Aesthetic Improvement of Muncie's White River Through the Planting of Trees

An Honors Thesis (ID 499)

By

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Muncie, Indiana
May 1983
As the White River flows through the city limits of Muncie, its north bank is managed by the Muncie Parks Department. In order to promote increased recreational use of the river bank as well as enhance the aesthetic experience of both the users of the area and those who drive past it, landscaping involving the planting of trees is to be done within the next few years (interview with W. Reiter, 1983).

Because of the loss of a large percentage of the trees planted in past river landscaping projects, a study was conducted to determine the tree species currently existing along the top of the levee between the river and the adjacent roadway. Two lengths of the riverbank were involved in the study. The first is located between the High Street and Washington Street bridges, which is across from Tuhey Park, and the second is the area from Tillotson Avenue west to Hawthorn Street. In addition to the listing of trees present at the time of the study, this paper presents some recommendations as to tree species which have a good chance of surviving along the river and which should be considered for planting in future projects.

THE VALUE OF TREES IN URBAN AND SUBURBAN LANDSCAPING

The planting of trees has played a vital role in man's existence since the time of the early Egyptians, Greeks and Romans to the present day. The use of trees within cities has increased in importance only since the beginning of the 18th century, however, when trees were recognized as
being a positive influence on the visual perceptions and psychological well-being of urban inhabitants. At that time the planting of trees began to be included in the designs of such cities as Berlin, Paris, New York and San Francisco (Nadel and Oberlander, 1977).

The principle reason for the use of plants within our environment is their aesthetic value (Robinette, 1972), and trees may readily serve to beautify the environment (Hudak, 1980). Various physical qualities affect their aesthetic value, with line and form, color, and texture being the three major considerations (Nelson, in Santamour et. al., 1976). Line and form involve the pattern of trunk and main branches (Nelson, in Santamour et. al., 1976) while shape, a related concept, encompasses the outline of the crown and branches (Noyes, in Little and Noyes, 1970). Color is exhibited in the flowers, fruit, twigs, bark, and foliage, while texture is the result of the visual qualities resulting from the "size and spacing of the leaves and twigs, shape and surface quality of leaves, and length and stiffness of petioles" (Nelson, in Santamour et. al., 1976).

Additional characteristics which affect the aesthetic quality of trees include the tone of color, the light reflection, the silhouette, the shadows cast, the size and the species' stem growth pattern, which may be as a single stem or in clumps (Noyes, in Little and Noyes, 1970; Nelson, in Santamour et. al., 1976). All of the above characteristics combine to create moods and feelings which add to
the aesthetics of an environment (Nelson, in Santamour et al., 1976).

Besides creating beauty in a setting, trees serve various other functions which are often especially beneficial in an urban or suburban area. One major category of activities performed by trees is that of acting as "air conditioners." This includes replenishing the air supply through the addition of oxygen, reducing air pollution, and filtering particulate matter, such as dust, soot, pollen and smoke, from the air (Little and Noyes, 1971; Robinette, 1972; Elias, 1973; Santamour, 1976; Nadel and Oberlander, 1977).

A second major function involves changing the microclimate of an area. This is accomplished through acting as a windbreak, shielding from the sun, providing shelter from rain and snow, and cooling air temperatures through transpiration (Little and Noyes, 1971; Robinette, 1972; Elias, 1973; Nadel and Oberlander, 1977).

Reduction of unpleasant noises can be an important benefit of trees in urban areas, especially when vehicular traffic noise is apparent (Little and Noyes, 1971; Robinette, 1972; Santamour, 1976; Nadel and Oberlander, 1977), while unpleasant visual experiences can be reduced through screening (Robinette, 1972; Santamour, 1976). Additionally, protection of the natural environment occurs through erosion control (Robinette, 1972; Weiner, 1975; Hudak, 1980), the protection, improvement and maintenance of water supplies (Little and Noyes, 1971; Weiner, 1975; Santamour, 1976), and the provision of wildlife habitat (Little and Noyes, 1971; Santamour, 1976).
As is evident from the previous enumeration of the various functions performed by trees, landscaping involving these woody plants will provide many benefits which will add to the value of the White River in Muncie in addition to the primary objective of recreation.

RECREATIONAL USES OF THE WHITE RIVER

The White River does receive a good amount of recreational use, as was observed by the researcher during her visits to the study sites in the spring of 1983. Activities along the top of the levee include walking, jogging and biking. Within the floodplain, people were seen to be walking and hiking, picnicking, sunbathing, fishing, playing games, and horseback riding.

THE BICENTENNIAL PARK

In recent years, a major development for recreation along the White River in Muncie has occurred, basically from the High Street bridge in the east to Hawthorn Street in the west, in the form of the Bicentennial Park project. Both study sites are included in the area of this project (interview with W. Reiter, 1983). The original plan, drawn up by a firm called Environmental Planners (Carlson, 1977), was river basin stabilization work involving revegetation, erosion control, and the construction of overlook platforms, activity centers, and a bike path. It included landscaping with trees such as flowering dogwood (*Cornus florida*), redbud (*Cercis canadensis*), flowering crabapple (*Malus* spp.),
ash (Fraxinus spp.) and oak (Quercus spp.) (interview with J. Savage, 1983). Work on the project began in July 1976 (Bates, 1976) with contracting being done by Keller Construction and landscaping subcontracted by Bruin Smith Nursery (Hill, 1977). Numerous problems resulted in the acceptance of a new set of plans prepared by Landplus West in 1978 (Anonymous, 1978) and the repair and removal of some of the original construction by a second contracting firm. The work was completed in late summer of 1980 (Yencer, 1980). Trees planted by the second firm were red maple (Acer rubrum), honeylocust (Gleditsia triacanthos), tuliptree (Liriodendron tulipifera), redbud (Cercis canadensis), Washington hawthorn (Crataegus phaenopurum) and sycamore (Platanus occidentalis) (from Landplus West Bicentennial Park Plans).

STUDY RESULTS

The names, both common and scientific, and number of each tree species found in the two study areas are given. The diameter at breast height (DBH), although not reported here, was recorded by the researcher for those trees which were large enough to have a main stem at 4.5 feet above the ground. No tree from Tillotson Avenue to the west terminus had a diameter greater than 5 inches and all trees located there appeared to be planted material. In the area between High and Washington Street bridges, however, some of the species present were too large to have been planted in recent landscaping projects, so the researcher has divided
the species along that area into two categories: those with DBH less than 5 inches, which are taken to be planted material, and those with DBH greater than 5 inches, which are assumed to be occurring naturally. In addition, Inserts 1 and 2 show the approximate locations of the trees surveyed.

High Street Bridge to Washington Street Bridge

approximate length of area 0.3 miles
Planted material (DBH<5")

<table>
<thead>
<tr>
<th>scientific name</th>
<th>common name</th>
<th>numbers present</th>
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<tbody>
<tr>
<td>Acer rubrum</td>
<td>Red maple</td>
<td>3</td>
</tr>
<tr>
<td>Cercis canadensis</td>
<td>Redbud</td>
<td>4</td>
</tr>
<tr>
<td>Crataegus phaenopyrum</td>
<td>Washington hawthorn</td>
<td>3</td>
</tr>
<tr>
<td>Prunus pennsylvanica</td>
<td>Green ash</td>
<td>4</td>
</tr>
<tr>
<td>Quercus spp. (Erythrobalanus)</td>
<td>Red Oak hybrid</td>
<td>2</td>
</tr>
<tr>
<td>Ulmus pumila</td>
<td>Siberian elm</td>
<td></td>
</tr>
</tbody>
</table>

Natural material (DBH>5")

<table>
<thead>
<tr>
<th>scientific name</th>
<th>common name</th>
<th>numbers present</th>
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</thead>
<tbody>
<tr>
<td>Ailanthus altissima</td>
<td>Tree-of-Heaven</td>
<td>4</td>
</tr>
<tr>
<td>Acer saccharum</td>
<td>Sugar maple</td>
<td>3</td>
</tr>
<tr>
<td>Robinia pseudoacacia</td>
<td>Black locust</td>
<td>5</td>
</tr>
<tr>
<td>Populus deltoides</td>
<td>Cottonwood</td>
<td>1</td>
</tr>
<tr>
<td>Ulmus thomasi</td>
<td>Cork elm</td>
<td></td>
</tr>
</tbody>
</table>

subtotal 17

Tillotson Avenue to Hawthorn Street

approximate length of area 1.1 mile

<table>
<thead>
<tr>
<th>scientific name</th>
<th>common name</th>
<th>numbers present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acer rubrum</td>
<td>Red maple</td>
<td>6</td>
</tr>
<tr>
<td>Cercis canadensis</td>
<td>Redbud</td>
<td>13</td>
</tr>
<tr>
<td>Crataegus phaenopyrum</td>
<td>Washington hawthorn</td>
<td>11</td>
</tr>
<tr>
<td>Elaeagnus angustifolia</td>
<td>Russian olive</td>
<td>1</td>
</tr>
</tbody>
</table>
Fraxinus pennsylvanica  Green ash  4
Gleditsia triacanthos inermis cv. 'Moraine'
Liriodendron tulipifera  Tuliptree  6
Picea glauca  White spruce  4
Platanus occidentalis  Sycamore  10
Prunus spp.  Cherry  4
Malus spp.  Crabapple  6
Quercus spp. (Erythrobalanus)  Red oak hybrid  2
Tilia spp.  Basswood  5

Total  74

SITE CHARACTERISTICS

Trees require acceptable soil, water, air, nutrients, lighting, spacing and temperature conditions in order to thrive (Carr, 1979; Kozlowski, 1979; Hudak, 1980). Before the selection of tree species to be planted is accomplished, it is very important to have some knowledge about the characteristics of the planting site in order to choose those species which are likely to survive. Some physical factors which should be considered in the analysis of a site include topography, exposure to sun, wind and pollution, soil features, existing vegetation, and intensity of pollution present. Social factors which should be kept in mind are the degree of automobile and pedestrian traffic present, the type of area, such as residential, industrial, commercial or recreational, litter and vandalism which may occur, and the types of uses occurring in the area (American Horticulture Society, 1976). Information on the characteristics for the two study sites has been collected through research and observation.
Insert 1
HIGH BRIDGE TO WASHINGTON STREET D.

approximate scale: 1 inch = 200 feet
Praxinus pennsylvanica
Gleditsia triacanthos
Liriodendron tulipifera
Malus spp.

PG Ficea glauca
Ps Prunus spp.
Qs Quercus spp.
Is Pilla spp.
General Description

The White River, which begins in east-central Indiana, is 365 miles long, has a total drainage area of 11,349 square miles and, along with its many tributaries, drains 31% of Indiana. It flows through Muncie in an east to west direction on its way to its union with the East Fork of the White River, and eventually with the Wabash River within the borders of Illinois (U.S. Army Corps of Engineers, 1973).

Within the city of Muncie the river's flood plain boundaries are irregular. A great deal of development is present in the areas which are subject to flooding, including residential, industrial and commercial buildings, the city's sewage and water treatment plants, and recreational areas (U.S. Army Corps of Engineers, 1973). As observed by the researcher, the development adjacent to the two study sites includes city parks, residences, and businesses to the immediate north, and basically residences and businesses to the immediate south. Additionally, an elementary school is located near the river west of Tillotson Avenue to the terminus point.

Because of the extreme build-up of this urban area, various flood control measures exist on the White River throughout Muncie. The river was channelized and a system of levees, floodwalls and pumping stations were constructed largely in the 1940's and 1950's by the Corps of Engineers, Louisville District. These structures are designed to protect against the greatest flood on record, which occurred
in 1913. Various other structures which protect against flooding to a lesser degree have been constructed with local funds. Within the study sites, flood protection works are present all along the north side and partially on the south side of the river between the High Street and Washington Street bridges, and completely along the north side of the river from Tillotson Avenue to Hawthorn Street (U.S. Army Corps of Engineers, 1973).

Topography

Both immediately adjacent to the river and on top of the levee where White River Boulevard is located at the study sites the slope is relatively small (0-2%) (Soil Conservation Service, 1972). Because of the presence of the levee, however, somewhat steep slopes do exist which range approximately between 20-30%, as calculated by the researcher from a topographic map. These are generally south-facing slopes which will result in slightly warmer temperatures because of greater exposure to the sun.

Soils

The soil immediately adjacent to the White River between the High Street and Washington Street bridges is Genesee silt loam while that next to and on the far side of White River Boulevard is Made land. The Genesee silt loam consists of calcareous and friable silt loam layers, though it is possible that the upper soil layers may include loam and silty clay loam, and the lower layers may include thin lenses of loam, sandy loam or silty clay loam soils and/or loose sand and gravel.
Genesee silt loams generally have a low to medium content of organic matter, high natural fertility, high available moisture, moderate permeability and slow run-off. The native vegetation is mainly hardwood trees (Soil Conservation Society, 1972).

The main part of the planting which is to occur will be on the Made land used in levee construction along the White River Boulevard. This soil ranges from combinations of soil and garbage to those of soil and concrete or stone. Soil material of an unknown type has assumably been used to cover the fill material (Soil Conservation Service, 1972).

The soil present along the White River from Tillotson Avenue to Hawthorn Street is a combination of Shoals silt loam and Linwood muck. The Shoals silt loam is generally deep and of medium texture. The organic matter content is low and the natural fertility is high. The available moisture content is high to very high, with moderate permeability and slow runoff. It is nonacid and mesic and its native vegetation is mixed hardwood trees (Soil Conservation Service, 1972).

Linwood muck soil is characterized by its deep and very poorly drained nature. The organic matter content is very high, the fertility low, the available moisture capacity very high, the permeability moderate and the runoff potential very slow. The native vegetation of this soil type is grasses, sedges and reeds (Soil Conservation Service, 1972).

Climate and Weather

The climate of Delaware County and the surrounding area is characterized by four well-defined seasons with warm
summers and moderately cold winters (U.S. Army Corps of Engineers, 1973). From data recorded for Delaware County, it has been determined that the average daily temperature is 63°F, with temperatures over 90°F occurring an average of 9 days during July, the hottest month. Temperatures below zero occur an average of 7 days in winter. January is generally the coldest month (Soil Conservation Service, 1972).

The concept of the Plant Hardiness Zone has been developed by the U.S. Department of Agriculture (Weiner, 1975). It is based upon the average annual minimum temperatures for the various areas of the country. Zones of hardiness can be given for a tree species to indicate the northernmost area in which the species can be grown. The northern half of Indiana falls within zone 5, which has an average annual minimum temperature from -20°F to -10°F while the southern half of the state experiences generally minimum temperatures between -10°F and 0°F and is in zone 6 (Weiner, 1975; Hudak, 1980).

The average yearly precipitation for Delaware county is 39.7 inches, with the maximum generally falling in spring and early summer. The average rainfall is more than 4 inches per month in the spring and less than 3 inches per month in the winter. The average yearly snowfall is 21 inches, most of which falls in January. An average of 27 days per year occur with snow cover present (Soil Conservation Service, 1972).

Relative humidity fluctuates throughout the day, generally acting as the inverse of temperature. As temperature decreases during a summer day from the afternoon to just
before dawn, relative humidity increases from somewhere in the 40's to the 90's or higher. During winter relative humidity ranges from 60 to 90 percent (Soil Conservation Service, 1972).

Social Factors

It is readily evident from observation that social factors need to be contemplated in the planting of trees along the White River in Muncie. It is an urbanized area which suffers air pollution from industry, residences and the like. Of special importance to the study sites is the relatively constant automobile traffic along White River Boulevard which adds exhaust to the immediate environment of trees planted. Also, since the riverbank is managed for recreation and a bicycle path is present the length of the river, pedestrian traffic on the levee is another factor of importance. Litter deposition and vandalism along the White River also occurs.

TREE CHARACTERISTICS

In addition to the consideration of site factors when selecting trees for landscaping purposes, awareness of the characteristics of the various species is also important. Physical features adding to aesthetics, mature size, rate of growth, longevity, ease of maintenance, and resistance to pests and disease are among the factors which should be evaluated (Nadel and Oberlander, 1977). For the woody plant species recommended as possibilities for landscaping,
along Muncie's White River, the aesthetic features, mature size, growth rate, root development, use by wildlife, and possible problems, diseases and pests are described. All species given occur within hardiness zones 5 and 6 and are distinguished as being tolerant to urban use (American Horticultural Society, 1976).

RECOMMENDATIONS

The following trees recommended to be considered in planting along the White River are initially based upon their survival chances for the site as suggested by William Crankshaw (1983). The primary list has been generated as a result of the narrowing down of the species which are most likely to thrive on the top of the levee by individual species characteristics. The second, more abbreviated, list is of those species which would find more suitable moisture conditions on the slope of the levee, but which could be planted on top of the levee with somewhat lowered chances for survival.

(Note- The word "unknown" after a characteristic category indicates that the researcher was unable to find the pertinent information for the species in the literature utilized.)
SPECIES MOST LIKELY TO SURVIVE

Broadleaf Trees

_Carya ovata_  Shagbark hickory

Aesthetic features:

Leaf- compound; 10"-14" long; 5-7 petioles; surfaces dark yellow-green above, pale yellow-green below; autumn color yellow to gold

Bark- smooth and grey on young stems; develops thin strips which curve away from the trunk with age

Size: height 70-90 feet; diameter 1-3 feet

Growth rate: slow

Root development: deep taproot in seedling

Wildlife uses: squirrels and other rodents utilize the nuts for food, as do various birds such as the red-bellied woodpecker, blue jay and rufous-sided towhee. The tufted titmouse also uses this tree for cover.

Problems: fallen fruit; highly susceptible to fire damage

Diseases: occasionally cankers, crown gall, leaf spots, powdery mildew or 'witches' brooms

_Fraxinus americana_  White ash

Aesthetic features:

Form-bole long, straight, cylindrical, though trunk sometimes divided into; crown oval; cross-shaped branching

Leaf- compound; 8"-12" long; 5-9 leaflets; surfaces dark green above, pale green or white beneath; autumn color unknown

Size: height 70-100 feet; diameter 2-3 feet

Growth rate: rapid

Root development: deep in porous soils; shallow and spreading on rocky sites
Wildlife uses: fruit eaten by mammals and various birds such as common flicker, several woodpeckers and red-winged blackbird

Diseases: Verticillium wilt, oystershell scale and cankers

*Malus* spp.  Crabapple

Aesthetic features:
Form- short trunk, rounded crown

Flower- pink to white, fragrant; blooms March-May

Fruit- 1"-2" diameter; yellow-green; present September-November

Bark- grey; scaly; cracked vertically

Size: height 15-50 feet; spread 25-35 feet

Growth rate: moderate

Root development: unknown

Wildlife uses: various birds, such as ruby-throated hummingbird, gray catbird, and several orioles gain food, cover, and shelter

Diseases: cankers, rust and scab

Pests: various insects

*Platanus occidentalis*  American sycamore

Aesthetic features:
Form- grows straight and tall with a heavy frame; irregular, spreading crown with somewhat crooked smaller branches

Leaf- simple; 6"-10" long; maple-like shape with 3-5 lobes and many large, coarse teeth; autumn color red

Fruit- 1"-1¼" diameter; tight, brown balls hanging from long stalks; present October often through winter

Bark- brown outer bark peels to expose creamy to white inner layers, giving a mottled appearance

*Quercus alba*  White oak

Aesthetic features:
Leaf- simple; 5"-9" long; 7-9 rounded lobes; pink when new;
surfaces blue-green or bright green above, slightly paler or grey fuzzy beneath; autumn color brownish red to purplish red; foliage often stays on tree throughout winter

Bark- light ashy grey; young bark with small, scaly blocks; becomes irregularly platted with the plates attached on one side or deeply furrowed with rounded ridges

Size: height 60-100 feet; diameter 2-4 feet
Growth rate: slow
Root development: deep
Wildlife uses: twigs and acorns eaten by many birds and mammals including mourning dove, various songbirds, deer, fox, raccoon, squirrels and cottontail rabbit
Diseases: antracnose, canker, leaf spots and others
Pests: galls, scales, and leaf-eating insects, among others

Quercus macrocarpa  
Bur oak

Aesthetic features:
Leaf- simple; 6"-12" long; 5 to 9 rounded lobes; surfaces shiny, dark green above, whitish and somewhat hairy below; autumn color reddish
Fruit- 3/4"-1½" diameter; up to half of nut enclosed in a cup with an unusual fringe
Bark- similar to Q. alba but darker and more deeply furrowed

Size: height 75-100 feet; diameter 2-3 feet
Growth rate: slow
Root development: deep
Wildlife uses: see Q. alba
Diseases and pests: see Q. alba

Quercus muehlenbergii  
Yellow oak

Aesthetic features:
Leaf- simple; 4"-9" long; 8-13 pairs of sharp teeth; dark green upper surface; autumn color unknown
Bark- light grey; flaky
**Juniperus virginiana**  Eastern red-cedar

**Aesthetic features:**
- **Form:** short, tapering bole; dense pyramidal or columnar crown
- **Foliage:** crown dark green; both scalelike and needlelike leaves, 1/16"-3/4" long
- **Bark:** light reddish brown; long, narrow scales; shreddy

**Size:** height 20-50 feet; diameter 1-2 feet; spread 10-20 feet

**Growth:** slow to moderate

**Wildlife uses:** fruit eaten by over 50 species of birds, including mockingbird, American robin, cedar waxwing and mourning dove, as well as by opossum. Used as cover by species such as screech owl, common grackle, and sparrows

**Diseases:** alternate host for apple rust

**Pests:** Juniper webber moth caterpillar

**Pinus resinosa**  Red pine

**Aesthetic features:**
- **Form:** tall, cylindrical bole; stout, right-angled branches; symmetrical
- **Foliage:** dark green needles; 3"-6" long; fascicles of 2; dark yellow-green
- **Bark:** flaky, orange-red when young; breaking into large, flat, reddish brown plates

**Size:** height 50-80 feet; diameter 2-3 feet

**Growth rate:** moderate to fast

**Root development:** spreading, with poorly developed taproot

**Wildlife uses:** as food, cover and nesting by a wide variety of birds, including mourning dove, chickadees, nut-hatches and cardinal
Diseases: damping-off and root rot
Pests: Nantucket pine moth and European pine-shoot moth

**Pinus sylvestris**  Scots pine

Aesthetic features:
Form- young boles often crooked, probably due to poor seeds
Foliage- blue green needles; 1 1/2"-3" long; fascicles of 2
Bark- bright orange higher on trunk and on branches; dark and furrowed on older trunks
Size: height 60-90 feet; diameter 1-2 feet
Growth rate: slow to moderate
Root development: unknown
Wildlife uses: used occasionally by birds for nesting
Diseases: stem blister rust and dry rot fungus
Pests: pine-shoot moth caterpillar and sawfly larva

**SPECIES SOMEWHAT LESS LIKELY TO SURVIVE**

**Broadleaf Trees**

**Celtis occidentalis**  Common hackberry

Aesthetic features:
Bark- greyish brown; corky warts and ridges; becoming scaly
Size: height 20-70 feet; diameter 1-3 feet
Wildlife uses: fruit eaten by birds, including bobwhite and pheasant

**Cercis canadensis**  Redbud

Aesthetic features:
Form- widespread, curving branches
Flower- red-purple or rarely white; clustered; blooms March to May
Leaf- simple; 2"-6" long; heart-shaped; autumn color unknown
Bark- dark; shreddy in patches, revealing reddish color
Size: height 40-50 feet; diameter 10"-12"
Wildlife uses: seeds eaten by bobwhite and a few songbirds
Cornus florida  Flowering dogwood
Aesthetic features:
Form- short trunk; wide-spreading, bushy crown
Flower- small cluster with four white petal-like bracts; blooms July to October
Size: height to 10 feet
Wildlife uses: twigs eaten by numerous birds, skunks, deer, rabbits and squirrels

Fraxinus pennsylvanica  Green ash
Aesthetic features:
Leaf- compound; 6"-9" long; 5-9 leaflets; surfaces yellow-green above, paler below; autumn color
Size: height 60-70 feet; diameter 2-3 feet
Wildlife uses: see F. americana

Gleditsia triacanthos  Honeylocust
Aesthetic features:
Leaf- compound, often doubly compound; 6"-15" long; surfaces shiny dark green above, dull yellow-green beneath; autumn color yellow
Fruit- 7"-18" long, about 1" wide; brown, twisted pod; stays on tree after leaves have fallen; present September through February
Bark- dark brown; broken into long, longitudinal ridges separated by deep fissures
Size: height 70-80 feet; diameter 2-3 feet
Wildlife uses: fruit eaten by deer, rabbits, squirrels and bobwhite

Gymnocladus dioicus  Kentucky coffeetree
Aesthetic features:
Form- rugged appearance in winter due to absence of small twigs
Leaf- doubly compound; 17"-36" long; pink when very young; autumn color gold
Fruit- 2"-10" long; brown pods; present September through winter
Bark- dark grey; ridged and scaly
Size: height 40-80 feet; diameter 1-2 feet
Wildlife uses: unknown

**Liquidambar styraciflua**  
**Sweetgum**

Aesthetic features:

Form- long, straight bole; conical or pyramidal crown; twigs with corky growths; hanging seedballs remain in winter

Leaf- simple; 6"-7" in diameter; star-shaped with 5-7 lobes; surfaces bright, shiny green

Size: height 50-120 feet; diameter 2-4 feet
Wildlife uses: seeds eaten by songbirds and squirrels

**Liriodendron tulipifera**  
**Tuliptree**

Aesthetic features:

Form- tall, clear, straight bole; small, somewhat open, conical crown; branches often angle upward; dried fruit cones often remain on tree during winter

Leaf- simple; 5"-6" long; 4-lobed; surfaces bright green to yellow-green; autumn color golden yellow

Flower- light greenish yellow to orange; tulip-like; bloom May to June

Size: height 50-150 feet; diameter 2-6 feet
Wildlife uses: seeds eaten by a variety of birds such as red-winged blackbird, cardinal and American goldfinch

**Tilia americana**  
**American basswood**

Aesthetic features:

Form- long, clear bole; rounded crown; arching branches

Leaf- simple; 5"-6" long; heart-shaped with many fine teeth; dark green, often shiny; autumn color brown

Flower- yellow; fragrant; in clusters hanging by stalk from narrow leaflike bract; blooms June through August

Size: height 50-80 feet; diameter 2-3 feet
Wildlife uses: attractive to bees
Conifers


Pinus strobus  white pine

Aesthetic features:

- Form: tall trunk; broadly conical crown; spreading horizontal branches
- Foliage: 3"-5" long; fascicles of 5; dark bluish green; long, slender and flexible

Size: height 80-100 feet; diameter 2-3 feet

Wildlife uses: see P. resinosa


LIMITATIONS TO PLANTING

As a result of the channelization and other flood control measures along the White River in Muncie, the U.S. Army Corps of Engineers places restrictions on landscaping and construction which may occur in the floodplain. All such plans must go through the Division of Water Quality in Muncie to assure that they follow the Corps of Engineers guidelines. These limitations generally prevent any new planting on the floodplain immediately adjacent to the river because of possible obstruction to the flow of floodwaters (interview with J. Craddock, 1983).

INCREASING TREE SURVIVAL RATE

Large scale landscaping projects, such as are planned for Muncie's White River park area, involve a considerable monetary investment. Therefore, steps should be taken to
insure the survival of all trees planted to the highest degree possible. Two areas of major concern which have caused much of the loss in the past are water requirements and damage by lawn mowers. A few simple measures should be taken to reduce losses due to these causes (interview with W. Crankshaw, 1983).

Moisture conditions on the top of the levee tend to be low especially during summer, due to soil and topographic conditions of the planting site. The first consideration which will increase the survival rates of trees planted is the selection of trees which do not require large amounts of water. The recommendations presented in this paper do take moisture requirements into account. A second factor which will add to the survival of trees planted is the season of the year the planting takes place. Work should be done when rainfall is the greatest, which is during the spring and early summer. Early planting should occur so that the trees will be as well established as possible before the dry summer conditions put additional moisture stress on the planting site (interview with W. Crankshaw, 1983).

Mower damage is readily evident on some of the trees currently present along the White River and has presumably caused the loss of many of the trees planted in the past. This loss may be avoided perhaps by placing two or three short stakes near the bases of the trees so that mowers cannot come into contact with them (interview with W. Crankshaw, 1983). Taking steps such as those suggested
above will insure greater survival of landscaping plant materials and ultimately increase the benefits to the environment and the inhabitants of Muncie.
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