TRESYSTM: TREE RECORDS SYSTEM FOR MUNICIPALITIES[1]

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Abstract. TRESYSTM is a computerized inventory and data processing service designed for the practical management of urban trees. A municipal arborist may modify its various features to adapt TRESYSTM to the particular needs of his own city or town. All inventory data is displayed in a directory to trees called Tree List. The variables are tabulated in a City Summary, which is used principally for planning, budgeting, and evaluating accomplishments. A Species Summary, which compares individual species or cultivars, is a useful guide for selecting trees to plant on different types of sites. Other optional products are available to improve efficiency of various operations. As work is performed, records are updated in Tree List, and new summaries may be obtained annually or at other intervals. A growing number of communities in several states has been using TRESYSTM since 1978, when it was first offered commercially. TRESYSTM also has been modified for managing trees on institutional properties such as university campuses, cemeteries, or industrial parks. Costs of installation and operation are modest, compared to the benefits and savings which can be realized.

Many progressive communities, wanting to develop better organized tree care programs, are realizing that some type of tree inventory and record keeping system is essential. Without an organized way of handling information on thousands of trees and planting sites, effective planning and management are impossible. Consequently, daily operations may be inefficient and over the years the tree program deteriorates, along with the trees.

Various methods have been developed for tree inventories, certain of which also incorporate procedures for storage and retrieval of records and data processing. Some methods are relatively simple and rapid, producing summaries of data which are useful for justifying tree programs and initial planning, but not in managing those already well established. At the other extreme are comprehensive management information systems, most of which employ large computers owned or leased by cities. These have extensive capabilities of producing all sorts of information needed in planning and management. However, they do require a large amount of the city arborist's time for development and operation of the system. Many towns and cities do not have the necessary computers and operators; others which do have them may not be able to accommodate the needs of the tree department.

An innovative solution is available through TRESYSTM, a Tree Records System for Municipalities. Now cities can subscribe to a computerized data processing service specifically designed for urban tree management, without having to invest in computers or divert data processing personnel from their usual tasks. This approach is novel in arboriculture and urban forestry, but is not at all uncommon in other fields. Many executives in the business community and in city management have found data processing service companies to be advantageous in proving specialized expertise and services.

The concept of TRESYSTM and how it works are explained in this article. The principal idea is to centralize technological capabilities of electronic data processing and management information systems in a service company. It provides these services to city tree programs so they can gain the benefits without being unduly distracted from their primary responsibilities in tree care. Through this centralization the service company can keep up with technological improvements in the rapidly developing field of data processing and incorporate them into its services to clients.

TRESYSTM has been designed to be versatile, practical, and quickly installed. A municipal arborist can tailor TRESYSTM to his own particular needs, using his experience and creative abilities to assemble pre-tested features in the most suitable combination; or a standard version of TRESYSTM can be chosen. The arborist need not spend time in learning about a computer, nor in

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operating one. TRESYSTM frees him to concentrate on important arboricultural decisions, and supplies information needed to make decisions, to issue work orders, and to keep records of accomplishments. It is a managerial tool which can extend his capabilities and improve his rapport with other city officials.

Inventory

Usually a city will require some assistance in selecting a system, conducting an inventory, and making full use of the results. Objectives should be clearly defined; procedures should be specified so objectives will be met; personnel need to be trained and supervised carefully so that data will be accurate; and processed data should be evaluated so that realistic recommendations can be formulated. Technical assistance in any of these matters is provided through the service company, and affiliated local representatives.

Once objectives and scope of the initial TRESYSTM inventory have been defined, plans can be completed within a day or two. Survey personnel can be trained in one to three days if they are able to identify the common tree species. Regular city employees may conduct the inventory, or special arrangements may be made for hiring seasonal help. These tasks are expedited because planning consists of choosing predesigned options; and data forms and printed instructions have been prepared so they are adaptable to local conditions.

Two versions of the TRESYSTM inventory are available, the speed survey and the intensive inventory. Either can be modified to fit particular needs. The *speed survey,* which is relatively fast and inexpensive, is appropriate when only citywide summaries are needed for initial planning purposes; or when finances are insufficient for a more thorough inventory. Only the most critical information is collected, either from all municipal trees or from a sample of them. The *intensive inventory* produces complete information needed for planning, management, and administering daily operations. It may be conducted in one year or over several years, and may include just street trees or also other municipal trees, e.g., in parks, malls, commons, or parking lots. Different forms have been designed for speed surveys and intensive inventories, to make data collection convenient and rapid.

A complete set of data in an intensive inventory consists of thirty to forty standard and optional variables. These include data on 1) the property address, its landscape quality, land use; 2) location of each tree; 3) species or cultivar; 4) tree diameter, height, and crown spread; 5) condition of health of foliage, branches, and trunk, each recorded separately; 6) causes of injury to foliage, branches, or trunk; 7) growing space for crown and roots; 8) traffic conditions; 9) presence of overhead or underground utilities; 10) work needed; and 11) optional data such as dollar value, specific diseases, or designation of need for immediate attention.

Data Processing and TRESYSTM Products

As the inventory progresses through different areas of the city, batches of data forms are sent to the service company for processing and storage. After the last batch of forms is received, data processing can be completed within one day. A series of TRESYSTM computer programs calculates summaries of various kinds and produces several standard and optional products. The programs include internal checks for finding and correcting erroneous data. A complete duplicate data set is also stored at a second location for safekeeping. The TRESYSTM products are then examined and evaluated so that recommendations may be incorporated in a supplemental report. Thus a person who understands trees communicates with the city arborist, not an uncaring computer.

Two standard products called Tree List and City Summary are returned to the city, with as many copies of these computer printouts as are needed. The *City Summary* consists of tables in which are tabulated the variables recorded in the inventory, with figures for the whole city and for areas within it. These are used principally for planning and budgeting. *Tree List* has a line for each tree, showing all data gathered in the inventory. In each area of the city, trees are listed numerically by property address within street, which are arranged alphabetically. Thus, Tree List serves as a directory to all trees, for use either in the office or

on the street.

Several types of optional products are available or under development. These can be produced upon request at any time of the year. They can assist the arborist in improving the effectiveness and efficiency of his program over the years.

Fig. 1. Quality control during data collection, processing, and retrieval is essential. High standards of quality are built into TRESYSTM methods.

Uses of TRESYSTM Products

Daily Operations. The Tree List is used principally in daily operations, and comes in two versions: abridged and complete. Abridged copies of Tree List are carried by all tree crews. The foreman records work done on each tree in the space below the printed line, by entering another date and appropriate code for planting, trimming, removal, etc. At the same time other tree records that have changed can be updated by entering new data beneath the old. If the foreman has time, other trees in the vicinity also can be checked and in this way, records are kept up to date wherever crews have worked. If most records have not been updated within a reasonable time, such as five years, a re-survey may be advisable. This method of updating is much faster than the original inventory, as only about one-third of the data will need to be revised, and this can be done quickly in the Tree List.

Work orders also can be issued in conjunction with the Tree List. A work order form with multiple copies is available on which the city arborist or district supervisor writes the Tree List page numbers, tree identities, and other entries indicating where, when, what, and by whom work is to be done. The work order form is also used for updating when copies are sent to the service company.

A complete Tree List contains all data recorded over the years, with a line for each date. It is kept in the office as a reference for several purposes. When a resident telephones to complain or inquire about a tree, its recorded history often enables the arborist to give an immediate answer. He thus saves the time otherwise required to inspect the tree and then respond to the request. When devising work schedules and assignments, Tree List may be consulted to estimate time, personnel, supplies, and equipment required, or to aid in choosing species for planting. For legal matters, Tree List contains information required to establish values for damage claims, e.g. losses caused by auto accidents; or in defense against law suits it may establish that the city was not negligent in tree care. Even after trees die and are removed, their records are maintained — in a place called Tree Heaven (trees which have spent their life enduring city conditions already have passed through purgatory).

Planning, Budgeting, Evaluating Progress. The principal uses of City Summary are for planning, budgeting, and evaluating accomplishments and progress. Every year as data are revised and updated, new copies of Tree List and City Summary are produced, so that fresh information is

available for organizing the work. In the first two tables, average landscape quality in each area of the city may be compared to the city average, or to values in previous years; numbers and percentages of trees and planting spaces are given, and also trees per mile and per acre. The next three tables give the status of updating by years, and the work done and work needed as recorded in the past year. Tables 6 to 8 summarize by areas site variables which influence tree performance and planting choices: amount of traffic, presence of utility wires or pipes, land use category, planting space dimensions, and vertical and horizontal space for crown growth. Tree characteristics are summarized by areas in Tables 9 to 14: averages and distributions of diameter, height, and crown spread; average health ratings of foliage, branches, and trunks; causes of injuries to each of these; and number and percentage of trees in each species and cultivar. Additional tables appear if data on other variables was collected in the city.

Such summaries of information have many uses. We will mention just a few examples, as most uses are readily recognized. Annual work done and improvements in landscape quality point to accomplishments worth noting in annual reports. If landscape quality is deteriorating, or there are accumulations of planting spaces or in dead trees to be removed, or if the rate of trimming is too slow for normal cycles, budget and manpower increases can be justified factually. Information about growing space and other site variables can be used to make advance plans for procuring planting stock. Planting needs by areas can be determined from numbers of open spaces or from work needs. Other work loads in each area — trimming, spraying, removal — can be projected from numbers of trees, sizes, and health conditions. Build-ups in diseases or insects can be detected from yearly trends in tree health and injury causes, and plans can then be made for more precise diagnoses and remedial treatments.

Optional Products for Special Needs. The routine use of Tree List and City Summary can in itself improve a city's tree care program, as already indicated. Furthermore, there are optional products available or under development for special applications. Species Summary gives many details about each species and cultivar that is present in sufficient numbers. This useful guide for selecting trees to plant on different types of sites can help to assure better health and to avoid maintenance problems in the future. A subset of Tree List can be printed according to any set of criteria. For example, all elm trees can be listed in a sequence that provides an efficient route for a spraying operation. Lists of open spaces or dead trees can help to locate places where trees need to be planted or removed. A master landscape plan can be prepared, showing present condition and future planting plans in each block. Graphical street profiles of any variable, such as landscape quality or tree condition, can be produced to assist in planning. Maps of the city can be drawn by computer, showing planting needs or pockets of unhealthy trees. Cost analyses can be used to compare productivity of crews or efficiencies of various equipment types, and to project costs for the next budget. Most of these options are based on data already in Tree List, so the additional costs of producing them by computer are relatively modest.

Availability and Costs

Development of TRESYSTM began in 1975, and continued with thorough testing in the borough of State College, Pennsylvania. According to comments from borough officials, the city arborist, and members of the tree commission, TRESYSTM has been functioning effectively since its inception. Communities in several states began installing TRESYSTM in 1978, when it was first offered commercially. It is now available nationwide and in Canada.

Technical services for installing TRESYSTM and keeping it in operation are available on a contractual basis, renewable annually. The computer programs used for data processing cannot be adapted easily to computers which some cities have, because of their complexity and specificity for arboricultural applications; so the programs themselves are not available.

The costs of TRESYSTM services depend mainly on the number of trees inventories, the data variables recorded, and the type of inventory, i.e. a speed survey or an intensive inventory. The lat-

ter can cost from $70 to $150 per mile of street inventoried, while a speed survey could be as low as $15 per mile of street sampled. These costs include all wages and materials, and related services such as planning, training personnel, data processing, and TRESYSTM products. After the inventory has been completed, in one growing season or over several years, the annual costs for data storage, updating, and TRESYSTM products may vary from $10 to $25 per mile of street However, conditions vary greatly from one city to the next, so these figures should be regarded as approximations.

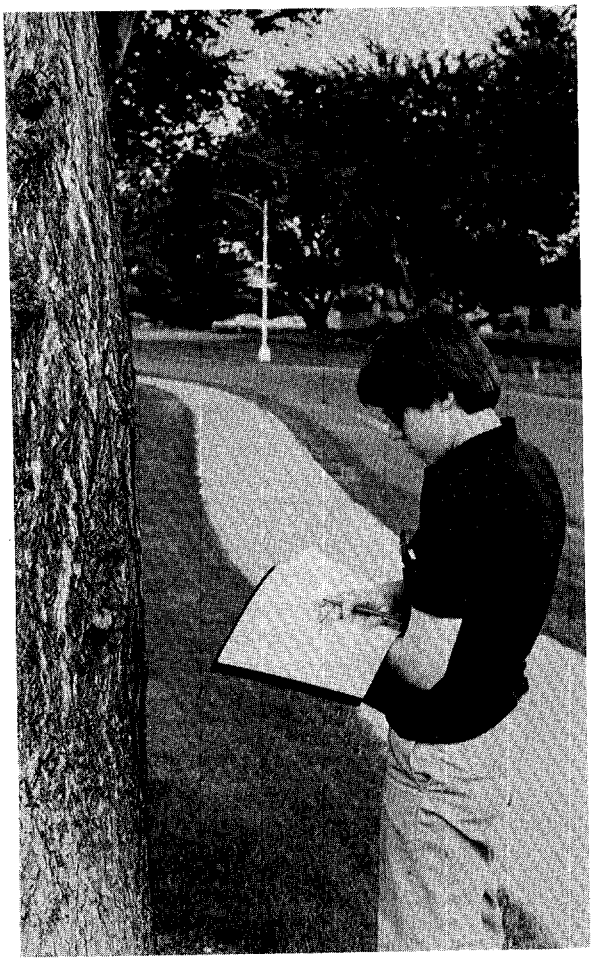

Fig. 2. Records of tree care are added to inventory data whenever work is performed. This continual updating process overcomes obsolescence of data, and provides annual summaries of accomplishments that are useful for planning and budgeting.

The expense of starting TRESYSTM may be reduced or spread out in several ways. 1) Conduct the inventory over several years, thus lowering the cost per year. 2) Decrease the number of trees through a sample inventory, or the amount of data through an abridged inventory (in either case, it would be possible to convert to a complete inventory through updating or supplemental surveys in subsequent years). 3) Use city employees or volunteers for conducting the inventory, but be sure to provide adequate training and careful supervision so the quality of the data will not suffer. 4) Include several small cities or towns in a coordinated inventory, e.g. a county-wide survey which could be arranged through a regional planning commission.

Benefits

Benefits which can be realized from TRESYSTM, or from other comprehensive management information systems, will depend partly on the ingenuity of the municipal arborist and the supportiveness of his city. The potential is great for improving the quality of trees and the efficiency of the tree care program.

The quality of trees can be improved through selection of better trees for planting and more effective allocation of cultural treatments. Many years may pass before such improvements can be fully appreciated, but they will start to accumulate soon after TRESYSTM techniques are applied. Results will be detected and documented in annual TRESYSTM reports.

The efficiency of tree care operations can be increased through TRESYSTM procedures of cost accounting, crew and equipment efficiency analyses, and cost projections. Unit costs of planting, trimming, spraying, and removal can be lowered, and thus the number of trees treated per year can be increased.

The initial impact of using TRESYSTM, however, may be to identify and justify needs of the tree department for budget increases and reallocation of resource. The inventory may turn up many dead and dying trees that should be removed, and replaced by cultivars that will require less maintenance. The work load may be higher for several years, and perhaps new or addi-

tional equipment will be required. Nevertheless, if TRESYSTM techniques are used to improve the efficiency of operations, the lower unit costs will offset the initial impact on the tree budget. The alert municipal arborist can exploit this opportunity to improve the overall capabilities of his department.

The ultimate results that may be anticipated include a more productive tree department, more valuable trees that are healthier and maintained at lower cost, and a more beautifully landscaped city. What an opportunity for those with the vision and ability to make it work!

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ABSTRACTS

Lambe, R.C. 1978. **Recognizing ornamental diseases.** Am. Nurseryman 147(10): 10, 24-25.

Because there are so many different plants classified as ornamentals and so many are genetically unrelated, and they are grown under a wide range of conditions, they are susceptible to a large number of different diseases. The majority of these are caused by pathogenic fungi, but others are incited by bacteria, nematodes, viruses, mycoplasmas, and flowering parasitic plants (dodder). The beginning diagnostician should start by attempting to decide whether the disease is caused by a plant pathogen or is abiotic (physiological disorder). He should determine if the plant is hardy to the area in which it is being grown. All parts of the plant should be examined, including leaves, stems, trunk, and roots. Finally, the diagnostician should be familiar with available cooperative extension and U.S. Department of Agriculture publications.

Shurtleff, M.C. 1979. **Trees for a city environment.** Grounds Maintenance 14()4: 16, 18.

A city environment demands hardy trees. They must be kept free of diseases, insects, mites, nematodes, and other pests. The ideal choices cope well with soil compaction as well as with the extremes of very dry or overly wet soil. The selected varieties must withstand wind, snow and ice storms, city smoke and other air pollutants, extremes in temperature, use of salt on sidewalks or streets, and mechanical injuries from cars and lawn mowers, and other external forces. Other things to consider include soil drainage and water table level, soil reaction or pH, exposure to wind and sun, local legal constraints, attitudes of neighbors, view(s) when the tree is half grown or fully grown, and the size of the mature tree.

Weekes, W.D. 1979. **The awesome live oak.** American Forests 85(2): 20-23, 56-59.

In a narrow belt extending from southeastern Virginia down the Atlantic seaboard, around the Gulf of Mexico, and into western Texas, grows a tree that symbolizes the Old South. The tree is *Quercus virginiana,* the live oak. The live oak grows best on rich hummocks and ridges a few feet above sea level. It grows well and fast in rich soil. The live oak is so named because it keeps its leaves throughout the year. The live oak became the first North American tree to be set aside for future use in a forest preserve. In 1799 Congress bought 150 acres of live-oak timberland. The live oak is an embodiment of virtues envied by mere mortals; boundless strength, tenacious steadfastness, endurance to weather all storms, indestructibility through time, and a secure indifference toward the future.