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Case Histories of Several Street Tree Species and Cultivars at Selected Sites in Five Ohio Cities

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CASE HISTORIES OF SEVERAL STREET TREE SPECIES AND CULTIVARS AT SELECTED SITES IN FIVE OHIO CITIES

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Foreword

The need for a comprehensive evaluation of new introductions of shade and ornamental trees for use in the North Central United States has long been recognized by horticulturists, utility companies, and others interested in high quality trees and the landscape environment. Two leaders in the street tree field, Mr. M. W. Staples, retired Vice President of the Davey Tree Expert Company, and Dr. L. C. Chadwick, Professor Emeritus of Horticulture, The Ohio State University and Ohio Agricultural Research and Development Center, developed a proposal for a 10-year comprehensive evaluation of street trees in urban and suburban areas. The OARDC, in cooperation with a committee of the Ohio Chapter, International Shade Tree Conference, and Ohio Electric Utilities Institute, established a research program entitled *Characteristics and Adaptability of Species and Cultivars of Shade and Ornamental Trees with Emphasis on Street and Highway Landscape Use*.

The project, which involves two parts, was begun at the Research Center in 1966. The first part involves a planting of numerous tree species and cultivars located in a randomized pattern at the OARDC, with many types of data taken throughout the year. The second part is concerned with evaluation of existing street trees in five Ohio cities--Cincinnati, Columbus, Toledo, Wooster, and the greater Cleveland area. It is anticipated that case histories developed in this phase will be valuable in preparing recommendations of trees for specific sites.

This publication is the first of a series which is intended to provide a location list and indicate annual growth data from trees in the city plantings. In addition to describing the case histories of many tree types at different sites, this publication will enable the reader to visit the plantings and observe the aesthetic aspects and the effects of many and varied environmental conditions.

Research data from the plots at OARDC will be statistically analyzed and reported in separate publications.

In addition to the Ohio Agricultural Research and Development Center, the supporting agencies are: Ohio Chapter, International Shade Tree Conference, Ohio Nurserymen's Association, Ohio Edison Co., Cleveland Electric Illuminating Co., Toledo Edison Co., Cincinnati Gas & Electric Co., Dayton Power & Light Co., Monongahela Power Co., Ohio Power Co., Columbus & Southern Ohio Electric Co.

Individuals cooperating in the conduct of the study in each city are:

Cincinnati: J. T. Farrell, Cincinnati Gas and Electric Co.

Cleveland Area: A. L. Rinaldi, Jr., formerly with Cleveland Electric Illuminating Co., and John Michalko, Consultant, Gates Mills, Ohio

Columbus: B. E. Swisher, Columbus and Southern Ohio Electric Co.

Toledo: R. May, Toledo Edison Co.

Wooster: O. D. Diller, Professor Emeritus, Ohio Agricultural Research and Development Center.

Richard E. Abbott, R/W Maintenance Supervisor with the Ohio Power Company, Canton, is chairman of the Steering Committee for the project.

Introduction and Procedures

With population growth and increasing congestion, trees are considered one of the most valuable environmental assets in the modern city and suburban area. They not only offer such aesthetic features as softening lines of buildings, screening unsightly areas, and modifying the harshness of concrete and asphalt, but they also affect the environment and improve human living conditions.

In many urban and suburban situations, trees are planted in an unnatural environment with detrimental features such as insufficient light and water, polluted air, high velocity wind currents, excessive salt from ice control programs, plus temperature fluctuations and heat radiation.

Because of increased emphasis on tree planting in cities and on streets and highways, many new species and cultivars are being selected and introduced for use in these landscape areas. The need for new trees has been accentuated with increased population, along with the decline and necessary removal of trees from older city areas. Unfortunately, limited data on adaptability of trees to specific conditions has led to the selection of types poorly suited to many sites. Consequently, the cost of maintenance and subsequent removal is great.

Many new introductions have several attributes for use as street or park trees. These include size or height which will not interfere with overhead or underground utilities, branching habit which does not interfere with foot or vehicular traffic, tolerance of some unfavorable environmental conditions, resistance to pest problems, and a lack of unfavorable characteristics such as flaking bark and undesirable fruit. Most of these new selections have been evaluated by the producer and, on an individual basis, by arboretums and similar agencies. However, no program has been developed in the North Central United States to make an intensive and continuing comparative evaluation in one location.

As more miles of streets and highways are added, the need for these new cultivars will continue to increase. Thus, a non-biased, scientific evaluation of morphological characteristics and environmental adaptations is essential to provide useful information to utility companies, municipalities, public agencies, landscape contractors, and home owners. Urban renewal, expansion of park development, increased construction of recreation areas such as golf courses, and landscaping of public and commercial buildings are additional factors indicating a need for more knowledge of ornamental tree selections which will be used in these areas.

Phase I of the research involves tree evaluation plots established at the Ohio Agricultural Research and Development Center in Wooster. This work was begun in the spring of 1966 when eight each of several tree selections were planted in a randomized design at one site. New selections are continually being added and in the spring of 1971 the collection included species and cultivars as follows:

Acer (Maple)	30 species and cultivars
Crataegus (Hawthorn)	13 species and cultivars
Tilia (Linden)	13 species and cultivars
Sixteen other genera	34 species and cultivars

Detailed data were taken at the time of planting and are being taken throughout each year on such factors as height, caliper, terminal growth, time of bud opening and leaf drop, flower and fruit characteristics, habit and branching character, pest problems, and leaf color.

In addition to the need for a comparative evaluation of tree selections, it is also necessary to obtain information on the growth of several types in various planting sites throughout Ohio. This is essential to thorough evaluation and knowledgeable recommendations since differences in soil, rainfall, temperature, exposure, and the surrounding area have a marked influence on the functional and aesthetic values of trees.

In phase II of the project, 53 selected species and cultivars of trees in existing street plantings are being evaluated. These trees, with five replications at a site, were selected at random in five Ohio cities--Cincinnati, the greater Cleveland area, Columbus, Toledo, and Wooster. There are 102 separate sites and, whenever possible, a selection is evaluated at more than one site within a city and in as many of the cities as possible.

The evaluation card used to record the annual data from the trees in the cities is shown below. The data are recorded, coded and prepared for possible statistical analysis and reference.

SHADE TREE EVALUATION

SPECIES _____ STREET _____

LOCATION (City) _____ UTILITY LINES PRESENT YES___ NO___

DATE _____ HEIGHT _____

PLANTING DATE _____ ROOT DAMAGE TO PAVEMENT _____

REPLACEMENT YES___ NO___ TREE LAWN WIDTH _____

DATE _____ AIR POLLUTION _____

REASON _____ DISEASE OR INSECT PROBLEM _____

HEIGHT _____

CALIPER _____ NEW GROWTH _____

SPREAD _____ WEATHER CONDITIONS _____

BRANCHING HABIT _____ WINTER DAMAGE _____

TREE QUALITY _____

OARDC

Data have been recorded annually since 1967 in all cities except Columbus. The Columbus plots were added in 1969 and data recording was begun at that time.

Data are taken as follows:

Tree Height: Measured with a Haga altimeter in feet.

Trunk Caliper: Determined at 4 feet above soil level with a tape calibrated in tenths of inches.

Branch Spread: Measured as the distance in feet between the two farthest points of the canopy. If a tree is exceptionally irregular in habit, an average spread is determined.

Site conditions are determined as precisely as possible. However, numerous variables in the microclimate such as rainfall, temperature, air currents, and air pollution are difficult to describe other than in an empirical manner. Any unusual circumstances and opinions relating to aesthetic and functional aspects are also noted. An annual photographic record of trees at each site is being compiled.

Results

The following results are from observations and data collection since 1967 (with a few exceptions) at the sites indicated. As noted previously, there are five replications at each site. The measurements are presented as averages of data from the five trees. If a street address is indicated, it is at the approximate center of each group of trees.

Except in the comments for each species or cultivar and in the discussion section at the end of this publication, no attempt has been made to draw conclusions or make comparisons. As indicated, the primary intent is to describe case histories in specific sites over a period of time. Statistical analyses of the data will not be conducted until more information has been compiled.

ACER BUERGERIANUM CLEVELAND 15200 EDGECLIFF

Planted: 1955

Site: 10' Tree Lawn (The planting area between the sidewalk and street)

	67	68	69	70
Height	18.0'	19.6'	20.0'	21.2'
Caliper	5.5"	5.9"	6.8"	7.7"
Spread	14.8'	16.8'	19.2'	24.0'

Comments: The habit of the trees is upright spreading. However, there is considerable variation in height, spread, and caliper. The plants are growing well and appear to be suited to this suburban situation.

ACER PLATANOIDES CLEVELAND 19202 ELSMERE

Planted: 1957

Site: 5' Tree Lawn

	67	68	69	70
Height	16.0'	18.0'	18.0'	20.0'
Caliper	4.1"	4.8"	5.2"	5.8"
Spread	9.0'	14.6'	15.0'	17.0'

Comments: The plants are uniform in height but vary somewhat in spread. Because of the natural character of *Acer platanoides*, they have had to be limbed up considerably to prevent interference with pedestrian and vehicular traffic in this suburban situation. This tree is somewhat wide for a relatively narrow tree lawn and street.

ACER PLATANOIDES WOOSTER 626 SUNRISE

Planted: 1954

Site: Property Owner's Lawn

	67	68	69	70
Height	21.2'	22.0'	22.6'	25.0'
Caliper	8.2"	9.0"	9.0"	10.2"
Spread	21.0'	23.2'	23.2'	25.8'

Comments: The trees are of a typical rounded form and very uniform in height and spread. They add considerable beauty and shade to the street, as well as to the homeowner's property. The difficult problems associated with *Acer platanoides*, which are heavy shade and a shallow root system, are evident in the detrimental effects on the lawn area under the trees.

Fig. 1. *Acer platanoides*, Sunrise, Wooster, Ohio. Location of this broad spreading tree on homeowner's lawn reduces interference with traffic. However, shade and shallow roots have detrimental effects on grass in the area.

ACER PLATANOIDES 'CLEVELAND' LYNDHURST (CLEVELAND) 5716 SHAWNEE

Planted: 1953

Site: 7' Tree Lawn

	67	68	69	70
Height	20.2'	21.8'	25.2'	--
Caliper	6.0"	6.0"	6.1"	--
Spread	11.4'	14.6'	17.2'	--

Comments: These trees are of the typical oval habit of this cultivar. They have not increased markedly in caliper considering that they have been in the planting for approximately 18 years. The trunks on some of the trees have frost cracks but the general appearance is good in this residential area. Some improvement could have been made by locating the trees in the center of the tree lawn rather than closer to the sidewalk side.

ACER PLATANOIDES 'CLEVELAND' TOLEDO 624 CHESTNUT

Planted: 1963

Site: 12' Tree Lawn

	67	68	69	70
Height	14.4'	16.4'	19.4'	22.8'
Caliper	2.2"	2.6"	3.3"	4.4"
Spread	4.2'	6.6'	9.8'	11.2'

Comments: These trees are upright spreading and somewhat more columnar than might be expected of this cultivar. It seems to fit well into this relatively wide tree lawn with power lines overhead.

ACER PLATANOIDES 'CLEVELAND' TOLEDO 1123 NOBLE

Planted: 1963

Site: 10' Tree Lawn

	67	68	69	70
Height	14.6'	16.0'	19.2'	23.2'
Caliper	2.9"	3.6"	4.3"	5.4"
Spread	4.6'	8.2'	11.2'	12.6'

Comments: All trees in this planting are of the typical oval form of this cultivar and are uniform in size. There are no utility lines present and the plants have a good appearance in this width tree lawn.

ACER PLATANOIDES 'CLEVELAND' WOOSTER 421 NORTH

Planted: 1956

Site: 8' Tree Lawn

	67	68	69	70
Height	19.2'	21.8'	24.0'	28.0'
Caliper	4.4"	4.8"	5.5"	6.5"
Spread	11.6'	12.4'	13.2'	13.8'

Comments: These trees are upright oval, very uniform, and appear to be growing well in this situation. They may become too large for this area since the street is somewhat narrow and is in a "close-in" city location.

ACER PLATANOIDES 'CLEVELAND' WOOSTER 902 PITTSBURGH

Planted: 1956

Site: 10' Tree Lawn

	67	68	69	70
Height	21.2'	23.6'	26.6'	28.0'
Caliper	5.2"	5.7"	6.0"	6.8"
Spread	13.6'	15.6'	14.6'	20.0'

Comments: The trees are pyramidal in habit. Although they appear to be a good choice for this 10-foot wide tree lawn, they are already growing into overhead utility lines and will pose a problem in the future.

ACER PLATANOIDES 'COLUMNARE' TOLEDO 4028 WREFORD

Planted: 1960

Site: Homeowner's Lawn

	67	68	69	70
Height	13.0'	13.2'	13.2'	14.2'
Caliper	2.3"	2.5"	2.6"	3.3"
Spread	3.6'	3.6'	4.6'	4.4'

Comments: The plants have a typical narrow columnar habit and are developing rather slowly. They are located in the homeowner's lawn rather close to the street. There is no sidewalk and they appear to be somewhat out of scale with the wide street and deep setback of the homes. A wide spreading tree, planted farther from the street, would have provided a better appearance in this area.

ACER PLATANOIDES 'COLUMNARE' WOOSTER 345 NORTH MARKET

Planted: 1961

Site: 10' Tree Lawn

	67	68	69	70
Height	13.8'	15.8'	17.0'	18.8'
Caliper	1.9"	2.2"	2.6"	3.3"
Spread	3.2'	3.6'	5.4'	6.4'

Comments: The trees are narrow columnar in habit, well established, and have a very formal appearance. Although there is an overhead line, the trees appear too narrow for this commercial area where the buildings are set back from the street.

ACER PLATANOIDES 'CRIMSON KING' TOLEDO 628 LAKE

Planted: 1964

Site: 8' Tree Lawn

	67	68	69	70
Height	13.6'	17.0'	17.6'	20.4'
Caliper	3.8"	4.4"	4.5"	5.6"
Spread	10.8'	12.8'	13.2'	15.2'

Comments: The trees are upright spreading in habit and quite uniform throughout the area. They appear to fit well into this setting and create a very good appearance on the street.

ACER PLATANOIDES 'CRIMSON KING' RICHMOND HTS. (CLEVELAND) 1015 EASTLAWN

Planted: Unknown

Site: 6' Tree Lawn

	67	68	69	70
Height	9.0'	10.4'	11.0'	--
Caliper	1.6"	1.8"	2.4"	--
Spread	5.4'	7.2'	7.4'	--

Comments: The trees are of typical spreading habit which will create some interference with pedestrian traffic because of this relatively narrow tree lawn. The street is wide and the houses are set back considerably from the sidewalk. So the spread is not aesthetically incompatible.

ACER PLATANOIDES 'FASSEN'S BLACK' CLEVELAND 14310 ARLIS

Planted: 1960

Site: 7' Tree Lawn

	67	68	69	70
Height	15.8'	17.0'	18.8'	18.6'
Caliper	3.6"	4.2"	4.3"	5.1"
Spread	8.8'	12.6'	14.2'	14.4'

Comments: These trees have the typical globular form of *Acer platanoides* and will probably lead to traffic interference problems because of a narrow street and a relatively narrow tree lawn. However, the trees create an attractive uniform appearance throughout the area.

ACER PLATANOIDES 'ERECTUM' | LYNDHURST (CLEVELAND) | 1268 CHURCHILL

Planted: Unknown

Site: 10' Tree Lawn

	67	68	69	70
Height	25.6'	26.8'	27.2'	--
Caliper	6.4"	7.3"	7.5"	--
Spread	6.8'	8.6'	10.0'	--

Comments: These trees are of typical columnar habit, are growing well, and there are no utility lines overhead. The trees are uniform and the formal shape may be aesthetically objectionable in this somewhat informal residential area.

Fig. 2. *Acer platanoides* 'Erectum', Churchill, Lyndhurst, Ohio. Narrow upright habit eliminates any problems of interference with traffic or overhead lines. The formal character may be out of place in this relatively informal suburban area.

ACER PLATANOIDES 'GLOBOSUM' CLEVELAND 4076 EAST 189TH

Planted: Unknown

Site: 8' Tree Lawn

	67	68	69	70
Height	8.8'	9.8'	9.8'	10.4'
Caliper	3.1"	3.5"	3.6"	4.0"
Spread	9.0'	9.0'	10.2'	10.2'

Comments: These trees have a very formal globe habit which is characteristic of this cultivar. They are uniform in height and spread throughout the planting. They provide a very formal appearance which is out of place in the rather informal suburban area. The only merit is the fact that the trees will not interfere with the utility lines directly overhead. One of the observers said, "This is the silliest looking street I have ever seen".

Fig. 3. *Acer platanoides* 'Globosum', East 189th, Cleveland, Ohio. Although these trees will not interfere with overhead lines, they are aesthetically displeasing and too formal in this suburban location.

ACER PLATANOIDES 'GLOBOSUM' COLUMBUS 2917 EASTMOORLAND DR.

Planted: 1953

Site: Homeowner's Lawn

	69	70 *
Height	12.0'	11.0'
Caliper	4.9"	5.2"
Spread	11.6'	10.3'

Comments: There is considerable dieback on all trees and no cause has been diagnosed. Because of this, the trees have a very poor appearance and do not add to the attractiveness of the area. They are planted on the homeowner's property and there are no sidewalks or utility lines. Because of the space available, a larger tree would have been more suitable in this location.

*Two trees removed.

ACER PLATANOIDES 'GLOBOSUM' TOLEDO 536 SPRING

Planted: 1965

Site: 8' Tree Lawn

	67	68	69	70
Height	9.2'	10.6'	11.8'	11.0'
Caliper	2.0"	2.4"	2.8"	3.7"
Spread	3.8'	5.6'	8.6'	8.8'

Comments: The trees have the typical globular form of this cultivar and, although there is a power line overhead, the trees will never interfere with it. As with other situations where this tree has been used, the appearance is overly formal and not ideally suited to a street tree situation. The street is very narrow and the houses are close to the sidewalk. Therefore, this size tree is suited to this relatively limited area situation. However, an informal or upright tree would be more aesthetic.

ACER PLATANOIDES 'GLOBOSUM' WOOSTER 709 NOLD

Planted: 1960

Site: 4' Tree Lawn

	67	68	69	70
Height	9.4'	9.8'	10.2'	11.8'
Caliper	2.0"	2.4"	2.8"	3.4"
Spread	4.4'	6.4'	8.4'	8.4'

Comments: These trees are of typical globular habit and are located in a very narrow tree lawn with utility lines overhead. The houses on this street are relatively large 2½ story structures and the trees are definitely out of scale.

ACER PLATANOIDES 'SCHWEDLER' CLEVELAND 4122 WEST 58TH

Planted: 1948

Site: 5' Tree Lawn

	67	68	69	70
Height	21.8'	23.2'	23.2'	25.0'
Caliper	6.3"	6.5"	6.5"	7.6"
Spread	13.6'	15.0'	19.0'	20.4'

Comments: These trees are upright spreading in habit and appear to be growing quite well in this site. Because of the narrow tree lawn, they might better have been located on the homeowner's lawn. This would have given the advantage of shade and also made this relatively narrow street appear wider.

ACER PLATANOIDES 'SCHWEDLER' COLUMBUS 1216 SHANLEY AT HARTWELL

Planted: 1959

Site: 8' Tree Lawn

	69	70*
Height	13.0'	12.0'
Caliper	2.3"	3.0"
Spread	6.8'	7.5'

Comments: These plants are of typical habit for this cultivar, which is rounded or globose, and provide a very unified appearance throughout the area. The presence of many larger trees on the homeowner's property might lead to some crowding in future years as this tree spreads in diameter. There are no overhead lines.

*One tree removed.

ACER PSEUDOPLATANUS CLEVELAND 4089 EAST 187TH

Planted: Unknown

Site: 6' Tree Lawn

	67	68	69	70
Height	23.0'	24.6'	25.0'	25.8'
Caliper	6.9"	7.0"	7.2"	8.3"
Spread	14.2'	15.8'	17.8'	16.2'

Comments: The trees are pyramidal, uniform in habit, and look attractive on this residential street with a relatively narrow tree lawn. The trees normally produce a relatively heavy crop of seeds which is somewhat objectionable.

ACER PSEUDOPLATANUS CLEVELAND 10717 GOVERNOR

Planted: 1955

Site: 5' Tree Lawn

	67	68	69	70
Height	26.0'	28.0'	28.0'	28.6'
Caliper	7.4"	7.8"	8.2"	9.4"
Spread	17.2'	19.0'	19.2'	23.4'

Comments: The trees are upright spreading in habit and are definitely too large for the area because of a very narrow tree lawn, narrow street, and shallow setback of the homes. As these trees become larger, they will probably create problems due to density and branch spread.

ACER PSEUDOPLATANUS TOLEDO 3228 RADFORD

Planted: 1957

Site: 12' Tree Lawn

	67	68	69	70
Height	20.8'	22.8'	21.2'	21.2'
Caliper	5.3"	5.5"	5.6"	6.8"
Spread	15.4'	15.4'	15.6'	17.0'

Comments: The trees are upright spreading and very well suited to the wide tree lawn and relatively deep setback of the homes. There are no utility lines overhead and the trees provide a good appearance for the entire area.

ACER RUBRUM TOLEDO 1739 BERDAN

Planted: 1963

Site: 6' Tree Lawn

	67	68	69	70
Height	11.6'	13.6'	16.6'	18.0'
Caliper	19.0"	21.8"	22.4"	24.0"
Spread	4.8'	7.8'	9.6'	11.0'

Comments: The plants are upright spreading and well established. However, because of seedling origin, there is considerable variation in size and shape. This is a good illustration of why vegetatively propagated clones of trees should be used for a more unified appearance.

ACER RUBRUM 'ARMSTRONG' WOOSTER 331 BLESSING

Planted: 1963

Site: 4' Tree Lawn

	67	68	69	70
Height	15.4'	17.0'	20.8'	21.8'
Caliper	2.3"	2.7"	3.4"	4.1"
Spread	5.8'	6.6'	7.0'	7.8'

Comments: The trees are of typical columnar habit and are growing very well. This is an excellent choice for the narrow tree lawn with a shallow setback of the adjoining houses.

ACER RUBRUM 'SCANLON' | CLEVELAND | 4371 WEST 155TH

Planted: 1958

Site: 5' Tree Lawn

	67	68	69	70
Height	17.6'	19.6'	21.6'	24.2'
Caliper	3.9"	5.1"	5.1"	5.2"
Spread	5.8'	8.6'	10.0'	11.2'

Comments: The trees are of columnar habit with a slight variation in height throughout the area but the spread is quite uniform. Although this is a very formal tree, it appears to be suitable on this narrow tree lawn with a relatively shallow setback of small homes.

ACER SACCHARUM | TOLEDO | SOUTHWAY AT GREENVALLEY

Planted: 1960

Site: Homeowner's Lawn

	67	68	69	70
Height	16.2'	16.4'	16.8'	19.8'
Caliper	2.6"	2.8"	3.4"	3.9"
Spread	5.2'	6.0'	6.4'	7.2'

Comments: The trees are typical upright oval habit, very uniform and appear to be growing well in this situation. There are no sidewalks or overhead lines and the trees are set back from the street on the homeowner's property. This appears to be a very good choice for this spacious planting situation.

AESCULUS CARNEA CLEVELAND 1830 DEFOREST

Planted: Unknown

Site: 6' Tree Lawn

	67	68	69	70
Height	14.8'	16.4'	16.2'	19.4'
Caliper	5.2"	5.8"	6.5"	7.6"
Spread	8.8'	11.4'	13.8'	15.4'

Comments: This tree is relatively formal and roundheaded and fits well into this situation, with power lines overhead on one side of the street. The tree lawn is of adequate width and the trees do not interfere with either vehicular or pedestrian traffic. There have been some problems with leaf scorch in this particular area in past years.

CARPINUS BETULUS CINCINNATI WEST LIBERTY AT ELM

Planted: 1960

Site: 5' Square In Walk

	67	68	69	70
Height	15.2'	16.6'	17.0'	16.8'
Caliper	3.1"	3.7"	4.0"	4.1"
Spread	7.8'	9.6'	9.6'	8.6'

Comments: The trees are formal, upright and oval in habit, with some dieback occurring which is possibly due to the site. The trees are planted in small holes in the sidewalk and the growth has been quite satisfactory considering that they have been in this site for approximately 10 years. There is some variation in height and spread and it does not appear that the trees will interfere with the overhead lines in the foreseeable future.

BETULA VERRUCOSA 'LACINIATA' WICKLIFFE (CLEVELAND) 2217 E. 290TH

Planted: 1957

Site: 10' Tree Lawn

	67	68	69	70
Height	27.8'	29.6'	28.8'	--
Caliper	6.1"	6.6"	6.6"	--
Spread	14.6'	15.8'	19.6'	--

Comments: The pendulous habit of this tree poses some problem with traffic interference. The tree is rather large for this tree lawn and is afflicted by bronze birch borer, which is a serious problem with this particular species. It is definitely not recommended for planting in many landscape situations because of this problem and the subsequent dieback of the top, resulting in high maintenance costs.

Fig. 4. *Betula verrucosa 'Laciniata'*, East 290th, Wickliffe, Ohio. Pendulous character results in traffic interference. Dieback due to borers further limits the value of this tree for street plantings.

CELTIS LAEVIGATA | CLEVELAND | 3640 WEST 114TH

Planted: 1959

Site: 7' Tree Lawn

	67	68	69	70
Height	24.0'	26.0'	26.6'	27.2'
Caliper	4.6"	5.1"	5.6"	7.0"
Spread	15.2'	17.4'	20.8'	23.4'

Comments: The tree is upright spreading and appears to be well suited to the area under utility lines. Although it is irregular in form, it is interesting and provides some shade for the area.

CERCIDIPHYLLUM JAPONICUM | BROOKLYN (CLEVELAND) | 7519 BROOKSIDE DR. S.

Planted: 1956

Site: 25' Tree Lawn

	67	68	69	70
Height	13.1'	13.8'	14.8'	15.8'
Caliper	1.9"	1.9"	2.2"	2.9"
Spread	4.4'	5.8'	10.8'	12.0'

Comments: The tree is upright and growing slowly, but is well established. Because of the typical narrow form when the tree is young, it appears to be a poor selection for this very wide tree lawn, even though the tree will eventually become considerably larger.

CRATAEGUS LAVALLEI CINCINNATI BANKS

Planted: 1964

Site: 5' Square In Sidewalk

	67	68	69	70
Height	10.6'	12.0'	14.0'	14.2'
Caliper	1.8"	2.2"	2.5"	2.8"
Spread	3.0'	4.0'	4.0'	4.8'

Comments: The tree is planted in a very difficult situation in tree wells in the sidewalk but appears to be growing quite well. There are overhead utility lines, but it is doubtful if there will be any interference. The trees have fruited satisfactorily during the period of this study. There will be some pruning necessary to maintain a more uniform character, which seems to be desirable in this particular area.

CRATAEGUS LAVALLEI BROOKLYN (CLEVELAND) 7408 ORCHARD GROVE

Planted: Unknown

Site: 7' Tree Lawn

	67	68	69	70
Height	14.4'	16.2'	16.6'	18.6'
Caliper	3.5"	3.9"	4.4"	5.2"
Spread	5.6'	7.8'	11.8'	10.6'

Comments: The trees vary from globular to oval in shape but are quite uniform in size throughout the planting. Some of the original trees in this planting were killed by what appeared to be fireblight.

CRATAEGUS LAVALLEI — SOUTH EUCLID (CLEVELAND) — MAYFIELD

Planted: 1957

Site: 2' Circular Planting Area In Sidewalk

	67	68	69	70
Height	12.2'	14.0'	14.0'	--
Caliper	3.3"	3.6"	3.6"	--
Spread	6.8'	7.4'	7.8'	--

Comments: These trees are located in small planting pockets in the sidewalk and, although they are much smaller and slower growing than similar trees in other cities, they are uniform and quite symmetrical in appearance. This is a heavily traveled street in a school area and, because of the location in the sidewalk, the trees are exposed to potential vandalism. The planting pockets are much too small and appear to be a difficult site for almost any tree selection. Regardless of the adverse conditions existing in this site, the trees selected appear to be as practical as any.

Fig. 5. *Crataegus lavallei* and *Crataegus oxyacantha 'Pauli'*, Mayfield, South Euclid, Ohio. Limited area for roots in these planting pockets has resulted in reduced growth rate. However, results have been satisfactory in this relatively difficult area.

CRATAEGUS LAVALLEI COLUMBUS 4784 COLONEL-PERRY

Planted: 1957

Site: 6' Tree Lawn

	69	70
Height	10.2'	12.2'
Caliper	2.5"	2.7"
Spread	4.2'	5.2'

Comments: This is a suburban area with a relatively wide tree lawn and houses set back approximately 40 feet from the sidewalk. The trees appear to be growing well, although not too rapidly, and have the typical formal character of the species at this size.

CRATAEGUS LAVALLEI TOLEDO 2024 CALUMET

Planted: 1964

Site: 5' Tree Lawn

	67	68*	69*	70**
Height	14.4'	16.2'	17.2'	17.0'
Caliper	2.9"	3.0"	3.0"	4.1"
Spread	4.2'	4.3'	6.5'	7.5'

Comments: This is a suburban area with the houses located close to the sidewalk and the trees planted in a relatively narrow tree lawn. The trees are uniform in character, although they are becoming open, which is typical of this cultivar with age. It would appear that many of the homeowners park their cars on the street and, since the trees are relatively close to the curb, there is a danger of damage due to opening car doors.

* One tree removed
**Three trees removed

CRATAEGUS LAVALLEI TOLEDO 1081 WOODRUFF

Planted: 1963

Site: 15' Tree Lawn

	67	68	69	70
Height	15.0'	17.2'	13.0'	13.6'
Caliper	3.2"	3.4"	3.7"	4.1"
Spread	9.2'	9.6'	9.8'	9.8'

Comments: This planting is located on a relatively narrow street in a wide tree lawn with a deep setback of the homes. The trees have begun to open up in character and there has been some evidence of apparent fireblight and dieback in the planting in past years. Because of the wide tree lawn and the large 2½ to 3 story houses, a larger tree would probably have been more suitable.

CRATAEGUS LAVALLEI WOOSTER WOODLAND

Planted: 1962

Site: 8' Tree Lawn

	67	68	69	70
Height	13.0'	14.2'	14.4'	16.0'
Caliper	3.2"	3.4"	3.7"	4.1"
Spread	8.2'	9.6'	9.2'	10.4'

Comments: There are low utility lines overhead but it does not appear that these trees will interfere with them in the foreseeable future. The trees are planted closer to the sidewalk than the street and, because of this, have been limbed up to prevent any interference with pedestrian traffic. The trees are uniform in height and spread and quite formal in character. The deep setback of most of the homes might have permitted the planting of trees on the homeowners' lawns and away from the power lines. However, changes in elevation in the area could have resulted in an unsatisfactory aesthetic appearance for the overall planting.

CRATAEGUS OXYACANTHA 'ALBA PLENA' CLEVELAND 18709 MAPLEWOOD

Planted: 1955

Site: 5' Tree Lawn

	67	68	69	70
Height	18.4'	20.2'	19.4'	21.4'
Caliper	5.9"	6.1"	6.7"	7.1"
Spread	15.2'	17.4'	19.8'	22.4'

Comments: The trees are broad spreading in character and are interfering with the lower level of utility lines. It is doubtful if any tree could be selected that would not interfere partially with these lines. This cultivar, as well as most selections of *Crataegus oxyacantha*, is unsatisfactory as a street tree because of its susceptibility to many plant pests. These trees are heavily infested with scale and insects. They become partially defoliated most summers due to leaf spot diseases. From the aesthetic standpoint, as related to habit and size, these trees are suited to the situation.

CRATAEGUS OXYACANTHA 'PAULI' CLEVELAND 4414 HENRITZE

Planted: 1955

Site: 5' Tree Lawn

	67	68	69	70*
Height	14.8'	15.0'	16.0'	15.8'
Caliper	3.9"	4.0"	4.0"	3.8"
Spread	8.6'	9.6'	13.4'	10.4'

Comments: The trees are essentially globular in habit, although there is some inconsistency in height and spread. The tree is unsightly during part of the year due to the pests mentioned previously. Again, this is a poor selection for a street tree due to the maintenance problems involved.

*Tree removed.

CRATAEGUS OXYACANTHA 'PAULI' TOLEDO 1912 GLENDALE

Planted: 1957

Site: 3' Tree Lawn

	67	68	69	70
Height	13.6'	14.8'	15.0'	16.0'
Caliper	3.1"	3.3"	3.5"	3.7"
Spread	5.2'	5.8'	8.0'	8.0'

Comments: These trees are located on a heavily traveled street in an open area. The tree lawn is extremely narrow and possibly too narrow for most tree selections. As indicated previously, these trees are affected by a number of pests and have a poor appearance throughout a good portion of the growing season. They are upright spreading in character. The trees were pruned in 1970.

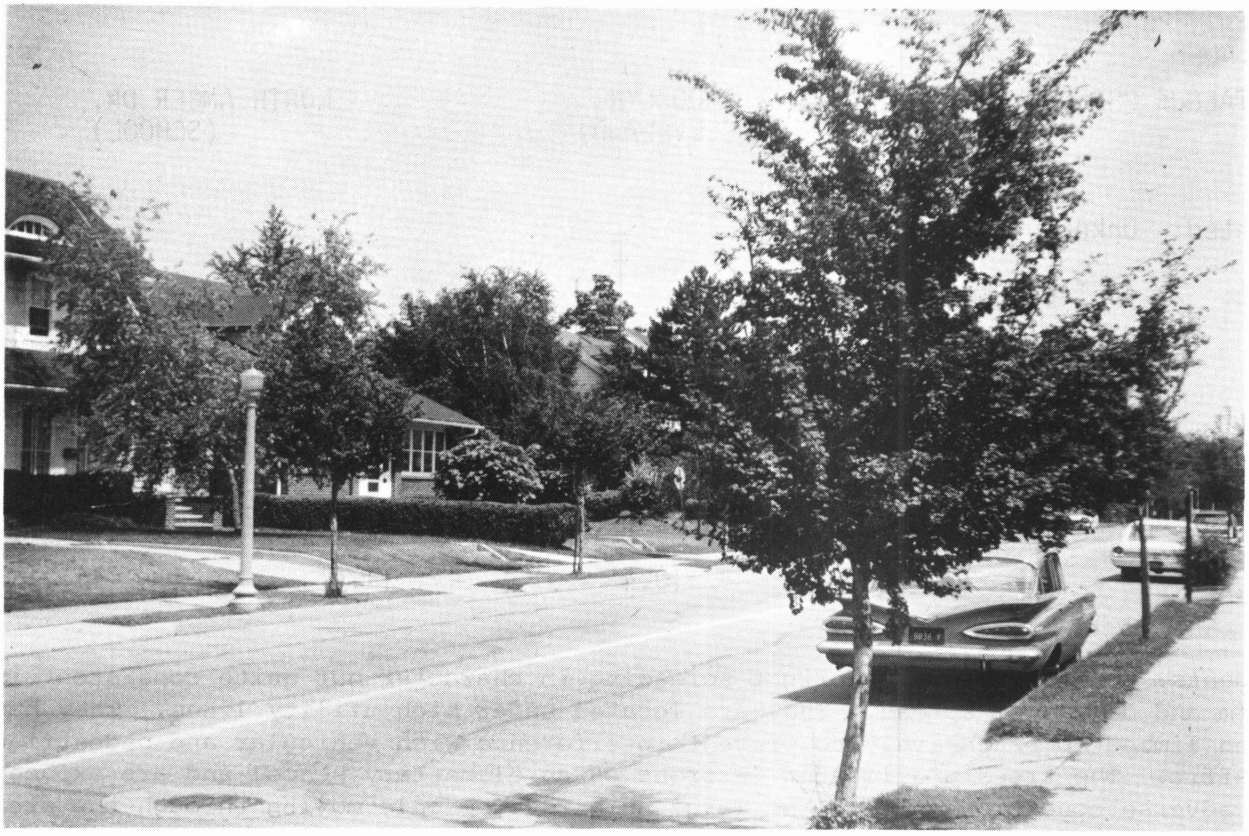

Fig. 6. *Crataegus oxyacantha 'Pauli'*, Glendale, Toledo, Ohio. This illustrates a tree lawn which is too narrow for most street tree selections.

CRATAEGUS OXYACANTHA 'PAULI' WOOSTER BEVER AT HENRY

Planted: 1956

Site: 6' Tree Lawn

	67	68	69	70
Height	18.4'	20.4'	20.4'	20.6'
Caliper	5.4"	6.1"	6.1"	6.1"
Spread	13.8'	13.4'	13.4'	13.6'

Comments: These trees have the typical upright spreading character of this cultivar and are located under high power lines. The trees are not uniform in height and caliper and have been limbed up to prevent interference with pedestrian traffic.

CRATAEGUS PHAENOPYRUM BROOKLYN (CLEVELAND) NORTH AMBER DR. (SCHOOL)

Planted: Unknown

Site: 4' Tree Lawn

	67	68	69	70
Height	13.6'	14.6'	14.6'	15.0'
Caliper	2.5"	2.7"	2.9"	3.4"
Spread	10.4'	10.4'	11.4'	11.8'

Comments: These trees are upright spreading in character but quite consistent in form and degree of spread. They are located under high utility lines. They have been limbed up extensively to prevent interference with vehicular and pedestrian traffic. The trees are located in front of an elementary school and are exposed to adverse conditions due to the large numbers of people moving through the area. These trees were pruned in 1970.

CRATAEGUS PHAENOPYRUM CINCINNATI 835 BANK

Planted: 1964

Site: 5' Square In Sidewalk

	67	68	69	70
Height	15.0'	16.0'	18.8'	14.8'
Caliper	3.0"	3.2"	3.5"	4.3"
Spread	8.2'	8.6'	12.0'	8.4'

Comments: These trees are planted in pockets in the sidewalk and must be limbed up extensively to prevent interference with pedestrian and vehicular traffic since they are located relatively close to the street. They are upright spreading in character, quite uniform, and appear to be growing very well under poor environmental conditions. These trees have fruited very heavily in this area and, because of the characteristic of holding fruit late into the fall and early winter, provide good color late in the season.

Fig. 7. *Crataegus phaenopyrum,* Bank, Cincinnati, Ohio. Satisfactory growth of these trees illustrates a good selection for a very poor growing site. Note the screens used to protect the trunks.

CRATAEGUS PHAENOPYRUM | MAYFIELD HEIGHTS (CLEVELAND) | 1521 FRUITLAND

Planted: 1959

Site: 2' Tree Lawn

	67	68	69	70
Height	16.4'	18.6'	16.0'	--
Caliper	4.0"	4.4"	4.4"	--
Spread	11.2'	11.8'	13.6'	--

Comments: The trees are located on a very small tree lawn which is much too narrow for any tree selection. There is a relatively shallow setback of the homes, but the trees could have been located on the homeowner's property, thus allowing more room for root growth and spread. The thorns on these trees are hazardous and are the subject of many complaints from residents in the area.

CRATAEGUS PHAENOPYRUM | COLUMBUS | 4955 ATWATER

Planted: 1957

Site: 6' Tree Lawn

	69	70
Height	11.6'	11.4'
Caliper	1.8"	2.2"
Spread	6.6'	7.8'

Comments: This is in a suburban area with a deep setback of the houses. The trees are out of scale with the area because of their small size and formal character. They have been limbed up sufficiently to prevent any interference with traffic but the formality is somewhat objectionable aesthetically. A larger tree would have been more effective since there are no overhead utility lines. Considering that these trees were planted in 1957, they have not grown very rapidly and are still small.

EUCOMMIA ULMOIDES CINCINNATI LIBERTY AT SYRACUSE

Planted: 1960

Site: 5' Square In Sidewalk

	67	68	69	70
Height	13.0'	14.0'	14.0'	14.2'
Caliper	2.5"	2.8"	3.3"	3.4"
Spread	5.4'	6.6'	8.0'	10.6'

Comments: The trees are uniform and upright spreading in character, which is typical of this species, and are growing in a very difficult environmental situation. They are planted in planting pits in the sidewalk and the trunks have been protected with wire screen since much damage has resulted, probably due to the closeness of the street and relatively narrow sidewalk. Considering the heavy air pollution and unfavorable site, the plants are growing very well. This indicates that this is probably a good selection for the difficult situation which exists in this area.

EUCOMMIA ULMOIDES CLEVELAND 13912 LIBERTY

Planted: Unknown

Site: 7' Tree Lawn

	67	68	69	70
Height	23.6'	25.2'	25.2'	28.4'
Caliper	7.3"	7.6"	8.5"	9.4"
Spread	13.4'	17.8'	21.4'	24.0'

Comments: The trees are uniform, broad spreading in habit, and appear to be an excellent choice for this street.

FRAXINUS PENNSYLVANICA SUBINTEGERRIMA 'MARSHALL'S SEEDLESS' — TOLEDO — 3912 BELLEVUE

Planted: 1964

Site: 12' Tree Lawn

	67	68	69	70
Height	19.2'	19.4'	21.8'	25.4'
Caliper	2.4"	3.0"	3.7"	5.0"
Spread	6.0'	9.4'	12.4'	13.6'

Comments: These trees are upright, spreading in character, and appear to be a good selection for this very wide tree lawn. There are no overhead lines, so height will not be a problem in the future.

FRAXINUS VELUTINA GLABRA 'MODESTO' — CLEVELAND — 4415 W. 182

Planted: 1958

Site: 10' Tree Lawn

	67	68	69	70*
Height	18.8'	22.3'	22.3'	15.0'
Caliper	5.4"	6.8"	7.0"	8.8"
Spread	13.2'	17.6'	17.7'	23.0'

Comments: This tree is a poor selection for planting because of its susceptibility to borers. The city of Cleveland does not plant this tree any longer due to the borer problem. Although the tree provides a good appearance for 6 to 8 years, it is not long-lived enough for planting in a public area such as this. The borer causes considerable dieback at the top, necessitating extensive pruning maintenance and ultimate removal of the tree.

*Three trees removed.

GLEDITSIA TRIACANTHOS INERMIS TOLEDO 2225 BERDAN

Planted: Unknown

Site: 15' Tree Lawn

	67	68	69	70
Height	15.6'	17.8'	23.6'	30.4'
Caliper	2.2"	3.0"	3.7"	4.9"
Spread	10.8'	13.4'	17.0'	17.6'

Comments: The trees are located in a wide tree lawn on a heavily traveled suburban street and are upright spreading in habit. There are no utility lines overhead. The trees are in scale with the surroundings and will provide shade for the street as well as the adjoining properties.

GLEDITSIA TRIACANTHOS INERMIS TOLEDO 1826 SCHANBERY

Planted: 1957

Site: 12' Tree Lawn

	67	68	69	70
Height	32.4'	35.4'	35.6'	37.0'
Caliper	6.6"	9.4"	9.4"	10.6"
Spread	24.2'	28.6'	31.4'	33.0'

Comments: These trees are located in a wide tree lawn on a very narrow street and, although the houses are not set back very deep, the trees are in scale with the area. They provide shade for the street and residential properties.

GLEDITSIA TRIACANTHOS 'MORAINE' COLUMBUS 2810 BROWNLEE

Planted: 1953

Site: Property Owner's Lawn

	69	70
Height	39.2'	32.2'
Caliper	12.7"	14.1"
Spread	32.0'	32.0'

Comments: Plants are in good condition and growing well. They are in scale with the area.

GLEDITSIA TRIACANTHOS 'SHADEMASTER' SOUTH EUCLID (CLEVELAND) 1268 PLAINFIELD

Planted: 1955

Site: 7' Tree Lawn

	67	68	69	70
Height	19.0'	21.2'	24.4'	28.8'
Caliper	1.9"	4.3"	5.2"	6.1"
Spread	14.6'	15.4'	21.6'	23.8'

Comments: This tree is relatively fast growing, somewhat less uniform than other Gleditsia cultivars, and requires much pruning during the first 6 years of growth. It fits well in this tree lawn and has utility lines overhead, although there is no interference with the lines at the present time. The street is residential and appears very attractive because of the large trees on both sides.

GLEDITSIA TRIACANTHOS 'MORAINE' CLEVELAND 15110 JUDSON

Planted: Unknown

Site: 16' Tree Lawn

	67	68	69	70
Height	33.0'	36.4'	41.6'	42.8'
Caliper	9.4"	10.2"	10.8"	11.5"
Spread	26.6'	27.4'	32.4'	36.4'

Comments: These trees are large, upright spreading, and form a canopy of shade over the tree lawn and sidewalk area. The uniform size and habit of these trees provide an excellent appearance to the area. This is considered by the local cooperators as one of the finest street in that vicinity. It is a major roadway in a residential area with heavy traffic.

Fig. 8. *Gleditsia triacanthos 'Moraine'*, **Judson, Cleveland,** Ohio. An excellent selection for a wide street and a wide tree lawn which is not only aesthetically pleasing but also provides shade for the walk and adjacent areas.

GLEDITSIA TRIACANTHOS 'SKYLINE' CLEVELAND 15824 STILLWOOD

Planted: 1956

Site: 7' Tree Lawn

	67	68	69	70
Height	30.2'	32.0'	33.4'	34.4'
Caliper	6.8"	7.9"	7.9"	9.1"
Spread	19.6'	25.2'	28.2'	30.2'

Comments: The trees in this area are irregular in height, caliper, and spread. However, they appear to be a good selection for this location.

GLEDITSIA TRIACANTHOS 'SUNBURST' BROOKLYN (CLEVELAND) 8815 MORTON

Planted: 1967

Site: 7' Tree Lawn

	67	68	69	70
Height	22.2'	24.0'	25.6'	--
Caliper	4.4"	5.1"	6.1"	--
Spread	15.2'	17.2'	18.6'	--

Comments: The trees are upright spreading, very uniform in size and habit, and fit well into this size tree lawn with a relatively shallow setback of the houses. There are utility lines over trees on one side of the street. Due to the unusual foliage color which is particularly bright yellow in the spring, these trees could be used better on shorter streets, cul-de-sacs, etc., where only a few trees are used in a limited area.

KOELREUTERIA PANICULATA TOLEDO 1655 FREEMAN

Planted: 1963

Site: 12' Tree Lawn

	67	68	69	70
Height	10.6'	12.8'	13.2'	16.0'
Caliper	2.2"	3.0"	3.5"	4.5"
Spread	7.2'	9.4'	11.6'	11.8"

Comments: The tree is relatively globose in habit with considerable variation in size in this area. The trees are located under power lines but, because of the height of the lines, will probably not pose a problem. Because of the close setback of the houses, adjacent to the tree lawn, the trees add to the landscape plantings of the homeowner's property.

LIQUIDAMBAR STYRACIFLUA COLUMBUS 1341-1333 GUMWOOD

Planted: 1956

Site: 12' Tree Lawn

	69	70
Height	17.7'	18.3'
Caliper	3.7"	4.3"
Spread	9.2'	9.5'

Comments: The trees are growing well and are uniform in habit. However, they will have to be limbed up to prevent interference with pedestrian and vehicular traffic, even though this is a relatively wide tree lawn. These trees have the typical formal pyramidal shape of this species when it is young.

LIQUIDAMBAR STYRACIFLUA CLEVELAND 14619 HARLEY

Planted: 1952

Site: 6' Tree Lawn

	67	68	69	70
Height	30.8'	30.0'	28.0'	31.4'
Caliper	8.5"	9.2"	9.2"	10.8"
Spread	20.2'	22.2'	23.6'	23.6'

Comments: These trees are somewhat large for a relatively narrow tree lawn. They are located close to the sidewalk, but have been limbed up to prevent any interference with traffic. The uniform size and habit of the trees present a very attractive setting for the homes. They provide shade for both the street and the homeowners' lawns.

LIQUIDAMBAR STYRACIFLUA TOLEDO 307 MANHATTEN

Planted: 1964

Site: 15' Tree Lawn

	67	68	69	70*
Height	10.4'	12.8'	14.2'	16.5'
Caliper	1.5"	1.7"	2.6"	3.5"
Spread	3.2'	4.2'	6.5'	6.5'

Comments: These trees are located in the center of a very wide tree lawn and will not cause any interference with either pedestrian or vehicular traffic. This appears to be an excellent choice for the area.

*One tree removed.

LIQUIDAMBAR STYRACIFLUA WOOSTER 718 WESTERN

Planted: 1963

Site: 8' Tree Lawn

	67	68	69	70
Height	10.8'	12.8'	14.2'	16.4'
Caliper	1.8"	2.1"	2.4"	3.5"
Spread	5.0'	6.2'	7.4'	8.6'

Comments: These are pyramidal, uniform in size and provide an excellent appearance for the street, particularly with the attractive fall color. They provide shade for both the lawn and street. However, the branches may ultimately interfere with power lines overhead.

OSTRYA VIRGINIANA BROOKLYN HTS. (CLEVELAND) 5086 W. 6TH ST.

Planted: 1956

Site: 12' Tree Lawn

	67	68	69	70
Height	22.0'	23.0'	15.2'	--
Caliper	3.8"	4.0"	3.8"	--
Spread	12.0'	14.4'	13.4'	--

Comments: These trees are pyramidal in shape, uniform in height, and relatively slow growing. This appears to be a good choice in the location and provides an attractive setting in a relatively wide tree lawn.

MALUS PURPUREA TOLEDO 3171 ASTOR

Planted: 1958

Site: 12' Tree Lawn

	67	68	69	70
Height	20.0'	22.0'	18.2'	19.6'
Caliper	6.3"	6.7"	7.5"	7.8"
Spread	17.8'	18.2'	19.4'	22.4'

Comments: This tree has a typical upright spreading habit with relatively low scaffold branches which create a problem with pedestrian traffic. The uniformity of size and habit creates a very attractive planting for this street and provides a nice setting for the homes. The fact that this species is susceptible to apple scab may create some maintenance problems and also lead to unsightly looking trees by midsummer.

Fig. 9. *Malus purpurea*, Astor, Toledo, Ohio. A low-branched tree such as this will interfere with traffic unless it is properly limbed-up initially. Large fruit and some susceptibility to disease limit the acceptability of this type of flowering crabapple in contrast to many other excellent types.

PHELLODENDRON AMURENSE TOLEDO 1121 CAMDEN

Planted: 1966

Site: 6' Tree Lawn

	67	68	69	70
Height	11.2'	12.6'	13.2'	13.2'
Caliper	1.5"	1.8"	2.3"	3.2"
Spread	3.4'	4.6'	8.2'	10.2'

Comments: These plants are upright spreading and well established after only 4 years in the planting. However, because of the natural spreading habit of growth, these will definitely provide a traffic interference problem in a relatively narrow tree lawn.

PHELLODENDRON AMURENSE WOOSTER 238 COLLEGE

Planted: 1962

Site: 10' Tree Lawn

	67	68	69	70
Height	10.4'	16.2'	15.0'	19.2'
Caliper	3.2"	3.7"	4.2"	5.3"
Spread	10.2'	10.2'	14.2'	15.2'

Comments: There are power lines overhead and because of this, the relatively low-spreading habit of growth of this tree appears to be suitable. However, the very broad character of this tree will probably create some eventual problems because of the shallow setback of the houses.

PLATANUS ACERIFOLIA | CINCINNATI | WEST LIBERTY AT PARKSIDE

Planted: 1962

Site: 8' Tree Lawn

	67	68	69	70
Height	15.4'	18.0'	20.0'	21.2'
Caliper	2.7"	3.6"	4.5"	5.4"
Spread	7.4'	9.4'	10.0'	14.8'

Comments: The trees are of typical pyramidal habit and are located against a chain link fence in a tree lawn between the sidewalk and a parking lot. Because of the air pollution and apparent heavy traffic in this area, the environmental conditions are unfavorable. However, the trees appear to be growing very well and should enhance the area as they increase in size. There are no power lines directly overhead, so this will not pose a problem. This species is a good choice for this location.

PLATANUS ACERIFOLIA | COLUMBUS | NEXT TO BROAD EX. CLUB

Planted: 1966

Site: Planting Areas In Sidewalk

	69	70
Height	31.4'	28.2'
Caliper	6.1"	6.5"
Spread	16.8'	16.0'

Comments: These trees are located in relatively small planting pits in the sidewalk in a downtown area and are growing extremely well. This is an excellent selection for a downtown area with heavy traffic and relatively unfavorable environmental conditions. The trees were pruned in 1970.

PLATANUS ACERIFOLIA TOLEDO 1415 PROSPECT

Planted: 1960

Site: 12' Tree Lawn

	67	68	69	70
Height	19.4'	21.8'	23.8'	28.4'
Caliper	3.2"	4.4"	6.0"	7.5"
Spread	11.6'	14.6'	17.8'	22.0'

Comments: The trees are uniform in size and shape. Their ultimate height will probably pose a problem since there are power lines directly overhead on one side of the street. They are located close to the sidewalk side of the tree lawn and provide a setting for the older houses which have a very shallow set-back from the street.

PRUNUS SERRULATA 'KWANZAN' WOOSTER NORTH AT MARKET

Planted: 1961

Site: 8' Tree Lawn

	67	68	69	70
Height	12.2'	13.0'	16.2'	--
Caliper	2.8"	3.2"	3.9"	--
Spread	8.4'	9.6'	10.8'	--

Comments: Trees are upright, V-shaped in character, and quite uniform. They will not grow out of bounds on this 8-foot tree lawn. This area is close to downtown and these relatively small trees are out of scale with the large buildings in the vicinity. They are somewhat protected from severe weather exposure and are growing well.

PRUNUS SERRULATA 'KWANZAN' LYNDHURST (CLEVELAND) MAYFIELD

Planted: 1956

Site: 10' Tree Lawn

	67	68	69	70
Height	14.2'	15.6'	15.8'	--
Caliper	4.4"	4.6"	4.9"	--
Spread	5.6'	5.6'	6.4'	--

Comments: The trees are upright, vase-shaped in habit typical of this cultivar, and uniform in size. They are in uniformly poor condition with considerable winter injury on the trunks. This is a poor choice for street trees in colder climates, especially on a major thoroughfare such as this. They even prove to be unsatisfactory on residential streets. Japanese cherries, in general, are no longer recommended for street tree use in the Cleveland area.

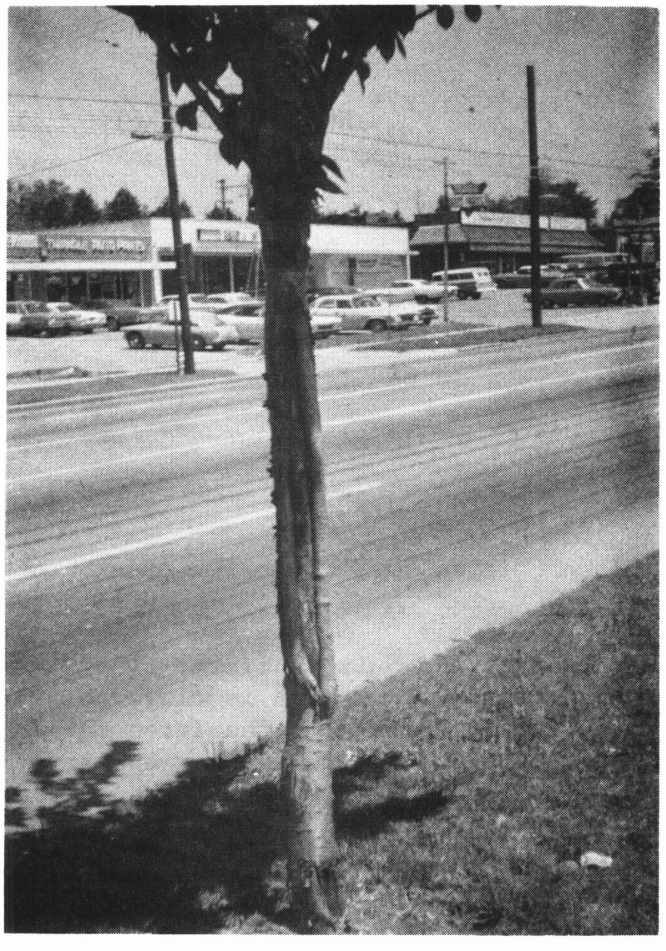

Fig. 10. *Prunus serrulata* 'Kwanzan', Mayfield, Lyndhurst, Ohio. Frost cracks on southwest side of trunk are common on this tree in exposed sites. This limits its value in many street situations in northern climates.

PYRUS CALLERYANA — CLEVELAND — 16511 FERNDALE

Planted: Unknown

Site: 7' Tree Lawn

	67	68	69	70
Height	28.4'	29.0'	29.4'	34.8'
Caliper	6.3"	6.4"	9.3"	10.4"
Spread	17.0'	21.8'	23.6'	29.0'

Comments: The trees are pyramidal in habit and have excellent glossy foliage which is typical of this species. Although this tree is attractive and seems to be well suited to this location, there has been considerable dieback observed on approximately 50% of the trees during the past year. Some cultivars of this species, such as Bradford or Chanticleer, would have been better selections for this location because of their more uniform habit and less susceptibility to disease problems.

PYRUS CALLERYANA — SOUTH EUCLID (CLEVELAND) — 4516 BUCHWOLD

Planted: 1960

Site: 12' Tree Lawn

	67	68	69	70
Height	18.8'	21.4'	20.4'	--
Caliper	3.1"	3.7"	4.5"	--
Spread	12.0'	13.2'	15.0'	--

Comments: The trees are upright spreading in habit, are in scale with the area, and appear to be a good selection for this tree lawn. The tree is a relatively fast-growing type and some dieback has been found in this particular planting.

QUERCUS PALUSTRIS WOOSTER OAKLEY

Planted: 1942

Site: 60' Lawn

	67	68	69	70
Height	37.4'	39.8'	40.8'	46.2'
Caliper	11.9"	13.4"	14.3"	16.1"
Spread	26.0'	28.8'	31.8'	35.4'

Comments: These large trees have the typical pyramidal pendulous character of the species, but do not interfere with traffic due to the setback from the sidewalk. The trees are alternated with *Quercus rubra* and create a very attractive setting on this street.

Fig. 11. *Quercus palustris*, Oakley, Wooster, Ohio. The pin oak in the foreground has typical pendulous habit which limits its value in close proximity to traffic areas. Located on the homeowners' properties as these trees are, they create a pleasing appearance for the area. These trees are alternated with *Quercus rubra maxima*.

QUERCUS RUBRA WOOSTER 406 OAKLEY

Planted: 1942

Site: 60' Tree Lawn

	67	68	69	70
Height	32.8'	36.0'	37.6'	38.6'
Caliper	12.3"	13.3"	13.9"	14.7"
Spread	28.0'	30.4'	30.8'	33.4'

Comments: These large oaks are in excellent condition and have a rather broad pyramidal habit which provides excellent shade in the area. The ultimate size of the tree is no problem since it is located on a 60-foot tree lawn.

QUERCUS SHUMARDI CLEVELAND 3664 WEST 107

Planted: 1949

Site: 6' Tree Lawn

	67	68	69	70
Height	34.0'	36.2'	36.8'	39.0'
Caliper	12.0"	12.6"	13.0"	15.4"
Spread	24.8'	27.8'	30.0'	33.6'

Comments: The trees are pyramidal and very uniform in size and form. Even though these are located on a narrow tree lawn and are adjacent to a narrow street, they have been limbed up sufficiently to fit the situation and prevent interference with traffic.

ROBINIA PSEUDOACACIA 'IDAHO' CLEVELAND BELMORE

Planted: Unknown

Site: 5' Tree Lawn

	67	68	69	70
Height	21.8'	--	26.0'	--
Caliper	4.8"	--	7.0"	--
Spread	15.0'	--	18.0'	--

Comments: These trees are located on a residential street with heavy traffic due to a hospital in the area. This selection is troubled by borers because of the black locust understock which constitutes the root and trunk of the tree. Although this has very attractive flowers in the spring, it is not desirable for street tree use because of the borer problem.

ROBINIA PSEUDOACACIA 'GLOBE' TOLEDO 3727 TALL OAKS

Planted: 1964

Site: Lawn

	67	68	69	70*
Height	10.6'	11.0'	12.2'	15.0'
Caliper	1.9"	2.4"	3.2"	3.6"
Spread	4.2'	6.8'	8.0'	11.7'

Comments: These trees are planted in the homeowner's lawn with no sidewalks present. They are uniform in height and caliper and have a formal globe shape. A larger tree would be more desirable considering the deep setback of the houses.

*Two trees removed.

SOPHORA JAPONICA CINCINNATI LIBERTY AT REPUBLIC

Planted: 1960

Site: 5' Square In Sidewalk

	67	68	69	70*
Height	17.0'	20.0'	20.0'	25.0'
Caliper	4.5"	5.0"	5.8"	6.5"
Spread	16.0'	17.6	19.0'	20.7'

Comments: The trees are globose in shape and appear to be growing very well in an apparently difficult environment. The foliage is very attractive and the flowers in midsummer add considerably to the aesthetic value of the tree.

*Two trees removed.

Fig. 12. *Sophora japonica*, Liberty, Cincinnati, Ohio. These trees are growing well in a difficult environment.

SOPHORA JAPONICA CLEVELAND 3287 WEST 33

Planted: 1960

Site: 6' Tree Lawn

	67	68	69	70
Height	19.6'	20.8'	23.4'	28.6'
Caliper	6.8"	7.4"	8.2"	9.4"
Spread	13.4'	16.8'	22.8'	27.0'

Comments: These trees are located on an old residential street with low overhead lines and very shallow setback of the homes. The trees have grown considerably since planting, are consistent in size and form, and add to the attractiveness of the street.

SOPHORA JAPONICA TOLEDO 1663 STANBERRY

Planted: 1957

Site: 10' Tree Lawn

	67	68	69	70
Height	20.4'	22.4'	24.0'	29.2'
Caliper	5.8"	6.6"	6.9"	8.0"
Spread	17.6'	19.6'	21.0'	21.0'

Comments: These trees are very attractive in a wide tree lawn and are in keeping with the scale of the area.

SORBUS AUCUPARIA — TOLEDO — 2124 JEFFREE

Planted: 1953

Site: 6' Tree Lawn

	67	68	69	70
Height	22.0'	23.8'	23.8'	22.5'
Caliper	3.8"	4.6"	5.1"	5.6"
Spread	12.4'	13.8'	14.2'	14.5'

Comments: The trees are upright spreading in habit, uniform in size and shape, and the attractive fruit has added markedly to the beauty of the area. These plants are susceptible to borers and other problems. However, as yet no problems have been found in this planting.

SORBUS AUCUPARIA — BROOKLYN (CLEVELAND) — 7419 PLAINFIELD

Planted: Date Unknown

Site: 7' Tree Lawn

	67	68	69	70*
Height	18.2'	19.6'	20.3'	21.0'
Caliper	4.0"	4.4"	5.7"	6.1"
Spread	8.8'	10.4'	17.0'	13.3'

Comments: These trees are located on a residential street with power lines overhead. However, the height and form of this tree will not result in interference with the lines. Some of the trees in this planting were killed earlier by what apparently was fireblight.

*Two trees removed.

SYRINGA AMURENSIS JAPONICA — BROOKLYN (CLEVELAND) — PARKSIDE DRIVE

Planted: 1955

Site: 7' Tree Lawn

	67	68	69	70
Height	10.6'	10.6'	12.4'	14.6'
Caliper	2.7"	2.7"	3.8"	4.1"
Spread	6.2'	6.2'	10.0'	10.0'

Comments: This plant may be grown as a shrub or small tree and generally does not attain a very large size. Because of this, it may be too small for many large street tree locations and is definitely too small in this particular site where the houses have a deep setback. The foliage is excellent and dark green throughout the summer months and the attractive white flower clusters in early June add to the beauty of the plant.

TILIA CORDATA — CINCINNATI — LIBERTY AT ELM

Planted: 1962

Site: 5' Square In Sidewalk

	67	68	69	70*
Height	17.6'	19.2'	20.0'	18.3'
Caliper	2.9"	3.6"	4.0"	4.9"
Spread	10.0'	11.0'	12.0'	12.0'

Comments: The trees in this site are inconsistent in size and shape but are growing well considering the heavy air pollution and the limited planting space in the sidewalk. There are power lines overhead and the tree may become large enough to interfere with these in the near future.

*One tree removed.

TILIA CORDATA — WOOSTER — 505 N. BEVER

Planted: 1956

Site: 8' Tree Lawn

	67	68	69	70
Height	17.4'	19.8'	21.2'	23.8'
Caliper	5.4"	5.9"	6.1"	7.3"
Spread	14.0'	15.8'	16.8'	21.0'

Comments: Most of the trees in this planting are pyramidal. However, there is some variation in size and form. This is not necessarily an undesirable characteristic. There has been a problem with sooty mold resulting from infestations of aphids on the trees.

TILIA CORDATA — SOUTH EUCLID (CLEVELAND) — 4181 BAYARD

Planted: 1958

Site: 12' Tree Lawn

	67	68	69	70
Height	17.4'	19.8'	20.8'	20.4'
Caliper	4.0"	4.1"	5.1"	5.6"
Spread	11.1'	12.2'	12.4'	13.8'

Comments: These trees are pyramidal in habit, but are quite variable in caliper and height. They are growing well in this residential area with power lines on one side of the street. This is a good selection for a wide tree lawn.

TILIA CORDATA | CLEVELAND | 4220 WEST 58TH

Planted: 1947

Site: 7' Tree Lawn

	67	68	69	70
Height	29.8'	31.6'	30.4'	31.2'
Caliper	10.0"	10.6"	10.8"	11.4"
Spread	18.2'	21.4'	24.8'	25.2'

Comments: The trees are quite variable in height and have been limbed up considerably to prevent interference with traffic adjacent to this narrow tree lawn.

TILIA CORDATA | SHAKER HEIGHTS (CLEVELAND) | 23500 S. WOODLAND

Planted: Unknown

Site: 28' Tree Lawn

	67	68	69	70
Height	21.2'	24.0'	22.2'	23.8'
Caliper	5.9"	6.5"	8.2"	8.6"
Spread	13.2'	14.2'	17.6'	19.4'

Comments: These trees are very uniform in size and shape and provide an attractive setting for the homes which have a deep setback from the street. The tree lawn is very wide. The trees are located on the sidewalk side and are not under power lines. Because of the deep setback and open areas, a larger tree might have been a better selection.

TILIA CORDATA COLUMBUS 1339 VINEWOOD

Planted: 1956

Site: 8' Tree Lawn

	69	70
Height	16.4'	17.2'
Caliper	4.1"	4.8"
Spread	11.4'	11.0'

Comments: These trees have an attractive pyramidal habit and appear to be a good selection for this size tree lawn and area.

TILIA CORDATA 'GREENSPIRE' CINCINNATI BANKS AT LYNN

Planted: 1963

Site: 10' Tree Lawn

	67	68	69	70
Height	11.8'	13.6'	17.0'	18.2'
Caliper	1.7"	2.1"	3.5"	3.9"
Spread	4.2'	7.2'	8.0'	9.6'

Comments: These trees are relatively formal in habit, consistent in size and, as is true in most cultivars, superior to the species. They are growing well under power lines in an area of severe air pollution.

TILIA EUCHLORA — WOOSTER — NORTHWESTERN (PARKING LOT)

Planted: 1964

Site: 6' Tree Lawn

	67	68	69	70
Height	10.6'	12.6'	15.4'	19.0'
Caliper	1.4"	2.0"	2.5"	3.3"
Spread	3.8'	6.0'	8.2'	9.0'

Comments: The trees are pyramidal, well established, and consistent in size and shape. However, they may become too large for this relatively narrow tree lot. There are power lines overhead and a problem may result as the trees become larger. The glossy foliage, typical of this species, is very attractive during the summer months.

ULMUS CARPINIFOLIA 'CHRISTINE BUISMAN' — SOUTH EUCLID (CLEVELAND) — BAYARD

Planted: 1959

Site: 12' Tree Lawn

	67	68	69	70
Height	18.0'	20.0'	--	--
Caliper	3.9"	4.2"	--	--
Spread	6.0'	8.8'	--	--

Comments: The trees are upright, oval in habit, and uniform in size and shape throughout the planting. This is a residential collector road with much traffic from vehicles and school children. The plants are growing quite well with no indication of any disease problems.

ZELKOVA SERRATA CINCINNATI BANKS AT COLERAINE

Planted: 1964

Site: 10' Tree Lawn

	67	68	69	70
Height	11.0'	12.0'	14.0'	14.2'
Caliper	1.7"	2.1"	3.0"	3.2"
Spread	6.0'	8.0'	10.0'	9.0'

Comments: The trees are small but have the typical upright spreading habit of the species. These are located on a 10-foot tree lawn which is adjacent to a sidewalk abutting a building. The trees will eventually be too broad for this site and will interfere with the street, sidewalk, and building. There are power lines overhead and a small narrow tree would have been a better selection for this site.

ZELKOVA SERRATA CLEVELAND 4431 FULTON

Planted: 1952

Site: 15' Tree Lawn

	67	68	69	70
Height	18.7'	21.0'	21.7'	21.0'
Caliper	7.4"	7.4"	8.5"	9.3"
Spread	13.0'	18.2'	18.4'	19.4'

Comments: The trees are of typical upright spreading habit, are growing well, and there is a variation in size. They fit well in a 15-foot tree lawn. There has been a slight amount of dieback believed to be caused by nectria canker, but the problem has not been serious.

ZELKOVA SERRATA

SHAKER HEIGHTS (CLEVELAND)

SHAKER BLVD.

Planted: Date Unknown

Site: 24' Tree Lawn

	67	68	69	70
Height	19.0'	21.4'	23.2'	23.2'
Caliper	5.9"	6.5"	6.6"	6.8"
Spread	15.8'	17.0'	21.0'	21.0'

Comments: The trees are of typical upright spreading habit and appear to be an excellent choice for this very wide tree lawn. They are consistent in size and form and there has been evidence of some dieback and canker problems.

Discussion

As previously stated, the primary intent of this publication is to describe case histories of street tree selections at many sites throughout Ohio. This will be a continuing program to accumulate necessary data to suggest which species and cultivars are most satisfactory under varying conditions and, conversely, which types appear to be undesirable in general or at specific sites. Because of the impossibility of controlling or measuring many environmental factors, evaluation decisions must be based on accumulated growth data, annual observations, and the opinions and experiences of the cooperators in the communities in the study.

Several general factors have been noted which relate to hardiness, pest problems, suitability of habit and size in a specific landscape situation, aesthetic features, tolerance to favorable environmental conditions, planting situations, and cultural practices.

Trees found to be seriously affected by boring insects were *Fraxinus velutina glabra* 'Modesto', *Betula verrucosa* 'Laciniata', and *Robinia pseudoacacia* 'Idaho'. Unfortunately, this pest did not cause severe damage until the trees had been in the plantings 8 to 10 years, necessitating costly removal and replacement. The long-term effectiveness desired in a public area planting also was lost. Similarly, trees such as *Sorbus aucuparia,* which can be killed by fireblight, are generally not recommended for long-lived street trees.

Less critical but still troublesome are trees which are readily defoliated due to leaf disease problems. This group includes several Malus (crabapple) cultivars which are susceptible to apple scab and *Crataegus oxyacantha* 'Pauli' which is affected by leaf spot diseases as well as scale and aphids. Plants such as these should not be used generally in street tree plantings since pest problems are often more severe due to the unfavorable growing conditions. As indicated in the results, *Fraxinus velutina glabra* 'Modesto' is no longer planted on streets in Cleveland because of extensive losses due to borers.

Although *Prunus serrulata* 'Kwanzan' was not observed in many sites, severe frost-crack injury was noted on trunks of these trees planted in an exposed area (Figure 10).

Growth habit and ultimate size are important characteristics in street tree plantings because of potential interference with overhead lines and pedestrian or vehicular traffic. This was noted in Wickliffe (Figure 4) where *Betula verrucosa* 'Laciniata' caused considerable interference because of the pendulous branching habit. *Quercus palustris* poses the same problem, although when located on a very wide tree lawn or on the homeowner's lawn as observed on Oakley in Wooster, no interference resulted (Figure 11).

Trees with natural broad-spreading habit, such as *Acer platanoides* (Figure 1) and *Phellodendron amurense,* should be used where tree lawn width is sufficient. This problem was noted with the latter species in Toledo and Wooster. A cultivar such as *Acer platanoides* 'Cleveland', with an upright oval habit, was found to be a better selection than the species at many sites.

The aesthetic effects of street plantings are dependent on many characteristics such as growth habit, uniformity of plant form and size, size in relation to the scale of the area, foliage color, flower and fruit features, and winter bark and twig character.

In general, cultivars or clones of species were found to be superior to seedling propagated species because of the uniformity of size and shape. Considerable variation was found throughout the entire planting of trees of *Acer rubrum* on Berdan in Toledo and *Tilia cordata* at most sites. In contrast, individuals of other seedling species such as *Liquidambar styraciflua* and *Platanus acerifolia* were uniform in overall effect. Plants with extreme formal character such as *Acer platanoides* 'Columnare', *Acer platanoides* 'Erectum' (Figure 2), and particularly *Acer platanoides* 'Globosum' were considered objectionable because this form detracted from the overall effect of an area. This was especially significant on East 189th in Cleveland where *Acer platanoides* 'Globosum' are planted on both sides of the street (Figure 3) and are entirely out of phase in this informal suburban area.

Trees with varied color foliage can have too striking an effect when used in excess. *Acer platanoides* 'Crimson King' with maroon foliage and *Gleditsia triacanthos* 'Sunburst' with yellow foliage should be used with discretion and are probably best used in limited areas such as on shorter streets and cul-de-sacs.

Although attractive flowering trees may be desirable in some situations, this factor should be given relatively little emphasis since the effective period is limited. The fruit produced on some flowering trees, such as *Malus purpurea,* may create a maintenance problem where fruit-bearing branches overhang traffic areas (Figure 9). In contrast, the fruit of other Malus, *Crataegus phaenopyrum* and *Crataegus lavallei* are attractive, hold into late winter, and do not pose maintenance problems.

A major cultural problem noted at many sites was associated with plantings in a limited planting space. For example, a 3-foot wide tree lawn, as observed in Toledo (Figure 6), was too narrow for the Crataegus in the planting and apparently too narrow for any tree selection. The thorns on other Crataegus species also posed a hazard because of the close proximity to the sidewalk.

Several tree selections were planted in pockets in the sidewalk. The most limiting of these was a 2-foot diameter circular sidewalk planting area in South Euclid (Figure 5). The *Crataegus lavallei* planted in these circles are growing slowly and are considerably smaller than younger trees of the same species located in more extensive planting sites.

Vandalism and vehicular damage are major problems in many areas and the resulting increased maintenance or replacement is costly. No one has devised a method to control vandalism. Locating trees a sufficient distance from the curb reduces damage from vehicles.

Several of the planting sites included in this study would be classed as unfavorable cultural situations due to air pollution, reflected light and heat radiation, salt runoff and spray, dry soil, and limited soil area for root growth. On the basis of observations throughout the state in this study, the following trees can be classed as most tolerant of apparently unfavorable environmental conditions: *Carpinus betulus, Crataegus lavallei, Crataegus phaenopyrum* (Figure 7), *Eucommia ulmoides, Gleditsia triacanthos* (cultivars) (Figure 8), *Ostrya virginiana, Platanus acerifolia, Sophora japonica* (Figure 12), *Tilia cordata,* and *Tilia cordata* 'Greenspire'. Other trees are known to tolerate unfavorable sites. However, those mentioned are types under observation in this study which are growing satisfactorily under obviously unfavorable conditions.

Although there are 53 tree types involved in this study, many more can be used. It is hoped that the planting and evaluation of new selections at the Ohio Agricultural Research and Development Center will lead to more extensive plantings of recommended types. This will add diversity to street tree plantings and determine types best suited for specific environmental conditions.

Summary

To evaluate new introductions of shade and flowering trees, a research project was begun at the Ohio Agricultural Research and Development Center in 1966. The research was divided into two phases.

In Phase I, tree evaluation plots were established at the Research Center to study many detailed characteristics of numerous newly introduced trees at one site.

In Phase II, which is discussed in this bulletin, 53 selected species and cultivars of trees existing in street plantings at sites in five Ohio cities are being evaluated annually. There are 102 separate sites and, where possible, a selection is being evaluated at more than one site within a city and in different cities. Because of the many variables, these data are being used to develop case histories of trees at specific sites over a period of time.

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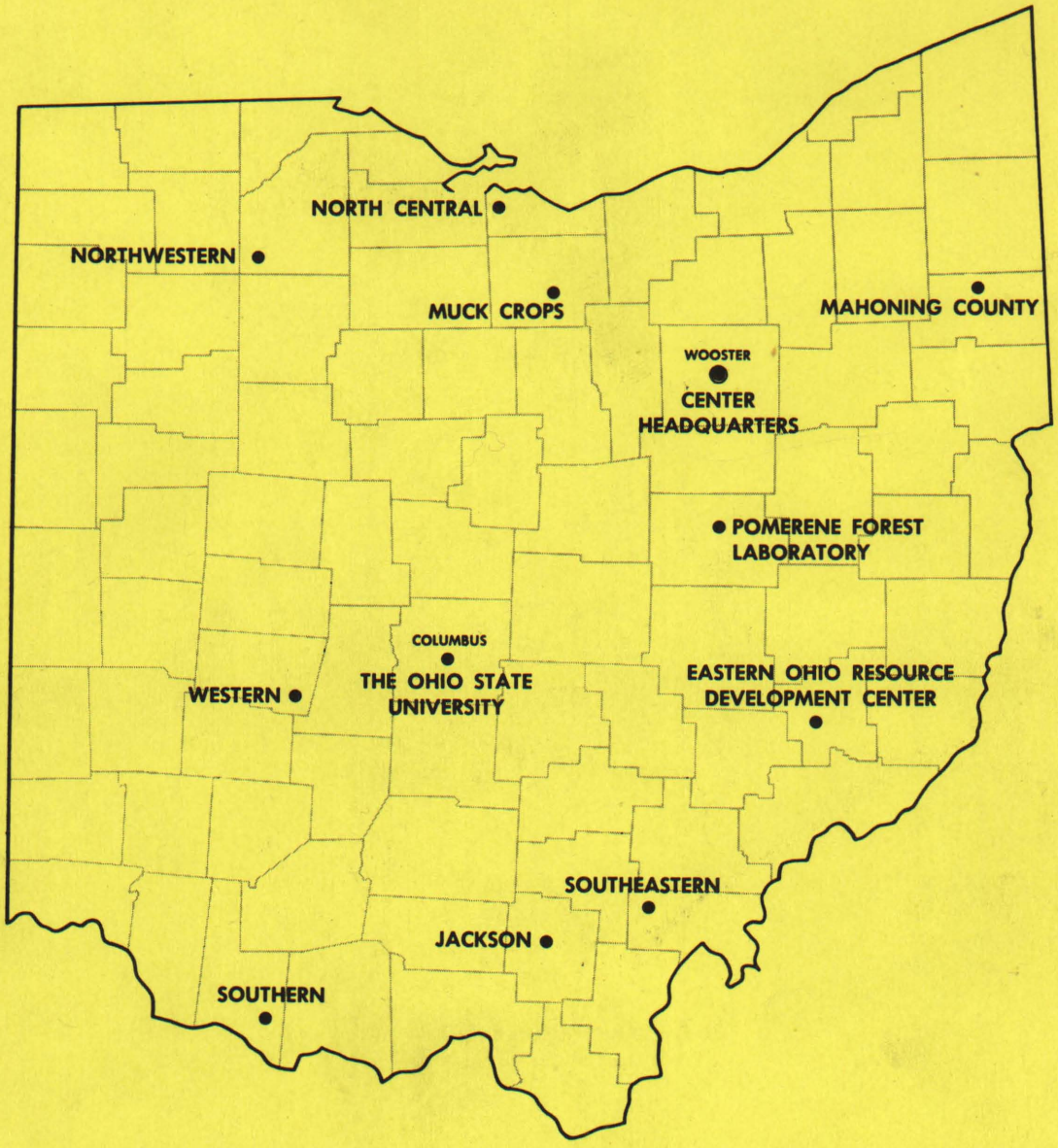
The State Is the Campus for Agricultural Research and Development



Ohio's major soil types and climatic conditions are represented at the Research Center's 12 locations. Thus, Center scientists can make field tests under conditions similar to those encountered by Ohio farmers.

Research is conducted by 13 departments on 6482 acres at Center headquarters in Wooster, nine branches, Pomerene Forest Laboratory, and The Ohio State University.

Center Headquarters, Wooster, Wayne County: 1953 acres

Eastern Ohio Resource Development Center, Caldwell, Noble County: 2053 acres

Jackson Branch, Jackson, Jackson County: 344 acres

Mahoning County Farm, Canfield: 275 acres

Muck Crops Branch, Willard, Huron County: 15 acres

North Central Branch, Vickery, Erie County: 335 acres

Northwestern Branch, Hoytville, Wood County: 247 acres

Pomerene Forest Laboratory, Keene Township, Coshocton County: 227 acres

Southeastern Branch, Carpenter, Meigs County: 330 acres

Southern Branch, Ripley, Brown County: 275 acres

Western Branch, South Charleston, Clark County: 428 acres