Native trees in an urban area: A case study of the Waterloo metropolitan area Black Hawk County, Iowa

Alice Christine Robbins

University of Northern Iowa

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NATIVE TREES IN AN URBAN AREA:
A CASE STUDY OF THE WATERLOO METROPOLITAN AREA
BLACK HAWK COUNTY, IOWA

An Abstract of a Thesis
Submitted
In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

Alice Christine Robbins
University of Northern Iowa
May 1988
ABSTRACT

This study investigates the history and role of the native forest in an urban area of about 100 square miles, encompassing the cities of Waterloo, Cedar Falls, and Evansdale in Black Hawk County, Iowa. It examines various human influences in an attempt to determine how important each has been in preserving or destroying the natural forest.

The original forests in the study area were concentrated along the rivers and adjacent bluffs. The most serious impacts to the upland forests have been agriculture, residential and commercial development, whereas the floodplain forests have been most affected by industrial expansion, gravel mining, flood control and highway projects. Overall, from 1855 to 1983, 70% of the forest loss was caused by agriculture and logging, and 30% by activities related to urban development.

A detailed analysis was performed using six aerial photo sets from 1937 through 1983, in order to determine more precisely the changes in woodland and their causes. Forest areas were designated as either dense (75-100% canopy cover) or open (5-75%), and acres of forest loss were measured and assigned to nine possible causes.

In the 1930's, patches of dense and open forest were equally prevalent in both upland and lowland areas. But the upland woods gradually became more open as development took place within them, while lowland forests became thicker and more extensive due to diminished grazing.
Over the 46-year period, forest loss was 1.7 times greater than forest regeneration. The greatest cause of total woodland loss was flood control, followed by agriculture, gravel mining, commercial/industrial development, and highway construction. When only dense woodland was considered, flood control and gravel mining were the most prominent causes, followed by highway construction, and commercial/industrial development. The predominance of flood control reflects a major effort under way over the last 20 years. The highway work in progress since the end of the study period, however, has now made highway construction the greatest cause of forest destruction.

Private actions were the predominant factors in forest loss until the mid-1960's, but since then, actions by the public sector (primarily highway and flood control projects) have surpassed them.

Forest preservation through parks has been much more effective in floodplains than in the uplands, partly because floodplains are less attractive for development, and partly because the uplands were urbanized during a time when cities were not interested in acquiring natural areas for parks (the 1950's and early '60's). County and state parks specialize more than city parks in the preservation of natural forest areas. An analysis of city parks revealed that significantly more woodland is present in donated parks than in purchased parks.

Knowledge of the causes of woodland loss and preservation should prove useful to planners and citizens interested in preserving their natural woodland heritage.
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This Study by: Alice Christine Robbins

Entitled: Native Trees in an Urban Area: A Case Study of the Waterloo Metropolitan Area, Black Hawk County, Iowa

has been approved as meeting the thesis requirement for the Degree of Master of Arts.

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Member, Thesis Committee

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Date: 4-29-68
Member, Thesis Committee

John C. Downey

Date: 6-23-68
Dean of the Graduate College
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CHAPTER 1: INTRODUCTION

Background

Forests of Iowa

When the State of Iowa was first settled, 15 to 20 percent of its land area was forested. The forests were concentrated along river valleys and the ridges adjacent to them, and were particularly heavy in the hills of the southern and northeastern parts of the state. (See Figure 1a). Most of the remainder of the state was prairie.

In Black Hawk County, where the study area is located, the wooded areas were found along the Cedar and Wapsipinicon River systems, and made up about 7% of the land (Western Historical Co., 1878).

Iowa's forests produce valuable hardwoods such as oak, hickory and walnut, but they have not generally been managed to produce a sustainable yield. Instead, they have been cleared for logging, agriculture and urbanization, until they now cover only 4% of the state (Fig. 1b). The federal and state governments as well as private organizations have tried various inducements to protect forest lands, but short-term economic forces have continued to promote clearing.

The shortage of timber was of concern to the early settlers in Black Hawk County and much of Iowa, and attempts have been made throughout the state's history to induce farmers to increase the wood supply by planting trees. Many farmers did plant woodlots, but imported lumber and the substitution of other materials for wood soon made a local supply economically unnecessary. Many woodlots were lost
Figure 1. Changes in Iowa Forest Cover, Mid-1800's to 1976.


during the 1970's when crop and land prices were high. Iowa is continuing to lose approximately 20,000 acres of forest a year, primarily due to the progressive decline of woodlands where grazing is permitted (D. Sand, personal communication, 1986).

Despite the overall decline of the natural forests and woodlots, trees have increased in some parts of the state. Some of the additional trees have become established in former prairie areas protected from fire, such as the Loess Hills, but most have been planted in cities and around farmsteads. Although urbanization is well known as a destroyer of natural environments, including forests, trees are highly valued for their shade and aesthetic qualities in urban areas. City residents plant trees, establish parks, and sometimes incorporate existing trees into new developments. A large proportion of Iowa's trees currently function as amenities in the human environment rather than as timber sources or as components of a natural ecosystem.

Trees in Cities

Trees have not always been accepted features of the urban environment. Ancient and medieval cities were compact, and although some had gardens and orchards within their walls, there was little room for shade trees. "Natural areas" were not found in towns. But slowly, beginning in about the 1500's, the attitudes of Europeans towards nature began to change. Instead of regarding nature as something that civilization had a duty to subdue, more people began to
appreciate natural beauty and wished to enjoy it in their daily lives (Thomas, 1983). In the United States, as in Europe, appreciation for nature in the urban environment became evident when farming and city growth had tamed the wilderness and put it beyond easy reach of city dwellers. By the 20th century, trees and parks had become integral to city development on both sides of the Atlantic. The term "urban forestry" is now applied to the planting and maintenance of trees in cities.

The profession of urban forestry generally concentrates on the planting and care of trees along streets and in parks (White, 1977). The focus of this study is the maintenance of characteristic elements of the natural forest indigenous to the region. My assumption is that native trees are desirable in an urban area. Native trees are already in place when an area is developed, so they provide a ready tree cover, avoiding the decades necessary for planted trees to achieve full size. They give character to the city; in the case of the study area, some of the native trees are spectacularly beautiful landscape features (Figs. 2 and 3). Most importantly, native vegetation provides a link with the land and its natural history.

Many American cities have grown up in forests, and as they have done so, some of the woodland has been cleared, some maintained intact, and some filled with buildings among the trees. Outside of the older downtown areas, agricultural development often precedes urbanization, leaving only isolated patches of woods for the city to
Figure 2. Bur Oaks as Landscape Features.
Figure 3. Shagbark Hickory and White Oaks in Cedar Falls.
expand into. In many eastern cities, farmland that was in production in the 17th and 18th centuries returned to second-growth timber prior to urbanization. In the midwest, which was settled later, natural savannas or artificial ones created by grazing have been popular locations for dwellings (Whitford, 1983). Many of the original trees in such areas still survive. Whether the original landscape was a thick forest or a grassland, the end result, at least in residential areas, is usually a landscape resembling a savanna.

The relationship of humans to the natural woodland around them is a topic of variety and interest, and the present investigation affords the opportunity to look at this relationship in an area whose size, history and geography make it an ideal setting for such a study.

Problem to be Investigated

Nature of the Problem

This study investigates the history and role of the forest in an urban area in Iowa, examining various human influences in an attempt to determine how important each one has been in preserving or destroying the natural forest.

Some of the questions asked about the study area were: what was the extent of the forests at the time of settlement? When and why were the forests cleared? How much of the original forest remains, and how is it being used? How have native trees been incorporated into urban development, and are the species being perpetuated? How effective have parks been in preserving natural woodland? How much
forest has been destroyed by other actions of the public sector, such as flood control projects, and how does this destruction compare with the amount of woodland preserved in parks? How does forest destruction by the private sector compare with that by the public sector? How has the quality of the forests changed over the years? And how has the fate of upland forests differed from that of floodplain forests?

The investigation was approached from both historical and spatial perspectives. Chapter 2 discusses the history of forests and humans in the study area as determined from literature, conversations and observations. Chapters 3 and 4 discuss the analysis of maps, aerial photos and park information in an attempt to quantify the effects of various land uses on the destruction and preservation of the woodlands. Chapter 5 contains commentary, comparisons and suggestions.

**Need for the Study**

There is considerable interest among conservationists and land use planners in preserving existing wooded areas. Tree protection measures have been incorporated in various local ordinances (mostly outside of Iowa), public agencies purchase wooded areas for parks and greenbelts, and landscape architects often attempt to incorporate existing trees into development plans. Public and private efforts to protect trees will be most successful when based on a realistic assessment of the situation. For that reason, a historical study of
the influences that have destroyed and protected trees in the past should prove valuable for future decision-making.

In the study area, I would also argue that there is a need for increased public awareness of the natural woodland heritage and the unique character that it gives to the land.

Study Area

The location of the study area and its general outlines are shown in Figures 4 and 5. The area includes the land inside the city limits of three cities along the Cedar River: Cedar Falls, Waterloo and Evansdale. There is also an unincorporated "county island" containing George Wyth park and some rural land between the park and Cedar Falls. Table 1 summarizes some basic facts about the study area.

Table 1

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Population</th>
<th>Sq. Mi.</th>
<th>Year Incorp.</th>
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<tr>
<td>Waterloo</td>
<td>75,985</td>
<td>62</td>
<td>1868</td>
</tr>
<tr>
<td>Cedar Falls</td>
<td>36,322</td>
<td>29.1</td>
<td>1858</td>
</tr>
<tr>
<td>Evansdale</td>
<td>4,798</td>
<td>6</td>
<td>1949</td>
</tr>
<tr>
<td>Unincorp. area</td>
<td>20</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>117,125</td>
<td>101.6</td>
<td></td>
</tr>
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</table>

Sources: U.S. Census and County Auditor's records.
Waterloo and Cedar Falls were established along the Cedar River and its wooded bluffs in the mid 1800's. Evansdale developed originally as a vacation community in the 1920's, and was incorporated as a city in 1949. The central city areas were built up early, but the outlying lands either developed later or remained undeveloped. Thus the native trees within the city boundaries have felt the effects of both rural and urban activities over the years. Agriculture, quarrying, construction, and park development are examples of important influences on the forests. These activities themselves have
been affected by social and historical trends that have changed the way they operate.

The study area is a particularly suitable location for an investigation of this kind for several reasons. It is of a manageable
size, so that personal inspection and interviews could be combined with written information to produce a picture not only of events but of attitudes affecting those events.

Its geography makes native forest areas readily distinguishable. Unlike sites that were completely wooded before settlement, the study area had well defined forested areas that can be singled out for study. The forest encompassed both floodplain and upland areas.

In addition, the native trees are fairly easy to identify. The cities are young enough that many of the trees that existed before urbanization are still standing; also, many native species are conspicuous because they have not been popular for planting.

The study area is not an unusually good example of tree preservation, but neither is it an unusually poor one. Thus it provides opportunities to investigate the results of "business as usual." Though the forces at work here are universal, their results are unique to the area. The purpose of this work is not to cast this metropolitan area as a prototype of other American cities, but to use it as a case study.

**Geographic Issues**

This project falls into one of the major fields of study within geography—the study of man and the landscape. While definitions of geography have changed over time and with different geographers, David Lowenthal's definition is well suited to the proposed study. He wrote that there are three realms of geographical study: the nature of the environment, what we think and feel about the environment, and how we
behave in and alter that environment (Lowenthal, 1967). The proposed project deals with all three of those aspects as they relate to the native forest in the study area.

Another geographer who described very well the kinds of issues that will be explored was Carl Sauer. He wrote in *The Morphology of Landscape*, "The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area is the medium, the cultural landscape the result. Under the influence of a given culture, itself changing through time, the landscape undergoes development, passing through phases, and probably reaching ultimately the end of its cycle of development" (Sauer, 1963, p. 343). The fact that the culture itself is changing is very relevant to this study, because social trends have had an important effect on what was done with the trees at any given time.

**Hypothesis**

A hypothesis for this project would involve predictions as to the answers to the questions posed above under the heading, "Nature of the Problem." I was aware that the original forests had been concentrated along the rivers and adjacent bluffs, and I expected to see a steady decline in both acreage and forest quality as the area was settled and developed. I expected that agriculture had been a major cause of forest loss in the early history of the area, with urban development becoming more important in recent times. I had observed the effects of large public works projects, but was unsure whether the amount of forest destroyed would compare with the amount protected by the public
sector. I had noticed that woodland protection through the park system was considerably more effective in floodplains than in uplands. The upland oak-hickory association appeared to be in danger of disappearing, with little protected in parks and little replanting of these native species by either the public or the private sector.

Review of Related Literature

The literature review will cover three areas: the value of trees in cities, the original tree cover of the study area, and related research. Because this study is largely historical, literature review is a major part of Chapter 2 (Historical Development of the Study Area).

The Value of Trees in Cities

The subject of trees in cities, or urban forestry, has generated a wealth of literature. There are numerous publications detailing the tangible benefits of trees in the urban environment: shade, pollution abatement, noise attenuation, temperature moderation, etc. (Gray & Denecke, 1978; Robinette, 1972). The benefits of trees have also been described by some researchers in terms of increased property values (Payne, 1973) and increased use of parks (Gold, 1972, 1977).

The other aspect of the issue is more spiritual. Trees in the urban environment are praised for their beauty, grandeur, moral benefits, and links to nature. A few quotations from 1911 to 1980 should illustrate the tone of this literature.

"The morale of a people is unquestionably in exact keeping with the outward and manifest appearance of the municipal home. Few
things contribute more to the cultivation of local pride and civic patriotism than beautiful trees in the parks and in the streets" (Solotaroff, 1911, p. 5).

"Travel where one may, in this country or abroad, it is soon learned that the final test of a city's beauty is its shade trees" (Pack, 1922, p. 19).

"Trees, rather than buildings, are the best measure of the civilized landscape. A community in which many mature trees survive and more are planted regularly demonstrates a sense of time, history, and continuity on the land" (Eckbo, 1964, p. 12).

"The potential of trees in shaping and humanizing cities remains an unperceived amelioration for a civilization that has nearly forgotten the relevance of art in civic design" (Arnold, 1980, p. 39).

In studies of children, trees and woods have been found to be among the best loved and remembered features of the city, and to provide an environment for creative and healthful play (Lukashok & Lynch, 1956; Litton, 1966; Hart, 1973).

In the early part of the twentieth century there was a great upsurge of interest in city beautification, including street tree planting and the development of parkways and greenbelts. We still enjoy the benefits of the street trees planted at that time, and of the guidelines and organizational structures that were created then.
In the past 20 years, there has been greater interest in preserving native trees, and literature is available on methods for states and cities to utilize in their efforts to preserve trees (American Society of Planning Officials, 1968; Tandy, 1972). Many cities have tree ordinances limiting the destruction of existing trees by public or private actions (Gray & Denecke, 1978). In Florida, for example, urban forestry ordinances typically emphasize the protection of unique natural plant communities and historic trees (Harrell & Gornicke, 1981).

The planting of native trees remains a somewhat neglected subject. Commercial nurseries frequently do not offer native varieties for sale, particularly if they are slow-growing or difficult to transplant. Guidelines concerning trees for planting generally evaluate the characteristics of various cultivated species for urban environments and climatic zones, but this information usually provides no guidance or encouragement concerning the planting of species native to the area. A notable exception is the work by Gary Hightshoe of Iowa State University, who has published a guidebook on native trees of the eastern United States, providing information on the characteristics, care, and original range of each species (Hightshoe, 1978). His study confirms, however, that many of these native species are unavailable commercially.

**Original Tree Cover in the Study Area**

The term "original tree cover" should not suggest something static and primeval. Since the state of Iowa was glaciated over
10,000 years ago, its forest and prairie vegetation have undergone continual change (Van der Linden & Farrar, 1984). The cool climate early on would have favored a spruce-fir forest similar to that of Canada. Later, warmer and drier conditions led to the invasion of hardwoods from the south and west, to be replaced in turn by prairie grasses throughout most of the state. For the past 4000 years, the climate has moderated and the hardwoods have expanded into the prairie zones. At the time of settlement this process was under way, with the bur oak prominent at the expanding forest edge where it could make a stand against drought and prairie fires. In this study, the term "original forest cover" refers to the forest cover present in the mid 1800's when settlement began.

The original survey notes for Black Hawk County provide an indication of the forest cover in existence at the time the area was surveyed (1855). Early forest cover is also shown on some nineteenth century hand-drawn maps, as illustrated in Figure 6 from 1875. The analysis of survey notes and early maps will be discussed further in Chapter 3.

In his book, Iowa As It Is in 1856, N. Howe Parker wrote that Black Hawk County had some of the best soil and timberland in northern Iowa (Parker, 1856). The Cedar River was heavily wooded all along its course through the county, except at the site that later became downtown Waterloo. There, the river ran through prairie for about half a mile on either side of the rapids. The area was a natural
river crossing, and its treeless character inspired the early name of the town, "Prairie Rapids" (Baldwin, 1982).

Cedar Falls, on the other hand, was established on a wooded site. The timber extended southward to about 4th Street in the western part

Figure 6. Forest Cover in the Study Area, 1875.

of the city, and to the intersection of Rainbow Dr. and Waterloo Rd. in the eastern part (Sweet, 1981). A local businessman writing a history of the city made this comment on the fate of the trees in the downtown area: "All east of Clay Street was heavy timber and thick underbrush. All that remains of the thousands of beautiful native trees, are the few now standing in the City Park between Franklin and Clay Streets [Overman Park]" (Leavitt, 1928, p. 5).

The high bluffs south of the river between Waterloo and Cedar Falls hosted an extensive upland forest community. A similar upland forest was found in Evansdale, in the neighborhood now known as Casebeer Heights. The nearest similar communities were outside of the county. To the north was the Big Woods between Denver and Waverly in Bremer County. To the south, upland forest covered a paha ridge in Tama county, part of which is now in Hickory Hills Park.

In the late 1800's and early 1900's, Iowa botanists explored and described the state's biota, reporting their findings in journals such as the Proceedings of the Iowa Academy of Sciences. Black Hawk County does not seem to have enjoyed great favor as a research site, but general information for similar areas and observations of existing trees can supplement the few studies in the county to fill out the picture of its early vegetation.

Gary Hightshoe, in his article "The Natural Forest Communities of Iowa" (Hightshoe, 1981), reviews the literature and combines those studies with personal observations to arrive at a classification of
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<td>Wet</td>
<td>lowland riparian successional</td>
<td>willow-maple-poplar</td>
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<tr>
<td></td>
<td>lowland alluvial flats</td>
<td>oak-birch-planetree</td>
</tr>
<tr>
<td>Wet-mesic</td>
<td>lowland mixed floodplain</td>
<td>maple-hackberry-elm-ash</td>
</tr>
<tr>
<td>Mesic</td>
<td>upland mesic climax</td>
<td>maple-linden</td>
</tr>
<tr>
<td>Mesic-dry</td>
<td>upland mesic-dry climax</td>
<td>oak-linden</td>
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<td></td>
<td>upland mesic-dry successional</td>
<td>aspen</td>
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<td></td>
<td>upland mesic-dry northern forest</td>
<td>pine-fir-birch</td>
</tr>
<tr>
<td>Dry</td>
<td>upland dry climax</td>
<td>oak-hickory</td>
</tr>
<tr>
<td></td>
<td>upland dry savanna</td>
<td>oak savanna</td>
</tr>
<tr>
<td></td>
<td>upland dry successional</td>
<td>cedar glade</td>
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</table>

forest communities, shown in Table 2. Most of these communities were represented in the study area. The pine-fir-birch association, which is rare in the state, was not present. In addition, large red cedar trees were found along the river banks. Most of those cedars were cut and sold by early fortune-seekers before the area was permanently settled.

The progression from wet to dry communities as set out in Table 2 can be illustrated by the change in forest composition from the Cedar River south through Hartman Reserve to University Avenue (see Figure 5 for these locations). Willow, silver maple, and cottonwood (Eastern poplar) line the riverbanks. Maple-basswood (linden) and oak-basswood associations are common in Hartman Reserve. The oak-hickory community is still visible in the residential areas between Grand Blvd. and University Ave., and some of the bur oaks of a former oak savanna remain standing along University Avenue.

One of the few detailed forest inventories in the study area was performed in the 1920's by O. R. Clark of the Iowa State Teacher's College in Cedar Falls. In a preliminary report entitled "An Ecological Comparison of Two Types of Woodland" (Clark, 1926), he compared the vegetation of the bluffs three miles east of Cedar Falls (probably near Hartman Reserve, but the exact location is unknown) to that of a lowland area near Snag Creek north of Cedar Falls (in or near the University of Northern Iowa's Matala Preserve).

The woodland on the bluffs was designated a Red Oak-Linden community, which was described as follows:
This forest is clearly an extension of the deciduous, climax forest which centers in the Ohio Valley, the less mesophytic character of this extension being indicated by the fact that the Red Oak (Quercus rubra) and the Linden (Tilia americana) have assumed a dominance not possible to them in the main climax forest farther eastward. Besides the two main species mentioned the Shagbark Hickory (Carya ovata) is also dominant and other prominent species are Quercus alba, Fraxinus americana and F. lanceolata, and Ulmus americana [white oak, white ash, green ash and American elm]. The hard maple (Acer saccharum) is frequent on the moist slopes of the ravines though it does not reach a large size. At the bottom of the bluffs near the river the Black Walnut (Juglans nigra) and the Butternut (Juglans cinerea) are abundant and assume a large size. In the more open situations the intolerant Large-toothed Aspen (Populus gradidentata) and the American Aspen (Populus tremuloides) are found though they are unable to compete with the dominants, as indicated by the standing dead trunks. The trees stand fairly close together with tall, straight trunks and small crowns. The crowns usually touch each other producing practically continuous shade beneath. Beneath the larger trees the Hop Hornbeam (Ostrya virginiana) is very abundant but never reaches large size and is able to survive only because of its tolerance. Aside from this species the layer of small trees and shrubs is not well developed though Xanthoxyllum americanum [prickly ash] and species of Cornus, Crataegus and Ribes [dogwood, hawthorne and gooseberry] are frequently found. (Clark, 1926, pp. 131-132)

The other area studied was a Bur Oak-Black Oak woodland located on an old floodplain along Snag Creek, about a mile north of downtown Cedar Falls:

This woodland is much more open than the one previously described, open spaces are common in which prairie species are found... The two dominant species, Quercus macrocarpa and Q. velutina [bur oak and black oak], make up the bulk of the woody species, the number of individuals of other species not being large. The list of shrubs found is practically limited to the Prickly Ash (Xanthoxyllum americanum) and species of Ribes, while the herbaceous ground cover is much less luxuriant than in the first type described. (Clark, 1926, p. 133)

In 1975 and 1978, vegetative inventories were conducted at Hartman Reserve (INRCOG, 1975; Black Hawk County Conservation Board,
The forest contains remnants of both oak-hickory and maple-basswood types, the first being adapted to open areas with high light intensity, and the second to closed, shaded environments. A red oak-basswood association is very common at Hartman, and is thought to represent a transition zone between light-tolerant pioneer species and the more mesic maple-basswood association common in the lowlands.

In the absence of human settlement, bur oak, white oak and hickory would have continued as pioneer species at the expanding forest edges, while red oak, basswood and maple would eventually have dominated the older, more shaded forest areas. But the lumbering of the late 1800's set back the successional timetable and allowed the pioneer species to regenerate in the cut-over areas. Thus the predominance of oaks and hickories in the uplands today is related to the logging practices of 100 years ago.

Related Research

Several studies have a particular relevance to the research described in this report. One is a University of Northern Iowa Master's thesis on local natural areas, one is a comparison of tree canopy cover and land uses in Dayton Ohio, and the others are studies of historical changes in natural lands in the midwest.

Mary Duritsa, a Black Hawk County naturalist, wrote a thesis that inventoried natural areas within Black Hawk County (Duritsa, 1983). The inventory included natural woodlands within the metropolitan area, but not woodlands that have been incorporated into urban development. The forests were broken into four categories according to quality.
(The present study was done with its own criteria and did not borrow from this earlier one.) Of 3044 acres of upland forest in the county, less than 100 were of high quality. Among those were portions of Hartman Reserve and the privately-owned tract known as "Cooper's Woods" in the city of Cedar Falls.

Duritsa's study was based on conditions existing in 1979, but she commented that examination of 1957 and 1979 aerial photos revealed substantial regrowth of woodlands, almost exclusively in floodplains. That observation was borne out by this study as well.

An investigation of Dayton, Ohio by Ralph Sanders concentrated on trees in urbanized areas rather than in remaining natural stands (Sanders, 1983). Sanders measured tree stocking levels and correlated them with seven different land uses. The highest tree stocking levels (around 50-60%) were found in one- and two-family residential areas, and the lowest in commercial and industrial/transportation areas. Parks, institutions and multi-family housing fell in between the other two categories. Variations within each land use were apparent, for example at modern office parks with extensive landscaped grounds.

Sanders commented on the fact that parks generally had fewer trees for their land area than one- and two-family residential neighborhoods—a trend that is apparent in this study as well. This led him to question whether the landscaping of public spaces was truly meeting the needs of people as shown in their own landscaping choices.
Neither of the previously mentioned studies looked at changes through history, but several other studies have taken that approach. I will review three that focused on the midwest.

John Curtis (Curtis, 1956) discussed the changes in forest quality that occurred in the mid-latitudes as a result of human activities. He distinguished two periods of land alteration: peripheral (before full settlement) and agro-urban. In the study area, peripheral development probably would have included the cutting of the large cedars. In the early period of agro-urban development, fires are reduced, allowing the quality of forest stands to improve. At the same time, forest area is decreasing due to logging and agriculture. Later, grazing severely damages the quality of the woodlands. Both grazing and logging change the character of the forest, encouraging the growth of species that can withstand the pressures. In formerly grazed lands, for example, thorny species thrive, while in forests that have been selectively logged, the more undesirable species are left to reproduce. Clearcutting encourages the growth of pioneer species adapted to heat and dryness.

The oak savannas that were not either cleared or cultivated often became forests due to the lack of fire. Consequently, oak savanna with its original prairie groundcover is one of the rarest vegetative communities in the country.

Another study (Whitford, 1977) traced the ecological history of the Milwaukee area as it became urbanized. The original vegetation was primarily woodland with some oak savanna, marsh, and meadow. By
1860, over half of the land had been cleared and plowed, and by 1870 most of the forest had been cut. Many of the remaining woodlands were grazed, preventing regeneration of native species. During the 1940's and '50's, the city expanded rapidly into the surrounding terrain. The resulting changes in the drainage system caused flooding, leading to the straightening of area streams. The stages in Milwaukee's development were several years ahead of those in the study area, but closely paralleled them.

Another project that was carried out in several states focused more directly on the forest patches remaining after early clearing (Sharpe et al., 1986). Researchers mapped forest cover and other landscape elements for pre-settlement times, the late 1930's (date of the first aerial photos), and the most recent year available. The forest islands were then studied in more detail. The researchers found that as the size and number of forest islands decreased, they become increasingly dominated by plants and animals that live at forest edges. Their isolation from each other also inhibited dispersal of organisms and seeds, thus changing their species composition in other ways.

Study sites for the project included a portion of southeast Wisconsin, which was researched by the botany department at the University of Wisconsin, Milwaukee. Several of the trends visible in an urbanizing area there are also visible in the Waterloo area. For example: almost all of the upland forest except a few woodlots had disappeared by 1937, but many of those woodlots were still present in
1975. Gravel pits increased greatly in area as the land became urbanized. An interesting comment made by two of the principal researchers was this: "Comparing this grid with others that are more highly agricultural, surprisingly we find that urbanization results in greater retention of natural vegetation. In agricultural areas of Wisconsin, fencerows, natural woodlots and wetlands are being destroyed at higher rates than in Hales Corners [the urbanizing area]" (Dorney & Stearns, 1980, p. 14).

The present study differs from the one just described in that it is more limited in area, it quantifies changes only in woodlands, not in all land uses, and it does not have the ecological focus. However, it pinpoints specifically which uses were responsible for woodland loss, and it distinguishes between dense and open woodlands, allowing for changes in woodland quality to be visible on the maps.
CHAPTER 2: HISTORICAL DEVELOPMENT OF THE STUDY AREA

Early Settlement

The Cedar Valley was highly regarded by early Iowa settlers for its beauty and its varied resources of river, timber, and prairie. Both Cedar Falls and Waterloo were established at the sites of river crossings and potential water power development, providing the basis for future city growth. The availability of wood and farmland completed the favorable picture (Berry, 1927).

Many of the original settlers in the study area chose the types of homesteads favored by Iowa pioneers--at the edge of the timber. Once the farmers had access to a plow that could break the prairie sod, they no longer needed to imitate their eastern brethren by clearing forest land for crops. They chose the timber edge where they had prairie land for farming and wood for building materials, tools, and fuel. Several of the early families in the study area, such as the Adams' and Overmans in Cedar Falls and the Hannas in Waterloo, built their homes in such areas. The Hanna homestead, on the site just east of Tunis Drive (Food 4 Less), was at the highest point between Waterloo and Cedar Falls (Corwin, 1983). Nestled against the woods in the congenial oak savanna, it looked out over the prairie to the valleys of Black Hawk Creek and the Cedar River.

In his reminiscences about the Big Woods in Bremer County, Charles E. Hall remembered how fortunate the dwellers on the timber edge considered themselves in relation to their friends on the prairie (Hall, 1931). They not only had access to timber but
were able to enjoy wild game, nuts, blackberry jam, crabapple jelly, and maple syrup. This must have been true near the woods in Black Hawk County as well.

Lumbering

The Iowa pioneer who owned a partly wooded tract was not waging a battle against the forest, but was a careful and prudent craftsman in wood, according to historian George Parker. Farmer in summer, woodman in winter, he cut trees judiciously and knew the properties of each kind of wood, often making articles for sale as well as for home use (Parker, 1940). Botanist L. H. Pammel agreed that, far from being a forest-hater, the Iowa pioneer respected the woods. In 1904 he observed that "not a grove of native trees stands in Iowa today that does not owe its existence to the fostering care of some pioneer" (Pammel, 1905, p. 5).

Despite the fact that the Cedar River valley in Black Hawk County was relatively well endowed with timber compared with more open areas, the early settlers were aware of its limitations. The History of Black Hawk County by John C. Hartman includes this excerpt from an 1855 letter written by Elizabeth Kitchen of Waterloo (Hartman, 1915, vol. I, p. 124):

Wyatt says nothing will ever make him leave Waterloo but the scarcity of timber. A good chance to get wood land would be a great temptation. In other respects we are well enough suited here, but wood will be high and hard to get before many years. Lumber too is dear and scarce... If we had a little more woodland this would undoubtedly be one of the best portions of the United States, as it is one of the handsomest.
To satisfy the demand for wooded acreage, forest land was often divided into small tracts and sold to people who lived some distance away from the timber edge. An acre of woodland was worth five to twenty times as much as an acre of prairie (Hall, 1931). While tracts of 80 or 160 acres were standard on the prairie, five to fifteen acre plots were common in the wooded areas. These small tracts may be seen on the early plat maps of Black Hawk County.

The pioneer farmer's need for wood was soon supplemented by the needs of the growing cities and the railroads that served them. The first mill in Waterloo was a sawmill established in 1854 (Western Historical Co., 1878, p. 382). By 1860 Black Hawk County had 12 sawmills in operation employing an average of 42 workers each (Haworth, 1933), and by 1878 the authors of the History of Black Hawk County were able to state that nearly all of the virgin timber in the county had been cut off (Western Historical Co., 1878). They also adopted a commonly-held optimistic view, stating that "much of the land it covered has come up with second growth and many groves have been planted by the settlers, so the supply has increased rather than diminished" (Western Historical Co., 1878, p. 308). Nevertheless, 27 years later the Iowa Geological Survey reported that the Cedar River valley in Black Hawk County "was once wood clad, but now much of it has been deforested" (Arey, 1906, p. 415). To supplement local supplies, a great deal of wood for the urban area was obtained from the Big Woods in Bremer County (Hall, 1931).
In Iowa as a whole, local lumber production reached its peak in about 1870. During the mid to late 1800's, as the lumber industry developed in the pine forests of Minnesota and Wisconsin and rail transportation was extended throughout Iowa, the northern softwoods became available for use here. John G. Miller, who operated a lumberyard in Waterloo, mentions in his memoirs that he switched from local to imported supplies in 1898, purchasing lumber from Dubuque (Miller, 1955). Lumber mills along the Mississippi were an important industry in the state, and the total amount of lumber sawed in Iowa continued to increase until about 1890. By 1913, however, the northern forests were exhausted and the Iowa sawmill industry had become small and localized once again (Haworth, 1933).

As the lumber industry turned back to local sources, some of the last of Iowa's great trees were felled. Thomas H. MacBride made the following statement at the 3rd annual meeting of the Iowa Park and Forestry Association in 1903 (MacBride, 1904, p. 6):

Our people have pretty well used up the original stock of native trees and have not yet felt the need of a new supply. Our old oaks and walnuts stood in primeval beauty for years while the forests of Minnesota and Wisconsin furnished forth pine for less money than it required to convert our century-old trees into lumber. Within about 15 years, however, these conditions have changed; pine lumber has become more and more expensive and it has at last become profitable to use the hardwoods of our own ravines and river plains. The result has been the almost absolute destruction of the original forest of Iowa.

That process was observed locally by John C. Hartman, a historian and editor of the Waterloo Courier. In explaining his contribution
for the purchase of a YMCA camp (now Hartman Reserve), he made the following comments (Forest Reserve, 1938):

Since boyhood I have roamed the woods and fields around Waterloo, and I have been sorry to see what has happened to many of the scenes of natural beauty. The trees along the Cedar have been felled in most places, and my desire that one of the few remaining tracts of virgin timber be preserved in its natural state led to my interest in this project.

Some of the timber cutting witnessed by Hartman occurred during the Great Depression, when many families who could not afford coal cut trees for firewood (L. Katoski, personal communication, May 7, 1986; M. Schwanke, personal communication, 1987).

Agriculture

Even though some lumbering continued after the boom of the late 1800's, the major threat to the forests had shifted to another area--farming. The time period between the end of the 19th century and World War I was one of unprecedented prosperity and security for farmers; in Iowa, land prices increased by 127% between 1900 and 1910 (Ross, 1951). As a result, farmers invested in land, mechanization, and drainage projects. It is likely that woodland clearing was a part of this trend as well. During the war, there was pressure for increased production, which might also have led to cropland expansion. After the war the agricultural community engaged in overinvestment and speculation, leading to the crash of 1921. From that time through the depression, financial hardship resulted in many people turning from coal back to wood as a fuel source.
A local resident who arrived in Cedar Falls in 1911 remembers that University Avenue (at the forest/prairie border) ran mostly through farms (O. Paine, personal communication, July 30, 1987). He suspects that forested tracts originally maintained for timber supplies were used as grazing land for dairy cattle, and eventually were cut altogether. The 1910 County Atlas, a part of which is shown in Figure 7, confirms the fact that farms had been established in the upland forest area by that date (Atlas of Black Hawk County, 1910). But a fondness for the woodland is evident in their names: Oak Land Farm, Greenwood Farm, Hickory Grove Farm, Oak Heights Farm.

Raymond J. Becraft (a student of L. H. Pammel) in 1923 described an upland forest community near Ames similar to the one in the study area. The effects of human activities that he mentioned were no doubt also being felt here (Becraft, 1923, p. 13):

The upland society has three dominant species: bur oak, shagbark hickory, and white oak. It is here that man has encroached most on the forest domain for his farming land. Judging from the remaining trees, white oak has suffered most in the cutting, and there are, indeed, but few good patches of this valuable species remaining . . . Cutting and heavy pasturage together threaten the ultimate destruction of the upland forest.

A potentially useful source of information on changes in farmland and woodland is the U.S. Census of Agriculture. The census data for Black Hawk County from 1885 to 1969 are presented in Table 3. Unfortunately, the census information contains large fluctuations that are hard to interpret and tend to mask directional trends.

It is not possible to see the early growth of farm acreage and loss of woodland, because the data do not begin until 1875. By that
Figure 7. Agricultural Development, 1910.

Table 3
Land in Farms, Black Hawk County

<table>
<thead>
<tr>
<th>Year</th>
<th>Land in Farms (Acres)</th>
<th>Woodland on Farms (Acres)</th>
<th>Natural</th>
<th>Planted</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
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</tr>
<tr>
<td>1875</td>
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<td>1880</td>
<td>344,200</td>
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<tr>
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<td>16,779</td>
<td>18,977</td>
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<td>11,700</td>
<td>13,773</td>
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<td>334,111</td>
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<tr>
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<td>3,152</td>
<td>6,586</td>
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</table>

Sources: Census of Iowa and U.S. Census of Agriculture

time the amount of farmland claimed in the county was already at a high level— in fact a higher level than ever recorded since. Perhaps this reflects overambitious estimation of acreage, or perhaps the decline in the late 1800's is due to the expansion of the cities.
The increase in woodland on farms between 1895 and 1910 may reflect the expansion of farmland into wooded areas. The decline in the 1930's may reflect the effects of the Depression, although those effects might have been expected earlier in the decade. The urbanization of the 1950's and '60's shows up in the decline of both farmland and woodland.

The Department of Agriculture began taking aerial photos in Black Hawk County in 1937, by which time a drastic reduction in the original forest acreage had occurred. Subsequent photos show that clearing for agriculture continued after 1937 in Evansdale, which was still largely rural. But in most of the study area, wholesale clearing for agricultural purposes appears to have come to an end by the close of the 1930's. Rapid postwar urban development was the next dominant influence on the local forests.

Urban Development

Downtown Waterloo had been established at a location where the prairie descended to the water's edge. Thus the development of the central city required little forest clearing. In Cedar Falls the situation was different. As in most of the eastern cities, clearing was necessary as the city developed. In its early days, "complaints were heard that one could not drive down Main Street for the stumps" (Western Historical Co., 1878, p. 35).

By the end of the 1800's however, the clearing of forests for Cedar Falls' development had slowed. William Galloway developed the city of Cedar Heights (east of Cedar Falls, now a part of that city)
along the Cedar River bluffs between 1900 and 1910, but here a new trend emerged: many of the native trees, predominantly oaks and hickories, were preserved in the yards of the homes. Many may still be seen today.

During the 1920's Jack Casebeer began developing cabins on the wooded bluffs overlooking the river in what would later become the city of Evansdale (Inman, 1972). Here as well, the houses were built among large oaks. The early cabins were later joined by more modern homes, but the oaks remain.

Up until the 1950's, Cedar Falls, Waterloo and Evansdale remained fairly compact individual entities. Cedar Falls and Waterloo were separated by about six miles of farms, attractive country homes, and patches of woods.

Aerial photos after 1950 show an explosion of subdivisions between Waterloo and Cedar Falls. Interestingly enough, however, the small wooded patches that remained after 1937 do not disappear from the photos. The trend begun in Cedar Heights continued. Instead of clearing the woods for subdivisions, developers and builders for the most part cleared selectively for the houses and streets and left some trees in the front and back yards of the homes.

In many cases wooded locations were preferred for development, and several wooded areas outside of the flood plain became the sites of expensive homes. Streets were laid out to conform to woodland boundaries, and the names of streets and neighborhoods often reflected this: Edgewood Drive; Oak Avenue; Acorn Lane; Sunny Lane and Shady
Lane (one outside and one inside an oak grove); Hickory Street, and Royal Oaks subdivision. Certain large lots, such as those along Sunset Dr. in Cedar Falls, retained patches of woodland in the rear yards, complete with understory. Further toward the bluffs north of Grand Blvd., expensive, rustic-style homes were built in the woods with little or no lawn.

Housing development within woodlands can make use of the trees as landscape features, but at great cost. In most cases a woodland that is developed is sterilized in the process--only the mature trees are retained, and there is no understory for wildlife or for the small trees that would eventually take the place of the older ones. In this sense, urban development has effects on the forest almost opposite to those of logging. Logging operations take the mature trees but allow the forest to regenerate itself. Urban development retains the mature trees but prevents regeneration.

It is common for trees to live longer in residential areas than in the countryside where agriculture and lumbering continue (Carney, 1987). But these mature trees are vulnerable to harm as part of an urban setting. Some are cut by homeowners who want a sunny garden or are afraid of limbs falling in a storm. Street and drainage projects take their toll. And trees can also be loved to death. People who do not understand the importance of protecting a tree's root system build buildings, driveways, and parking lots too close to trees and kill them (Fig. 8).
The eventual outcome of an urbanized woodland is a change in its character, as described by Gray and Denecke (1978, p. 26): "In many cases, native forests have been urbanized as cities have grown into them. Often in these situations, the original forests have been so altered by the supplemental planting of introduced species that they
have taken on the characteristics of manmade forests." This process is under way in the study area, especially in the upland forest areas where residential development has occurred, but very little land has been preserved in its natural state.

The last remaining large patch of ridge-top forest in the urban area was Hanna's woods. Located across University from the old Hanna homestead, it was long the site of annual Old Settlers picnics (D. Sulentic, personal communication, 1983). After the war, however, it was sold and converted, little by little, into nursery plots and a row of homesites. The Waterloo Park Commission offered to purchase a portion of the woods, but the nursery owner was not interested. Perhaps Hanna's woods exemplifies Pammel's statement that "the passing of the fathers of the commonwealth has sealed the fate of the primeval woods" (Pammel, 1905, p. 5).

Despite the loss of woodland in the postwar era, this same time period resulted in the preservation of two large and important wooded tracts: Hartman Reserve, which became a county park, and the Black Hawk Creek greenbelt, which was purchased by the City of Waterloo. Hartman Reserve is considered the only protected area of upland forest in the county. It contains an active nature center and a great diversity of forest communities, although it does not extend out to what was once the prairie border. The Black Hawk Creek greenbelt is a linear park in a wooded floodplain offering trails for hiking, horseback riding, and cross country skiing.
Parks

Hartman Reserve and the Black Hawk Creek greenbelt are examples of forest preservation by public purchase. The acquisition of forest land for parks would be considered by most people the logical way to protect such land. People interested in natural scenery would tend to agree with William H. Whyte that "land that is best for parks tends to be land with slopes and streams and woods" (Whyte, 1968, p. 168). But that is not necessarily so in the minds of park planners. This study looks into the history of park development in the study area to determine to what extent forests have been protected by public purchase. In order to understand the process, it is necessary to investigate the purposes that local officials had in mind when they planned the park system.

Park development in America has gone through several stages in its history. Galen Cranz, in his book *The Politics of Park Design* (Cranz, 1982), identifies the following major eras: The Pleasure Ground (1850-1900); the Reform Park (1900-1930); the Recreation Facility (1930-1965); and the Open Space System (1965-present). Those stages are most visible in large cities, but small cities of the Midwest such as those in the study area also responded to the trends, although in a somewhat milder form.

When Waterloo and Cedar Falls were founded in the 1850's, they had single blocks set aside as public squares. Cedar Falls had Overman Park and Waterloo had Washington Park on the west side and Lincoln Park on the east side of the river. These were formal public
spaces designed in an older European style. Overman Park (Fig. 9) was the only one of the three that was naturally wooded (Leavitt, 1928).

Figure 9. Cedar Falls, 1868.
Source: Birdseye View of Cedar Falls, Black Hawk County, Iowa, 1868.
These small squares remained the only public parks in the two cities until after 1900, with the exception of College Hill Park in Cedar Falls (another small urban square, now called Seerley Park).

Meanwhile, the Pleasure Ground movement was being ushered in with the development of Central Park in New York, designed by Frederick Law Olmsted and Calvert Vaux. The ideal of the pleasure ground was to create a picturesque, pastoral environment in which to escape the noise, dirt and crowds of the city. Many pleasure grounds, including Central Park and Golden Gate Park in San Francisco, were manmade landscapes designed so that one pleasing vista would open into another as the visitor moved through the park. Activities in these parks were primarily passive—strolling, boating, picnicking, and riding along the winding paths on a horse or bicycle—but facilities for sports such as tennis and croquet were frequently included.

At the time that pleasure grounds were developed, life for the average working family in a large city was dismal. After long hours in a dirty and unsafe factory, the worker would return to a one-room tenement that housed an entire family without windows or running water. High infant death rates, tuberculosis and other diseases were common. The promoters of pleasure grounds—primarily the wealthy and influential—wanted to provide a bit of nature to help uplift the common man, but also to give the aristocracy a place to promenade in their fine carriages. Pleasure grounds have been criticized as being patronizing and sentimental, but many of them continue to be very
successful and their landscapes remain some of the most beautiful urban environments to be found anywhere.

Pleasure grounds reached their peak of popularity in the late 19th century, and they spread to smaller urban areas that did not have the pressing social problems of the big cities. Cedar Falls once anticipated having a pleasure ground of its own. In Peter Melendy's 1893 book on Cedar Falls history, he provides a diagram of such a park, to be named Rownd's Bluffs or Garden City Park, which would have been located on 130 acres on the bluffs east of the city (Melendy, 1893). The plan is shown in Figure 10. According to Melendy, the plan was already laid out and the park was being developed by the Rownd brothers (a wealthy and influential local family). The site was naturally wooded, sloping down to the river, and would have been a spectacular location for a park. But the park remained only an idea.

The historical tract entitled Cedar Heights at the Cedar Falls Historical Society library mentions the park envisioned by Melendy, but states that "it took the enterprising William Galloway to actually develop it" (Cedar Heights, n.d.). Galloway purchased the land from rainbow Drive to the river and from Belle Ave. to Parrish, including the Rownd property, for the city of Cedar Heights. "When Mr. Galloway platted the area," says the historian, "he allowed for a park which is Lookout Park." Lookout park has a small promontory with grass and picnic tables that commands a fine view. Attached to this are some steep ravines that have retained their natural forest cover, but the
Figure 10. Plan of Bluff Park, 1893.

Source: Melendy, Peter. (1893). Historical Record of Cedar Falls, the Garden City of Iowa. Cedar Falls: Peter Melendy.
park bears no resemblance to the 130 acre pleasure ground that was once planned for the area.

It must be noted that Rownd's Bluffs Park was to be privately owned. Other parks developed in the late 19th century were privately owned as well, for example Sans Souci Park, Electric Park, and the Cedar River Park. All of these areas were in the floodplain near the confluence of Black Hawk Creek and the Cedar.

It was not until after 1900 that the cities became involved in parkland acquisition. The early 1900's could be compared to the 1960's and early 70's in that there was an awakening awareness of nature, a desire to solve social problems, and a commitment to making city life more agreeable. Between 1906 and 1911 the City of Waterloo acquired Byrnes Park (then called Prospect Park), Cedar River Park, the City of Waterloo Park (an extension of Cedar River Park), Lafayette Park, Gates Park, and two riverfront parks opposite each other (Waterloo's City Park System, 1909).

Cedar River Park was in a wooded floodplain. Mature trees now remain in a lawn type setting throughout much of the park. Byrnes and Gates were large parks located in the newly developing areas on both the west and east sides of town. Byrnes was not naturally wooded, but Gates Park contained an oak grove along Virden Creek (Fig. 11).

Cedar Falls was not far behind Waterloo, establishing its Park Board in 1917. By 1921, the city had acquired four of its most popular parks, all of them partially wooded. Island and Tourist Parks are located across the river from downtown and were purchased by the
Figure 11. Gates Park.
city. Pfeiffer Spring park and part of Washington Park, near the mouth of Dry Run Creek, were donated by Henry and Annie Pfeiffer. All four of these parks are in the floodplain except for a portion of Pfeiffer Spring.

Washington Park was once larger than it is now. Its original plan (dated 1919) shows a major portion of the park along the wooded north bank of Dry Run Creek opposite Pfeiffer Spring Park (Fig. 12). Stepping stones in the river once led to a shelter house there. But through an unrecorded or unofficial transaction, the land was turned

Figure 12. North Bank of Dry Run.
over to Cedar Falls Utilities. It is now scheduled to become the site of a 4-lane highway. The park also extended northward to include land now used by the Cedar Falls Wastewater Treatment Plant (R. Bruns, personal communication, August 12, 1987).

The "City Beautiful" was a commonly heard term in the early 1900's, and to achieve it some cities built downtown malls, impressive public buildings, parks and parkways. The idea of a system of parks connected by river valleys or landscaped drives took hold in many cities, but had only a brief moment of favor in the study area. That moment is preserved in a 1910 map of existing and proposed park areas in Waterloo (Robinson, 1910). It shows a greenbelt connecting Lafayette Park to a park along the river, a proposed greenbelt along Virden Creek, and a proposed parkway from Lafayette Park to Independence Ave. The Virden greenbelt and the parkway were never implemented, and the other greenbelt had a short life. The City of Cedar Falls did not take advantage of this moment in history to create a greenbelt along Dry Run Creek. That creek, whose lower reaches are city-owned, remained primarily an area for equipment and materials storage, landfilling, etc., and has recently been designated a highway corridor.

The "Reform Park" discussed by Cranz was popular in the teens and 20's, primarily in large cities. It provided for organized recreational activities such as swimming, crafts, dancing, and sports. Many such parks had large gymnasiums or clubhouses and professional "playmasters." No such major developments were undertaken in the
study area, but bath houses and public swimming were available in the Cedar River at both Cedar Falls and Waterloo.

By the 1930's, parks had become an accepted element of city planning, and with the help of the federal government's Civilian Conservation Corps, many more parks were established in the study area. It was at this time that Waterloo tackled its downtown riverfront, which had become neglected and trash-strewn, and established several parks there. One park in particular, Pioneer Park north of the 11th St. bridge, had large trees and a building made of native limestone ("Pioneer Park," 1935). Waterloo's riverfront parks have had particularly evanescent histories. Many that were spoken of with pride in newspaper accounts of the 30's and 40's have since disappeared, ("City Buys," 1942; "Reed Looks," 1946), while others have been established. Pioneer Park was covered over with rip-rap during the construction of the flood control dikes, but some of its large cottonwoods can still be seen at the water's edge (Fig. 13).

Two other riverfront parks that existed in 1910 (Robinson, 1910) have also disappeared. One was connected to Lafayette Park by a greenbelt; it no longer exists. The other was across the river at the wooded entrance to a river channel or "cut-off" in the Mitchell sandpits area, and extended for some distance along the riverfront. That area was later used as a dump, and the cut-off was channelized. A small, grassy playground (Rooff Park) now exists next to the channel, but most of the natural woodland in the area has been removed.
The farm foreclosures that occurred during the Depression made possible, in 1940, the first acquisitions for the largest park in the study area: George Wyth State Park. The park was originally known as
Josh Higgins Parkway, and was a project of Cedar Falls industrialist George Wyth (Smith, 1940). He intended it to be a motor parkway between Cedar Falls and Waterloo through the woods on the north side of the river. While Wyth worked with the state to acquire land for the west end of the parkway, the City of Waterloo changed its plans to acquire land to complete the project; thus the park was expanded to the north instead (R. Wyth, personal communication, August 17, 1987). In recent years the original parkway has been closed to automobile traffic and is now a popular bikeway. Current plans call for the bikeway to be extended into Waterloo, thus completing Wyth's vision in another form.

As the cities in the study area expanded, they established small neighborhood parks in newly developing areas. These parks became more prevalent after World War II when new residential neighborhoods were built with great rapidity, and many were located adjacent to schools. The neighborhood parks were very much in the tradition of the "recreation facility," as described by Cranz. He believes that after the era of parks for social reform had passed, parks became simply a place for people to spend their leisure time. Concerns for efficiency of cost and operation began to override aesthetic concerns; shrubs and undergrowth were considered undesirable, and some parks were nothing more than a square of blacktop surrounded by a chain link fence. Cranz asserts that parks in this period lacked philosophical goals, with the result that they often had a barren appearance and found it difficult to obtain prime sites or fend off encroachments. One might
note that the perceived goal of many parks was the provision of playground space, in response to the baby boom; and playgrounds were not thought to need prime sites.

Most neighborhood parks in the study area are of the playground variety, containing ball fields and play equipment. Because preserving scenic natural areas was not one of the functions of neighborhood parks during the 50's and 60's when the upland forest areas were developed, the opportunity to preserve some of this forest in public ownership was largely missed.

Two anecdotes, one from Waterloo and one from Cedar Falls, will illustrate the extent reached by the "recreation" mentality during the 50's and 60's. It was during this period that the City of Waterloo expanded Gates Park to create a golf course. The golf course land contained a bur oak grove that had been known as a stopping place for travelers in covered wagons. It had originally been quite dense, and though it had suffered from timber cutting during the Depression, it retained many old trees. The golf course designer hired by the city recommended cutting all of these trees and clearing the area entirely. Fortunately, the Park Commission rejected his plans and had a course designed that preserved all the oaks (L. Katoski, personal communication, May 7, 1986).

A similar situation occurred in Cedar Falls when the city acquired Kiwanis Park, 5 wooded acres atop the bluff west of downtown (Fig. 14). At that time the city Recreation Commission wanted to clear the site for a ball field, but the Park Commission was
determined to leave it wooded. The Park Commission prevailed, and Kiwanis Park is now one of the few neighborhood parks in the study area where one can enjoy woodland wildflowers.

Figure 14. Kiwanis Bluff Park.

Just as the cities were turning away from natural areas as sites for parks, the county became involved. In 1955 the State Legislature authorized the creation of County Conservation Boards, and Black Hawk County established one in 1956. Partly with the aid of federal funding for wildlife habitat, the county acquired several parks in the study area in the late '50's and early '60's, all in floodplains.
Beginning in the late 1960's, a new interest in "open space systems" became evident throughout the country. The perceived alienation of urban dwellers from nature led to the search for natural areas that could be protected and made accessible to the public. The new parks were less structured than those of the recent past. Many were along waterfronts, and the turn-of-the-century idea of connected park networks and greenbelts once again became popular. The upsurge of interest in fitness correlated well with this trend, and bicycle and jogging trails were incorporated into many greenbelt areas. It has been in this era that the cities in the study area have made major strides in protecting wooded lands.

Acquisition of the Black Hawk Creek Greenbelt in 1969 was an achievement made possible by the determination of Waterloo Park Director Leonard Katoski, and a federal matching grant. Its 1100 acres include two previously donated parks, Martin Park and the Robertson Bird Sanctuary. The completion of the greenbelt required considerable persuasion of landowners and, on a few occasions, condemnation. The boundaries were roughly based on a 30 year floodplain. Trails within the greenbelt are used for hiking, horseback riding, and cross-country skiing (Fig. 15), but for the last decade there has been no funding available for its maintenance.

Hartman Reserve (Fig. 15) was mentioned earlier as one of the last remaining tracts of virgin timber in the county, one that was preserved as a YMCA camp in 1938. In 1976 the YMCA sold the land to the County Conservation Board for an outdoor educational area, but not
Figure 15. Leonard Katoski Greenbelt and Hartman Reserve.
without controversy. Alternate proposals involved the sale of the uplands for residential development, and the lowlands for a proposed freeway corridor. There was concern for keeping the land on the tax rolls. Only after much pressure by committed individuals was the sale approved by a 3-2 vote of the Board (E. Buckles, personal communication, 1987; B. Clausen, personal communication, 1987).

Hartman Reserve is now the site of the Conservation Board's most visible and most popular environmental education programs. Partly as a result of this popularity, the highway was eventually routed away from Hartman Reserve.

As the 1980's draw to a close, the largest recreational development in the area's history is being considered. Major highway construction will create large borrow pits, which are to be developed into recreational lakes as part of the "Cedar Valley Conservation and Recreation Plan." Local economic development groups, recognizing the economic impact of tourism and recreation, financed initial work on the plan, which includes proposals for lake development, trails, and the purchase of floodplain areas all along the Cedar River from Black Hawk Park to the edge of downtown Waterloo. Since most of the funding will have to be raised privately or through bond issues, it is unknown how much land will be preserved. However, one of the early projects will be the extension of George Wyth Park eastward to include an enlarged lake and a high quality wooded area.
Public Works

Public works projects have had major effects on the trees in the study area. Examples of these actions are flood control projects, urban renewal, and highway construction.

After the disastrous floods of 1960 and 1961, plus other smaller floods during the 1960's, the cities of Waterloo and Evansdale undertook a major flood control effort which took the better part of two decades. Virden Creek was channelized, and flood dikes were constructed along the Cedar River, Black Hawk Creek, and Elk Run Creek. In some areas, particularly in downtown Waterloo, these flood dikes displaced parks. In other areas, as along Black Hawk Creek, they took out portions of the lowland forest. Figure 16 shows how a flood dike has displaced the forest along the bank of the Cedar in southeast Waterloo.

In one of Waterloo's most ambitious projects, flood control and urban renewal were combined in the late 1960's in what was known as the "Westfield-Virden Project." The mouth of Black Hawk Creek was channelized and the land around it filled. In the process large areas of sloughs, floodplain forest, an island and an entire neighborhood were eliminated. The filled area is now the site of the John Deere electric foundry.

Cedar Falls did not participate in the dike building when Waterloo and Evansdale did, but is now considering flood protection for the downtown area only. A current proposal by the Corps of Engineers would result in the destruction of large amounts of
remaining riverfront forest in the vicinity of the wastewater treatment plant and Washington Park.

Highway construction is another public action that has had major impacts in the study area and will have more serious ones in the near future (Fig. 17). In his 1968 book *The Last Landscape*, William H.
Figure 17. Effects of Highway Construction.
Whyte wrote of the effects of highway construction on the landscape. The 1950's and 60's were a time of rapid construction of interstate highways and other major roads in most parts of the country, and public opposition to the arbitrary decisions of highway planners had finally led to some improvements in the process. For example, a federal law passed in 1966 prohibited the taking of park land for federally funded highways unless no "feasible and prudent" alternative could be found. Whyte was concerned, however, that the improvements were coming too late. By the early 1970's, he said, "unless a whole new highway program is superimposed on the interstate system, which seems unlikely, the bulk of the damage to parks and neighborhoods will already have been done" (Whyte, 1968, p. 130). He warned, however, that other public projects like hospitals and airports would continue to make demands on public land.

The major highways in the study area were not constructed until long after Whyte's book was written, and one is still in the planning stages. Despite extensive environmental review and, in the case of Highway 218, negotiations with environmentalists for a less damaging route, the highways are still causing major damage to woodlands in the area. The major reasons for this are: much woodland is not in parks and thus not officially protected; the laws protecting parkland from highway encroachment are easy to circumvent (The major highway that will be constructed through Cedar Falls received five exemptions); undeveloped areas are cheaper to acquire than developed areas and fewer people stand up to defend them; and some people regard wooded
areas as unproductive wastelands needing to be "cleaned out" or improved.

One component of highway construction that is often overlooked when impacts are being evaluated is the need for borrow material to construct the roadbed and to build it up in floodplains and at intersections. Borrow pits take large amounts of land, often in wooded floodplains. As mentioned above, the borrow pits associated with ongoing highway construction in Waterloo and Cedar Falls are planned to become recreational areas, and their boundaries have been designed with the help of a landscape architect. Where possible they have been located outside of wooded areas, but significant amounts of trees will still be taken. In Evansdale, where Highway 380/20 was constructed in the early 1980's, a large parcel of dense woodland was removed for the extraction of fill.

Other Land Uses

No special inventory was conducted on other land uses, but general observations indicate some distinctive patterns. Many churches have native trees on their grounds; one even has a small patch of woods with understory (Fig. 18). Most of these churches appear to have been built in the 1950's and '60's, perhaps in wooded plots that had remained vacant until then. By contrast, few schools have such trees around them, with the exception of Cedar Heights School, built in the early 1900's.
Figure 18. Native Trees on Church Grounds, Cedar Falls.
Two notable pieces of property that retain majestic old trees are Greenwood Cemetery (Fig. 19) and the adjacent Riverview Park, a church camp that has recently been purchased by the Western Home retirement center. Both are on the bluffs above the Cedar River west of downtown Cedar Falls.
Figure 19. Greenwood Cemetery Contains Native Oaks and Cedars.
CHAPTER 3: METHODOLOGY

This chapter describes the methods used to obtain visual and quantitative information on the changes in forest cover from the time of settlement to the present.

Data Sources

Maps and Aerial Photos

Soil survey maps, hand-drawn maps from the 19th and early 20th centuries, and aerial photos were sources of visual data used in this study. The early maps and the aerial photos were used to determine locations of woodlands at different periods in history and the causes of forest removal.

The Soil Survey of Black Hawk County (U. S. Department of Agriculture, 1978) was used to determine the location of alluvial soils. These soils proved more useful for locating floodplains than did federal 100-year floodplain maps. The alluvial soils are more biologically relevant, and are not as drastically changed when flood protection structures are built. Because the area around the mouth of Black Hawk Creek had been filled before the current soil survey was done, it was necessary to refer to an older soil survey (Iowa State College, 1920) to determine the original soils there.

For determining forest cover at the time of settlement, two main sources were used. One was the original survey notes for Black Hawk County, dating from 1855, which supply information on the vegetation found along the mile grid walked by the surveyor. These notes had
been analyzed by students in the UNI Biology Department, who had plotted the information on soil survey maps (Clausen, n.d.).

The other source used for estimating original forest boundaries was a large wall map of Black Hawk County, dated 1869, that is hanging in the library of the Grout Museum of History and Science in Waterloo (Krause & Ensign, 1869). Wooded areas had been drawn in by hand, and the map appears to be fairly accurate. Portions of the forest had been cleared since 1855 in order to obtain lumber for buildings, fuel and railroad ties. But when combined with the survey notes this map can provide information on probable forest boundaries within square miles. The combination of these two maps represents the "best guess" as to original forest cover.

Other hand-drawn maps appearing after 1868 were inspected and some are reproduced in Chapter 4. Most of them appear to be general in nature and not as detailed as the Krause and Ensign map.

After the early 1900's, no maps of the study area could be located that showed currently wooded areas. The county atlases of 1910 and 1925 were consulted to determine where farms were located.

Good visual data became available in the late 1930's, when the Agricultural Stabilization and Conservation Service began commissioning aerial photography. Aerial photos of Black Hawk County from the ASCS are available at the UNI library for 1937, 1941, 1952, 1957, 1964, 1968 (portions), 1970, 1974, and 1979. For this study, the photos used were taken approximately a decade apart: 1937/41 (the poor quality of the photos necessitates looking at both years), 1952,
1964, 1974, and 1979. For 1983, satellite photos from the U.S. Geological Survey were used. Major forest removals related to highway construction were estimated for dates after 1983 and into the near future by observing ongoing work and by consulting highway maps from the Iowa Department of Transportation and the City of Waterloo. But it was not possible to measure changes in forest density, additions to forest areas, or minor subtractions past 1983.

The quality of the aerial photos and consequently the accuracy of the maps improves dramatically over the years. The 1937 photo is a series of composites in which the edges of each frame form black lines that obscure small areas; Dry Run Creek is covered by a large title block. Photos for 1941 through 1957 are composites on a single sheet for the entire county; these sheets have problems such as pale areas and poor registration. From 1964 to 1979, the scale and clarity of the images increase greatly. For 1964, the county is covered on four sheets. For 1979, there are 262 sheets approximately two feet square. The 1983 photos, however, were taken from a high altitude and are not as large or detailed as the more recent ones from USDA.

Park Information

Parks were studied in terms of how much woodland they protected, when they were established, whether they were purchased or donated, and where they were located with respect to the natural forests.

Information on parks was obtained from lists and maps available from the city parks departments, the County Conservation Board and the County Auditor's office. The method of acquisition of parks in
Waterloo and Cedar Falls was requested from Dick Bruns, Cedar Falls Park Superintendent, and Leonard Katoski, former director of the Waterloo Park Commission. It was surprising to learn that the park boundaries in Waterloo and Cedar Falls were not the same on all park department maps, nor were they all available in the form of legal descriptions. Where parks adjoin other city-owned land there may not be well-defined boundaries; in Cedar Falls, several parks have lost parts of their former acreage with no written records.

Map Analysis

General Procedure

In order to determine changes in forest cover over time, information from the maps and aerial photos was transferred to separate vellum sheets that fit a standard sized base map, then successive sheets were compared to determine gains and losses. The wooded areas (1937 and after) were divided into open forest and dense forest categories. Each loss of wooded land was assigned a cause, and the category of forest was noted.

Methods of Data Transfer

Soil survey. Soils in the study area were identified that had native vegetation listed as either trees or mixed trees and grasses. The locations of these soils were traced from the soil survey maps, reduced to the size of the base map, then pieced together, traced, and reduced to the size of the final maps.

Hand-drawn maps. When transferring information from hand-drawn maps, a small cutline map of the study area was used and slides of the
older maps were projected onto it in segments, then traced. Adjustments were made based on street patterns and other factors that could give a better indication of where the forest boundaries were.

Aerial photos. The base map used was a blue-line print of a 1979 aerial photo composite at a scale of 1" = 2000 ft. The base map was approximately 2 ft. x 3 ft. in size, and was donated by Aerial Services, Inc. of Cedar Falls. A sheet of vellum was taped over it and the two were placed on a light table. Wooded areas from 1937/41 were drawn onto the vellum by visual inspection of the 1937 and 1941 photos. The locations of existing wooded areas, roads, etc. on the 1979 photo provided some guidance, but certain areas, such as Dry Run Creek in Cedar Falls, have changed completely since that time. It was essential to know where native trees still exist, since there were few roads in some areas in 1937 to provide reference points. Previous field inspections of residential and commercial areas provided this information.

After the 1937/41 data were transferred, another sheet of vellum was placed on top of the previous one, and the wooded areas were drawn on for 1952. The two vellum sheets were then removed from the base map and compared. When a discrepancy was found, the two aerial photos were compared to see whether an actual change had taken place or whether the difference was one of interpretation. Often it was found that the wooded areas had not changed. If they had, a notation was made on the earlier dated map indicating additions or subtractions between it and the later dated map. The land use on the later map,
and sometimes the current land use, was used as a guide to determine the cause of the change.

The data for subsequent years were transferred in a similar way using map pairs. Sometimes the photos for other years were consulted for reference.

After the maps were completed they were photographically reduced using a W.A. Brown copy camera. The negatives were traced onto 11 x 17 sheets of vellum, then transfer patterns were applied to indicate the different forest densities.

Criteria for Interpretation

Forest density. Two categories of forest density were used: dense and open. The open forest areas had about 5 to 75% canopy cover. Dense forest consisted of areas with about 75 to 100% cover. The 75% figure was chosen based partially on the density of areas that subjectively appeared to have distinct boundaries, and partially in order to include residential and grazed areas in the open forest category. There is no natural savanna in the study area.

At first, the intention was to categorize the forests according to whether or not they were able to regenerate themselves; grazed or mowed areas, for example, would be non-regenerating. But that proved impossible to determine from aerial photos, and unworkable as well. Large areas of thin forest exist in floodplains where sandy deposits are becoming forested; even with very few trees these areas would have had to be classified as regenerating, the same as long-standing dense forests. Other areas, such as the Black Hawk Creek greenbelt, had
been grazed but instantly changed their status as soon as the grazing was discontinued. It seemed better to use an objective measurement such as canopy cover than to attempt to interpret the status of every wooded area.

Forest densities could only be used for the years when aerial photos were available. The maps for earlier years show only a forest pattern.

The significance of the dense forest category is both biological and aesthetic, as illustrated in Figure 20. Only forests that are not mowed, developed or heavily grazed can maintain some semblance of their natural understory vegetation and wildlife.

Causes of change. It proved relatively easy to identify the causes of forest destruction from 1937 on. It was more difficult to categorize the causes, since they are interrelated. Consequently, two lists of causes were compiled. In one, all sand and gravel mining was listed separately; in the other, it was grouped with highway or flood dike construction if it was obviously conducted for that purpose. The causes of forest destruction were also categorized as public or private.

Area determination. In order to measure the sizes of forest areas gained or lost, an acre grid was made from a small piece of mylar. Another section of mylar was taped over it so that the squares could be marked as they were counted and the marks erased each time. The grid was placed over the forest areas on the map, and the squares counted.
Figure 20. Wildflowers in Dense Forest: Pfeiffer Spring Park (top) and Robertson Bird Sanctuary (bottom).
In order to maintain consistency when determining total acreage and wooded acreage within parks, the parks were located on the aerial photo base map and measured the same way the wooded areas were measured. The results often conflicted with the acreage listed by the parks departments, being either greater or smaller than the official numbers. Reasons for this discrepancy could include inaccurate park records, problems with the scale of the aerial photo mosaic, boundaries within water bodies, and steep topography in some areas.

Comparison of Time Periods

For some of the graphics in the next chapter, it was necessary to compare forest loss between the different time periods studied. For example, 1952 to 1964 was one time period and 1964 to 1974 was another. Since the time periods did not have the same number of years, the total forest loss during each period was converted to an average annual loss.

Sources of Error

There is some uncertainty involved in any study requiring measurement. In this case, the main sources of uncertainty were in the measurement of the acreage, and in determining boundaries of forest areas and causes of their destruction. The error in area measurement is approximately 5%, based on the differences in results when the same area was measured more than once.

A greater potential source of error, and one that cannot be quantified, is the personal judgment involved in deciding where to
locate a boundary between dense and open forest, or in assessing a few questionable areas where the cause of forest removal was ambiguous. The most difficult judgments included determining forest quality in large wooded tracts away from urban development, and categorizing areas where trees existed in unevenly spaced clumps. It was also difficult to decide where to indicate supposedly natural forest regeneration while excluding the growth of Chinese elms in vacant lots, for example.

Because the same areas were examined more than once, and many comparisons were made both forward and backward in time, one may be assured of consistency in the results. However, reproducibility cannot be guaranteed. Another person making the same study would probably arrive at similar conclusions, but would not have the same numerical results.
CHAPTER 4: RESULTS

This chapter summarizes the findings concerning changes in forest area and quality from the time of settlement to the present, and particularly from 1937 to 1983 when better data allow more detailed analysis. Results are presented in the form of maps, tables and graphs, with the maps grouped together so that they may be viewed as a series.

Spatial Interpretation

The map series on pages 86 through 98 is useful in showing where forests were located and where changes occurred. It also provides a means to assess changes in forest density over time.

The base map (Fig. 21) can be used as a guide to place forested areas on the other maps in the context of the city street system.

The soil map (Fig. 22) shows soil types that are associated with trees. The Soil Survey of Black Hawk County (USDA, 1978) describes the soils of the county according to various characteristics, one of which is the type of vegetation under which the soil was formed. Forest soils have a different profile than prairie soils, which in turn are different from savannah soils; thus the soil survey can give a general indication of where forests existed over periods of thousands of years. The soil survey also shows alluvial soils that are too young to show evidence of past vegetation, but are often wooded.
These soil types are not a true guide to pre-settlement woodlands for several reasons. The soils formed under forest or savannah comprise an area smaller than that which was wooded at the time of settlement. Relatively recent changes, such as forest expansions into prairie, had occurred before corresponding changes in the soils had time to develop. Another problem in identifying upland forest areas is that the original soil types are not accurately mapped for much of the urbanized land. The soils in these areas have been so highly disturbed by construction that identification is difficult, and they are therefore classified as "urban land."

The soil map is primarily useful for showing the alluvial floodplains so that lowland and upland forests may be compared. Though much smaller than the 100-year floodplains now used for planning purposes, these alluvial lands have been perceived throughout the area's history as generally undesirable for farming or building. These areas host distinctive biological communities, and most were originally wooded except along the upper portions of small streams such as Dry Run Creek.

**Nineteenth Century Maps**

In order to make a more accurate estimation of where the forests were located at the time of settlement, it is necessary to look at the original survey notes and other early maps. Figure 23 has been constructed from the original (1855) survey notes as transcribed by UNI biology students, combined with information on an 1869 hand-drawn map (Fig. 24). The surveyor recorded the location and angle of
forest/prairie boundaries as he walked the section lines, and frequently noted the species of trees encountered. The survey notes provide information on the locations and types of forest along a mile grid. Unfortunately, there is no information on what lay within the square miles. In addition, it is difficult to know how the surveyor identified savannah areas. At times he noted "grove," "oak barrens" or "scattered trees" without delineating boundaries. In other locations where it seems likely there was woodland, none is noted on the survey. Use of the 1869 map allowed for an estimate of probable forest boundaries not indicated in the survey notes.

The 1869 map (Fig. 24), "compiled and surveyed by Frank Krause and D.W. Ensign," has both forest and property boundaries drawn in. It appears to have been done in a careful and detailed manner. Since the forest boundaries generally extend further than those on the survey notes, it is likely that this map includes more savannah areas than the earlier one.

It is obvious that some forest lands had been cut between 1855 and 1869, but for some areas it is impossible to tell. The land in the river bend across the river and east of downtown Cedar Falls is one example. Since the original survey grid did not go through this bend, it is not possible to know whether it was originally wooded or not. It is shown devoid of trees on the 1869 map, but the property lines show very small lots, often an indication of forest land. For that reason the best guess is that it was wooded the time of
settlement. Possibly this area was cut early for fuel, lumber, and farmland as the city of Cedar Falls grew.

In the uplands in the center of the map (at that time between Cedar Falls and Waterloo), three openings are visible. The map shows a railroad running through all three of these openings; that railroad apparently was removed because it does not show up on later maps. Since this upland area was a prime location for woods such as white oak and hickory that were favored for railroad ties and durable products, these openings probably indicate early clearcuts. The wood may have been loaded onto rail cars for transport to lumber mills. Later the areas were probably farmed or grazed, since they remained open after that time.

The Andreas Map that was shown in Chapter 1 (Fig. 6) was produced in 1875. Since it is very close to the Krause and Ensign map, it was not reproduced in this chapter.

**Twentieth Century Maps**

Two locally produced maps are shown in Figures 25 and 26. Figure 25 is the map of original forest cover by local historian Clarence Baldwin. It appears in his book, *Crossroads on the Cedar* (Baldwin, 1967). The map shows the general outlines of forested areas, but due to discrepancies between it and the previously described maps, and the omission of a grove along Virden Creek (currently in Gates Park), it should be thought of as no more than a general approximation.

Figure 26 has been designated "School Map" because it was published by Waterloo Community School District. It is undated, but
includes the name of a superintendent who served from 1905 to 1908. In the upper-left-hand corner of the map, the effects of railroad construction are visible along the river, where a swath of woods has been cut away. This map indicates little change in the forest boundary compared with previous maps. It is difficult to know whether this map was simply copied from earlier ones or whether it indicates the true situation in the early 1900's. But as discussed in Chapter 2, this area had a number of farms at the time, and it was probably undergoing steady clearing. Neither Figure 25 nor Figure 26 was used in estimating changes in forest cover.

Maps of the cities and county produced after the early 1900's did not indicate forest cover. Perhaps this trend reflected a perception that the area was no longer a frontier where natural resources were of predominant importance, but a developed area where the street system was of greater interest. Not until 1937 was visual information on the extent of the forests again available.

Aerial Photos

Figures 27 through 32 were based on aerial photographs, representing a sequence of nearly 50 years. Detailed comparisons of these maps were used to prepare Tables 5 through 8, where causes of forest loss are quantified. The Cedar River and area lakes are shown on these maps, but smaller creeks are not. It is difficult to see their courses on the photos, and they change somewhat over the years. The general locations of the major creeks are evident from the woodland patterns and can be seen on the base map.
Some general trends are apparent in the sequence of maps. In 1937-1941, patches of dense and open forest are equally prevalent in both upland and lowland areas, probably depending on whether the woods were grazed or heavily logged. As time goes on, the upland areas that remain become sparse as development takes place within them. Meanwhile, the lowland areas (corresponding to the alluvial soil types) develop more and thicker forests. Note particularly Black Hawk Creek (lower center) and the area beneath the bluffs of the Cedar River where several small quarry lakes are located (G-11).

The improvement in these lowland forests was something of a surprise, since the initial expectation was for the quantity of woods to decline steadily and for formerly dense forests to be invaded by urbanization. It is probable that the late '30's were the lowest point in terms of forest quality in the study area, given the extensive tree cutting that took place during the Depression. The subsequent improvement probably resulted from the decline of livestock raising as well as the decline of lumbering. Some of the wooded areas improved in quality as parks were created, although certain park developments, such as campgrounds, required partial clearing.

While the lowland forests became thicker, the opposite occurred in the upland forests. The effects of urbanization can be followed, as dense patches become open or disappear (F-8 to G-10). "Hanna's Woods" can be seen as the large rectangle of dense upland woods in the early map (H-9); it slowly decreases in size as its land is converted
into a nursery and garden shop, other commercial properties, and a row of homes along Hackett Road.

Certain major projects are evident in the map series. Between 1964 and 1974, the mouth of Black Hawk Creek (L-8) was channelized and the sloughs and floodplain forests were filled as part of the Westfield-Virden Project. This project had the single greatest impact on woodlands within the time period studied.

Flood control projects also affected the woodlands along Black Hawk Creek (I-6 to K-8), and in a wooded area near the boundary between Waterloo and Evansdale (0-6). The dike in this latter area was built between 1979 and 1983, causing a straightening of the river bank there.

Highway projects also have distinctive effects. The construction of Highway 20 (now Hwy. 57) through George Wyth Park cut through the wooded area extending north of Fisher Lake (F-12) between 1974 and 1979. Between 1979 and 1983, a new route for Highway 20 was constructed through Evansdale (0-4 to R-4) on its way across the study area. (It was completed through the county in 1986, taking a swath out of the Black Hawk Creek Greenbelt in the process.) Other major highway projects are under way at the present time, and their full effects were not evident by 1983. Impacts of the routes that have been or will be built after 1983 are shown with dotted outlines on the last map, which is titled "1983+."
Parks

The last map in the series is the park map (Fig. 33). It shows the locations of parks and university preserves in the study area, with woodland indicated within them. It does not include other publicly owned land.

A few parks stand out as preserving large amounts of floodplain woodland. Moving from west to east along the river, we see Black Hawk Park (no. 1 on Figure 33) and Ulrich Park (15); the Matala Preserve owned by UNI (2); Island Park (3) and George Wyth State Park (4). Canfield County Park lies just adjacent to the southeast corner of George Wyth. The Katoski Greenbelt along Black Hawk Creek is also very prominent (32).

Major areas of floodplain woods that are not protected are also evident. (Refer to Figure 32.) East of George Wyth Park there is a considerable amount of woodland both on the islands and along the banks (H, I-10). A large portion of this land is planned to be incorporated into an expanded George Wyth Park as part of the Cedar Valley Lakes project. Some of the woodland will be lost to highway and lake construction, and some will be retained for recreational areas. The woodland on the islands is owned by the city, but is not officially park land at this time.

Between Hartman Reserve and the river (G-11), dense forest has grown back in an area that was once quarried, logged and farmed. The County has been interested in acquiring this land, but the owner has been unwilling to donate it. The land is designated as future
parkland in the Cedar Valley Lakes Plan, but its acquisition will be subject to the availability of funds.

In the southeast portion of the study area, large tracts of woodland exist outside of parks. Two wooded areas in Waterloo on either side of the river (0, P-6) have been considered for parkland development in the past. The city owns much of the area inside the large river bend (the "Mitchell sand pits") and used some of the land for a landfill at one time. Any proposed development has been put on hold due to lack of funds.

In Evansdale, major wooded tracts remain unprotected. Along Elk Run Creek, the privately owned woodland is heavily used by dirt bikes. Three parks in Evansdale do preserve a portion of the woodland along the Cedar River and Elk Run Creek. Two of these parks are owned by the County (numbers 12 and 14), and one of the two--Elk Run Heights Park--is operated by the adjacent city of Elk Run Heights. Deerwood Park (11) belongs to the City of Evansdale. The property was once a farm, and the city acquired it through back taxes. Interestingly, it is located near some dense woodland but actually contains very little. Much of the forest that was on the property had been cleared for agriculture before it became a park, as was evident in the map series. Neither the city nor the county is interested in acquiring more parkland in Evansdale.

Looking at the upland forest areas in Cedar Falls and West Waterloo, it is evident that almost none have been preserved in parks except along the edge of the bluffs. Ulrich Park in the northwest
corner of Cedar Falls contains some steeply dissected terrain overlooking the river. Further toward the center of the study area, six parks can be seen along the bluff line (parks numbered 20, 22, 24, 25, 27 and 28). These are Pfeiffer Spring, Lookout, Hartman Reserve (owned by Black Hawk County), Castle Hill, the Trolley Car Nature Trail, and Castle Bluff.

But further south where the extensive oak-hickory forest existed, only one small patch of woods is contained in a park (Valley View, no. 26). Ironically, one additional patch of native oaks will soon become a city park of sorts. After highway construction has removed a house on University Avenue and half of the trees that surrounded it, the remaining trees will exist in a traffic island managed by the Waterloo Park Commission (This land is shown in Figures 52 through 54 in Chapter 5).

Comparing Figure 32 with Figure 33, one can see that there are many upland forest areas in all three cities that are now classified as "open" woodland. Most of these have been developed as residential areas, but the neighborhood parks that serve them are located outside the wooded tracts.

Gates Park in the northeast part of Waterloo (number 7 on Fig. 33) is unusual because it contains large numbers of upland oaks.
FIGURE 21.
BASE MAP.
Soils formed under trees

Soils formed under mixed trees and grasses

Alluvial deposits

FIGURE 22
SOIL MAP.
Forest indicated on survey notes

FIGURE 23. ORIGINAL SURVEY MAP 1855.
FIGURE 26
SCHOOL MAP 1905–1908.

Source: Blackhawk County, Iowa: for use in the community schools.
(n.d.) [Map]. Waterloo: Charles Elliot, County Superintendent.
FIGURE 27.
WOODED AREAS 1937-1941.

- **Dense woodland**
- **Open woodland**

Legend:

- □ Dense woodland
- □ Open woodland
FIGURE 28.
WOODED AREAS 1952.

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Forest boundaries from previous map

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FIGURE 29.
WOODED AREAS 1964.
FIGURE 30.
WOODED AREAS 1974.
FIGURE 31
WOODED AREAS 1979.
FIGURE 32

WOODED AREAS 1983+.
FIGURE 33.

PARK MAP.

1 Black Hawk Park
2 Matale Preserve
3 Island Park
4 George Wyth Park
5 Cedar River Park
6 Robinson Crusoe Island
7 Gates Park
8 Lincoln Park
9 Pioneer Park
10 Lafayette Park

11 Deerwood Park
12 Elk Run Hts. Park
13 Casebeer Hts. Park
14 Casebeer Hts. Access
15 Ulrich Park
16 Kiwanis Park
17 Overman Park
18 University Preserves
19 Central Park
20 Pfeiffer Spring Park
21 Washington Park
22 Lookout Park
23 Kuehn's Park
24 Hartman Reserve
25 Castle Hall Park
26 Valley View Park
27 Trolley Car Trail
28 Castle Bluff Park
29 Galloway Park
30 Robertson Bird Sanctuary
31 Prescott Park

32 Leonard Katoski Greenbelt
33 Byrnes Park
34 Martin Park
35 Washington Park
Quantitative Interpretation

As described in Chapter 3 (Methodology), each time a wooded area disappeared between one map and the next, the area lost was measured and the cause of the loss was noted. Between 1937 and 1983, forest expansions were also measured. The results are presented in the tables and graphs in this section.

The causes of changes in woodland area have been categorized and ranked in several different ways. The different interpretations were necessary for three reasons. First, the time of the study is over a century, but detailed information is only available for a 45 year period, so results were tabulated separately for the longer and the shorter time periods. Second, woodland quality must be considered. The cutting of the trees in a sparsely wooded pasture is different from the clearing of a portion of dense, natural forest complete with understory. Consequently, separate tables were prepared for total woodland and for dense woodland.

Third, some of the reasons for forest loss overlap. One of the greatest causes of forest destruction is sand and gravel mining. This industry has operated throughout the region's history, with the material being used for road building, construction, concrete production, etc. But in recent years major highway and flood control projects have necessitated large borrow pits that can readily be identified with these projects. It seemed appropriate to include the effects of these borrow pits with those of the projects for which they were created; on the other hand, a total figure for sand and gravel
mining was desired. Therefore, the results were tabulated both ways—
one with borrow assigned to the associated projects, and once with
borrow grouped with other gravel mining. Undoubtedly, the amount of
borrow assigned to highway construction is low, since some gravel has
always gone to highway construction. But the amounts required in
recent years have been significantly greater.

Some explanation is necessary for what is not included in the
tables. The tables show forest destruction by category—dense or
open. But when an open woodland is destroyed, that is often the
second stage in a process which began when the forest was thinned by
grazing or other activities. This study does not count that initial
conversion as a factor in forest destruction, nor does it account for
the decades-long disappearance of a natural forest that will occur
when the understory is removed. Providing numerical information on
the conversion of dense to open woodland and vice versa would have
taken an inordinate amount of time, and the boundaries between such
areas are not exact. The effect of this omission is to understate the
effects of agriculture and residential development, which are the
primary causes of change from dense to open woodland. Information on
the changes in woodland status must be obtained visually through the
map series.

Woodland Loss, 1855-1983

Table 4 shows changes in woodland from the first to the last map
available—a period of 128 years. Because of the lack of detailed
information for the first 82 years of this period, only two categories
are used for causes of forest loss: agriculture and logging, and urban development. The latter category includes all activities other than agriculture and logging, including gravel mining, residential development, highway construction, etc. The changes between 1855 and 1869 are necessarily rough estimates because the precise woodland boundaries are not known for 1855, and because the definition of woodland boundaries might have been different for the original surveyors and for the mapmakers in 1869.

Table 4

Woodland Loss, 1855-1983

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<td>39</td>
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<td>18</td>
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<td>Urban Development</td>
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<td>222</td>
<td>1467</td>
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<td>AVERAGE ANNUAL LOSS (acres):</td>
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<td>26</td>
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</table>
The results show that from the time of settlement to 1983, approximately 70% of the forest loss was accounted for by agriculture and logging. These influences were greatest prior to 1937. Urban development was important as a cause of forest loss when downtown Cedar Falls was first being developed, then subsided until the post-World War II era.

**Changes in Woodland Acreage, 1937-1983**

Tables 5 and 6 show changes in woodland area based on aerial photo analysis. The actions responsible for forest loss were grouped into eleven categories, which in turn were classified as either private or public. Table 5 also shows additions in woodland acreage, but Table 6 does not because there is little significance to the classification of newly growing woodlands as dense or open.

Most of the categories are self-explanatory, but a few of them may require clarification.

"Borrow" indicates the sand and gravel pits constructed for the purpose of obtaining fill for highways or flood dikes.

"Logging" refers to one area of dense forest west of George Wyth Park disappeared and later began to reappear. The only logging operations that would show up in this study are those that leave 5% or less of the tree cover. Selective cutting, which has been conducted in many of the woodlands, normally would not be discernable.

"City Operations" includes land used for schools, wastewater treatment plants, utility plants, equipment storage areas, and other city buildings. Most of this land is located along Dry Run Creek in
Table 5

Changes in Total Woodland, 1937-1983

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<td>53</td>
<td>18</td>
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<td>88</td>
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<td>-</td>
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Table 6
Changes in Dense Woodland, 1937-1983

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</tr>
<tr>
<td>Urban Renewal</td>
<td>-</td>
<td>-</td>
<td>53</td>
<td>-</td>
<td></td>
<td>53</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL PUBLIC</strong></td>
<td>12</td>
<td>91</td>
<td>155</td>
<td>155</td>
<td></td>
<td>413</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL SUBTRACTIONS</strong></td>
<td>34</td>
<td>249</td>
<td>229</td>
<td>166</td>
<td>(238)</td>
<td>678</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Additions of woodland do not appear on this table.
Cedar Falls. It also includes River Hills School near Hartman Reserve, and the Waterloo Wastewater Treatment Plant.

"Urban Renewal" refers to a portion of the Westfield-Virden project. Since this project was a combination of flood control and urban renewal, the area of woodland loss was assigned to each of those causes, with flood control given approximately as many acres as would have been required for a flood dike in that location.

Table 5 shows that over the 46 year period, the amount of total woodland lost was approximately 1.7 times the amount added. Private actions took more total woodland than public actions (Table 5), whereas public actions took more dense woodland than private actions (Table 6). The primary reason for this was that the most important private actions (agriculture, residential and commercial/industrial development) had their greatest impacts on open woodland, whereas densely forested floodplains were the sites of most of the public projects.

The column entitled "1983-1995" gives a rough approximation of the anticipated effects of projects in the planning or construction stages as of 1983. The numbers are shown in parentheses, and are not added into the totals. But it is particularly important to note the major effect that highway construction is having and will have on the forests of the area.

Ranking the Causes of Woodland Loss

Tables 7 and 8 take the data from Tables 5 and 6 and group the borrow areas with other categories as explained above, then rank the
Table 7

Causes of Loss of Total Woodland, 1937-1983

<table>
<thead>
<tr>
<th>Rank</th>
<th>Cause</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Flood control (including borrow)</td>
<td>233</td>
</tr>
<tr>
<td>2.</td>
<td>Agriculture</td>
<td>155</td>
</tr>
<tr>
<td>3.</td>
<td>Private gravel mining</td>
<td>149</td>
</tr>
<tr>
<td>4.</td>
<td>Commercial/industrial</td>
<td>143</td>
</tr>
<tr>
<td>5.</td>
<td>Highway construction (including borrow)</td>
<td>138</td>
</tr>
<tr>
<td>6.</td>
<td>Residential</td>
<td>88</td>
</tr>
<tr>
<td>7.</td>
<td>Urban renewal</td>
<td>61</td>
</tr>
<tr>
<td>8.</td>
<td>City operations</td>
<td>51</td>
</tr>
<tr>
<td>9.</td>
<td>Logging</td>
<td>8</td>
</tr>
</tbody>
</table>

causes in order of importance. Ranking no. 1, which includes borrow with the projects, provides the data that were used in preparing the graphs shown later in this section.

In Table 7, ranking no. 1, flood control is clearly shown as the predominant factor in forest loss over the 46-year study period. Agriculture, gravel mining and commercial/industrial development all rank very close together in second place. Ranking no. 2 shows the effect of including borrow with gravel mining; this places gravel
Table 8
Causes of Loss of Dense Woodland, 1937-1983

<table>
<thead>
<tr>
<th>Rank</th>
<th>Cause</th>
<th>Acres</th>
<th>Rank</th>
<th>Cause</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Flood control (including borrow)</td>
<td>202</td>
<td>1.</td>
<td>Flood control (without borrow)</td>
<td>169</td>
</tr>
<tr>
<td>2.</td>
<td>Private gravel mining</td>
<td>103</td>
<td>2.</td>
<td>Gravel mining (including all borrow)</td>
<td>166</td>
</tr>
<tr>
<td>3.</td>
<td>Highway construction (including borrow)</td>
<td>87</td>
<td>3.</td>
<td>Commercial/industrial</td>
<td>67</td>
</tr>
<tr>
<td>5.</td>
<td>Agriculture</td>
<td>56</td>
<td>5.</td>
<td>Agriculture</td>
<td>56</td>
</tr>
<tr>
<td>7.</td>
<td>Residential</td>
<td>31</td>
<td>7.</td>
<td>Residential</td>
<td>31</td>
</tr>
<tr>
<td>8.</td>
<td>City operations</td>
<td>24</td>
<td>8.</td>
<td>City operations</td>
<td>24</td>
</tr>
<tr>
<td>9.</td>
<td>Logging</td>
<td>8</td>
<td>9.</td>
<td>Logging</td>
<td>8</td>
</tr>
</tbody>
</table>

Mining at the top and drops highway construction down considerably. Flood control, agriculture and commercial/industrial development remain important.

In Table 8, which shows only the loss of dense woodland, one can see that flood control and gravel mining have had the most significant effects on the forests. In the near future, however, highway construction is expected to surpass flood control in importance.
Comparisons Between Jurisdictions

Figure 34 was prepared in order to permit comparisons between the different jurisdictions in the study area. In reviewing this information, it must be remembered that the city boundaries are those that existed in 1983. During the period between 1937 and 1983, the boundaries expanded, enclosing some areas that were previously unincorporated. Thus not all forest loss ascribed to the cities actually occurred inside their boundaries at the time. The three cities, plus the unincorporated area including George Wyth Park, all have different profiles of forest loss from 1937 to 1983.

In Cedar Falls, the private sector surpasses the public sector, with residential development the primary cause of woodland loss. The category of "city operations" is also larger for Cedar Falls than for the other cities in relation to its size. This is because Cedar Falls has taken woodland along Dry Run Creek and the Cedar River for the wastewater treatment plant, the utilities plant, the street department, the fire department, and a former landfill.

Up until the present, Cedar Falls has not participated in the major flood control and highway projects that have taken place in Waterloo and Evansdale. This is one reason why Cedar Falls has a different forest loss profile than the other two cities. However, plans are under way in Cedar Falls for both types of projects, with significant impacts on city-owned woodlands.

The agricultural clearing in Cedar Falls has occurred primarily along the portion of Black Hawk Creek that crosses the southeast
corner of the city. Clearing accelerated in this area in the 1970's, although it had been effectively stopped in Waterloo by the acquisition of the greenbelt.

In Waterloo, the effects of a 20-year flood control effort are evident in the fact that flood control is by far the greatest cause of forest loss. Commercial/industrial development and gravel mining are the other major sources of forest loss in Waterloo. Commercial/industrial development is primarily associated with the expansion of John Deere, and to a lesser extent of Platt's Nursery. Continuing gravel mining operations north of the Cedar River contributed to the loss of floodplain forest in that area.

Urban renewal is a category unique to Waterloo. It is closely related to both flood control and industrial development, since the urban renewal land was floodplain that was filled to become a site for the expansion of John Deere.

The forest loss profile of Evansdale shows the predominance of agriculture, primarily in the large river bend area. Forest clearing for agriculture continued in Evansdale throughout the study period. Remaining a small city, Evansdale has had little forest loss associated with commercial/industrial or residential development. Its major upland forest area has been thinned but not yet destroyed by homebuilding. But Evansdale's attachment to a larger metropolitan area is shown by the fact that highway construction has now become the greatest cause of forest loss in that city. This presages the effects
Figure 34. Forest Loss: Comparisons Between Jurisdictions, 1937-1983.

Height of bar represents number of acres lost to the land use listed at top.
of the highway building that is occurring and will soon occur in Waterloo and Cedar Falls.

The unincorporated "county island" in the study area consists of George Wyth Park and some farms and residential land to the west of it. The primary cause of forest loss here has been agricultural clearing. It was also on this farmland where the only instance of forest destruction by logging was observed. The highway impacts were caused when Relocated Highway 20 (which has since been relocated again) was constructed through the northern portion of George Wyth Park.

Changes Over Time

Figures 35 and 36 show how the effects of various land uses varied over time. The first point on each graph represents the average annual forest loss for that category between 1937 and 1952. The second point represents average loss between 1952 and 1964, and so on.

In Figure 35, the residential and commercial/industrial uses show the effects of the building boom of the 1950's and '60's. The profile for agriculture reflects the boom of the early '70's. Highway and flood control graphs show increasing trends throughout the study period. Highway construction gained momentum in the early 1980's, and will continue to increase throughout the next decade. Flood control, on the other hand, had its greatest impacts in the late 1970's and
Figure 35. Forest Loss: Timelines for Selected Land Uses, 1937-1983.

The points on the graphs represent the average annual number of acres lost to the stated land use during the sequential time periods studied (first point represents 1937-1952, second represents 1952-1964, etc.) Dashed lines show future projections past 1983.
Figure 36. Forest Loss: Role of Public vs. Private Actions, 1937-1983.

The points on the graphs represent the average annual number of acres lost to public or private uses during the sequential time periods studied (first point represents 1937-1952, second represents 1952-1964, etc.)
early '80's, but will begin to taper off as most of the work is completed.

The ascendency of highway and flood control projects—both publicly funded—is shown in the Figure 36, which plots public and private forest destruction over the study period. Private impacts peaked in the postwar economic boom, but in the period following 1964, public impacts have far surpassed them. In the most recent time period (1974-1983), public actions took six times as much total woodland and 14 times as much dense woodland as private actions. By that time most of the upland forests had already been developed or removed, and most of the dense forests that remained were in floodplains where the major public works projects were carried out.

**Park Information**

Information was obtained on each park and preserve in the study area, including date established, method of acquisition, total acres and acres in woodland.

The total amount of woodland in parks and preserves is approximately 1733 acres. This represents woodland that has been publicly protected from as early as 1908. One of the questions to which this study sought an answer was whether the public sector has protected more woodland than it has destroyed. The amount of publicly destroyed woodland is only known between 1937 and 1983; that amount is 483 acres. At least 260 additional acres are expected to be destroyed
soon, or have already been lost since 1983. It is unlikely that the public sector destroyed enough woodland before 1937 to make the total approach 1733; therefore it appears that on balance, public efforts have resulted in more forest protection than destruction.

An additional aspect of the park study compared the forest cover in parks that were purchased by the city vs. those that were donated by private parties. For the cities of Cedar Falls and Waterloo, the park director (or former park director in the case of Waterloo) was asked to note on a list of parks whether the property had been purchased or donated. This information is not exact, since it is not known for a small number of parks, and some others were partly donated and partly purchased. However, the results show a large difference in the amount of woodland in the two types of parks. In Cedar Falls, purchased parks were approximately 28% wooded and donated parks were about 52% wooded, while in Waterloo the percentages were 43% for purchased parks and 59% for donated parks.

In both Waterloo and Cedar Falls, the acquisition of wooded parkland was heaviest in the early 20th century and in the last two decades. Neither city acquired any wooded parkland between 1950 and 1964, with the exception of Castle Hill Park, which was acquired when Waterloo annexed the city of Castle Hill, and the Gates Park golf course.
As demonstrated by the forest loss analysis, the private sector was more prominent in forest destruction in the earlier history of the study area than in recent years. All of the private actions studied—agriculture, residential development, commercial/industrial development and gravel mining—peaked at some time in the past and have subsequently declined. Publicly financed forest destruction has always been evident in the steady encroachment of roads, wastewater treatment plants, city buildings and other public uses on woodlands. But in the last twenty years the impact of the public sector expanded greatly with flood control, urban renewal and highway projects.

Agriculture has been particularly destructive to the natural woodland in the study area. Agriculture and logging were responsible for 70% of the forest loss recorded between 1855 and 1983, with most of this loss accounted for by agriculture. The effects of logging only became permanent when the cut-over areas were converted to farmland. While most of the agricultural development went unrecorded by maps and photos at the time, it is clear that agriculture was responsible for most of the clearing and forest decline that had occurred by the time of the early aerial photos. Some agricultural clearing occurred even within the most recent period studied, as farmers in the outlying areas slowly expanded their cultivated acres.
But in many urbanizing woodlands, forest quality improved as grazing was discontinued.

Urban-oriented land uses had their first effects in the clearing of downtown Cedar Falls. Afterward, residential and commercial/industrial impacts were limited to the wooded areas that had escaped the plow. Those impacts accelerated rapidly in the prosperous period of the 1950's and '60's when there was still a large amount of developable land with some forest cover. Residential development destroyed a considerable amount of forest land, but for the most part thinned and changed the character of the forest by preserving only mature trees.

The most important factor in the commercial/industrial category was the steady expansion of John Deere at its site near the mouth of Black Hawk Creek. In the late 1960's this expansion moved from the "private" to the "public" category with the Westfield-Virden project.

The decline in residential and commercial/industrial forest destruction in the latter years of the study occurred primarily because there was little upland forest left to develop, and floodplains were not considered desirable sites for building. The one wooded floodplain area that had become industrialized had already been fully developed, and subsequent industrial expansions have been on outlying farmland.

The remaining private category studied was gravel mining, which also declined over time. Its greatest impacts appear to have occurred prior to the late 1930's. Now, most of the permanent private gravel
mines that serve the study area are located outside of the city limits. During recent years, most sand and gravel extraction in the study area has been classified as "public," since it has been closely associated with highways and flood control projects.

Public

As private forest destruction has declined, public forest destruction has increased dramatically. A relatively small percentage of this public activity is associated with city operations (Fig. 37). Most is related to flood control and highway projects, which have been constructed with federal and state assistance. At times the availability of this assistance has caused activities previously carried out by the private sector to be taken over by the public sector. But without outside public funding the local community would not be able to afford such large projects.

Major projects. It is the major projects that have caused the most damage to woodlands, while generating the most enthusiasm from community leaders. The following quotations are from a report entitled The Banks of the Cedar Turn to Green... and Gold (Waterloo, Iowa Urban Renewal Board, 1967). It describes the Westfield-Virden Project, which converted over 100 acres of forest to industrial property:

The City of Waterloo, Iowa is reaching for the stars, and there are very few who think the goal is too high. Suddenly the community has seen its latent, undeveloped potential for growth. And suddenly there is a new air of confidence, a new vigor, a new zeal for change... the city is embarking on one of the most dramatic programs in all the land. For a city that ranks 201st of all America's metropolitan areas, the program has no parallel in scope and potential...
Figure 37. "City Operations." Bulk material storage near Dry Run Creek (top). River Hills School (bottom).
After 105 years, the banks of the Cedar, along a 2.5 mile span from Fourth St. to Sans Souci Bridge, will become usable, productive land, permitting an entirely new network of streets, new buildings, new parks and new beautification.

In that 1967 report there was no mention of the loss of natural areas, nor was any environmental impact analysis required. There was considerable discussion of beautification and landscaping, but those improvements seem to have been limited to the pines and flowering trees around the John Deere foundry.

Twenty years later, the highway projects and associated sand and gravel pits are taking hundreds of acres of trees. But most community enthusiasm seems to focus on the recreational areas to be developed around the borrow lakes. Here is a description of the proposed recreation plan (Cedar Valley Conservation/Recreation Area, 1986):

The Cedar Valley Conservation/Recreation Area . . . will become the largest and most diverse natural/recreational area complex in the state of Iowa. Because of the scope, uniqueness, and variety of available recreational opportunities it offers, the Cedar Valley Conservation/Recreation Area will attract users from not only the surrounding area but throughout the Midwest and across the United States.

The differences between the projects of the 1960's and of the 1980's are striking. Environmental impact statements were prepared for the major highway projects, and mitigation measures included the purchase of recreational land to make up for land adversely affected by the new roads. A route for Highway 218 was chosen that avoided damage to Hartman Reserve and Cedar Falls' scenic river bluffs, leaving open a railroad track for possible future use as a trail. (The new route was no less damaging to woodlands, however.) The Cedar
Valley Conservation and Recreation Plan includes proposals to acquire and manage natural areas of forest and wetland, to build trails, and to greatly expand the park system, although funding will be a problem.

The attitudes of civic leaders have clearly reached the point where they consider recreational development, including the preservation and enhancement of natural areas, as beneficial to the local economy—provided, of course, that this development is combined with a more traditional form of progress (highways).

Highway construction. Because highway planning and construction were under way during the time that this study was being done, numerous photographs were taken of areas affected by the highway construction. These are shown in Figures 38 through 41 as well as others in this report. Due to the river crossings and the need to build up highways above the flood level, large amounts of floodplain forest must be destroyed. The destruction is particularly great because the elevated highways are being built on fill rather than on structures. The slope of the fill makes the width of the right-of-way about three times that of the roadway itself (Fig. 38). In Figure 40, note how the borrow pits affect more land than the highway itself.

Many of the floodplain areas affected by the highway and borrow pit construction are fairly remote. But in the upland areas, the loss of even small patches of trees is very noticeable. The new highways are taking at least four groves of old oaks in Waterloo, including a large area across Rainbow Drive from the Cattle Congress grounds. The
groves of oaks, being undeveloped, appear to have been convenient locations for rights-of-way.

Several photos are shown of the construction of the Hackett Road Bypass, which was graded while this study was in preparation (Figs. 38, 41, 53 and 54). This road is intended to convey traffic from west

Figure 38. Hackett Road Bypass Crosses the Floodplain.

Figure 39. Trees in the Path of Relocated 218.
Figure 40. Evansdale Before and After Highway 380/20.
Waterloo to a new bridge across the Cedar. As it approaches the river it cuts through forest along the bluffs and in the floodplain. It also goes through oak groves along University Avenue and Rainbow Drive, demonstrating the effect of highway construction in visible areas, where the impacts are out of proportion to the number of trees destroyed. Figure 41 shows a trio of 110 year old oaks as they are felled one by one for the Hackett Road Bypass. (Remains of the first tree may be seen at left in the top photo.) Although the northern end of the bypass dissects a city park (the Trolley Car Nature Trail), its southern end was diverted away from the Katoski greenbelt by the Federal Highway Administration, in compliance with the prohibitions on the taking of parkland purchased with federal funds.

Portions of the Hackett Road Bypass exemplify a nationwide trend. A bypass is a project that would have been a road widening except for the fact that developed property or existing traffic conditions made it more advantageous to relocate the road through nearby open areas. Highway bypasses are becoming a significant threat to remaining natural areas in urban settings.

The fact that public projects are now the greatest cause of forest destruction should give planners and conservationists something to consider. Influencing the actions of public agencies is a different process than influencing those of private companies and individuals.
Figure 41. Trees Give Way. 110-year old oaks fall one by one to the Hackett Road Bypass near Rainbow Drive.
Factors in Forest Preservation

Private

The private role in forest preservation has been through the acquisition of parklands for later transfer to public agencies, through development that preserves existing trees, and through the voluntary preservation of wooded tracts (though that is often not permanent).

Parkland acquisition. Some of the most important wooded parks in the study area were first acquired by private individuals. Among them are George Wyth State Park, Hartman Reserve, Pfeiffer Spring Park, and two portions of the Katoski Greenbelt--Martin Park and the Robertson Bird Sanctuary. Parks acquired privately are not always donated to the public; sometimes they are sold. But it is interesting that the parks that have been donated to both Waterloo and Cedar Falls have a larger percentage of woodland than the purchased parks. Perhaps these patterns of parkland acquisition indicate that private individuals are more likely to think of parks as means of preserving natural areas, while park boards are more likely to think of them as sites for recreational activities.

Development. The development of subdivisions or commercial buildings in wooded areas is usually regarded as a form of forest destruction, and in the long run it is. But in the short run--for a space of several decades--it can be a form of preservation if the some of the trees are retained. Trees in a cemetery or a residential neighborhood are reasonably protected from destruction by agriculture
or highway construction, for example. The isolated patches of woods in Waterloo and Cedar Falls probably would have been cleared for agriculture if they had not been used for urban development, as shown by the clearing of similar wooded patches in Evansdale. In the absence of protection by public ownership or by steep or flooded terrain, the next most effective method of protecting trees appears to have been residential development. As mentioned earlier, this form of protection applies only to mature trees (except in rare cases), not to forest ecosystems.

Homeowners, whether in naturally wooded areas or not, will plant trees and eventually create an urban forest. But in this study area, the perpetuation of some remnants of the existing forest has created a landscape very distinguishable from an ordinary urban forest. This landscape must be considered a form of tree preservation, at least as long as the old trees remain alive.

Private development can also affect the fate of adjacent woodlands indirectly, given the fact that most forest destruction is now coming from public works projects. Nearby valuable property can direct such projects into parks or open space corridors—as in the case of a highway bypass. But if high value property surrounds a woodland on three or more sides, it will tend to deflect destructive projects from that land.
Private preservation. For various reasons, some landowners maintain wooded tracts intact. Over time, many of these lands in the study area have been either developed or transferred to parkland status. One of the largest privately owned tracts remaining is along Elk Run Creek in Evansdale. This large, dense forest stands out in contrast to the farmland and residential areas around it. The current owners purchased it 20 years ago for development, but that plan did not work out financially. Most of the area is also in a floodplain. They now have no plans to develop the wooded area, but they allow horseback riders and motorcyclists to use it. They would be willing to sell or donate the land as a park, but there has been no interest on the part of the County or the City of Evansdale (J. Young, personal communication, Sept. 2, 1987). According to the owner, Highway 380 was constructed through the best part of the tract. Gilbert Drive was also extended through it at approximately the same time.

Public Parkland acquisition. The preservation of land in public parks is a process made up of many variables and subject to the quirks of chance, history, and personality. As the section on park history showed, many of the early parks in Waterloo and Cedar Falls were acquired through the generosity and persistence of civic-minded citizens. Several of the most densely wooded parks--the county parks and the Katoski Greenbelt--were purchased when certain federal funding programs were in effect. Trends in park theory and city policies (e.g. combining parks with schools) affected the locations and types
of parks established. And park acquisitions have been strongly affected by the timing of property sales, the willingness of owners to sell their land for parks, and the availability of funds. A discussion of local park history invariably turns up tales of close calls and missed opportunities—the parcel that was offered for sale when the city had no funds, or whose donation was almost agreed upon when the owner died or a relative protested. The result of park development throughout the study area has been relatively good protection of woodland in floodplains and along bluffs, poor protection of upland forest, and many wooded areas remaining in private hands.

The predominance of floodplain land in the park inventory is readily explainable. Floodplain land is less attractive for development and less valuable in monetary terms. In the past, much floodplain land was divided into small woodlots; on many of these, tax payments eventually lapsed, allowing the land to be acquired for back taxes. And river greenbelts are naturally desirable for recreation and habitat protection.

It is not easy to pin down the factors that prevented the acquisition of more upland forest. In Chapter 2 it was pointed out that city park philosophy in the 1950's and early '60's, when much of the upland forest was developed, stressed playgrounds rather than natural areas as park sites. There was also a lack of interest on the part of property owners, who undoubtedly perceived this land as much more usable than floodplains. Leonard Katoski, who was Director of
Parks in Waterloo from 1956 until 1984, said that the park commission usually tried to get wooded land when possible, but was often thwarted by owners unwilling to sell (L. Katoski, personal communication, May 7, 1986). For example, the commission at one time attempted to buy eight to ten acres of "Hanna's Woods" from Mr. Platt, but was told the property had too much economic potential.

The immediate past Parks Director, Bob Brooks, was more blunt about the manner in which many neighborhood parks were acquired: "Whatever someone else didn't want, we ended up with" (R. Brooks, personal communication, 1986). He added that in the last 20 years, the city has not had the financial ability to buy land. Brooks echoes the observations made by Albert Rutledge in his book, *Anatomy of a Park* (1971, p. 11):

In the Midwestern corn and soybean belt, tree cover is a premium. The town of Urbana, Illinois once stood as an exception, for it was blessed with 6,400 acres of prime forest--its "Big Grove." Today, only 300 acres remain, and much of this is scheduled to go under to make way for industrial development. So, muscled out of land well suited to their needs, park agencies are left with naught but flat and barren fields.

The lack of attention--or perhaps the lack of success--in acquiring wooded parkland in the uplands is exemplified by three parks (Kuehns in Cedar Falls, Galloway in Waterloo and Casebeer Heights in Evansdale) that are located immediately adjacent to wooded neighborhoods but contain no native trees themselves. They function mainly as sites for manmade play equipment, not as preservers of natural vegetation (Fig. 42).
Figure 42. Kuehns Park (top) and Casebeer Heights Park (bottom). Both are grassy playgrounds in wooded neighborhoods.
The role of neighborhood parks. The question must be asked whether neighborhood parks should function as preservers of natural vegetation. Their purpose is more often seen as one of providing recreational space within a certain walking distance, serving particular neighborhoods, or providing open spaces near schools. But if there are some natural features such as rock outcroppings, streams or forest remnants in a developing area, these can add greater diversity and interest to neighborhood parks.

From casual observations, it appears that heavily forested areas are popular playscapes for children. Even small plots where woodlands have been left undisturbed show the signs of use--packed dirt paths, toys, forts and tree houses. Woods provide an appropriate atmosphere for fantasy and exploration, which are necessary components of childrens' play.

It is normally left to regional or large municipal parks to provide access to nature. The City of Waterloo has two notable parks--Hope Martin Park and Robinson Crusoe Island--that combine natural floodplain forests with structures around which children can invent games. But there are few similar provisions in neighborhood parks, where children can go on their own.

Seymour Gold has studied neighborhood parks, focusing on the reasons why they often have relatively few users (Gold, 1972, 1977). In 1977 he studied six parks in Sacramento--two with a predominance of trees and shrubs, two with trees and open areas, and two with only few and small trees. 179 users were asked whether the landscape
pattern encouraged or discouraged their use of the park, and which features of the park they liked most. The parks with trees were more attractive to the users, and in those parks the trees were perceived as the most significant features. Gold concluded that the lack of trees is one reason for the non-use of neighborhood parks.

Studies of land values adjacent to parks seem to support the idea that wooded parks can be more desirable than the open playground variety. A large park in Philadelphia along a stream valley was found to have increased property values around its borders (Hammer et al., 1974). In Columbus, Ohio, an evaluation of five parks revealed that houses facing scenic areas sold for more than those a block away, but those facing heavily used recreation areas sold for less (Weicher & Zerbst, 1973). And a study of land values around a neighborhood park in a Texas subdivision found higher assessed values but lower selling prices for houses facing the park (Kitchen & Hendon, 1967). Judging from the article's conclusion, the authors, as well as the city assessor, wanted to believe that parks increased neighboring property values. But their assumptions seemed to be proven wrong by the lower selling prices (similar to those near school grounds). This park was a relatively flat, featureless playground, not much different in people's minds from a schoolyard, and certainly not the same type of landscape as a wooded ravine or a scenic grove.

Of course, one must acknowledge the negative attitudes that some people hold toward wooded areas in neighborhoods, regarding them as places for criminals to hide or for undesirable activities to go on.
Parks with good maintenance and access are less likely to provoke these types of fears than are unmanaged woodlands.

**Failure of public protection.** Acquisition of wooded areas for parks does not automatically guarantee their protection in perpetuity. Public projects such as road widenings and flood control dikes can take parkland even though it has been protected from private development. In some cities, parks are threatened by projects such as hospitals, city halls or even shopping centers. As discussed in the Chapter 2 of this report, several parks in the study area have disappeared for various reasons over the past 75 years.

Operations and maintenance affect the condition of woodlands in parks. If the forest is mowed, as for a golf course or picnic area, it will gradually decline. And some wooded areas are removed entirely. In analyzing the aerial photos from 1937 to 1983, it was found that 20 acres of trees were removed from the parks for purposes of recreational development. (These acres were included in "city operations.")

The case of Central Park in Cedar Falls illustrates some interesting points about attitudes toward wooded parkland, both in its acquisition and in its conversion to other uses. Before the park was created, Dry Run Creek (once wooded) was relocated and its old channel used as a landfill. When filled, this landfill area was converted into a park. Trees grew up along the new creek channel, and this wooded portion was added to the park later. When the route for Relocated Highway 58 was determined, there was a choice between an
elevated highway through the wooded part of the park or an at-grade highway through the open area (Fig. 43). The elevated highway was chosen. In rejecting the at-grade alternative, the Federal Highway Administration made these comments (Federal Highway Administration, 1986): "This alternate would take more land from Central Park than the selected alternate. It would also severely divide the park and impact existing and planned recreational areas. Therefore, this alternate was not considered a feasible or prudent alternative."

Incorporation of Forest into Urban Development

Visual representation is the most effective way to communicate the role of the native forest in the community. Accordingly, this section employs photographs both to illustrate particular points and to allow the reader to visualize some of the wooded areas shown on the maps.

Residential Development

In heavily wooded regions, residential developers often clear entire subdivisions or homesites prior to construction. This pattern is found close to the study area in what is left of the Big Woods in Bremer County. However, many of the subdivisions in the study area were laid out on property where large trees existed in relatively small patches. Here, developers often (but not always) used the trees to enhance the homesites. It is interesting to note the different attitude toward trees in places where they are abundant and where they are scarce.
Figure 43. Central Park. Highway 58 will traverse the wooded portion (top) while sparing the former landfill (bottom).
Native trees enhance both affluent and modest neighborhoods, as shown in Figures 44 and 45. In Figure 46, one of the largest native trees in the study area grows in a front yard, and a solitary bur oak survives between a sidewalk and a parking lot. This latter tree gives an indication of the area where Virden Creek, now underground, once flowed.

Commercial Development

Along University Avenue—once the edge of the prairie—are several examples of prominent old oaks that have been incorporated into the landscaping of commercial property. Figure 47 shows a restaurant whose image is greatly enhanced by the presence of two oaks adjacent to the building, and a Hardee's restaurant that was constructed back from the road, preserving a landmark bur oak in an otherwise barren environment. Other examples of native trees on commercial property include a motel, a land bank, a nursery, office buildings, a gift shop in an old farmhouse, and a photography studio. The photography studio was built purposely to take advantage of the beautiful trees on its lot; unfortunately it was built too close to the trees and damaged them. Some of the other trees thus preserved are unhealthy, as shown by the loss of their smaller branches (possibly due to poor drainage or soil compaction), but many have remained in good condition. There are other opportunities to make use of trees in commercial areas, especially if windows, terraces or greenhouses are used in order to allow for views of the trees from the building itself.
Figure 44. Native Trees Grace Affluent Neighborhoods...
Figure 45. ... And Modest Ones.
Figure 46. White Oak on Grand Blvd. (top), and Bur Oak on St. Albans St. (bottom).
Figure 47. Existing Trees Used in Commercial Landscaping.
Tree Maintenance

Native trees that are retained in manmade landscapes are vulnerable to harm due to the human activities around them. During the years that this project has been under way, many individual native trees have disappeared from residential and commercial property without major changes in land use. Some of the causes of their demise include: wind storm, excavation around a cellar, removal of tree obstructing a billboard, fear of branches falling on a house, cutting of trees prior to sale of property, and paving or compaction around roots.

The last two factors are the greatest causes of tree mortality, but for opposite reasons. Trees are cut to enhance the saleability of a parcel because the trees are considered undesirable to prospective buyers. On the other hand, trees are killed by paving or compaction because they are considered desirable and are retained during the construction of buildings, driveways, additions, or parking lots without proper protection. In view of the potential advantages of trees in commercial landscaping, it seems inappropriate to foreclose the options for future owners by removing them from the property. However, developers, contractors, architects and landscape architects need to be better informed on how to incorporate trees into development plans without injuring them. The cities provide no information on tree preservation when approving site plans for development.
Figure 48 shows examples of types of development destructive to trees. It is evident that there is a lack of public awareness of the importance of a tree's root system to its survival, since roots are often cut or paved over. Several examples have also been observed where the tree is given what appears to be ample space when a building is constructed nearby, but the tree dies nonetheless. In those cases, soil compaction by heavy construction equipment most likely prevents the roots from obtaining adequate air and moisture. Figure 49 illustrates proper preservation of a tree. Its root system was left intact by avoiding disturbance under the drip line (outer extension of branches) during excavation for a flood control structure in Evansdale.

Replanting and Regrowth

Most of the study area, with the exception of new subdivisions, has a well developed urban forest whose density now varies little between areas that were originally wooded and those that were not. But the character of the forest is changing. The trees that property owners plant are chosen for their ease of care, speed of growth, appearance and availability, not for their likeness to native species. The native trees that are popular tend to be from the mesic forests, but are often different varieties than those found locally. Seedless ash, crimson maple and greenspire linden are examples of cultivated trees that are related to native species but have been bred for their ornamental qualities. Non-native evergreens such as pines and spruces
Figure 48. Construction and Paving Too Close to Trees.
are also well liked, although the native red cedar is not popular. Hackberries were frequently planted in past years, as indicated by the older that are common in parts of the metro area. However, they are not now enjoying great popularity.

Of the oaks, pin oak is by far the most commonly planted, even though it is not well adapted to local soils. Red oak and swamp white oak are also available, but swamp white oak appears to be rarely planted. Species from the dry uplands—bur oak, white oak, and shagbark hickory—are extremely difficult to obtain. Local nurseries
may have one or two white or bur oaks per year, and they carry no hickories. These oaks and hickories, being adapted to dry areas, have deep tap roots that make them difficult to transplant. In addition, they are slow growing and hickories are said to be susceptible to disease.

Despite the difficulty in obtaining the species native to the dry uplands, some homeowners in existing wooded neighborhoods have planted them. Small bur oaks and white oaks have been observed in some areas of Waterloo and Cedar Falls; for example, in the area north of First St. in Cedar Falls (near Greenwood Cemetery), three houses have bur or white oaks that have been recently planted. The previous owners of the church camp, Riverview Park, also planted a row of native oaks on their property, which contains many mature specimens. But the level of interest in these trees is not sufficient to replace the existing trees when they reach the end of their life spans (Fig. 50). In Greenwood Cemetery itself, the city does not plant large tree species due to concerns about root growth.

The types of trees found in an urban neighborhood vary with the age of the neighborhood, its location, and the affluence of its residents. Silver maples, cottonwoods and Chinese elms often predominate in more modest parts of town, the Chinese elms often growing up on their own. These non-native weed trees are so tenacious that they often take over old fields and vacant lots to the exclusion of other trees, except red cedar. Many dense woodlands in the northern part of the study area are Chinese elm stands; these were not
Figure 50. Old and Young Bur Oaks in Residential Neighborhoods.

included on the maps since they do not represent regrowth of native trees.

In the early 20th century, American elms were extremely popular for parks, cemeteries and street trees; elms were also among the most common wild species in the lowlands. Dutch Elm disease wiped out the
elms in this study area almost completely, both in the natural areas and in the cities. This loss caused significant disturbance to natural forest communities, where other trees are now filling in. The cities, particularly the older sections of Waterloo, have not recovered. The few streets that were lined with species other than elms, such as maples or hackberries, now stand out in marked contrast to the rest of the city.

In public parks, the management of existing trees and the planting or encouragement of new trees determines whether the characteristic natural forest will remain in the future. Observations of city parks indicate that in the past, little effort was made to plant native species. The same types of trees that are favored for residential planting have also been favored in the parks.

The Cedar Falls director of parks states that no particular effort is made to plant native species, but sometimes trees are replanted from river bottoms; this is likely the reason why a few small bur oaks are growing at Pheasant Ridge Golf Course. At two parks along the riverfront, a special effort was made to plant native species, including a grove of red cedars at Melendy Park (R. Bruns, personal communication, March 27, 1986).

According to the Waterloo city forester, that city does make an effort to plant native trees, and most trees planted are native species or their cultivars. The city prefers trees several feet tall for planting, and purchases them locally; as mentioned earlier, local nurseries rarely carry native upland species. The lack of money
prevents the city from doing much replanting (R. Tagtow, personal communication, June 5, 1985). However, some native upland trees are obtained by transplanting those that grow up in a meadow area within the Katoski greenbelt.

One possibility for management of woodland in parks is the rotation of heavily used areas to allow natural regeneration of the trees. Once saplings have grown up in one area, it can be mowed again, leaving the saplings in place, while another area is allowed to regenerate. The preference of the public for manicured parks might militate against this technique, but it might be worth trying in light of the lack of funds for tree purchases.

The policy of the county parks differs from that of the city parks. The County Conservation Board plants thousands of trees per year within the county parks and on private property, buying extensively from the State Nursery. The State Nursery supplies seedings only a few years old, including hard-to-find native varieties not normally used for ornamentals. The County's policy is not to reproduce the natural forest, but to choose species best suited to the soil type and the purpose of the plantings (J. Knapp, personal communication, 1985). Both native and non-native species are planted; evergreens are used for shelterbelts, for example. The County also clearcuts portions of existing woodlands, which tend to be of uniform age, in order to provide a variety of wildlife habitats and to allow pioneer species to regenerate.
Highway landscaping has not in the past provided much opportunity for native plantings, but that is changing. An oak-hickory mix will be used for landscaping along the Hackett Road Bypass in Waterloo.

Harmony with Landscape

Occasionally a parcel of land will exhibit what to a geographer represents an almost ideal harmony between human vision and the natural landscape. Various philosophers have described this relationship in terms of the wooing or taming of the earth. As described by Rene Dubos (1968, p. 201):

What we long for is rarely Nature in the raw; more often it is a landscape suited to human limitations and shaped by the efforts and aspirations that have created civilized life. The charm of New England or of the Pennsylvania Dutch countryside is not a product of chance, nor did it result from man's "conquest" of nature. Rather it is the expression of a subtle process through which the natural environment was humanized in accordance with its own individual genius.

Descriptions of these characteristic landscapes often refer to agricultural or peasant societies such as those studied by Vidal de la Blache in turn-of-the-century France. But in most of urban America, such landscapes are seen only on disappearing farmlands or on individual properties whose owners happened to have a sensitivity to the land. Two of these properties that existed in Waterloo have met very different fates.

One was on University Avenue just east of Hackett Road. The house was built in 1914 by William Galloway, a well-known Waterloo industrialist who also developed the city of Cedar Heights, discussed earlier in this report. The house was on the ridge between the Cedar
River and Black Hawk Creek, at what was once the prairie-forest boundary, and enjoyed a long view over a pasture toward the Cedar valley. Situated in an oak grove, the house could take advantage of the shade of the trees and the cooling southerly breezes in summer. In winter the bare oak branches formed a sturdy but graceful network over the house and gardens (Fig. 51).

Galloway lost the property in the recession of 1920-21. After sitting empty for five years, the house was bought by Nicholas Sulentic, another prominent local businessman. The Sulentic family...
lived there for 60 years, during which time their affection for the property and Anne Sulentic's landscaping ability perfected the blend between house and land.

In the 1970's, the property was designated a corridor for the Hackett Road Bypass, despite the family's offer to donate it for a park. The bypass was routed through the Sulentic House partly to avoid disturbing commercial property on the other side of University, which was of greater value. Ironically, the commercial property that was saved exemplified an attitude toward land use exactly opposite to that of the Sulentic house. The land had been filled in order to create a level parking lot, asphalted from one end to the other, and adorned with flat, windowless buildings (the largest of which has been vacant for at least eight years). This type of development was typical of the 1950's and 60's landscaping on the rest of University Avenue.

The Sulentic House was demolished in 1987, along with most of the trees around it (Figs. 52-53). A small number of trees remain in the traffic island, but may have been damaged due to the parking of heavy equipment over their roots during road construction.

About a mile and a half from the Sulentic house, on Rainbow Drive, was another house that incorporated the natural forest into its landscaping, but in a less manicured fashion. The house sat atop the bluff, approached by a winding drive, and surrounded in spring by woodland wildflowers that were allowed to thrive in the moist shade of the trees. Here the forest is dominated by maple and red oak, which
Figure 52. Sulentic House in 1987. Construction crews remove trees, then the house itself.
Figure 53. Highway Grading. The Hackett Road Bypass is constructed through the Sulentic property, leaving commercial land across the street intact.

in the fall turn to blazing yellow and rich red. At the death of the owner, Mrs. Cross, the property was left to the city with instructions to tear the house down and create a park on its grounds. That property is now Castle Bluff Park (Fig. 54).
Map-Photo Series

In order to help the reader visualize the incorporation of the natural forest into the urban area, Appendix A presents portions of the 1979 and 1983 forest maps with photographs placed in order to show the appearance of different forest remnants.

Recommendations for Study Area

Throughout Iowa's history, there has been no shortage of recommendations on how to protect forest land. As the forests continue to disappear, remedies are continually proposed. Few are effectively implemented. A study of this kind would not be complete without recommendations for protecting the resource which is its subject, but it should be understood that recommendations mean nothing without vigorous and long-term advocacy by concerned citizens.
If the community desires to maintain the legacy of our native forests, steps will have to be taken to ensure that remaining woodlands are preserved, and that when the old trees in urbanized woodlands die, young trees of similar species will take their places. This effort would require significant changes in attitudes, awareness, and the availability of native nursery stock. Below is a summary of some of the actions that could be taken by both the private and public sectors.

**Private**

*Business.* Establish a native plant nursery to make available trees, shrubs and flowering plants native to the area. Make beneficial use of existing trees in commercial landscaping, providing they are adequately protected from construction damage.

*Community groups.* Increase public awareness of our natural woodland heritage. Continue and expand efforts to raise money for tree planting.

*Individuals.* Plant native trees on private property, and protect existing trees from damage. Continue to work with park boards to assist in acquisition of natural areas for protection.

**Public**

*Park boards.* Make an effort to acquire parcels of land for the park system that have native upland trees, even if the parcels are small. Plant native trees in existing parks, and allow natural regeneration when possible. Pursue land acquisition for the Cedar Valley Conservation/Recreation plan.
Planners (local, state and federal). When building permits are issued, provide information to owners and builders on methods of protecting trees during construction.

Avoid the automatic use of wooded areas for highway corridors. When it is necessary to remove native woodlands, replant or protect the same species elsewhere. When performing benefit/cost analyses for public projects, give full credit to the non-monetary benefits of natural areas and scenic trees. Try to avoid expansion of the flood dike system into other natural areas.

City councils. If there is sufficient community interest, enact a tree ordinance calling for protection of trees or woodlands of special value. Provide more funding for tree planting and parkland acquisition. Inventory natural areas and woodlands within city boundaries, and develop policies for protecting them.

Suggestions for Further Research

It would be interesting to see other areas analyzed in terms of the public/private and floodplain/upland categories that were used here. In an area that is surrounded more by forest than by farmland, such as some parts of the New England and the Southeast, the patterns found in this study might well be reversed.

One of the observations made in this study area was that residential developers tended to seek out savanna-type landscapes and to retain some of the large trees. In densely forested areas in an adjacent county, however, homesites have often been completely cleared, leaving a sunny lawn surrounded by forest. This raises the
question of whether the attitudes of developers and homebuyers change depending on the abundance and types of trees in an area.

Attitudes toward trees also vary in different parts of the country. As mentioned earlier, many cities in Florida and other states have tree protection ordinances. By contrast, the Waterloo city forester regards as his main task encouraging the general public to see trees as assets instead of nuisances. The Des Moines city forester stated that Iowans do not care about trees (R. Bair, personal communication, June 28, 1984). Do people in prairie states have an inherently different attitude than people in forested states, or are there other factors that determine such preferences?

Public preferences comprise an entire topic of study that is essential for understanding the urban landscape, but was only touched on in this study. Many writers believe that human beings need to experience a sense of place, identification with their surroundings, and aesthetic inspiration in their daily lives (Mumford, 1938; Lynch, 1960; Nairn, 1965). But perhaps, as David Lowenthal asserts, desirable landscapes are a matter of individual taste, and "few people really look at the places they live in, work in, or travel through. Anesthetized against their surroundings, they spare themselves pain" (Lownethal, 1963).

It was assumed here that native trees are desirable because of their beauty and their links to the land and its history. But it would be interesting to test that assumption through public opinion surveys. During a local Arbor Day project in 1986 that highlighted
100-year old oaks, it became clear that even the members of a community group dedicated to tree planting were unaware of these native trees. Given the loss of other landscape features such as historic buildings and arch bridges in the Waterloo area, is it realistic to assume that the community would support special consideration for native trees? On the other hand, there are indications that individuals do appreciate these trees even if they are unaware of their origin.

Another aspect of this project that could be expanded upon is the study of parks. In particular, an interesting study might be conducted, in this area or another, of parks that have ceased to exist or been encroached upon for other uses. People tend to think that parks provide permanent protection, but that is not always the case. Also useful would be an investigation of local children's preferences for forests vs. playgrounds as play areas.

Summary and Implications

This study investigated the changes in the original forest in the Waterloo metropolitan area from 1855 to the present, with emphasis on the period from 1937 to 1983. From the time of settlement to 1983, approximately 70% of the forest destruction was due to agriculture and logging and 30% to urban development. In the 46 years between 1937 and 1983, flood control projects were the primary cause of forest destruction. At the same time, floodplain forests generally improved in quality while upland forests declined in both area and density. Forest loss was 1.7 times as great as forest regeneration between 1937
and 1983. The most serious impacts on the forests changed through history, moving from agriculture and logging to urban development, and from private activities to public works projects.

Of particular significance in these findings are the increasing role of the public sector in woodland loss, the importance of agriculture in destroying woodlands, and the difference in protection of floodplains and uplands.

Floodplains, being undesirable for development, are natural locations for parks and greenbelts, but they are also vulnerable to disturbance from flood control projects, gravel pits and highway crossings. Floodplain greenbelts need to be acquired and made accessible to the public, but the uplands should not be neglected. Their biological character is different, and they are in greater jeopardy from residential and commercial/industrial development. Even small neighborhood parks can help preserve some of the upland woods.

In outlying areas, agriculture can cause forest destruction that is even more complete than that caused by most urban land uses. Therefore it is important to protect forest remnants in outlying areas where they are at risk from agricultural expansion.

Most importantly, this study documented the increasing impact of the public sector. The same governmental bodies that purchase and manage parkland are also responsible for the majority of the destruction of natural areas that is now occurring here. Public projects have taken parkland several times, although an attempt is usually made to protect it. However, the protection of existing parks
is not sufficient to prevent damage to natural areas, since many of these areas are not in parks. One reason why the public sector has become so prominent in the last 20 years has to do with the peculiarities of the study area. There was little vulnerable forest remaining except in floodplains, and public projects are more likely to affect floodplains than are private projects. Nevertheless, natural areas and scenic groves are too often chosen for highways, flood dikes, borrow pits and city operations because they are perceived to have little value. In searching for the greatest agents of forest destruction, local, state and federal governments must look first to themselves.

Some hopeful signs apparent in this study are the ability of the natural forest to regenerate itself once freed from the pressures of logging and grazing, and the obvious fondness that many residents of the area feel for beautiful native trees. With sufficient public awareness and funding, these tendencies could lead to better perpetuation of the native forest heritage of the area. As the situation stands now, much of the floodplain and one tract of transitional (lowland, bluff and upland) woods are protected in parks, but the urbanized areas are making a slow transition to a typical urban forest with little resemblance to the original character of the woodlands.
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APPENDIX A: MAP-PHOTO SERIES
APPENDIX B: TEXT PHOTOS IN BLACK AND WHITE
Figure 2. Bur Oaks as Landscape Features.
Figure 3. Shagbark Hickory and White Oaks in Cedar Falls.
Figure 11. Gates Park.
Figure 8. Tree Damaged by Parking Lot Construction.

The eventual outcome of an urbanized woodland is a change in its character, as described by Gray and Denecke (1978, p. 26): "In many cases, native forests have been urbanized as cities have grown into them. Often in these situations, the original forests have been so altered by the supplemental planting of introduced species that they
city. Pfeiffer Spring park and part of Washington Park, near the mouth of Dry Run Creek, were donated by Henry and Annie Pfeiffer. All four of these parks are in the floodplain except for a portion of Pfeiffer Spring.

Washington Park was once larger than it is now. Its original plan (dated 1919) shows a major portion of the park along the wooded north bank of Dry Run Creek opposite Pfeiffer Spring Park (Fig. 12). Stepping stones in the river once led to a shelter house there. But through an unrecorded or unofficial transaction, the land was turned

Figure 12. North Bank of Dry Run.
Figure 13. Pioneer Park.

The farm foreclosures that occurred during the Depression made possible, in 1940, the first acquisitions for the largest park in the study area: George Wyth State Park. The park was originally known as
determined to leave it wooded. The Park Commission prevailed, and Kiwanis Park is now one of the few neighborhood parks in the study area where one can enjoy woodland wildflowers.

Figure 14. Kiwanis Bluff Park.

Just as the cities were turning away from natural areas as sites for parks, the county became involved. In 1955 the State Legislature authorized the creation of County Conservation Boards, and Black Hawk County established one in 1956. Partly with the aid of federal funding for wildlife habitat, the county acquired several parks in the study area in the late '50's and early '60's, all in floodplains.
Figure 15. Leonard Katoski Greenbelt and Hartman Reserve.
remaining riverfront forest in the vicinity of the wastewater treatment plant and Washington Park.

Highway construction is another public action that has had major impacts in the study area and will have more serious ones in the near future (Fig. 17). In his 1968 book *The Last Landscape*, William H.
Figure 17. Effects of Highway Construction.
Figure 18. Native Trees on Church Grounds, Cedar Falls.
Figure 19. Greenwood Cemetery Contains Native Oaks and Cedars.
Figure 20. Wildflowers in Dense Forest: Pfeiffer Spring Park (top) and Robertson Bird Sanctuary (bottom).
Figure 37. "City Operations." Bulk material storage near Dry Run Creek (top). River Hills School (bottom).
Figure 39. Trees in the Path of Relocated 218.
Figure 40. Evansdale Before and After Highway 380/20.
Figure 41. Trees Give Way. 110-year old oaks fall one by one to the Hackett Road Bypass near Rainbow Drive.
Figure 42. Kuehns Park (top) and Casebeer Heights Park (bottom). Both are grassy playgrounds in wooded neighborhoods.
Figure 43. Central Park. Highway 58 will traverse the wooded portion (top) while sparing the former landfill (bottom).
Figure 44. Native Trees Grace Affluent Neighborhoods
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included on the maps since they do not represent regrowth of native trees.

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Figure 53. Highway Grading. The Hackett Road Bypass is constructed through the Sulentic property, leaving commercial land across the street intact.

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