

IOWA PUBLIC TREE INVENTORY SYSTEM¹

by Steven E. Jungst

Abstract. A computerized public tree inventory system was developed for cities in Iowa. The system contains computer programs for analyzing inventory data for street trees, park trees, and greenbelt trees. In all cases, the public tree manager may select only those programs from the system that best fit the needs of the city. By using a computerized system capable of analyzing public tree populations in each of the three major management categories typically found in cities, the public tree manager can do a more efficient job of managing the urban forest.

There are a number of computerized inventory systems in existence for use in urban settings (Sacksteder and Gerhold, 1979). The programs perform numerous tasks, ranging from keeping maintenance records for city trees (Johannsen, 1975) to aiding in the planning of planting programs and disease-control programs (Cramer et al., 1976). Most of the programs currently in existence are designed for a specific town and deal exclusively with street trees, trees planted between the curb and the side-walk. During 1978, a computerized inventory system was developed for small Iowa towns, but it too was restricted to use with street trees (Wray and Prestemon, 1983).

With the cooperation of the Iowa Conservation Commission, a generalized computer inventory system has been developed for use in Iowa cities. Initial mailings were sent to mayors or city managers in each of the 27 cities in Iowa with a population of 10,000 or more. In the questionnaire, several basic questions were asked to determine whether the city officials believe they had sufficient quality and quantity of street trees, park trees, and greenbelt trees; whether they had a current inventory system, and if not, whether they thought they could benefit from such a system. Follow-up mailings were done until a 100% response had been obtained. In addition to a general feeling of the inadequacy of quality and

quantity of public trees in the cities, 79% of the officials questioned indicated that they did not have a current inventory system for public trees.

City officials were also asked to identify the person or persons responsible for public tree management in their city. Each of the individuals was then contacted, and visits were arranged to further discuss specific problems regarding public tree management in each city.

Based on the questionnaires and interviews, the public tree inventory system described here was developed and is available to all towns wishing to use the system.

System Programs

The inventory system has been developed to provide as much flexibility to users as possible. It can be used in either large or small towns, but some of the advantages of its use may not carry over to small towns. The system consists of a number of computer programs capable of analyzing data, not only from street trees, but also from park trees and trees located in greenbelts. The programs are available to the cities in either batch form or interactive form. The street-tree component and the park-tree component each contain four programs. The greenbelt component contains three programs. It is not necessary to use all programs in each component, however, Each of the independently operating programs performs a specific function in the analysis and presentation of information. Public tree managers can evaluate their information needs and select only those programs from the system that best fit their individual requirements (Table 1).

Information for the street-tree and park-tree programs comes from a complete tally of all trees in the population of interest. For each tree, the following information is recorded: species, diameter class (Table 2), and broad and specific conditions (Table 3).

¹ Journal Paper No. J-11035 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa. Project 2286.

Table 1. Programs available in Iowa Public Tree Inventory System.

<i>Batch programs</i>	<i>Interactive programs</i>	<i>Program descriptions</i>
Street tree programs		
Scheck	Ischeck	Checks field data for keypunch errors.
Scover	Iscover	Produces a title page and code explanations.
Sanal	Isanal	Gives data listings and/or analysis of tree data.
Smaint	Ismaint	Searches data for condition problems specified by user.
Park tree subroutines		
Pcheck	Ipcheck	Checks field data for keypunch errors.
Pcover	Ipcover	Produces a title page and listing of codes.
Panal	Ipanal	Gives data listing and/or analysis of tree data.
Pmaint	Ipmaint	Searches data for condition problems specified by user.
Greenbelt tree programs		
Gcheck	Igcheck	Checks field data for keypunch errors.
Gcover	Igcover	Produces a title page and code explanation.
Ganal	Iganal	Analyzes size and condition information and estimates harvestable volumes. (Information is sample based.)

Information for the greenbelt tree programs is obtained, not from a complete tally of all trees, but rather, from samples of trees in fixed area plots located at random throughout the greenbelt. Information recorded for each tree in the sample is the same as for street and park trees, but the manager also can collect additional information for trees that may be harvested from the greenbelt. The additional information collected for harvest trees consists of: 1) a product indicator (firewood, sawtimber, or veneer); 2) diameter to the nearest inch at breast height; 3) merchantable height; and 4) total height. Estimates are then generated for greenbelts on a per-acre basis by using stratified random sampling formulae.

Street and Park Tree Programs

Although there are separate programs for street-tree inventories and park-tree inventories,

Table 2. Diameter classes used in the inventory system.

<i>Diameter class</i>	<i>Diameters represented</i>
1	0 to 3 inches
2	3 to 6 inches
3	6 to 12 inches
4	12 to 20 inches
5	Greater than 20 inches

Table 3. Condition codes used in the inventory system.

Broad conditions

1. Good condition+
2. Fair condition
3. Poor condition

Specific conditions

- * 1. Insect damage to foliage
2. Insect damage to stem area
3. Disease damage to foliage
4. Disease damage to stem areas
5. Mechanical damage to main stem
6. Needs pruning or has overhead wire problems
7. Nonbiotic disease or under stress
8. Limited growing space
9. (Broad condition 2): Unknown
(Broad condition 3): Dead

+ No specific condition listings should be used for trees in good condition.

* With the exception of condition 9, specific conditions are the same for both broad condition 2 and broad condition 3. The decision to place a tree in broad condition 2 or 3 depends on the severity of the specific conditions.

the function and output of the programs are similar.

Data check. Data for street or park trees are first run through the check program provided in the system to insure that major errors in recording and data transfer are corrected. The program checks to be sure that all data are within permissible ranges. Where obvious errors exist, error messages are printed, and the operator can then correct the data before any analysis is done.

Title page. When the user believes that a title page and explanation of codes used in other programs in the system is desirable, the cover program can be run to provide this information. This program does not require street- or park-tree data, but does indicate dates and location of the inventory.

Data analysis. The analysis program available in the system provides information in two forms. In

the first form, data that have been collected are printed out by blocks within the city or by zones within the park. This provides a useful list of tree locations and their associated size and condition information, which can be used in a number of management situations.

In the second form, the program provides an analysis of the data by species. For each species, the following information is generated:

Total trees,

Percentage of the total population in the species,

Diameter size classes,

Further breakdown of broad conditions into specific conditions.

In addition to the species analysis, the same information is provided for all species combined. The final piece of information provided is the number of additional planting spaces available in the town or park.

Condition search. Whether the user elects to do an analysis of the data or not, it is possible to search the data for specific condition problems. Such a search is useful as an aid to scheduling maintenance activities and for estimating budget and equipment needs for maintenance. This program allows the user to specify either one or two specific conditions each time a search is run. If two conditions are specified, the user can indicate whether the search should be restricted to those trees containing both conditions or whether the search should be for trees containing one or the other of the conditions. Once this information is specified by the user, the program searches the data set and prints all the information available for any tree having the conditions indicated.

Greenbelt Programs

Management of greenbelt areas presents some problems different from those encountered in management of either street or park trees. Usually, individual trees take on less importance in a greenbelt setting than if they were in a park or planted along a city street. The manager is, typically, concerned about the general state of the stand of trees in the greenbelt but probably does not need detailed information on each tree. Because there is less value associated with greenbelt trees, a system that allows collection of

necessary information with the smallest possible expenditure of time and money is desirable.

To collect information under these conditions, a sample-based procedure is useful. By collecting information in this way, estimates of species mix, size distribution, and tree conditions can be generated without the need for measuring all the trees in the greenbelt.

Data check. A check program is available for greenbelt data. This program performs the same function as the check programs for street and park trees and should be used before doing an analysis of the data.

Title page. A cover program can be used to provide a cover and code listing specific to the greenbelt being sampled. Tree data from the greenbelt are not required, but as with the street- and park-tree cover programs, information on inventory dates and location is necessary.

Data analysis. The analysis program for greenbelts operates differently from other analysis programs. No data listing is available since only a sample of the greenbelt has been taken. The species analysis and the total population analysis are similar to those discussed previously in that estimates are broken down by size class and condition class. The difference is that all values are on a "per-acre" basis, and number of trees by size and condition is a statistical estimate with an associated standard error.

It also is possible for the manager to specify, during the inventory, trees that may be removed from the greenbelt. In some cases, cities harvest some material from their greenbelts to provide firewood for parks or city residents or to sell as sawtimber or veneer to provide additional revenue to the city. By indicating, during the inventory, trees that will be removed and what they will be used for, the manager can have the program provide an estimate of the amount of firewood, sawtimber, and veneer available per acre for harvest.

Discussion

The urban forester's need for current information concerning species distribution, size distribution, and condition of public trees is obvious. The more up-to-date such information is, the easier it

is for an urban forester to do an effective job of managing the public tree population. In smaller towns, it may not be necessary to use a computerized system, but in cities where there are vast numbers of trees to be taken care of, a computerized system offers substantial savings in time and effort. The use of a complete system, such as the one described here, provides necessary information about all segments of the public tree population and makes the manager's job easier.

Complete documentation of the system is available from the author on request. The documentation consists of the following manuals:

- Iowa Public Tree Inventory: An Overview
- Iowa Public Tree Inventory: Batch System Documentation and User's Guide
- Iowa Public Tree Inventory: Manual for Field Data Collection
- Iowa Public Tree Inventory: Key punch Guide and Data Deck Organization

Literature Cited

- Cramer, D.E., F.J. Deneke, and G.W. Grey. 1976. *Computer use in city tree inventories*. J. Arboric. 2(10): 193-196.
- Johannsen, H.J. 1975. *Municipal tree survey and urban tree inventory*. J. Arboric. 1(4): 71-74.
- Sacksteder, C.J., and H.D. Gerhold. 1979. *A Guide to Urban Tree Inventory Systems*. School of Forest Resources, Pennsylvania State University. Research Paper No. 43. 52pp.
- Wray, P.H., and D.R. Prestemon. 1983. *Assessment of Street Trees in Iowa's Small Communities*. Submitted for publication in Iowa State Journal of Research.

*Associate Professor
Department of Forestry
Iowa State University
Ames, Iowa 50011*

ABSTRACT

HERMS, DANIEL and T.D. SYDNOR. 1982. **Suggestions for dealing with common tree maintenance problems.** Am. Nurseryman 156(8): 69-75.

Disease diagnosis requires a number of skills, artistic as well as scientific. The diagnostic process is broken down into three stages: (1) perceiving the problem, (2) determining the causes (in nature, there are always several associated causes), and (3) deciding on a treatment (problems with multiple causes present multiple alternatives). The successful diagnostician must order his thinking and stay on track. It is helpful to formulate a series of questions, such as the following: 1) is the problem infectious or noninfectious, 2) what stresses are involved, 3) are the stresses acute or chronic? If the problem is infectious, what are the nature and cycle of the pest; 4) how long has the problem been present, 5) what are all possible management decisions, and 6) what management decisions should be carried out now? Plant disease clinics and soil laboratories can be useful diagnostic aids, but it is important that complete information be supplied with each specimen.