA or VA. Practices vary with locality, and builders find it wise to keep the amount of tree preservation reasonably in line with what can be reflected in mortgage appraisal. Landscaping requirements of the FHA do specify that trees be provided:

Shade tree: Provide at least one tree in appropriate location preferably at southwest side or corner of house. Street tree is acceptable alternate.

Existing planting shall be acceptable as required planting to the extent that it is equivalent, suitable and preserved in good condition.²²

²¹Levitt and Sons, Inc. Lake Success, New York.

²²U.S. Department of Housing and Urban Development, Federal Housing Administration. Minimum Property Standards for One and Two Living Units, November 1966. FHA No. 300. p. 240.



Garfield Park East by Levitt and Sons, Inc. in Willingboro, N.J.

New trees can be planted instead of preserving existing trees, but the comparison is hard to make. Mature trees look better and are more valuable than saplings. The larger the trees purchased for a site, the more expensive they are. Also, the buyer should be careful to deal with reputable nurseries to ensure that the trees he obtains have been properly nurtured and will survive. For these reasons, some developers who for various reasons cannot preserve trees on location have found it economical to transplant large trees either from their own nursery or from wooded parts of the site. Tree-transplanting equipment can now manage trees of 30 feet and more in height. One builder who develops treeless farmland plants 12-to-15 foot trees on land scheduled for development last and makes this area a nursery for the remainder of the subdivision. Transfers to the home site are accomplished for \$10 a piece. The initial cost and care of the trees brings total cost to \$20 per tree.²³ The developers of Columbia, Maryland, have both planted seedlings (20,000) for eventual transfer to park areas and roadsides and prepared existing trees (6,500) for transfer by pruning and root feeding. In large-scale developments, the future site of a golf course or open park area can function as a source of transplantable trees or, if time permits before trees are needed, as a nursery for saplings.

The large mass-builder, such as Levitt, has established a backlog of experience in applying tree preservation techniques and has access to competent advice about how and what to preserve. Such a builder is likely to make efforts to save trees and for him advice from the local planning agency about tree preservation may be unnecessary although often appreciated. But to other developers without a standard tree preservation policy, the community planner can provide especially valuable guidance by showing the developer how to alter his grading plan or how some extra money spent in selective clearing of a site can save on landscaping costs and increase the sales value of the property. Informed cooperation between planners and developers is essential in the stages preceding subdivision approval. Planners especially can help developers counteract or avoid the problems inherent in saving trees so that those which are slated for preservation survive. The community also has other leverage points at its disposal. Where use permits are involved it can grant them with conditions attached to save trees. If trees are prize examples of their group or historically valuable, the city can also bargain to transplant them to a private park.

²³House and Home, September 1964, p. 72. Also: Stanley Cerely, "Transplanting Semi-Mature Trees," Architectural Review (Feb. 1968), p. 131.

Tree Promotion

In addition to planning for trees, communities can enlist the support of the homeowner and of business and civic groups to promote and preserve trees. Sometimes such groups can spur the community to adopt tree planting or preservation programs.

Cities can encourage the planting of trees by supplying and planting street trees free or at a small charge. Many cities have their own program for pruning, spraying, and removing diseased trees, but property owners are frequently expected to water their street trees. In Palo Alto, street trees are furnished free, except in new subdivisions where developers pay a fee for the trees; the city accepts the responsibility for watering the trees for three years. In Fremont, California, developers are required to plant trees themselves according to the city's specifications and a tag (see illustration p. 44) is attached to the tree to encourage the homeowner to care for it. To help the homeowner in proper selection of plants for his garden the City of San Francisco houses in its arboretum the Sunset Magazine Demonstration Home Gardens. Plant materials and equipment are donated by local manufacturers and garden suppliers.

Electric and other utility companies have become involved in tree promotion as a by-product of their effort to cut tree-trimming costs. They find it advantageous to promote the planting of trees which have the least potential for conflict with utility systems. A number of brochures, e.g., "Trees to Fit Your Home and Street" (Pacific Gas and Electric) or "The Right Tree in the Right Place" (Sacramento Municipal Utility District), educate the local citizenry to the benefits and problems of trees and give helpful advice on proper care and planting. The Philadelphia Electric Company meets with civic or neighborhood groups and presents a slide lecture. If the neighborhood desires, the electric company arborist prepares with municipal approval a street tree plan recommending appropriate trees for the area. The lecture and planning service are free, and public-spirited citizens are thus encouraged to request tree-planting in their neighborhood.

A nonprofit corporation such as the Saratoga Horticultural Foundation in Saratoga, California, can be established. This foundation serves as an independent experimental station to propagate shade tree and ornamental shrub stock which is uniformly dependable and is suitable to the western climate. It engages in shade tree evaluation and cooperative tree research with the University of California. It can provide guidance and, through its licensed nurserymen, supply reliable plants to California cities.

Private support comes in a variety of ways. In New York City, Mrs. Albert Lasker prodded the official powers into its Salute to the Seasons program with the provision of trees and flowers and the encouragement of tree planting by residents. In a full-page ad in the New York Times, June 3, 1968, the following message from Mayor Lindsay made a plea for more trees:

. . . Trees can certainly do a lot for our city and in the past few years we've planted several thousands. Yet in all of Manhattan, we still have fewer than 30,000 street trees. We have more mail-boxes than that. And more public waste baskets.

Our goal, therefore, is to have 20,000 more street trees in Manhattan by the end of 1970. But it costs money to plant trees. Only a partnership between private enterprises and city government will make it possible for us to reach our goal.

A number of business concerns, like the sponsors of this message, Barney's, because of their deep faith in the future of this city and their sense of responsibility for that future, are already helping us. We are extremely grateful to them and to any others who will "go into partnership with us" to make our streets more beautiful.

Be the first on your block to plant a tree.

Arbor Day offers an appropriate time for tree promotion. A number of years ago the Chicago Sun Times gave away 10,000 trees to residents on the Saturday after Arbor Day. In California, the horticultural industry took advantage of the publicity opportunity of Arbor Day to promote tree plantings. Chapters of the California Association of Nurserymen donated trees and enlisted the endorsement of local newspapers, schools, and women's clubs.

Garden clubs have been called the spark plugs of community beautification campaigns. The city manager of Traverse, Michigan, asked garden clubs to sponsor a tree-selling program to obtain trees for the boulevard by campaigning for donations from local business and residents. The result of the boulevard tree-campaign was the establishment of a city nursery and a continuing beautification effort. Fifty per cent federal matching grants are now available to communities for such beautification programs. Among the suggestions made by the Citizens' Advisory Committee on Recreation and Natural Beauty in its brochure, Community Action for Natural Beauty, are establishment of a tree bank, encouragement of planting by parking lot operators, and a city planting program.

The Federal Highway Administration has recently modified its guidelines for tree and other vegetation clearance along roadways to make possible preservation of valuable trees. The guidelines now include the following statement:

Wherever possible large trees or clumps of trees of special historic or scenic value in the right-of-way should be retained in their natural setting. Where such trees are within the recovery area appropriate guardrail should be used.²⁴

Most tree promotion efforts are oriented toward the planting of trees, but a significant result of the public education and participation essential to such a program is increased awareness and appreciation of existing trees. The City of Palo Alto and its chamber of commerce have published a booklet describing the tree heritage in that city and listing the location, age, and descriptive characteristics of representative trees visible from the streets and in the parks. A guide for a suggested "tree tour" is included as well as information about how citizens can help maintain and preserve Palo Alto's trees.

²⁴Department of Transportation News, Federal Highway Administration. July 1, 1968.

Two other California cities have made notable progress in promoting tree preservation. Berkeley has formed a Landmark Trees Committee (part of its Civic Art Commission) whose immediate goal is the publication of a booklet outlining the history, characteristics, and location of trees which are outstanding because of rarity, age, or visual attractiveness. A longer-range goal is legislation to protect such trees. The City of Los Altos has inaugurated a Tree Adoption Program whereby a property owner forced to remove a healthy tree can list the tree in a catalog published by the city (see form from catalog on following page). Another property owner seeking a tree can obtain leads from the catalog and contact appropriate owners. Trees listed in the catalog are not for sale; they are available to the prospective "buyer" for the cost of removal. The tree-owner is spared the cost of removal and the buyer can obtain mature trees at very reasonable cost in comparison to their value. New transplanting equipment makes it possible to transplant even large and old trees successfully.

Tree promotion and the boosting of tree appreciation in a community are at the same time one of the least costly or troublesome and yet most effective means of protecting trees. Regulations often follow in the footsteps of tree promotion and appreciation, but regulations are subject to challenge. As one tree-fan has stated:

If motherhood is good we can still not create a good mother by legislative fiat. The complexities of tree preservation are such that only good planning, respecting and adjusting nature's forms and ways can insure survival of a livable environment. No tree preservation ordinance alone can do that.²⁵

REGULATING TREES

Trees in the Public Domain

Trees in the public domain are those which are growing or (in the case of subdivisions) will grow on public lands, public strips adjacent to the street, or on planting easements. Also included in this definition are those which can be considered nuisances because they endanger the general public. As part of a basic street tree ordinance, some communities regulate street trees in new subdivisions and nuisance trees on private property. Sometimes, however, trees in new subdivisions are covered through the subdivision ordinance.

Street Trees.--Ordinances relating to street trees or other trees on public property are fairly well-known and established. Most ordinances spell out the respective responsibilities of the city and the property owner for planting and maintenance, the details of obtaining a permit to plant, trim, or remove a tree, the authority for establishment of an official street tree list, and the penalties for injuring a tree or allowing a tree to become hazardous to the public. Some ordinances also delegate the authority to prepare a master street tree or planting plan or establish a shade tree commission and

²⁵Gerald Lloyd. Personal communication.

LOS ALTOS BEAUTIFICATION COMMITTEE
"TREE ADOPTION PROGRAM"

Type of Tree Silk Oak (Grivallia)

Date: February 27, 1968

Height of Tree Approximately 20' - 25'

Trunk Diameter _____ (Measured 30" from ground level)

Owner's Name _____ Phone Number _____

Owner's Address _____

Tree Location:

Rear Yard x

Front Yard _____

Side Yard _____



UTILITIES CHECK LIST

Water -- Sewer -- Gas --

Sprinkler: Yes _____ No x Fences --

Type of Lawn: Grass x Other _____

Miscellaneous Obstruction _____ None

I, the undersigned owner of the property listed above, hereby authorize the placing of the aforementioned tree or shrub in the inventory of the "Tree Adoption Program" (including photographing and publicizing). It is further understood that the cost of removal and all negotiations will be between the undersigned and the "Adaptor" (purchaser).

Signed _____ Dated _____

spell out its powers with regard to trees in public places. Additionally, cities usually establish administrative standards for tree planting and other arboricultural practices.²⁶

Street Trees in New Subdivisions.--Communities can require subdividers to furnish street trees either by making developers supply and plant them or by requiring that they pay a fee to the city which does the planting. To some extent such a requirement is duplicated by the FHA regulation allowing the developer to substitute a street tree for the required shade tree per lot. The following sample provisions illustrate the variety of methods a community can utilize:

Large-Scale Plantings. The Department of Public Works shall require the planting of street trees within the parkway of any new subdivision

The Department of Public Works shall, at its discretion, either require the subdivider to plant Official Street Trees or to deposit an amount of \$15.00 per tree with the City of Campbell for the purchase and planting of the specified number of street trees as determined by the following criteria:

The distance between trees shall allow for a minimum of one (1) tree per interior lot with a frontage of seventy-five (75) feet or less, or a minimum of two (2) trees per lot with a frontage of more than seventy-five (75) feet. At least three (3) trees shall be provided for a corner lot

(Proposed Street Tree Provisions of
Campbell, California, Municipal Code,
1968.)

Required Improvements . . . Street Trees. Street trees shall be placed in the strips between roadway and both sidewalk pavements. Spacing of trees shall be a maximum of fifty (50) feet staggered across the roadway, and located so as not to interfere with proposed driveways. Trees shall be a minimum of 1-1/2" in diameter when planted.

All details regarding choice of trees shall be as required by the Tree Warden of the City of Medford. The Tree Warden, in making his selection, will consider the existence or future installation of overhead wires and underground utilities. Wherever possible, existing trees suitable for shade and landscaping shall be preserved and protected against damage during construction.

(Rules and Regulations of the Medford,
Massachusetts, Planning Board Governing
the Subdivision of Land, 1966.)

²⁶For further detail about such ordinances and models the reader is urged to consult PAS Report No. 86, Land Development Ordinances and the references listed in the bibliography under street trees.

Street Plantings. It is the intent of the Town of Portola Valley that the natural character of existing tree and other vegetative cover shall be preserved and enhanced to prevent soil erosion, and where proposed street construction necessitates removal of such tree and other vegetative cover, by planting indigenous material in a manner satisfactory to the Planning Commission. The Commission may, however, approve other materials providing they are in harmony with the indigenous material. Plantings shall not under the circumstances impair traffic, pedestrians, or fire safety, nor interfere with pathways within the right of way where these are required. In areas where there is no existing tree or major vegetative cover within the street right of way, the subdivider shall install such planting as is required by the Commission.

(Subdivision Regulations, Portola Valley, California: 1964.)

Required Planting and Maintenance:

(a) The Department of Recreation and Parks shall require the planting of "Street Trees" within the "Planting Strip" or "Planting Easement" of any new subdivision in conformity with the uniform "Plan" covering the area involved.

(b) The Superintendent of Parks shall supply, plant, maintain, and irrigate said trees at such times and places as the development of the subdivision, its occupancy and other conditions make feasible.

(c) In the event a subdivider desires to plant, irrigate and maintain "Street Trees" within the "Planting Strip" or "Planting Easement" areas of new subdivisions he may apply to the Superintendent of Parks for a permit. Such permit may be issued but only after such person agrees to plant in accordance with the "Plan" and to provide such maintenance as determined necessary by the Superintendent of Parks.

(d) The final map of all subdivisions of land within the City of Sacramento shall, from the effective date of this ordinance, convey to the City a tree "Planting Easement" over those strips of land as defined by this chapter. No final map shall be approved by the City Council which does not provide for such "Planting Easement."

(e) It shall be the responsibility of the property owner to properly maintain all "Planting Strips" abutting on his property regardless of whether such property is developed. This maintenance shall include keeping such strips free from weeds or any obstructions deemed contrary to public safety and in conformance with the official "Plan."

(Tree Ordinance, Sacramento, California: 1960.)

Nuisance Trees.--Communities can fairly easily justify regulating trees on private property when they are public nuisances or constitute a hazard to the community at large because they are physically dangerous to cars and pedestrians or jeopardize the survival of other vegetation. The ordinance adopted by Carmel-by-the-Sea, California, deals with the problem in a succinct manner:

All trees, shrubs, and other plants growing on private property, when infested by any insect or infected by any disease threatening the life of same or which by reason of such infestation or infection endanger the life or growth or healthful existence of other trees, shrubs, or other plants within the City not so infested or infected, or any trees determined by either the Superintendent of Public Works or the City Forester to be a clear and present danger to persons or property may be declared, by resolution of the City Council, to be a public nuisance and thereafter abated as provided for in this article.

(Carmel-by-the-Sea, California;
Ordinance No. 138 C.S., 1967.)

The ordinance of Briarcliff Manor, New York, is very specific in regard to diseased or dangerous trees:

It shall be unlawful for any owner, lessee or occupant of land in the Village to permit or maintain on such land any trees which are infected with the dutch elm disease or with any other infectious disease, or which have dead branches or other dead wood which may become the host of the scolytus beetle, the carrier of the disease.

It shall be the duty of the owner or lessee of any land in the Village of Briarcliff Manor to be caused to be cut down any trees on such land which are infected with the dutch elm disease and to be caused to be pruned from all elm trees on such land any dead branches or other dead wood which may become the host of the scolytus beetle, the carrier of the disease, and to cause any trees which may be cut down and any dead branches or other dead wood which may be pruned from trees, to be forthwith removed from the land and to be burned in accordance with regulations to be established by resolution of the Board of Trustees.

It shall be unlawful for any owner, lessee or occupant of any land in the Village to permit or maintain on such land any trees or shrubbery which are infected with caterpillars, tent-caterpillars, insects, worms, maggots, parasites, larvae or grub of lepidopterous insects or other creeping segmented animals, which cause or tend to cause disease, destruction or damage to such trees or shrubbery by devouring the bark or foliage thereof; and which may spread by passing from such trees or shrubbery to Village trees or shrubbery or to trees or shrubbery upon the property of others

and thence to Village trees or shrubbery, thereby causing destruction to property or becoming an unsightly and public nuisance.

It shall be the duty of any owner, lessee or occupant of any land in the Village to prevent and to destroy such infestations of any trees or shrubbery on such land by causing such trees and shrubbery to be sprayed, or to be re-sprayed, as often as may be necessary to prevent and to destroy infestations by such injurious and disease carrying insects.

(Briarcliff Manor, New York, Ordinance No. 126.)

In both places, the property owner must remove or treat the trees himself or be assessed by the city or town for removal or treatment.

Communities can also regulate private trees that obstruct or endanger the public right-of-way: The Fremont, California, tree ordinance is instructive:

An agent of the city may inspect any tree or shrub adjacent to or overhanging any public street in the city to determine whether the same or any portion thereof is in such a condition as to constitute a hazard or impediment to the progress or vision of anyone traveling on such public street. Any tree or shrub or part thereof growing upon private property but overhanging or interfering with the use of any street that endangers the life, health, safety, or property of the public shall be declared a public nuisance. If the owner of such private property does not correct or remove such nuisance within ten days after receipt of written notice thereof from the city, the city shall cause the nuisance to be corrected or removed and the cost shall be assessed to such owner.

The owner of any parcel of real property upon which any trees or shrubs are now, or may hereafter, be standing, shall trim, or cause to be trimmed, the branches thereof so that said branches shall not obstruct the passage of light from any street light located in any public street or other public right-of-way adjacent to the street or sidewalk; and such owner shall trim or cause to be trimmed, all branches of any trees or shrubs which overhang any street or other public right-of-way, so that there shall be a clear height of 10 feet above the surface of the street or other public right-of-way unobstructed by branches; and such owner shall remove or cause to be removed from such trees or shrubs all dead, decayed, or broken limbs or branches that overhang such street or public right-of-way, and when any such trees or shrubs are dead, the same shall be removed so that they shall not fall on the street or other public right-of-way.

(Fremont, California: 1959)

Trees on Private Property

Trees on private property which are undiseased and are not public nuisances are more difficult to regulate than public trees because trees are considered part of the land on which they grow and regulation of them can be deemed an infringement of private property rights. Much of the legality of any ordinance in this area rests upon the constitutionality of exercising the police power when aesthetics are the principal grounds for control. In some communities flood hazard control, minimizing wind erosion, or other health and safety factors can be effectively used, if in fact these are substantial problems. In any event, it seems that ordinances which seek to protect and regulate trees for a variety of reasons have a greater chance of success in the courts than those depending upon aesthetics alone. A paper by Raymond Ott, the City Attorney of Fremont, and Donald Meany, Deputy City Attorney of Palo Alto, California, explores the legalities of the situation in detail with particular reference to the laws of California, but in principle it has applicability to all states. Any community considering enactment of regulations for trees on private property is urged to consult this document in its entirety, although some references will be made to it in this section with regard to California community tree regulations.²⁷

Regulation of trees on private property can occur in two ways: (1) indirectly through the developmental process (subdivision, zoning, or grading controls) or (2) directly through a special tree ordinance.

Subdivision Ordinances.--Subdivision ordinances which regulate trees come in three varieties. They can be simply hortatory, urging the developer to consider trees and to show those slated for removal on his map submissions; they can be negative, forbidding the developer to cut down trees without prior approval or the securing of a permit; or they can be mandatory, requiring the developer to have so many trees within the property lines. This last possibility, of course, allows a developer to cut down existing trees and plant new ones, but in many instances it will persuade the developer to retain as many existing trees as he can in order to satisfy the requirement.

The hortatory type of control seeks mainly to encourage the developer:

Existing features which would add value to residential development, such as trees, watercourses and falls, historic spots and similar irreplaceable assets, shall be preserved, insofar as possible, through harmonious design of the subdivision.

(Land Subdivision Regulations, Rye, New York, amended to 1964.)

²⁷ Raymond E. Ott, (City Attorney, Fremont, California) and Donald C. Meany (Deputy Attorney, Palo Alto, California). Regulating Trees on Private Property, League of California Cities, 1966, Spring Conference, Palm Springs, California.

Some subdivision ordinances merely require that tentative maps indicate the location of all existing trees, those which are to be removed, and new ones to be planted. A proposed amendment to the Marin County, California, subdivision regulations, makes this requirement somewhat less strenuous in regard to showing all trees on the map but maintains the same basic intent. Required in the tentative map submission is a preliminary landscaping plan showing:

- (1) All existing trees, spaced more than 30 feet apart, by species and estimated height and spread. Trees to be removed shall be indicated.
- (2) In more densely wooded areas or in tree clusters only the outline need to be shown. However, outstanding or specimen trees within the clusters must be shown if they are to be removed.
- (3) A conceptual plan for proposed trees and other plant material.
- (4) Any other recognizable feature of importance to subdivision design such as rock outcroppings.

Subdivision regulations with negative tree-cutting sanctions forbid the developer to cut trees without express permission. (Sometimes approval of the subdivision map is considered sufficient permission; in other cases permits for the removal can be required.) Prefacing its tree-cutting restrictions with a recitation of the problems caused by tree removal--increased soil erosion and surface drainage, increased costs to control drainage, and impairment of the stability and value of property--the town board of North Castle, N.Y., imposes such a requirement upon developers:

It is hereby ordained by the Town Board of the Town of North Castle that in presenting plans of developments for approval by the Planning Board, that [sic] the applicants must in addition to existing requirements show the area from which trees will be removed.

The Planning Board of the Town of North Castle is empowered to require that trees will be left standing in areas upon the subdivision, and no live tree, exceeding 3 inches in diameter may be cut down in such areas without expressed consent of the Planning Board to be indicated upon the approved plan. The Planning Board may also require that trees shall not be cut down on or removed from any building plot on the subdivision unless the area is to be occupied by a building thereon. In such instances trees may be cut down in area to be occupied by buildings or driveways and within a distance of ten (10) feet around the perimeter of such buildings or driveways.

(Planning Board Regulation, Town of North Castle, Armonk, N.Y. 1956.)

Both positive and negative controls on trees are exercised in the subdivision ordinance of Saratoga, California (1961, as amended). The negative restrictions originally read in this fashion:

No native, ornamental, or orchard trees required to be shown on the tentative map . . . shall be removed or destroyed without a prior permit to do so from the City Planning Commission. Such permits may be applied for from time to time up to the date of approval of the final map, no fee shall be charged therefor, and no special form of application shall be necessary.

The City Council shall by resolution establish reasonable standards to guide the granting, conditional granting or denial of such permits.

The above prohibition shall also apply for a reasonable time prior to the actual filing of the tentative map, and no such trees shall be removed or destroyed prior to said filing of said tentative map with the intent or design to circumvent the requirements of this ordinance.

The Planning Commission of the City of Saratoga may refuse approval of any tentative map, and revoke any previous approval of any tentative map already approved, upon the violation of this section by the owner or subdivider.

Presumably because of opposition to the stringency of the ordinance, the following amendment was added in 1962:

The tentative approval of a subdivision map shall automatically constitute a permit from the City Planning Commission to remove all such trees within all portions of all subdivision street rights of way which are to be improved and to remove such trees from the area of each of the lots of said subdivision on which a main structure can be erected in accord with the zoning ordinance of the City of Saratoga then applicable to said land.

The Saratoga ordinance also makes it mandatory for the developer to plant trees on a lot and maintain them for a year. It specifically does not allow trees to be planted in a street right-of-way and specifies the appropriate location of trees for interior and corner lots. At the discretion of the zoning administrator, the new plantings can be reduced by one for each existing tree which serves the same function as a new tree would. Trees are to be provided according to the standards in Chart 3 (See page 30).

In 1962, Philadelphia drafted legislation requiring trees in residential subdivisions, but because of legal complications and objections from builders it was not adopted. The proposal required one or two trees per lot or one every second or third lot depending upon the density of the district or alternatively one tree for every 4,000 square feet of open area in the subdivision. The

CHART III: TREE PLANTING STANDARDS FROM
SARATOGA SUBDIVISION ORDINANCE
(MINIMUM NUMBER OF TREES)

District	Interior Lot			Corner Lot		
	Evergreen	Deciduous	Total	Evergreen	Deciduous	Total
R-1-10,000 R-1-12,500	-	2	2	2	2	4
R-1-15,000	1	1	2	2	3	5
R-1-20,000	1	1	2	2	3	5
R-1-40,000	1	2	3	3	3	6
R-M	1	1	2	2	2	4

ordinance specified a minimum caliper of three inches in diameter, but existing trees were allowable substitutes for planted trees.

Commenting on the subdivision process as a means of tree control, attorneys Ott and Meaney consider it very difficult to prosecute a developer who cuts down trees before he submits his subdivision map with the intent to subvert the law. They also question whether the subdivision map act, in California at least, gives a city authority to include standing trees on private property within the definitions of "design" or "improvements."

Ordinances aimed directly at trees (to be discussed later) seem preferable if one is to avoid this difficulty. Subdividers would then need to inventory only trees affected by the tree ordinance generally and would be liable to the same requirements as other property owners.

Zoning Ordinances.--Tree preservation policy can also be carried out through site plan review or other provisions in the zoning ordinance. The zoning ordinance of Monterey, California, makes tree preservation a definite aim the site plan review committee:

The purpose of the Site Plan Review Committee shall be to encourage good development. It shall study the siting of proposed construction and its impact upon the existing topography and natural vegetation, and relationship of proposed construction to existing public and private improvements in the immediate area. It shall not act on architectural aspects. It shall encourage the elimination of unnecessary grading, endeavor to retain the natural character of the site including the preservation of trees. [Emphasis added]

A person upon whose land there exists a requirement for Site Plan Review Committee approval shall submit to the Planning Department, one (1) week preceding a meeting, a plot plan showing the location and sizes of all affected trees, all proposed structures and improvements including fences, retaining walls, houses, parking areas, garages, carports, swimming pools and driveways. The map shall also show all proposed grading and areas of natural vegetation which will remain undisturbed. No grading or construction shall begin until Site Plan Review Committee approval has been granted.

(Ordinance 1386--Zoning Ordinance--
Monterey, California)

Through the planned unit development concept, a community can exercise considerable leverage in obtaining development which preserves natural features. In this case tree preservation is an implicit part of the intent of the regulation, and the processing of PUD applications should not be overlooked as an aid to tree preservation.

One zoning ordinance contains a subsection on trees for each zone. For all residential zones, and certain commercial zones, the following provision is applicable:

Trees. Trees with a six (6) inch diameter trunk size shall be shown on all plans submitted for approval, and no trees six (6) inches in diameter or more shall be removed without permission of the Commission; provided that the Commission, after review by the Architectural and Site Committee, shall have the power to waive the requirement if the applicant can show that such requirement is unreasonable to that particular property.

(Los Gatos, California: 1966.)

Grading and Erosion Control Ordinances.--The Montgomery County sediment control program was mentioned earlier as an indirect way of maintaining wooded sites. Some grading and excavation or site development ordinances can also be useful in tree preservation, particularly when destruction of the natural cover of so many acres of land is considered cause for obtaining a permit. These ordinances can be especially useful in protecting trees on sites which are scheduled for quarrying or other excavation operations.

One California community, Ridgecrest, found that a serious wind erosion problem existed and drafted an ordinance to control the blowing of sand. This type of ordinance applies to any disturbance of the land by excavation, leveling, or spreading soil on the land, although it exempts normal landscaping and farming operations. Such an ordinance is more extensive than a grading ordinance, and it imposes requirements such as the following on any one granted a permit to disturb the soil:

- a. Developers are to be encouraged to "tie into" already developed areas rather than to move into isolated areas.
- b. Developers and builders shall not disturb more than necessary the native vegetation within the proposed development.
- c. Such protection shall be sufficient to prevent undue deposit of soil, sand or dust on nearby property, and shall minimize the amount of dust eroded into the atmosphere. Protection must be provided both for the period during which soil disturbing operations are under way, and for any extended period following such operations if the natural protective vegetation is destroyed, or disturbed by the soil disturbing operations.
- d. Lots and areas within and without proposed developments that have had the soil disturbed during the development shall be treated by the developer to prevent them from creating a wind erosion problem. Methods to gain this protection can be by the use of the following materials applied in combination or singly to produce an effective wind erosion control. [A list of methods follows in the ordinance.]

(Ordinance 38, Ridgecrest, California.)

Tree Ordinances.--Specific tree ordinances regulating trees on private property are as yet not very common. For this report, only six were found, four from California, one from Georgia, and one from New Jersey. Judging from this small sample, tree preservation legislation applies mainly to undeveloped property or in some cases property undergoing redevelopment. Only one ordinance applies to both developed and undeveloped property in the city.

Summit, New Jersey's, tree ordinance is used constantly, according to the city forester. The ordinance specifies permitted conditions for tree removal and makes issuance of the building permit the vehicle for enforcement. The ordinance reads in part:

The City of Summit hereby finds that indiscriminate and excessive cutting of trees upon tracts of land has resulted in creating increased surface drainage and increased soil erosion, thereby causing increased municipal costs to control drainage within the City, and impairs the benefits of occupancy of existing residential property in such areas; impairs the stability and value of both improved and unimproved real property in such areas with attendant deterioration of conditions affecting the health, safety and general welfare of the inhabitants of the City.

This ordinance shall apply to all persons or corporations who are or will be applying for building permits for more than one home or a home to be built as a part of an uncompleted development.

No Building Permit shall issue unless such person or corporation shows on an appropriate plan all proposed tree removals in relation

to the survey stakes marking out a building foundation or dwelling, garage, driveway, recreation area, or any site that warrants tree removal. The species and condition of trees shall be checked by the City Forester and shall be indicated upon the plan. Such plan shall be certified by the City Forester to the Building Inspector of the City of Summit.

No live tree exceeding three (3) inches in diameter shall be cut down except under the following circumstances:

(a) If their presence would cause hardship, or endanger the public or an adjoining property owner.

(b) In areas to be occupied by buildings, driveways or recreation areas, and within a distance of fifteen (15) feet around the perimeter of such building, depending on tree species and conditions to be determined by the City Forester.

(c) Unless the area shall have a cut or fill of land deemed injurious or dangers to the trees. The determination of the City Forester in this respect, shall depend on the species of tree and degree of injury and shall be indicated on the plan referred to herein.

No material, machinery or temporary soil deposits, shall be placed within six (6) feet of any existing tree trunk or stem.

(Summit, New Jersey: 1959.)

Few legal difficulties and no challenges have been encountered. The success of the ordinance stems at least partly from the advice and assistance the city forester can provide to the builder. Close cooperation between forester and building inspector is also critical. The city forester states that he makes unscheduled trips to building site to discourage the builder from circumventing the ordinance. An aggrieved person can appeal a decision of the city forester to the city council. If a builder does violate the ordinance, he is subject to a \$200 fine or a month in county jail, or both.

Atlanta, Georgia's, ordinance regulates tree cutting in what the ordinance defines as the tree protective zone and establishes the position of city arborist to carry out the regulations. A tree is defined as "any woody plant except dogwood that has a single trunk with a caliper of five inches or more at six inches above the ground." A dogwood, the official tree of Atlanta, becomes subject to regulation when the caliper reaches two inches. The following excerpts from the ordinance explain its method of tree protection:

Tree Protection Prior to Development. To prevent the unnecessary destruction of trees on land where a building permit or subdivision approval has not been issued, the destruction, within any five-year period, of more than 25 per cent of the trees on any one parcel of real property within the City, without prior approval of the City Arborist, shall be prohibited.

Tree Protective Zone. The Tree Protective Zone shall correspond with that portion of the lot covered by the front, side and rear yard requirement as established by the Zoning Ordinance.

To prevent the unnecessary destruction of trees during development or redevelopment of any tract or lot within the City of Atlanta, trees shall not be cut, otherwise damaged or destroyed within the Tree Protective Zone except in accordance with the Tree Planting and Maintenance Regulations and the provisions of this ordinance.

Submission of Site Plans for Development to City Arborist. A site plan for the development or improvement of any tract of land located in the City of Atlanta shall be submitted to the City along with the application for a building permit. No building permit shall be issued until the site plan has been reviewed and approved, in writing, by the City Arborist and a permit . . . has been issued. Such plans shall be reviewed and either approved or denied and a permit . . . issued or denied within fourteen (14) days of submittal.

Otherwise such plans shall be considered approved and such permit considered issued by the City Arborist. In the event such plans are denied the reasons therefore shall be reported, in writing, to the applicant. The site plan shall show, in addition to the usual requirements the following information:

- A. All existing trees within the Tree Protective Zone which are at least 5 inch caliper at 6 inches above the ground and all Dogwood trees which are at least 2 inch caliper at 6 inches above the ground.
- B. Trees to be removed and trees to be maintained.
- C. Specifications for the removal of existing trees and protection of existing trees during construction.
- D. Grade changes or other work adjacent to a tree which would affect it adversely with specifications on how the grade, drainage and aeration will be maintained around the tree.

The function of the City Arborist in the review of site plans will be to assure that trees are retained in lawn or paved areas within the Tree Protective Zone without making demands on the owner which would deny him the reasonable use of his land.

Tree Protection During Development. During any building, renovating or razing operations, the builder shall erect suitable protective barriers around all trees specified to be maintained and shall not allow storage of equipment, materials, debris or fill to be placed in this area except as may be necessary for a reasonable time if no other storage space is available.

(Atlanta, Georgia: 1967.)

The ordinance includes sections dealing with permits for tree cutting, pruning, and removing; it also provides for diseased trees, trees endangering the streets, penalties, and appeals. In case of windstorms, ice storms, or other disasters, the section requiring permits for tree removal or cutting can be waived in order to speed emergency work. The individual homeowner in areas zoned for single- or two-family occupancy is also exempt from permit requirements except where more than two neighboring lots are being developed at one time.

In Monterey, California's ordinance regulating the removal of trees from undeveloped private property a tree is defined as any woody plant with a single trunk of a circumference of 19 inches or more at 24 inches above ground level. This ordinance aims to avoid both the economic and ecological problems precipitated by tree removal in a community where scenery and beauty of setting draw tourists:

The City of Monterey was originally forested by Pine, Oak and other trees and the scenic beauty of the City of Monterey has been perpetuated by the maintenance of forest areas which attract many visitors to the City. The majority of residential property within the City of Monterey is on hillside and sloping terrain. The wanton and wholesale destruction of trees could decimate the scenic beauty, cause erosion of topsoil, create flood hazards and risk of landslides, reduce property values resulting in the encouragement of sub-standard development, increase the cost of construction and maintenance of drainage systems through the increased flow and diversion of surface waters and reduce the attractiveness of the area to visitors.

For these reasons the Council of the City of Monterey finds it in the public interest, convenience and necessity to enact regulations controlling the removal of trees within the City in order to retain as many trees as possible consistent with the economic enjoyment of private property.

The ordinance is more specific than Atlanta's or Summit's with regard to how the issuer of permits for tree removal makes his determinations:

Any person, firm, partnership, corporation or other legal entity, or agent of any such person, desiring to remove one or more trees on any undeveloped parcel in the City of Monterey may apply in writing to the City Manager to do so in a manner prescribed by him for such removal. Said application shall contain the number and location of the trees to be cut or removed and a brief statement of the reason for removal, as well as any other pertinent information the City Manager may require. On receipt of such application, the City Manager, or his designated representative, will inspect the premises and determine which trees may be removed.

The determination of the City Manager, or his designated representative, shall be based upon the following criteria:

- (1) The condition of the trees with respect to disease, danger of falling, proximity to existing or proposed structures and interference with utility services.
- (2) Necessity to remove trees in order to construct proposed improvements to allow economic enjoyment of the property.
- (3) Topography of land and the effect of tree removal on erosion, soil retention and the diversion or increased flow of surface waters.
- (4) Number of trees existing in the neighborhood on improved property. The City Manager shall be guided by the standards established in the neighborhood and the effect of tree removal upon property values in the area.
- (5) Good forestry practices, i.e., the number of healthy trees that a given parcel of land will support.

The City Manager shall give priority of inspection to those requests based on hazard, danger of disease. The City Manager may also refer any request to another Department, Board, Commission, City Council or Committee for report or recommendation.

(Ordinance 1410 C.S.
Monterey, California: 1964.)

A tree ordinance can also be aimed at preserving specific kinds of trees which are culturally and historically significant. A proposed ordinance in Los Altos, California, protects California live oaks, coast redwoods, and deodar cedar by declaring:

In view of their importance to the community as a whole, it shall be unlawful to destroy or remove any of the aforementioned trees regardless of their location within the City without the approval of the Planning Commission and City Council. This shall not apply to any tree with a trunk diameter of less than ten inches (10"). The measurement shall be taken at a point three feet (3') above the grade at the base of the tree.

A different rationale for tree preservation is control of high winds. In communities where this justification is appropriate, tree preservation can be keyed to the protection of the general health and safety of the residents. The Fremont, California, tree preservation ordinance is illustrative:

In enacting this chapter, the city council hereby finds that throughout the history of the development for human habitation of the area now comprising the City of Fremont there has existed, and still exists, a serious problem of high winds of such magnitude that the public health, safety and general welfare have required the taking of steps to combat the injurious effects of such winds. Among such steps has been the establishment and growth

of stands of trees and of individual trees by private individuals resident in the area. However, since the incorporation of the city and the accompanying rapid rate of conversion of agricultural lands to urban development, certain property owners have cut down great numbers of trees within the city limits, and such extensive cutting of trees has reached a point where further wanton destruction of trees would, because of the wind problem as aforesaid, give rise to substantial danger to the public health, safety and welfare from dust, erosion, and other hazardous elements attendant to unrestricted high winds. Therefore, the provisions of this chapter are intended to limit the unnecessary destruction of existing trees on private property so as to preserve existing windbreaks, and for conservation purposes, as well as to preserve the natural beauty which said trees lend to said city, all for the protection of the public health, safety, prosperity and general welfare, while at the same time recognizing individual rights to develop private property in a manner which will not be prejudicial to the public interest.

The ordinance specifies that:

No person shall cut down, destroy, remove or move any tree (including an olive tree) with a trunk diameter of six inches or greater, measured at four feet above ground level, growing within the city limits, unless and until a permit so to do has been obtained from the city manager or his designated representative, provided, however, that this section shall not apply in cases involving commercial type nut or fruit bearing trees, or any tree located on a lot of parcel of land not exceeding 10,000 square feet in area

Following investigation, the permit shall be issued unless the city manager shall find that any such tree is in a reasonably healthy condition and is necessary in order to preserve the health, safety and welfare of a substantial number of persons in the community by serving a windbreak function; or that the public interest will be otherwise unduly prejudiced by the destruction or removal of any such tree; and that the public interest in preservation of any such tree is not outweighed by the individual hardship on the applicant in the event the application is denied.

(Fremont, California: 1966.)

The Fremont ordinance also contains a provision that if the necessary findings to forbid tree removal cannot be made, the permit can be withheld 20 days, during which time the city council may consider compensating the landowner in order to preserve the trees. Subdivisions are also made subject to the provisions above regarding tree removal.

The tree ordinance of Pacific Grove, California, contains a statement of purpose very similar to that of Monterey. Windbreaks, conservation, and preserva-

tion of natural beauty are cited as reasons for control. Unlike Monterey's ordinance, however, it covers all property in the city:

. . . no tree of any kind or character growing within the city limits of the City of Pacific Grove may be cut down, removed, or moved unless and until permission so to do has first been obtained from the City Manager of said City, or his designated representative. Every person, firm, or corporation wishing to cut down, remove, or move any tree or trees within said City shall pay the sum of two dollars (\$2.00) for a permit so to do, upon application to the City Manager or his designated representative; and such permit, when granted, shall entitle the holder thereof to cut down, remove, or move not to exceed a total of five trees on the single parcel of real property described in the permit so granted. Prior to the issuance of such permit the City Manager, or his designated representative, shall inspect the premises involved and shall designate the tree or trees to be cut down, removed, or moved. Where more than five trees are to be removed from, or moved from place to place upon a single parcel of real property, the application shall be referred to the Beautification Committee for recommendation to the Council. Unusual cases where less than five trees are involved may be referred to the Beautification Committee by the City Manager.

(Pacific Grove, California.)

This ordinance is perhaps more likely than any of the others to come under attack. The ordinance does not specify any size of tree (it would include even the smallest sapling), nor does it set forth any criteria for determining when a tree may or may not be cut down. This lack of criteria for tree removal also applies to the Los Gatos zoning ordinance cited previously.

What constitutes a well-written, direct-control tree ordinance? Ott and Meany have stated, "we are in an uncharted legal wilderness," but they do offer some very constructive suggestions, particularly with regard to an ordinance covering developed and undeveloped property:

- (1) Definition of trees, including size, to which ordinance applies. Because measurement by height is complicated, circumference or caliper at a specified height above the ground is suggested.
- (2) A list of desirable trees to which ordinance applies.
- (3) Restriction of ordinance to residential zones; application only to trees outside the buildable area of lot, i.e., only trees within the required set-back distances.
- (4) Provision for variances, particularly an exception for trees close to the building line.
- (5) Provisions for trimming, treatment, and removal of damaged or diseased trees.

- (6) Provision for appeal to the planning commission or city council.²⁸

In order to inform developers about ways to safeguard trees designated for preservation and to give the city some means of controlling careless or willful destruction of these trees, the following provisions should be incorporated into an ordinance:

- (1) Inventory trees prior to start of building.
- (2) Prohibit cut and fill greater than so many inches around base of trees.
- (3) Report damage to tree so city can treat it.
- (4) Prohibit storage of oil, gas, chemicals, or construction material around trees.
- (5) Install drains to divert excess water from trees to be preserved.
- (6) Prohibit attachment of wires or signs to trees.²⁹

The tree ordinance must be carefully drafted in order to avoid constitutional challenge. The line between appropriate exercise of the police power and violation of property rights is not always clear. Regulation in setback areas only, where the right to build is already taken away, is one way to avoid the charge that property is being taken without just compensation. The reaction of state courts to such ordinances should be anticipated. One must also take into account the attitude of the community. Where trees are prized highly and potential house buyers prefer wooded lots, challenge from developers is much less likely.

Even if one protects and preserves trees during development, what stops an individual property owner from cutting down his trees? Not much, really. Although the Pacific Grove ordinance aims to overcome this difficulty by regulating all trees. It has been shown already that problems could arise out of such an ordinance. Even the Atlanta ordinance applies only to individual homeowners when trees are to be cut or removed from two or more adjacent lots. Ott and Meany's suggestions for a tree ordinance on developed property would protect trees only within the setback requirements. Protective covenants or home associations sometimes safeguard trees within a residential area. If trees are of paramount significance or beauty, a community can seek a scenic or conservation easement from the owner. In general, though, one can rely on the principle that most homeowners like trees and won't cut them down unnecessarily.

²⁸Ibid.

²⁹Ibid.

CONCLUSION

Actually saving trees is not as simple as wanting to save trees. Tree regulations for private and public property can further tree preservation, but tree preservation means more than regulation. Equally important are tree promotion and planning for trees in the community. These efforts must proceed with both knowledge of the characteristics of trees and an understanding of the reasons for saving them. Trees are part of our landscape and our heritage. Even if we could survive without them, we probably wouldn't want to.

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