CITY NEIGHBORHOOD AND OAK SAVANNA

by

NANCY M. ATEN

(Under the Direction of Darrel Morrison)

ABSTRACT

Ecological landscape rehabilitation is explored in cities, especially the significance of scale, and the sense of place that is encouraged through the use of an indigenous vegetation model. The natural landscape and natural processes in cities have been modified beyond recognition, simplified, and obscured; however, the dependence of people on those processes and resources remains in a critical, tenuous, and not completely understood balance. In process-based ecological restoration, considerations of scale are related to ecosystem spatial characteristics and potential connectivity of restored patches. In cities, with unbuilt ground in very small fragments, the idea of a whole ecological landscape integrated with dense human population encourages consideration of larger scale rehabilitation. A process of ecological rehabilitation at a neighborhood scale is suggested, toward “success” in ecological and social terms, by considering case study neighborhoods in central city Milwaukee, their characteristics relevant to landscape rehabilitation, and oak savanna as a vegetation model.

INDEX WORDS: Urban Ecology, Oak Savanna, Ecological Restoration, Landscape Scale, Milwaukee

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DEDICATION

For the poet in my life, who shares and inspires my hope and passion.

For my parents, who gave me paths, wildness, climbing-trees, and mysteries instead of a yard.

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With gratitude and respect for Darrel Morrison;
he is the reason I entered this field.

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of a few very special classmates.

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" 'Space' is everywhere. 'Place' is *some*where."
- Brian Reilly, Milwaukee Makes Place initiative (Reilly 2002)

"The weeds in a city lot convey the same lesson as the redwoods."
- Aldo Leopold (Leopold and Schwartz 1966)

"… in cities, what we really have is a chance to practice environmentalism *at its greatest intensity*."
- William Jordan (emphasis mine; Gordon 1990)

The oak savanna is a plant community once widespread in southern Wisconsin. Proposing its use as a landscape rehabilitation model in central Milwaukee neighborhoods, at scales of a few blocks and larger, this thesis asks whether the city human-populated landscape can coexist with a semblance of oak savanna, enabling some degree of ecological function, and explores the cultural and social value of such an integrated landscape.

What is the feasibility and potential effectiveness of ecological restoration at a larger than usual urban scale, given the land use patterns and environmental factors in an urban neighborhood? Can human needs for privacy and expressiveness, and community and usefulness, be met within the ecological framework? When multiple property owners are involved, what is the potential support from, and effect on, the neighborhood sociopolitical structures? And, how could change at this scale affect people's relationship with nature and the place where they live?

The mayor of Milwaukee wrote recently: "Increasingly, environmentalists are uniting with urban advocates and developers to forge a common vision of (1) urban life as a big part of the answer to environmental challenges and (2) environmentalism as a big part of the answer to the challenges of cities" (Norquist 1998). There is both insight and challenge in this statement, for the potential depth of that common vision and as-yet unexplored realizations.

Culture and nature

Despite Norquist's optimism, there has been bias in much of the thinking in environmental ethics toward non-anthropocentrism; that nature or wilderness has intrinsic value that does not include people and culture, which philosopher Andrew Light argues has led to a silence from environmental ethicists about urban issues:

> "If nature is to be considered as valuable in itself … then it will be best identified in those areas relatively independent of human intervention as opposed to those humanly shaped areas which exemplify exactly those culturally bound preferences that many environmental ethicists wish to reject." (Light 2001)

There is certainly a spiritual aspect to this bias; people need a model for living that gives some amount of comprehension, hope, and willingness to act on faith. Wilderness as an ideal is like religion to the soul: it lets us find our place in a world without sense. But the problem of our wilderness ideal, according to William Cronon (Cronon 1997), is not so much its model of hope for our ability to sustain life on earth, but a nearly complete disconnection with everyday lives and our behavior at home. Our invented wilderness ideal has removed humans and history from what we use as a vision for the earth's future.

This is as much about policy and practice as it is about philosophy. Cronon is, I think, mostly worried about well-intentioned but misguided environmental policies and practices – those expressing less concern in cities, valuing the far-away over the next-door, or over-simplifying our interrelatedness with complex, functional ecosystems.

> "Any way of looking at nature that encourages us to believe we are separate from nature – as wilderness tends to do – is likely to reinforce environmentally irresponsible behavior. (…) Any way of looking at nature that helps us remember –

> as wilderness also tends to do – that the interests of people are not necessarily identical to those of every other creature or of the earth itself is likely to foster *responsible* behavior." (Cronon 1997)

Light describes a category of oft-made suggestions by non-anthropocentrists characterizing the city as a "source of disvalue" (Light 2001). Eco-centrism seems a safer position for an environmentalist to take, to mistrust culture, considering the vast environmental losses attributed to us, and considering our widespread belief in an inevitable deterministic progress (the latter discussed in Berry 2000 p. 89-91). Light is concerned by the embodiment of the conceptual nature-culture dualism in a geographical dualism between wilderness and cities, and suggests that an ethic must consider both "the importance in ecological terms of environmental issues in the urban context", and "the regressive social dimensions of an anti-urban bias in environmental thought" (Light 2001).

For landscape architects, one manifestation of this wilderness/city dualism relates to the use of plants in landscapes. Plants have seemingly, unfortunately, become divided into ecological ones (in "preserves") and decorative ones (around people). Regardless of the cause, landscape architects are in the best position to address this disconnection – fundamentally knowing and working with plants, endeavoring to contextually weave ecology and design in places for people.

Another troubling aspect of the dualism, as discussed by Cronon, is elitist environmental policies – those favoring urban recreationists; devaluing native peoples, rural people productively working the land, and the poor in cities of landscapes no longer wild. The following "Principles of Environmental Justice" were adopted in 1991 at the first National People of Color Environmental Leadership Summit, in Washington, D.C., and this response feels just right, and clearly relevant for cities:

> “Environmental Justice… affirms the sacredness of Mother Earth, ecological unity and the interdependence of all species, and the right to be free from ecological destruction…
>
> …demands that public policy be based on mutual respect and justice for all people, free from any form of discrimination or bias…
>
> …mandates the right to ethical, balanced and responsible uses of land and renewable resources in the interest of a sustainable planet for humans and other living things...
>
> …calls for the education of present and future generations which emphasizes social and environmental issues, based on our experience and an appreciation of our diverse cultural perspectives...
>
> …requires that we, as individuals, make personal and consumer choices to consume as little of Mother Earth’s resources and to produce as little waste as possible; and make the conscious decision to challenge and reprioritize our lifestyles to insure the health of the natural world for present and future generations.” (Grossman 1994)

Andrew Light concludes with the potential of ecological restoration and cities:

> “I am tempted to gauge the relative importance of different environmental practices in terms of their ability to engender a more participatory relationship between humans and the nature around them. I believe that restoration ecology represents such a practice, and its greatest headway so far in terms of serving as a conduit for public participation in nature, has been in urban areas.” (Light 2001)

Light gives as examples the work of the ecological restorations at the University of Wisconsin Arboretum and the Chicago Wilderness. These are important and exceptional projects, and yes, in cities, but on somewhat separated tracts of land. As a supplement to projects like these, this thesis suggests restoration in cities at a finer spatial granularity of interaction with people. “We will only have a fully environmental ethic… when we turn our attention to the preservation of richly textured urban spaces as often as we do to old growth forests” (Light 2001).

Scale and ecology

Ecological restoration is broadly defined by the Society for Ecological Restoration as "the process of renewing and maintaining ecosystem health" (SER Board of Directors, 1995), or to repair or replace "essential ecosystem structures and functions that have been altered or eliminated by disturbance" (Jordan 1995). The term "rehabilitation" is sometimes used to reflect an awareness that these may be ideal definitions toward which work progresses. Ecological restoration or rehabilitation has been less often practiced in dense urban areas, although the trend is changing – particularly for urban riparian corridors. In 1996, the eighth annual Society for Ecological Restoration conference included a session titled "Topics for Consideration in Urban Restoration", where four-and-a-half of six papers were about riparian areas. But even then, urban landscape restoration seems to be pursued on patches or corridors of land – land without built structures and human inhabitants, separate from them by property ownership or physical boundaries.

Special issues on urban forestry of the journal Urban Ecology in the mid-1980s discussed, for forests in cities, what exists and what is possible – recognizing both ecological function and value, and the overlay of social and institutional constraints and opportunities (Stearns 1984). In these discussions there is a general sense that an urban ecosystem is a *kind* of ecosystem, recognizing the "unnatural" degree of human disturbance and control over its elements, which distinguish it from pre-settlement ecosystems or simply from ecosystems possible outside of cities. Thus, articles talk about different urban vegetation succession patterns; adventive species in cities; survivability of species in urban conditions; similarities in structure although not function to other ecosystems (e.g. suburban savannas)… recognizing the difficulties while supporting the value of greenness in cities. A struggle to strengthen the ecological basis for landscapes within cities is clear – "Even in the city one cannot separate the tree from its understory, nor from the substrate on which it grows"

(Stearns 1984 p. viii) – although the ways and means to strengthen that basis are not. "One sees… the beginning of an ecological construct relative to city trees… Nonetheless, it must be recognized that perturbation resulting from a human decision will be one of the foremost factors" (Stearns 1984).

This could be considered the other way around. Instead of understanding the urban ecosystem compared to a "natural" ecosystem, then encouraging valued commonalities, one could understand the "natural" ecosystem and evaluate its potential for existing with the city and with people. Look first at the system that has thrived for a good long time without us, its complexities, relationships, evolution, and then see if we can live *with* it and be *of* it, accommodating life to a fuller extent.

One challenge of rehabilitation in cities is perception: if "urban ecology" is understood as a different kind of ecology and as a different kind of ecosystem, it might lead to the practice and acceptance of lesser ecological functioning in cities under the auspices of such differences. Although urban environments severely limit and challenge natural systems, an urban ecological landscape simplified to street trees, stormwater drains, and recreational city parks is not a necessary consequence of those limitations.

Cities do pose daunting challenges from an ecological perspective. Human construction and reconstruction have wrought earth-moving and the leveling of topographic relief; the engineering of water supply; severe and fine-grained fragmentation of land resulting from property ownership, property boundaries, and density of built structures; the consequent urban air, soil, and water pollutants; the introduction of invasive exotic species and significant simplification of the vegetated landscape. Ecological improvement in cities has been approached in a variety of ways and scales. McHargian ideas have influenced city and regional land use planning, including greenbelts, river corridors, mass transit – "land, air, and water resources are indispensable to life and thus constitute social values… a recognition of these social values, inherent in natural processes, must precede prescription for the utilization of natural resources" (McHarg 1969). Sustainable construction techniques, materials, and respect for energy accounting allow for a lighter ecological footprint (Thompson and Sorvig 2000).

The "urban cliff hypothesis" has been proposed by researchers at the University of Guelph (Larson and Lundholm 2002). Their hypothesis suggests that much of urban areas represent human-constructed and assembled modern rock outcrop habitats – the faces of buildings, the harshness of environmental conditions – where a significant number of the urban biota (52% in an analysis of 115 species "recruited into agriculture or associated with humans as mutualists or commensals") are species endemic to cliff , cave, or talus slope habitats. The researchers suggest that humans have thus vastly expanded the degree of cliff habitat worldwide, and in doing so, displaced the flora and fauna from other habitat types, perhaps with species now selecting for stress tolerance and opportunistic behavior. Although the ideas and implications are unconventional and partly hypothetical, the theory does try to describe a whole ecological landscape in structure and function, with people layered in, at urban scales.

When considering ecological restoration and urban ecology together, the significance of scale seems apparent. For restoration, considerations of scale are related to ecosystem spatial characteristics and potential connectivity of restored patches, compared to available or unbuilt land (interestingly, this is of significance in urban areas when the project is a riparian restoration). But in cities, the natural landscape and natural processes have been modified beyond recognition, simplified, and obscured to the extreme; unbuilt ground is in very small bits here and there. An evaluation of opportunities from the restorationist's usual perspective thus concludes with dim prospects in cities; and so (except for riparian corridors), urban restoration-minded projects work on the individually largest tracts of land available – a park, a vacant lot, an individual property owner, maybe some connected front yards. Urban ecology or urban forestry, on the other hand, tends to consider the city at its whole spatial scale (although often without a compelling ecological framework). The Georgia Forestry Commission and Trees Atlanta define as a goal "to manage the urban forest as a continuous resource regardless of ownership boundaries". This thesis takes a restoration perspective that begins with the natural ecosystem, and then reconsiders it within the city's spatial scale and human habitation.

Midwestern oak savanna provides a unique opportunity for that consideration, because of its structure. It is possible to imagine the savanna canopy and openness being modeled within the city street grid, and possible to imagine the adoption of the savanna groundlayer flora by residents. Of course, natural processes are connected to physical factors, not political boundaries – some level of compatibility in scale between oak savanna and city neighborhood is assumed, but this must be considered further. The combination of structural compatibility and an appropriate indigenous plant community – which contributes to sense of place – forms the basis for exploring the involvement of, and impact on, people.

Scale and people

We, the people, are dense in the urban landscape, with complex layers of culture, society, economics, politics, and neighborhoods.

With the substantially constructed urban landscape has come a correspondingly substantial loss of visibility of the natural processes; at the same time, our dependence on those processes and resources is in a critical, tenuous, and not completely understood balance. From the position that true understanding of natural processes leads to responsibility, eco-revelatory design has emerged. Design is subjective, but design also has a particular ability to reveal the functioning of the natural systems in a human place – by drawing attention in certain ways, by visual emphasis, by telling a story, by directing one's involvement. This is difficult considering the complexities of ecological systems, as well as the differences between cultural perceptions of "nature" and the reality of ecological function.

The field of landscape ecology considers the way people experience place and how that is interrelated with ecological processes and forms, often considering landscapes at scales of human perception. Landscape ecologist Joan Nassauer has expressed another challenging reality of the eco-revelatory idea:

> "… the task of design as revealing ecological systems implies that ecological systems are visible. Yet the carbon cycle is not visible, sheet erosion is not visible, toxic chemicals in water often are not visible, the North American flyway is only partially visible, and so on." (Nassauer 1995 p. 244)

In addition, there is choice of the manner of revelation. Principles are conveyed not always in exceptional behavior, but in everyday interactions and environments. One application of eco-revelatory design is to make functional landscapes not exceptional, but integral – immediate in the everyday life of people, and also widely shared.

This brings up the question of scale in revealing ecological processes. Scale can affect the ability to express an ecological idea, and it also can affect the degree of perception. For example, if one front yard in an urban neighborhood is a prairie and the rest are lawns, the prairie is in sharp contrast, but as an oddity, an exception. If several blocks are seen as a prairie, no lawns within, the perception might be different – an integral landscape, one that cultivates experience. Whether a landscape is integral, which is not the same as unnoticed, depends on time and participation.

The role of participation in ecological restoration has particular relevance in cities. Bill Jordan has described restoration as something of a performing art, and expresses a value of such collective performance:

> "…by doing [restoration], we discover who we are in relationship to a particular landscape, a particular kind of ecological community. […] But there is something else going on here as well, and it is, if anything, even more important… We see this if we turn our attention away from the *product* of restoration… toward the *process* of restoration itself. … [restoration] as a process, an act, a *deed*, of critical importance for our relationship with the rest of nature…" (Gordon 1990)

Landscape restoration at neighborhood scales provides an opportunity for a larger degree of participation; these are the everyday landscapes in which people live, and there are lots of people in city neighborhoods.

Anne Whiston Spirn, in The Language of Landscape, tells stories of a deeper understanding of landscapes, the "reading" of landscape and interactions of people and landscape in that language. The stories are immediate: a neighborhood built long ago over a covered-up stream, with a meander of broken-down buildings and vacant lots troubled by flooding, nearly invisibly tracing the old path of the stream and cracked pipes. "The meanings landscapes hold are not just metaphorical and metaphysical, but real; their messages practical; understanding may spell survival or extinction… Relearning the language that holds life in place is an urgent task" (Spirn 1998). In this part of West Philadelphia, learning the language has meant speaking it too: in a neighborhood reforestation process, vacant lots are used by students of the neighborhood middle school to plant, tend, and grow trees during their tenure; to talk to neighbors, choose where to plant trees, advise about care, and transplant the trees before they graduate.

Thesis organization

By considering case study neighborhoods in central city Milwaukee as examples, their characteristics relevant to landscape rehabilitation, and oak savanna as a vegetation model, a process of planning and designing an ecological rehabilitation at a neighborhood scale is suggested, toward the goal of increasing the likelihood of "success" in ecological and social terms. Chapter 2 reviews historic vegetation of Milwaukee and the relevance and characteristics of oak savanna in this place; Chapter 3 examines case study neighborhoods in Milwaukee and a few of their characteristics that could inform an ecological restoration process. Chapter 4 resolves the two – discussing particular ways in which neighborhood and oak savanna could mesh, and suggesting how to evaluate feasibility – not *how* could such rehabilitation be done, but what considerations affect *where* it could be tried? Chapter 5 is a speculative design proposal, and includes suggestions for evaluating effectiveness; Chapter 6 concludes with a summary of key ideas.

Chapter 2: Southern Wisconsin Oak Savanna

Milwaukee is centered on the confluence of the Milwaukee and Menomonee Rivers along with the smaller Kinnickinnic River at the western shore of Lake Michigan, and covers the watersheds of smaller streams as well. Prior to Anglo American settlement in the 1830s, tall, rounded clay bluffs rose from the lake and rivers, which cut through limestone bedrock in most places. Initial settlers established on somewhat higher points of land among the marshes of the river confluence, and described oaks on the bluffs leading to forest beyond.

Lloyd Shinners, a student of Aldo Leopold, in his 1940 University of Wisconsin thesis, describes the history of Milwaukee flora evocatively:

> "All the region was covered by glacial ice during its last advance. Beyond the front of the ice at the time it had reached its farthest south lay a narrow strip of tundra, and a broader strip of coniferous forest. Beyond these lay deciduous forest, centering in the southern Alleghenies and the Ozarks. To the southwest was prairie. The tundra flora passed through our region quickly and disappeared to the north. Evergreen forest followed, filling the lowlands with tamarack swamps and the highlands with pine forest. But those did not remain long except in the coolest and dampest places. The climate was warm and dry, and the prairie moved in from the southwest. One line of march ran along the highest ground, following the kettle moraine up to Green Bay. As the land became drier, it spread onto sandy and finally onto drier soils, covering nearly all of our area. Another line of march came through central Illinois and up the broad, sandy shores of the predecessors of Lake Michigan, which have since been washed away, and reached at least as far as Milwaukee. When the melted ice had given rise to a chain of lakes whose shores stretched almost continuously to the ocean, a pathway was opened for plants from the sea beaches and adjoining parts of the coast. Deciduous forest was the last to arrive, coming in two divisions: oak-hickory moving up stream valleys from the south, and beech-maple coming overland from the east around the north end of Lake Michigan after being partly deflected by the prairie at the south end.
>
> The two arms of deciduous forest were closing in on our area when the first settlers arrived, opening the way for a new flora, the weeds, and disrupting the succession of those already present." (Shinners 1940 p. 1-2)

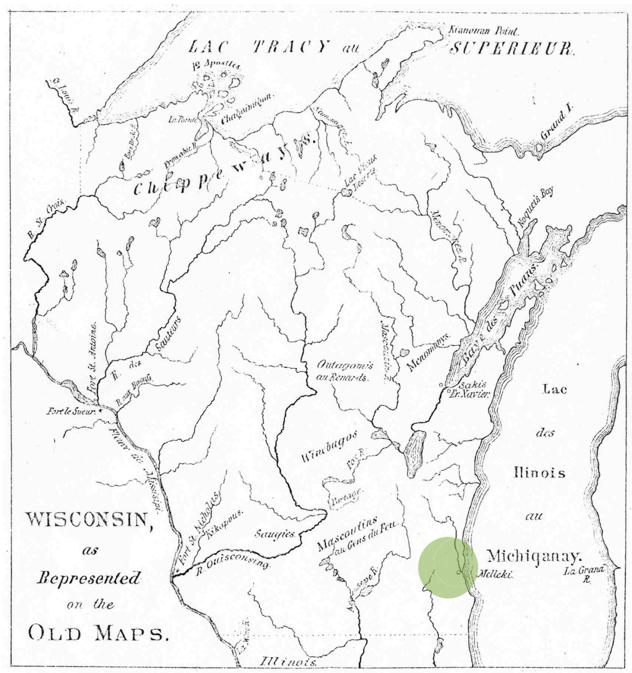


Figure 2.1: Milwaukee and regional geography (Lapham 1846)

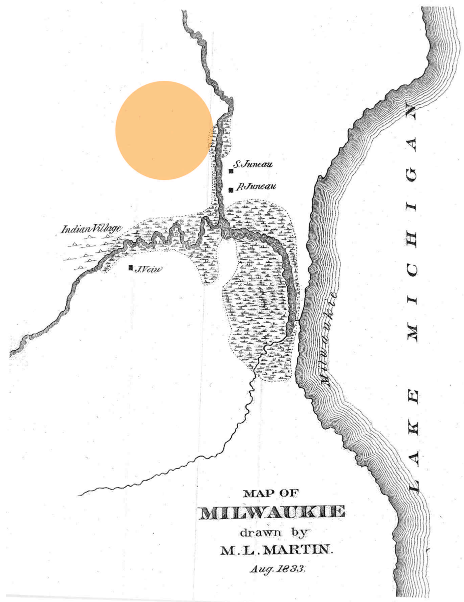


Figure 2.2: General area of study in historic context, on higher ground between Milwaukee and Menomonee Rivers
(Buck 1881 p. 38)

Niagara limestone forms the bedrock through Milwaukee, except for some shaly limestone near the lake. Soils, on the higher ground between the Milwaukee and Menomonee Rivers, are glacial till, often clay or clay loam, sometimes stony (Martin 1965).

Prior to settlement, Milwaukee was the home of the Menomonees, or Wild Rice Eaters, and north of the Milwaukee River, the Potawatomies (Lapham et al. 1870 p. 10-11). *Ziziana aquatica*, or wild rice, was the only native grain in this region. An 1848 flora from geographical surveyor C. C. Parry noted its abundance in inundated land around rivers, upstream from a narrowed outlet (Owen et al. 1852 p. 620); this is what the Milwaukee River near its outlet must have been like. Early settlers also reported corn cultivation by Native Americans in Milwaukee, in 12” or so high heaps or little hills, on higher ground (Flower and Western Historical Co. 1881 p. 114-5). The Potawatomi tended the landscape in another sense by replacing dug roots of medicinal plants with their seedheads (Anderson 1996 citing

[Smith 1925]). Fire was used by Native Americans in this area to manage or maintain openings, including for hunting and cultivation, supplementing lightning-ignited fires (Leach, Ross and Faber-Langendoen 1995).

Among the earliest written accounts of vegetation in the Milwaukee area are the land surveys of 1835-1836, and the floras of Increase Lapham, one of the first Anglo American settlers. Lapham, within months after arrival in Milwaukee on July 1, 1836, published a flora of 212 species, followed by updates in 1838 (over 200 additional species) and 1840 (over 140 additional species). Accomplished in many scientific disciplines, Lapham also extensively collected, and exchanged herbarium specimens with leading scientists of the time, including Asa Gray, Douglass Houghton, George Vasey, and others (Voss 1978). As further validation of his botanical credibility, no spring ephemeral species are listed in 1836, appropriate given his arrival in July; most of the species on that first list are summer- or fall-blooming, and a good number are wetland species, as could be expected. When seeing Lapham's handwritten first flora, and a copy inscribed to a friend, I imagined his treks and sense of discovery. He collected *Linnaea borealis* (Twinflower) those first weeks; this more boreal/bog-habitat species might have been a bit of a challenge to find in Milwaukee, but undoubtedly he felt the same delight as I suspect most botanists even today do, when finding the plant of the genus named for Linnaeus.

Lapham's first flora, in addition to the many wetland species, includes a significant number of species considered today as oak savanna indicators (more on this later). He describes oak savanna scenes southwest of the city limits:

> "…the country consists of oak openings, interspersed with small prairies… The oak most usual on the openings, are the white oak and burr oak (sic) (*Quercus macrocarpa*); but these species are seldom mixed, and the kind of tree gives name to the openings; thus we say 'white oak openings,' or 'burr oak openings.' There is believed to be a difference in the character of the soil on the different kinds of openings, as well as on the prairies." (Lapham 1846 p. 110)

But what existed within the city limits of Milwaukee? J. S. Buck, in 1890, wrote:

> "These bluffs were exceedingly beautiful in a state of nature. Their fronts were bold and round, and from Spring Street (Wisconsin Avenue) to the Menomonee, and from Seventh to Twenty-fifth streets, were covered with a young and thrifty growth of oak, mostly being what is termed 'openings'." (Buck 1881)

John G. Gregory, in 1931, quotes from writings of several early visitors and residents. He notes a variety of opinions, from those discouraged by the "swamps", to those inspired by the beauty of the bluffs. In several cases, oak openings are described. In 1837, a traveler identified as W.T. wrote:

> "Wisconsin is a land of variety. Here are the 'regular-built' woodlands of New York. Here are the oak openings – scattered oaks, with no underbrush – here are the bewitching undulating prairies, and here are the wild wonders." (Gregory 1931 p. 103)

In 1895, about his arrival in 1842, Selby recalled:

> "In 1842, little had been done to alter the natural beauty of Milwaukee. The low land along the two rivers (Milwaukee and Menomonee), extending back from thirty to sixty rods [approximately 150-300 meters], was covered with a healthy growth of shrubs that were indigenous to the marshy ground they sprang from. The hills, or more correctly I should say the uniform bluffs that surrounded the low land, had an imposing and beautiful aspect, rising quite abruptly from forty to sixty feet, and were covered by native forests, in front by oak openings and behind by dense trees of oak, maple, beech, and other hardwood timber. The ground under the openings was carpeted by the native grass." (Gregory 1931 p. 206)

In 1880, about his visit in 1830, Loomis wrote:

> "On the east bluff, the expanse of the whole point… was dry, and somewhat undulating, with gullied openings, where were what the French call Bois franc – free woods – and intersected with Indian trails." (Gregory 1931 p. 53)

One landscape image of the time is reproduced in Figure 2.3: the home of Jacques Vieau, a very early French settler in Milwaukee, establishing his home "a mile and a half up the Menomonee River, on the south side, at the foot of the lime ridge" (Thwaites 1888). Vieau managed several northern trading posts to which, each spring, he carried his season's

Figure 2.3: Savanna as perceived by early settlers. Sketch of the Jacques Vieau home as it appeared in 1795, drawn around 1880. Accuracy confirmed by son Peter Vieau, born here, in writing ("[the sketch] is perfect in every respect and could not be got up better, everything in it is very natural") (Buck 1881). In 1795, for at least a couple of decades, there were only a handful of non-Native American people in Milwaukee, associated with fur trading, and it seems unlikely there was significant landscape modification by those early traders. Note the savanna appearance; clearly Vieau's perception of this landscape.

fur pelts. The log building at the top of the bluff is the family's home; the trading post warehouse is behind it.

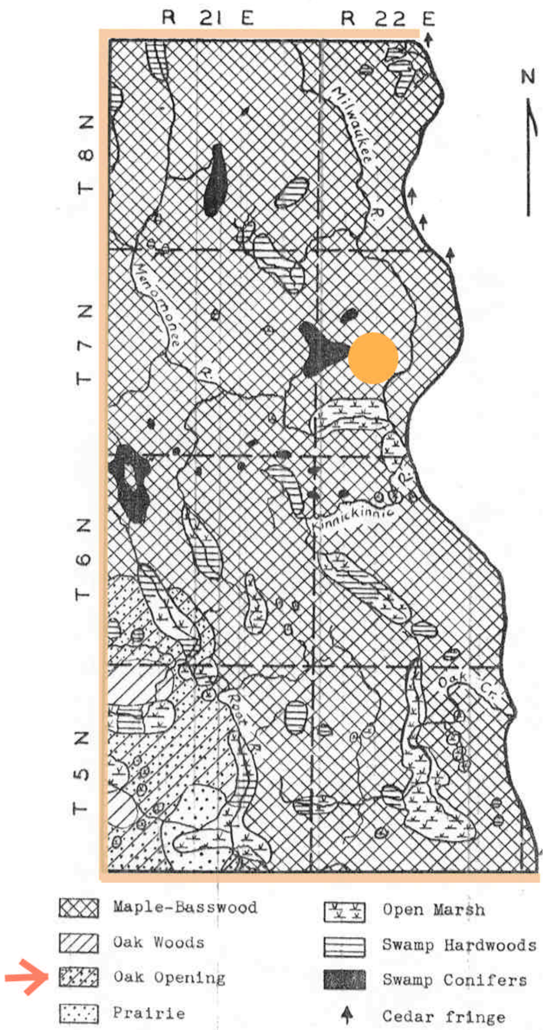
> "The buildings in the picture were destroyed in 1836 or 1837, at the time of the great land speculation. I have often heard my father say that when he arrived at this place, about the third week of August, 1795, it was in the evening. He beached his batteau a little to the west of the spot where his post was established, and had two tents put up at the foot of the bank, one for his men, the other for the family." (Thwaites 1900)

Oak openings, although described in early writings, are not of great significance in survey records for Milwaukee; this may be in part due to their smaller-size patches here (smaller than the survey resolution), as well as perception of them as a transitional community (Randy Powers, personal communication). Bur oaks are a clearly fire-evolved species, unlike many deciduous forest tree species of the area. Larger bur oaks with thicker bark – those avoiding fire until at least 12-15 years old (Curtis 1971 p. 337) – survive most fires, and burned trees will sprout from the root crown or stump. There are remnant bur oaks in the Milwaukee area – state "champion" trees – which pre-date settlement and have open-grown crowns, a distinct character of savanna structure.

In the1950s, Harold Goder, a student of John Curtis at the University of Wisconsin, interpreted 1835-1836 survey records including witness trees and written notes for parts of Wisconsin; his published paper about Racine County, just south of Milwaukee, describes the oak openings west of the Root River (which extended into Milwaukee County). Note that the interior survey lines were 80 chains (1 mile) apart, each defining a section; trees marked were those reasonably close to the lines although this varied. Goder counted each quarter-section (160 acres) corner as one point of occurrence for sampling; from the survey notes and data he defined plant community types (for oak openings, the presence of bur oaks and the great distance between trees). Within each type, importance value was computed (the average of relative frequency, density, and dominance; frequency measures in how many samples the species occurs; dominance the basal area of trunks, and density the number of individuals).

> "The dominant tree was bur oak, accounting for 69% of all the trees recorded in the oak opening area [importance value 67%]… White oak (*Quercus alba*) and black oak (*Quercus velutina*) were subdominant. Minor species included white ash (*Fraxinus americana*) and shagbark hickory (*Carya ovata*). The greatest percent of all trees occurred in the 10 to 12-inch diameter size class. The largest trees noted, bur oaks, were in the 36-inch diameter size class. The greatest distance recorded was 620 feet and the shortest distance, 11 feet" (Goder 1956).

This seems consistent with the fire-dependent oak savanna we imagine; the largest and oldest trees are the fire-tolerant bur oaks, and then there are a variety of younger bur oaks and other tree species – species that are not able to grow old in the fire regime.



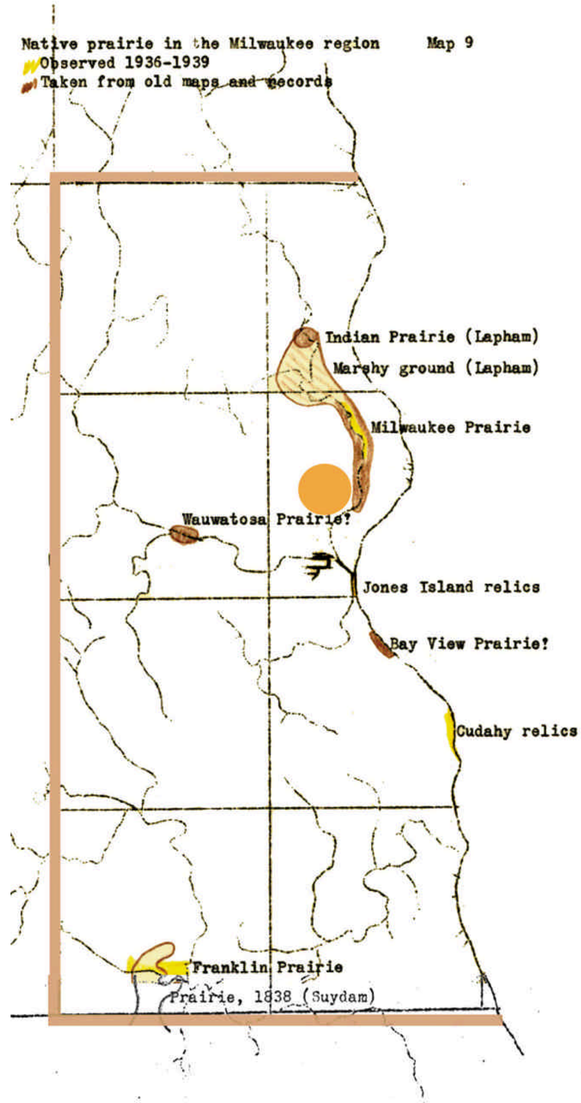


Figure 2.4: Vegetation of Milwaukee County, 1835-1836. Believed drawn in 1951 from 1835-1836 survey records including witness trees and written notes (Goder 1956; photocopy is Map #363, special maps section, Milwaukee County Historical Society). Drawing is gridded by 6x6-mile survey sections. The only oak openings are shown in the southwestern portion of the county; however, note coarseness of distinction in surveys – outlier or smaller oak openings probably not reflected. Approximate thesis study area noted by orange circle.

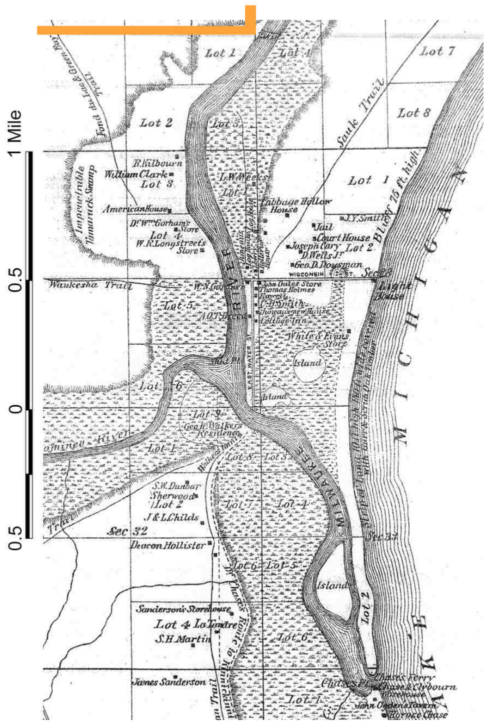
Figure 2.5: Observed open prairie in Milwaukee County, 1940. Shinners, based on Lapham's notes of Indian Prairie, and on Shinners' fieldwork (Shinners 1940). The noted areas are prairie, not savanna, but their presence near the study area adds to the likelihood of patchy oak openings nearby. Approximate thesis study area noted by orange circle.

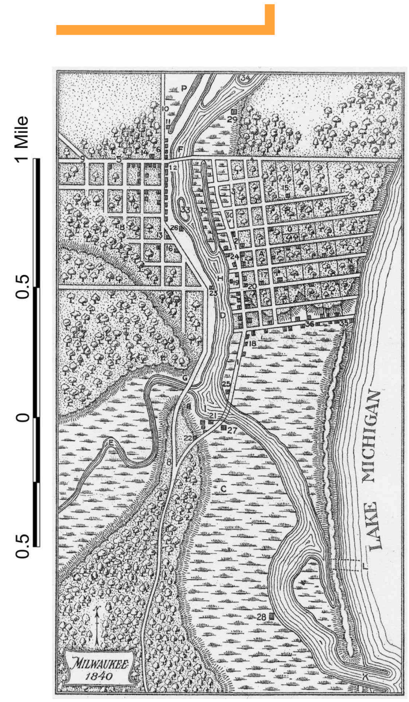
Milwaukee changed rapidly from 1830 to 1860. Lapham writes that the Anglo American population of Milwaukee, near zero in 1835, was 1,206 soon after he arrived a year later, and 6,068 in 1843 (Lapham 1846 p. 112). The landscape was altered substantially to accommodate this population, by early town promoters. The original clay bluffs over limestone, rising from 50 to 150 feet from the rivers and lake, were lost to a tremendous amount of land re-shaping, from the early days of tree-cutting for building, and plank roads in the lowlands, to canals and dams, to the considerable flattening of bluffs and filling of lowlands to allow for the city's outward expansion. One author noted in 1890 that, prior to the presently leveled downtown intersection at Spring Street (Wisconsin Avenue) and 6th Street, a house had stood at the northwest corner sixty to seventy feet above the new grade, and there had been a "quicksand hole with tamaracks" on what became the southwest corner.

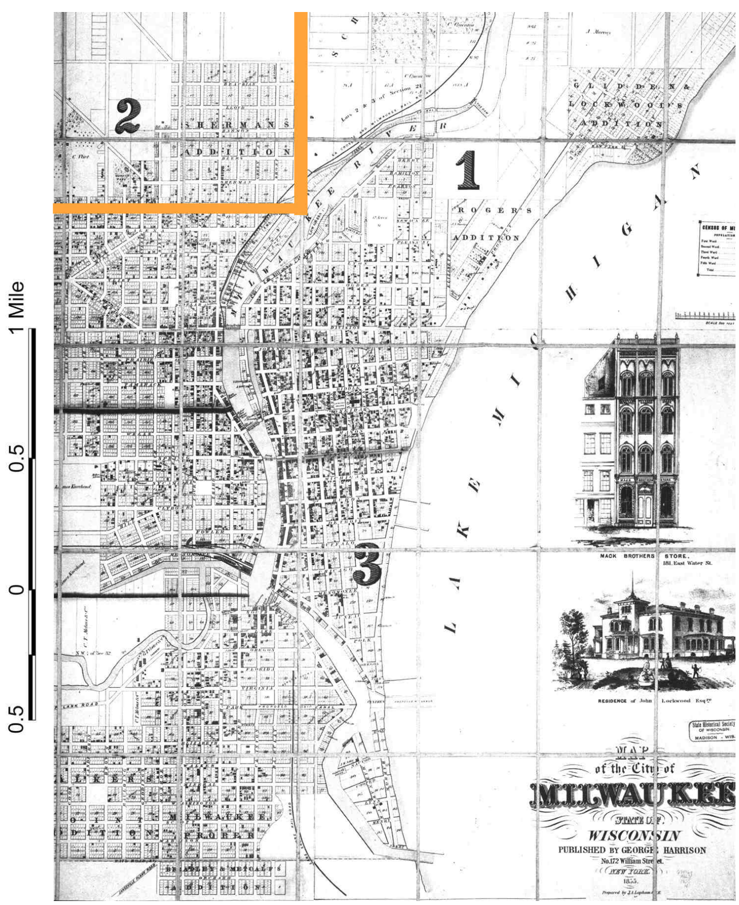
> "The white man came with pick and spade,
> And soon our hills were brought to grade,
>   Those hills, so round and pretty –
> Our riverfront was lined with docks,
> Canals were built; with gates and locks,
>   And soon we had a city." (Buck 1881 p. 120, on Milwaukee's development)

Across the Milwaukee River, where development proceeded to the north and west from the city center, the bluffs were less modified; they exist today in many places although certainly re-graded to some degree.

Figures 2.6, 2.7, and 2.8 show a progression of city development from 1836 to 1855. The general area of study for this thesis, which will be described in Chapter 3, begins in the northwest corner of these early maps (as shown by bold orange lines). Prior to the 1830s, this land above the rounded bluffs west of the river perhaps progressed from oak openings to deciduous forest. Within twenty years, the land was cleared, and the city grid well established.







Progression of development, 1836-1855. Approximate southeast corner of thesis study area shown in all maps by bold orange lines. Scale is approximate.

Figure 2.6 (upper left): Milwaukee, 1836. A recollection of early settlers (published fifty years later, with sections and street names added for reference) (Flower and Western Historical Co. 1881 p. 32).

Figure 2.7 (upper right): Milwaukee, 1840 (Gregory 1931 p. 197).

Figure 2.8 (left): Milwaukee, 1855. Map of the City of Milwaukee by Increase Lapham. State Historical Society of Wis. (Milwaukee 1983 p. 11).

Oak savannas characterized much of pre-settlement southern Wisconsin (5.5 million acres, according to Curtis 1971), varying in scale of patchiness and abruptness of transition; something less than 0.02% of the original area remains in remnant oak savannas – although much more may remain in degraded oak-associated vegetation (Nuzzo 1986; Leach and Givnish 1999). The story of the study of oak savanna communities in Wisconsin in the past fifty years has been a balance of historical research, study of remnant sites broadly and with environmental gradients, reassembly experiments, and restoration practice, experimentation, and evaluation. John Curtis and his students in the 1950s-1960s (Curtis 1971; Bray 1955; Bray 1960) were influenced by ecological concepts of plant community continuums – Gleason's "The individualistic concept of the plant association" (Gleason 1926). Curtis and his students described oak savanna origin, maintenance, structure, composition; and significantly, the recognition of soil differences between types of oak savanna, and of the relationship of light intensity and groundlayer species within an oak savanna. These environmental gradients were further developed by later researchers (Leach and Givnish 1999), who noted a substantial change in species composition following the light gradient within a site. Curtis' definition of the structure of oak savanna is a range from one tree per acre to a maximum density of 50% canopy cover.

Oak savannas persist because of a dynamic of climate (the variability of droughts and wet seasons), herbivory, and fire (Cochrane et al. 2000). Fire, both natural and anthropogenic, has been estimated to have occurred every one to ten years in oak savannas (Cochrane et al. 2000), which would have allowed occasional young bur oaks to grow to maturity, while reinvigorating the groundlayer species composition and limiting forest encroachment.

A few recent debates have particular relevance to restoration. First, the community vs. transitional ecotone discussion: are oak savannas mutually evolved and distinctive associations, or more chance-composed transitions between forest and prairie? Oak savannas here were part of a broader, somewhat patchy mosaic of prairies, forest, and wetland. It seems, through the landscape processes that occurred (especially fire), and influenced by existing vegetation, edaphic conditions, topography, aspect, etc., that patchiness begets patchiness, and oak savanna represents a dynamic in space, scale, and time. Although whether community or ecotone is not resolved, the value of groundlayer species diversity in savanna situations, and savanna's influence in the larger historic landscape, certainly indicates restoration relevance.

A second debate relates to the groundlayer balance of forbs and grasses, and the role of shrubs. Recent authors have noted the likely bias, from analyzing sites with a fire suppression and grazing history, of Curtis and Bray's work which indicated grass domination; and in studying reselected sites in southern Wisconsin, have suggested a forb-dominated groundlayer in all but the sunniest and sandiest sites (Bader 2001; Leach and Givnish 1999).

The uncertainty of restoration approach is a third debate, especially given the rarity of remnant sites and hence incomplete knowledge about savanna ecology, composition, and structure. Contemporary restoration is generally process-based, e.g. re-establishing fire or a substitute, while removing or controlling exotic species, and supplementing the available seedbank. Some restorationists have advocated attention, in oak savannas, to the reintroduction of conservative or high-fidelity species (Packard 1994; Stevens 1995), more than attention to early successional or more generalist species.

Oak savannas are considered important in restoration for broader ecological reasons; for example, their likely importance as invertebrate habitat. This is suggested in part because of the common fidelity of insects to host plant species (and an inverse relationship as pollinators), and the diversity of groundlayer species in savannas (Leach, Ross and Faber-

Langendoen 1995). Redheaded woodpeckers, whose numbers are in decline in Wisconsin, are savanna specialists, requiring both the oaks for cavity nests and the groundlayer for insects as food, eating in the same manner as flycatchers (Mueller 2002).

Through a series of "Midwest Oak Savanna and Woodland Ecosystems" conferences in the 1990s, further classification of oak savanna types is evolving (Pruka and Faber-Langendoen 1995; see also the seminal flora, floristic assessment, and community descriptions of Swink and Wilhelm 1994). Smaller-scale oak savanna patches in the Milwaukee area above the bluffs were most likely similar to "northern bur oak openings", as presently categorized by The Nature Conservancy, part of a broader division of mesic sites. This type is categorized by 10-30% canopy of bur oak and some white oak, both grasses and forbs, and varying shrub cover. Characteristic shrub species including New Jersey tea (*Ceanothus americanus*) and leadplant (*Amorpha canescens*) are fire-adapted by resprouting after fires.

As part of this recent literature, a group of colleagues in Wisconsin developed a list of indicator species for oak savannas in southern Wisconsin (Pruka 1995). Category-1 indicator species "are the best indicators of former savannas and open woodlands because they tend to be limited to partial canopy conditions". Category-2 are moderate indicators; species "commonly found under partial canopies, they are also important parts of either prairies or forests". The study continues with Category-3 or marginal indicators, and a set of potential indicator species without sufficient information yet to categorize their degree of relevance.

As a way of comparing the mostly pre-settlement vegetation described by Lapham with a modern-day understanding of oak savanna, Pruka's Category-1 and -2 indicator species are compared with Lapham's floras. A few notes of explanation are needed. Lapham's floras have not been checked against vouchers, at least some of which still exist. These floras have no habitat notes or groupings; they're simply lists of species – this reminds us that certain indicator species, especially Category-2 and lower, certainly could have existed in other habitat types. To balance this, note that Lapham probably identified species which were more *common* in his treks; thus the indicator species, with a *requirement* for partial light, if commonly occurring, seem more likely to have been in savanna patches providing those conditions more reliably. Lapham made occasional misidentifications (although his tackling of grasses and sedges is impressive), and for quite a number of his species the contemporary nomenclature is unclear – it is possible that a few of these might also be on Pruka's lists if we were more certain of their translation. The species that do match Pruka's lists are mostly fairly distinctive forbs.

Given these caveats, the comparisons in Table 2.1 show that Lapham, in his first three floras in approximately four years, found 42% of Category-1 oak savanna indicator species, and 46% of Category-2 indicator species. In addition, in the very first few months (his 1836 flora), he identified 25% of the Category-1 species. One can imagine him exploring the marsh edges and the oak openings at the edges of the bluffs before exploring farther away, into the forests, in later seasons.

These species strengthen the argument for the appropriateness of oak savanna on Milwaukee bluffs, and provide a historic reference for species to include in landscape rehabilitations.

Table 2.1: Oak savanna indicator species Categories 1 and 2 (Pruka 1995) found by Lapham in the years 1836, 1838, 1840. Translation of both to contemporary nomenclature is via USDA's PLANTS database. Note, USDA has chosen to follow many of the taxonomic splitters who are using molecular data to divide genera such as *Aster* and *Solidago* into aggregates (per Andrew Hipp). Thus this list contains some as yet unfamiliar genera like *Symphyotrichum* (from *Aster*). The full listing in Appendix A provides Lapham's Latin names with the USDA names.

Latin (PLANTS database)	Common (PLANTS database)	B.P.	I.L.	I.L.	I.L.	
http://plants.usda.gov		1995	1836	1838	1840	
Anemone virginiana	Tall Thimbleweed	1	x			
Arnoglossum atriplicifolium	Pale Indian Plantain	1			x	
Astragalus canadensis	Canadian Milkvetch	1			x	
Calystegia spithamaea	Low False Bindweed	1	x			
Castilleja coccinea	Scarlet Indian Paintbrush	1	x			
Ceanothus americanus	New Jersey Tea	1	x			
Cypripedium pubescens	Yellow Lady's Slipper	1	x			
Dodecatheon meadia	Shooting Star	1	x			
Elymus virginicus	Virginia Wildrye	1			x	
Erigeron pulchellus	Robin's Plantain	1		x		
Heuchera americana	American Alumroot	1	x			
Hypoxis hirsuta	Common Goldstar	1		x		
Lilium philadelphicum	Wood Lily	1	x			
Lysimachia quadrifolia	Whorled Yellow Loosestrife	1	x			
Oenothera biennis	Common Evening-primrose	1	x			
Pedicularis canadensis	Canadian Lousewort	1	x			
Polemonium reptans	Green Valerian	1		x		
Polygala senega	Seneca Snakeroot	1	x			
Prenanthes alba	White Rattlesnakeroot	1		x		
Ranunculus fascicularis	Early Buttercup	1			x	
Ranunculus rhomboideus	Labrador Buttercup	1		x		
Triosetum perfoliatum	Feverwort	1		x		
Veronicastrum virginicum	Culver's Root	1	x			
Zizia aurea	Golden Zizia	1	x			
	Totals (Indicator-1 species)	(57)	14	6	4	42%
Allium cernuum	Nodding Onion	2			x	
Amorpha canescens	Lead plant	2	x			
Andropogon gerardii	Big Bluestem	2			x	
Asclepias exaltata	Poke Milkweed	2	x			
Asclepias tuberosa	Butterfly Milkweed	2	x			
Bromus ciliatus	Fringed Brome	2	x			

Coreopsis palmata	Stiff Tickseed	2		x		
Dalea candida	White Prairie Clover	2		x		
Dichanthelium latifolium	Broadleaf Rosette Grass	2	x			
Elymus hystrix var. *hystrix*	Eastern Bottlebrush Grass	2	x			
Eupatorium purpureum	Sweetscented Joepyeweed	2	x			
Euphorbia corollata	Flowering Spurge	2	x			
Galium boreale	Northern Bedstraw	2	x			
Gentianella quinquefolia	Agueweed	2	x			
Geum triflorum	Old Man's Whiskers	2			x	
Lathyrus venosus	Veiny Pea	2			x	
Leersia virginica	Whitegrass	2			x	
Lithospermum canescens	Hoary Puccoon	2	x			
Moehringia lateriflora	Bluntleaf Sandwort	2		x		
Potentilla arguta	Tall Cinquefoil	2			x	
Pulsatilla patens ssp. *multifida*	Cutleaf Anemone	2			x	
Pycnanthemum virginianum	Virginia Mountainmint	2	x			
Schizachyrium scoparium	Little Bluestem	2			x	
Sorghastrum nutans	Indiangrass	2		x		
Symphyotrichum laeve	Smooth Blue Aster	2			x	
Symphyotrichum sericeum	Western Silver Aster	2			x	
Symphyotrichum shortii	Short's Aster	2	x			
Thalictrum thalictroides	Rue Anemone	2		x		
	Totals (Indicator-2 species)	(61)	13	5	10	46%

Chapter 3: Case Study Neighborhoods

The bluffs to the west of the Milwaukee River were mostly developed from the 1840s through World War I, with development moving west and north from the city center. Industry had begun to be established near the river. The neighborhoods provided economically diverse housing for both managers and workers, and easy walking distance to the city.

The general study area, as an application model for this thesis, is bounded by the river to the east, 20th Street to the west, Burleigh Street on the north, and Walnut Street on the south. This is an area which would have encompassed the transition from river to bluffs to savanna, and then eventually to forest. Prior to the arrival of streetcars in the 1890s, North Avenue, which bisects this study area, was considered the north boundary of the city – the walking-distance-from-downtown boundary (Milwaukee 1983 p. 150).

This part of the city retains its original single-family and duplex residential fabric. The houses are stylistically and economically diverse, and include two classic ethnic immigrant Milwaukee housing styles: the raised flat (first a wood frame house later raised on a brick semi-basement, for two dwellings), and the rear house (a smaller first house at the rear of the lot; then a later larger second house at the front as family circumstances and need determined). Immigrant settlement patterns reflected ethnic and religious ties; the northeast portion of the study area was originally the Wilhelmsburg community, settled in the 1840s by immigrants from areas of Northern Germany; part of the southwest portion was settled in the 1890s by Jewish immigrants of Polish-Russian origin (Milwaukee 1983 p. 148-53; Simon 1996).

Third Street, running north-south and edging the Harambee and Brewer's Hill areas to their west, is one of the oldest commercial streets in the city. This route was initially part of the Green Bay Indian trail and was followed by the old Green Bay plank road. Third Street, here, has been renamed Dr. Martin Luther King Jr. Drive.

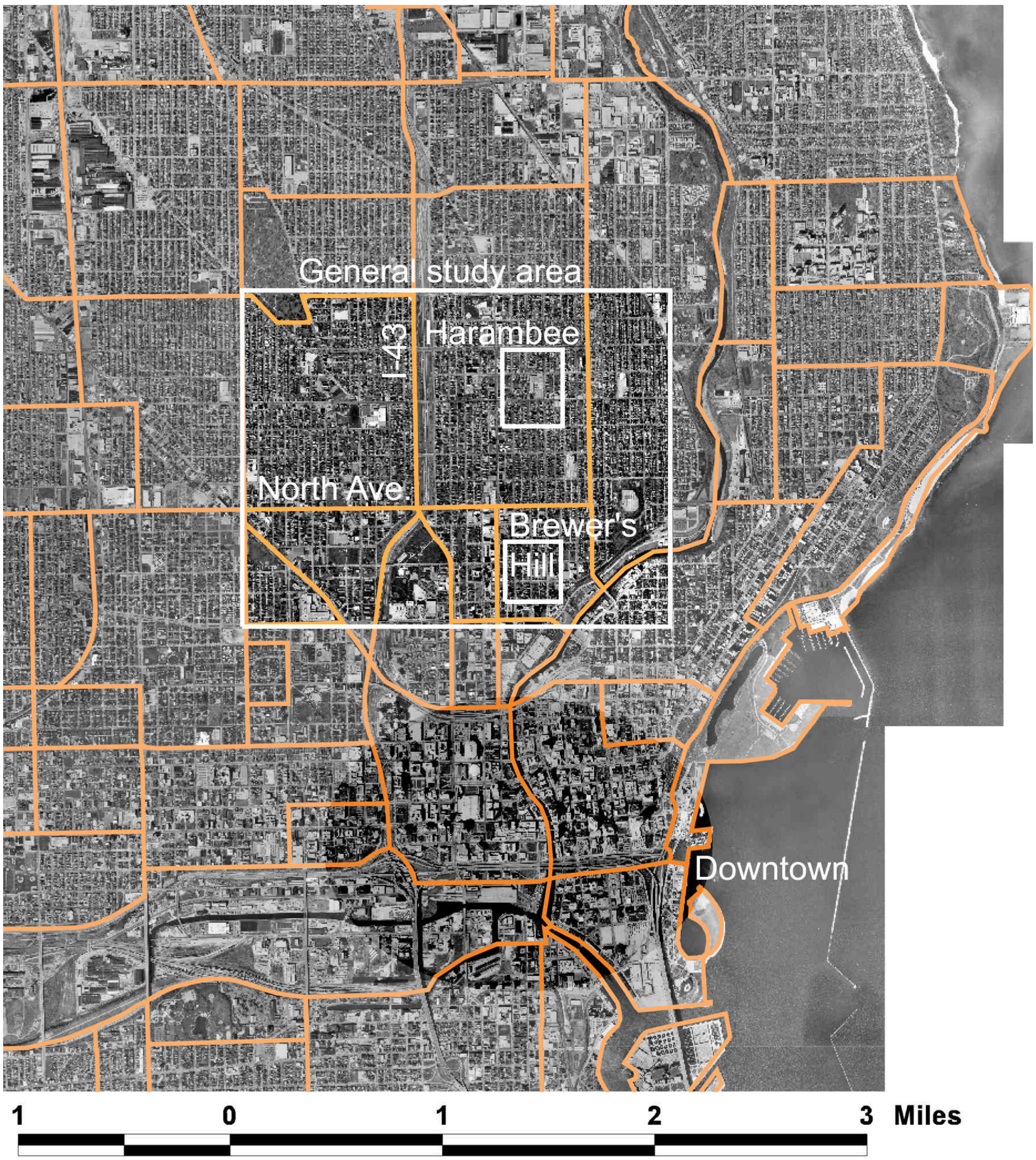


Figure 3.1: General area of study in contemporary aerial photo. 2000 aerial photograph overlaid with broad neighborhood boundaries (orange) defined by the City of Milwaukee, and two sites for closer thesis analysis in Harambee and Brewer's Hill neighborhoods.

The north-south freeway, I-43, also bisects the center of the thesis study area (dividing the North Division and Harambee neighborhoods). Forty years ago, the corner of 8^{th} and Walnut (near bottom center of the study area) was the African American city center, known as Bronzeville, "…Milwaukee's modest version of Harlem's 125^{th} and Lennox. The Regal theater, law offices, a pool hall, and nightclubs created a blend of commerce and culture. Prominent artists, such as Duke Ellington, would perform downtown and then hang out at the Flame in Bronzeville after hours" (Norquist 1998). The corridor demolition and freeway construction in 1966 (protested by few) irrevocably changed this area, with the loss and division of the neighborhood, and the isolation of areas west of the freeway.

In 1860, the African American population of Milwaukee was 122 (Milwaukee 1983). This population began a dramatic increase around the turn of the century, and again after World War II. Race has played an important role in attempts to reform the school system here, and the story is complicated. Segregationist school districting policies through the 1960s were fought with lawsuits and forced desegregation and bussing. Most recently, the city has advocated school choice and an accompanying voucher system; some schools have been re-envisioned as specialty schools. Fulton Middle School in the Harambee neighborhood was re-formed in 1991 as Malcolm X Academy, an African American immersion middle school, in a predominantly African American neighborhood. The school's curriculum is designed to reinforce African American values, culture, and achievement, and has used the Harlem Renaissance to structure teaching that connects arts and culture (Otis–Wilborn et al. 1999).

The Milwaukee Department of City Development, in 2000, undertook a project to identify named neighborhoods, respecting the stability of neighborhoods over time, and encouraging their explicit recognition in the city urban fabric. Subdivisions, major streets, community groups, housing styles, historic areas, *residents' opinions*, and *physical and* *natural barriers* (emphasis mine) were part of the process of identifying areas (Milwaukee 2003). There is another factor in neighborhoods behaving like neighborhoods: namely the location of public institutions, particularly schools and churches, which can reflect the organization of community groups. It's also interesting to note the frequent historic location of such buildings at locally high elevations in the landscape.

In considering possible sites for this study, I assumed that these neighborhood definitions, especially by virtue of physical and natural barriers (for landscape ecotypes), and residents' opinions (supporting cooperative work) provided a good first-level spatial definition. The presence of a church or school is presumed advantageous; it provides space, an anchor, and possibilities for soliciting and organizing resources. Four schools were initially considered in four neighborhoods: schools within a predominantly single-family or duplex residential area. Each site area itself is defined, somewhat arbitrarily, as at least one block surrounding the school grounds, for sites roughly a quarter-mile wide. The premise of this thesis is to approach rehabilitation on a scale where a sense of the larger landscape is achievable, across multiple residential properties.

The residential patterns in these areas are somewhat dense; small narrow city lots (typically, 30' x 150'), but primarily single-family or duplex structures (few multi-unit buildings). In the 1990 census, Milwaukee ranked as the seventeenth largest city in the United States, and the tenth most dense. At a density then of 6,500 people per square mile, Milwaukee compared to Detroit, 7,400; Washington, D.C., 9,900; Boston, 11,900; and New York, 23,700 (Gibson 1998). Although the study neighborhoods do not have tall buildings, they're still urban.

Two of the sites, Malcolm X Academy within the Harambee neighborhood, and Palmer Elementary School in Brewer's Hill, are described in this chapter. Two other sites (west of the freeway) initially assessed are not considered further at this time: in one case, the high school's big-box scale represents a different set of challenges; in the other, lack of predominantly residential land use, as well as an atypical and unfair advantage of a two-block park adjacent to the school, would also distract from the proposals outlined in this thesis.

Harambee and Brewer's Hill neighborhood sites are examined in terms of land use patterns, available unbuilt land, demographic factors, visual landscape character and existing conditions, and civic projects and programs in their areas. By this examination, along with consideration of the ways in which an oak savanna restoration could be approached, and the conditions which would help such processes, a preliminary understanding of relevant neighborhood factors can be developed.

These two neighborhoods are within a mile of each other. Both are east of the freeway and west of the Milwaukee River, on higher ground above the still perceptible rounded river bluffs. Brewer's Hill has a neighborhood association and website; their website documents an annual neighborhood picnic, and the association held a general membership meeting four months ago. Harambee is an African word meaning unity, or coming together to accomplish a common goal. The Harambee neighborhood recently hosted, at the nearby Martin Luther King Library, a grass-roots awards ceremony honoring long-time civil rights leaders of the area, in a gathering of neighbors, warmth, and home-cooked refreshments.

Most homes have a front walk to the front door. Most lots have mown grass with some foundation plantings; however, the aesthetic is freer and more individualistic than many suburban areas. Some properties are bounded by chain-link fences and there are a few wooden picket fences as well. Homes in these neighborhoods generally do not have driveways; some have detached rear garages with alley access, but parking is mostly parallel street parking. Impervious surfaces are the roofs, institutional parking, streets, and sidewalks. Non-infiltrating surface rainwater is channeled through storm sewers.

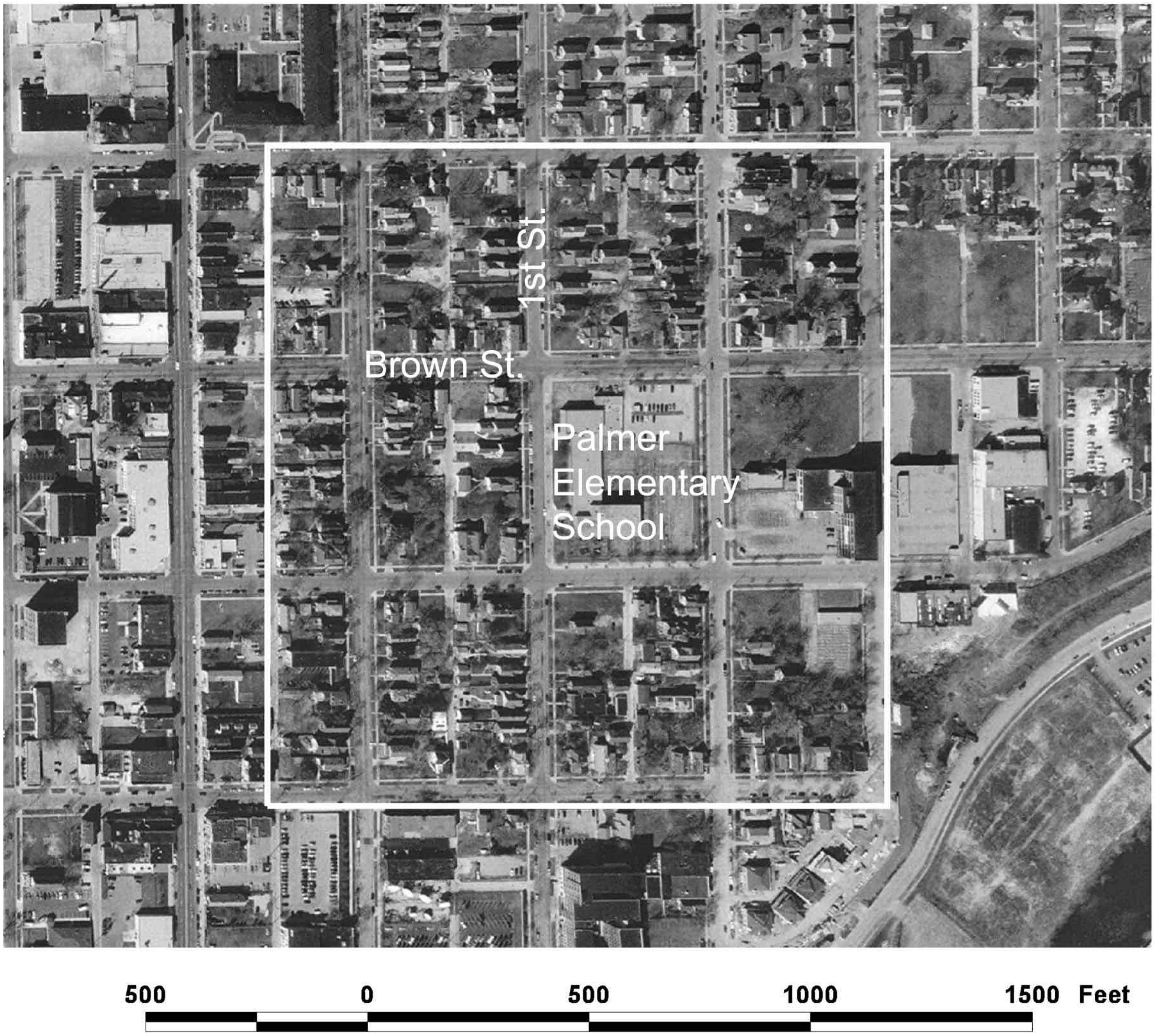


Figure 3.2: Brewer's Hill neighborhood, Palmer Elementary School site.

Figures 3.2 and 3.3 are aerial photographs to see the arrangement and scale of structures and land in each neighborhood site. Brewer's Hill is on the edge of the remaining bluffs on the west side of the Milwaukee River (seen at the lower right corner of this aerial photograph). In this study, it has the most diverse housing in terms of economic diversity of the early settlers, as well as recent attention by "rehabbers" and city-encouraged redevelopment. Like the Harambee site, it is very near Martin Luther King, Jr. Drive, a historic commercial district (the north-south street at the left of the photograph).

Figure 3.3: Harambee neighborhood, Malcolm X Academy middle school site.

In the Harambee neighborhood site, there's a hill (rising over thirty feet in a half block) just north of the school, and vistas toward downtown, to the south. Particularly in the lower right section of the photograph, the pattern of historic rear lot houses can be seen. Most of the houses here date from 1880 – 1920. The Harambee site, especially, has the typical pattern of predominantly long, narrow north-south blocks, so that most of the houses face east or west and are shaped with their long axis east-west; this matters for patterns of sunlight and the oak savanna flora, as will be discussed in more detail later.

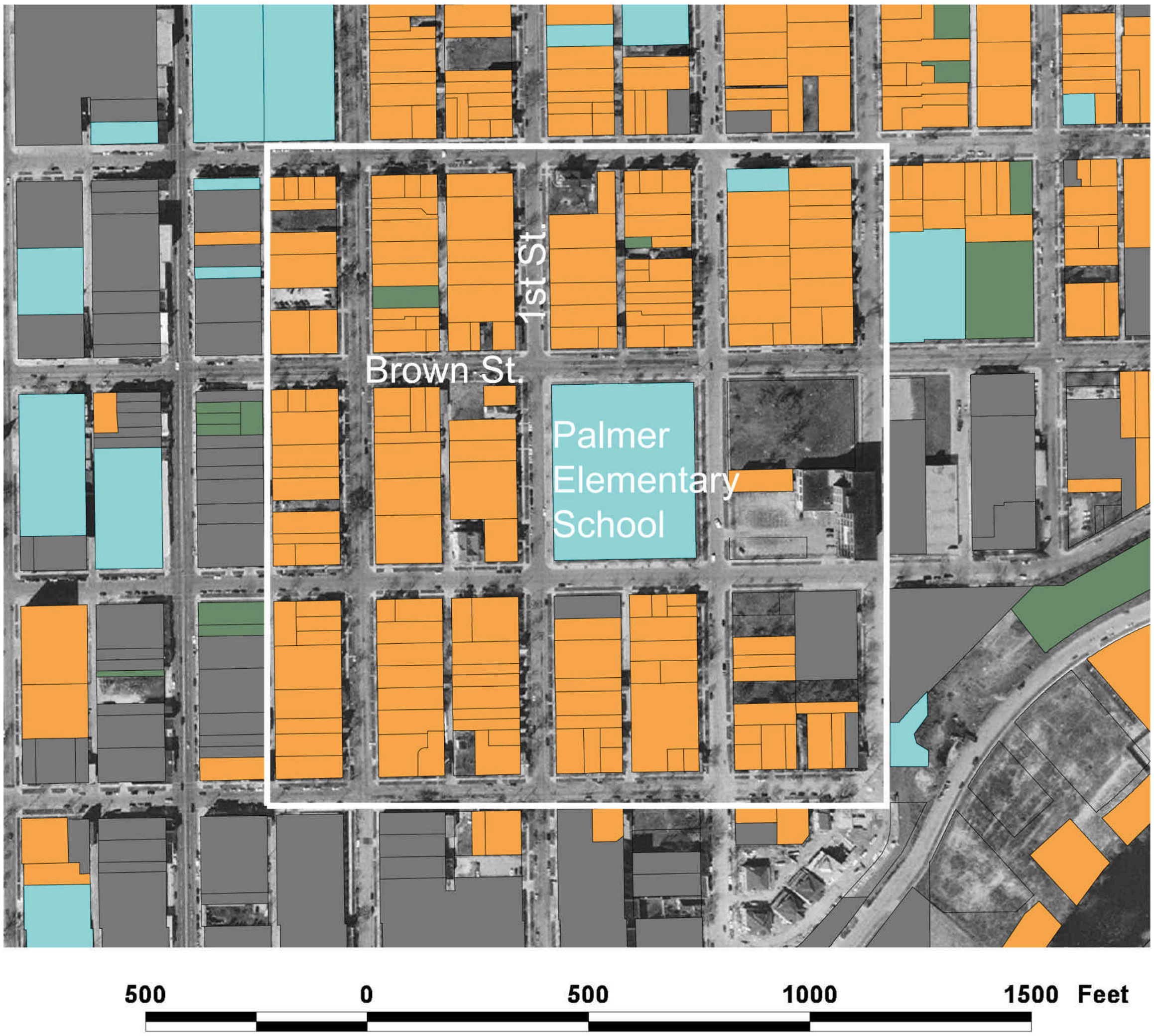


Figure 3.4: Brewer's Hill land use pattern. **Residential** in orange (lightest); **institutional/public** in blue; **vacant/unbuilt** in green; **commercial** in gray.

Figures 3.4 and 3.5 compare land use patterns in the two neighborhood sites. Both sites appear (from the aerial photographs in Figures 3.2 and 3.3) to have a significant amount of land without structures. However, in Brewer's Hill, notice the wider (perhaps double) residential lots, and very few vacant lots; this could mean a greater reliance on private property owners for any larger visually prominent restoration sites, discussed in more detail later. The commercial pattern of buildings along MLK Drive, just west of the site, is clear.

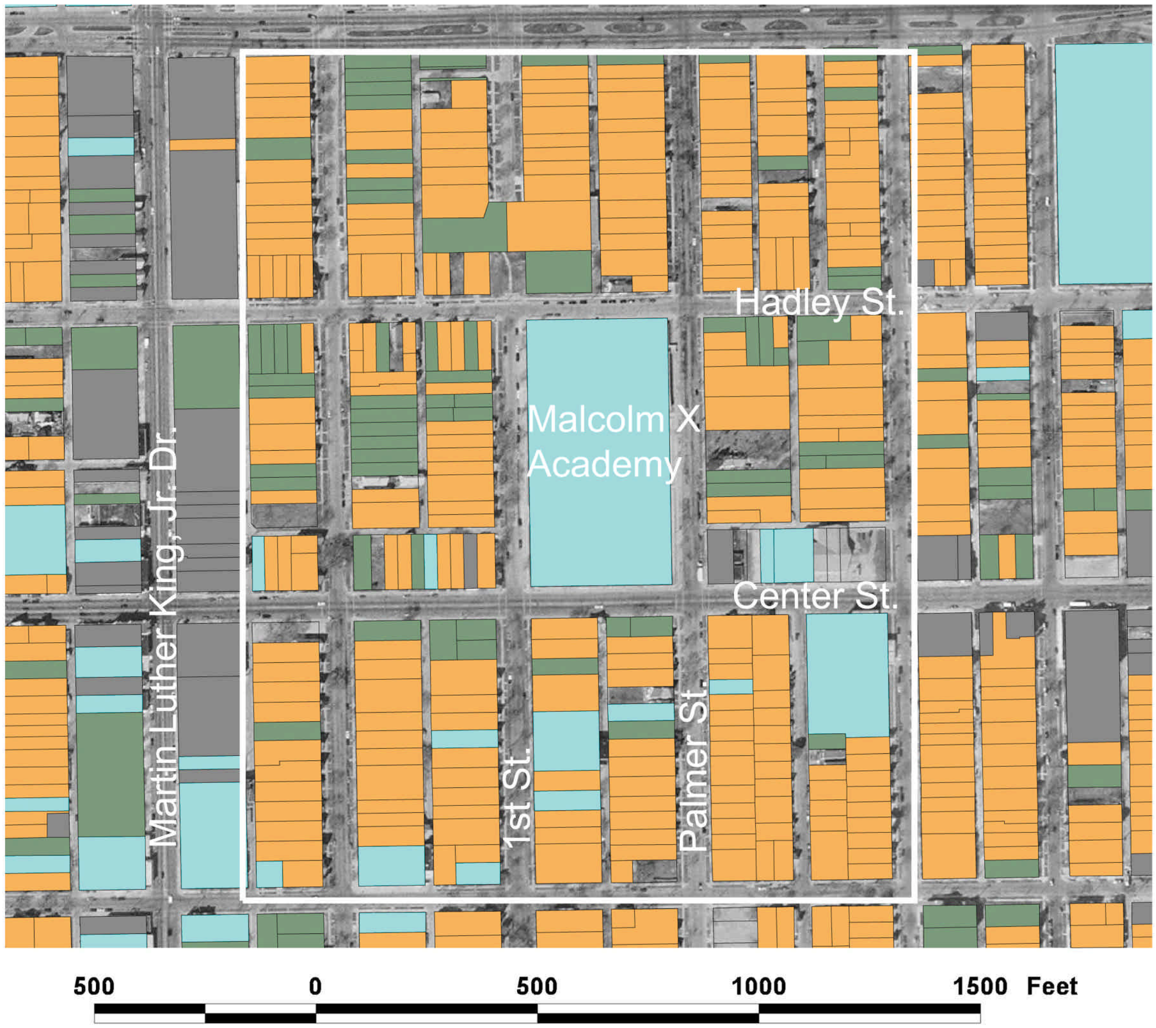


Figure 3.5: Harambee land use pattern. **Residential** in orange (lightest); **institutional/public** in blue; **vacant/unbuilt** in green; **commercial** in gray.

In Harambee, there is a similar sense of some open land, but it is due in this case to a number of vacant lots on the site. There is even unbuilt land within the commercial pattern of MLK Drive nearby. Institutional and public property includes, in addition to Malcolm X Academy, a day care facility with outdoor play spaces, and a small grocery store. The Martin Luther King Library is a block away from the northwest corner of the site.

Census data provide a closer look at the economics and built history of the sites. The Harambee and Brewer's Hill sites are compared in the following figures:

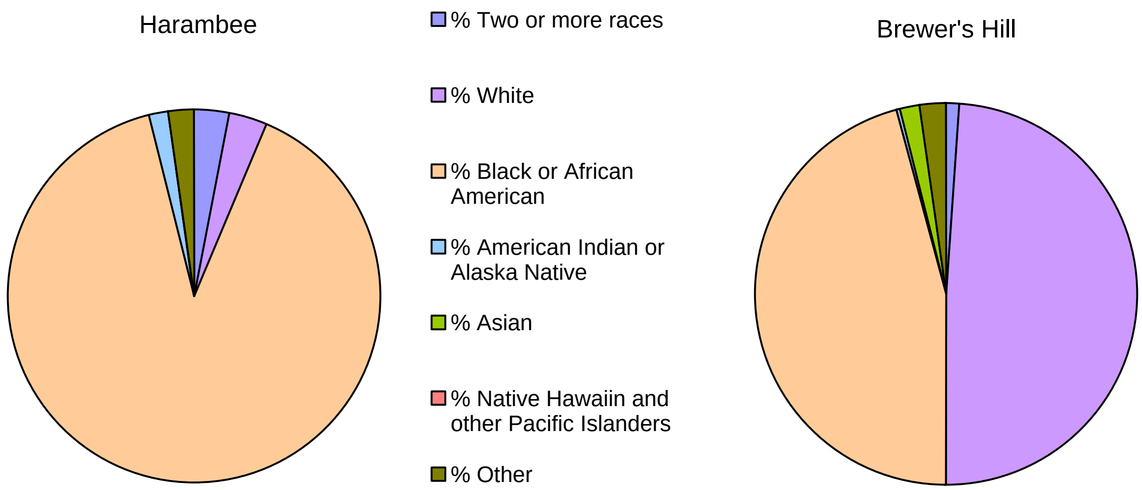
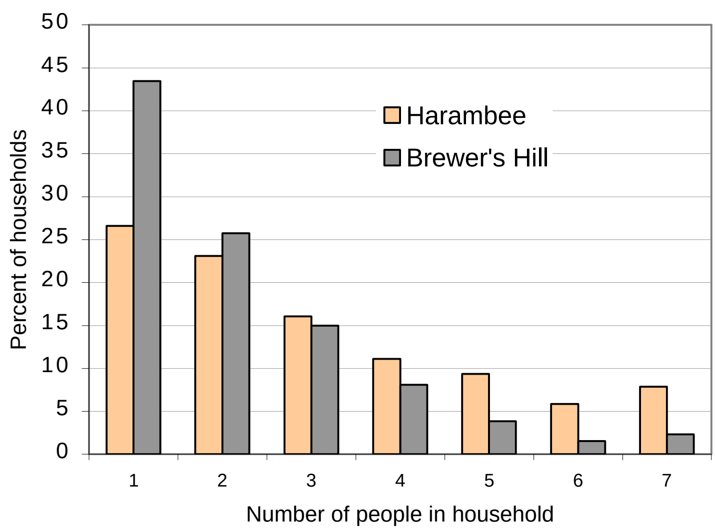


Figure 3.6: Race. Harambee has 3.2% Hispanic or Latino residents (of any race), and Brewer's Hill 5.4% Hispanic or Latino residents. The Harambee area, 90% African American, surrounds Malcolm X Academy, an African American immersion middle school established ten years ago. Brewer's Hill has a nearly equal number of Anglo and African American residents (US Census Bureau, Census 2000 Summary File 1, block-level data covering only the thesis sites).



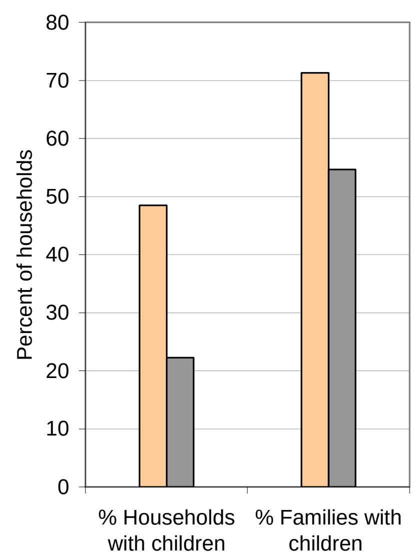


Figure 3.7: Household size. In Brewer's Hill, more single-person households may reflect recently rehabbed multi-unit buildings (Census block-level data).

Figure 3.8: Children. Nearly 50% of households in the Harambee area include children (where 68% of the households are families). In Brewer's Hill, just over 20% of the households include children (where only 41% of the households are families).

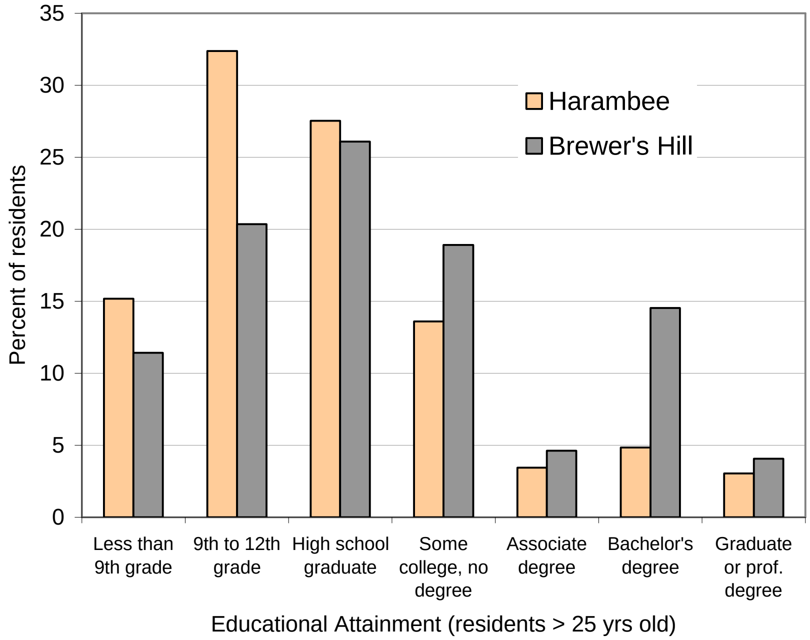


Figure 3.9: Education of residents. In the Harambee area, 53% of residents are high school graduates or higher; in Brewer's Hill area, 68% (US Census Bureau, Census 2000 Summary File 3, tract-level data covering an area about twice the size of the thesis sites).

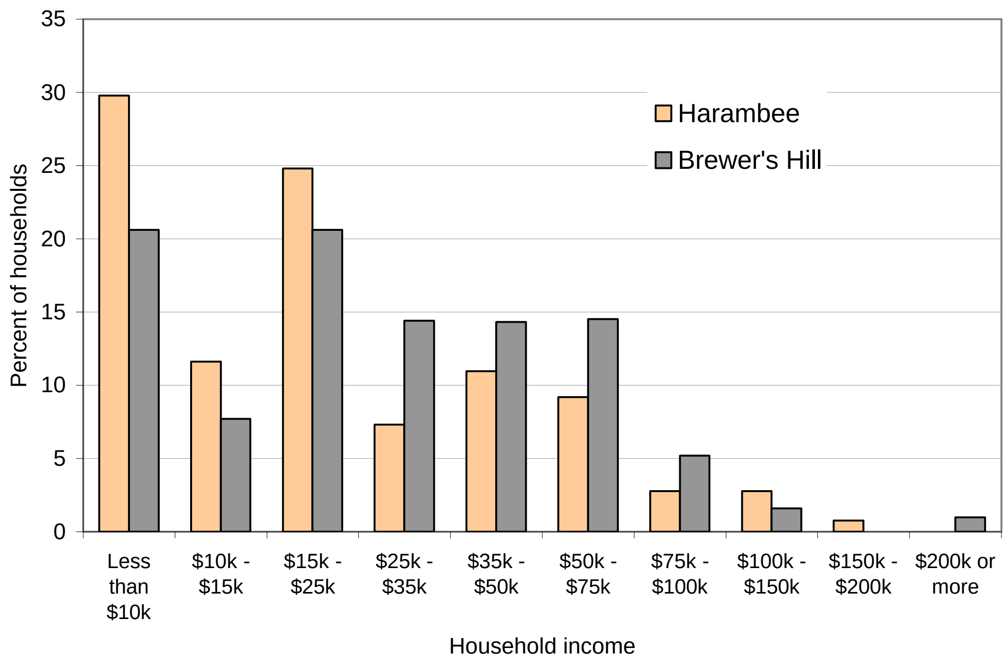


Figure 3.10: Household income. Median household income is under $20k in Harambee and in the mid-to-upper $20s in Brewer's Hill. The wider income range in Brewer's Hill corresponds to housing prices (Census tract-level data).

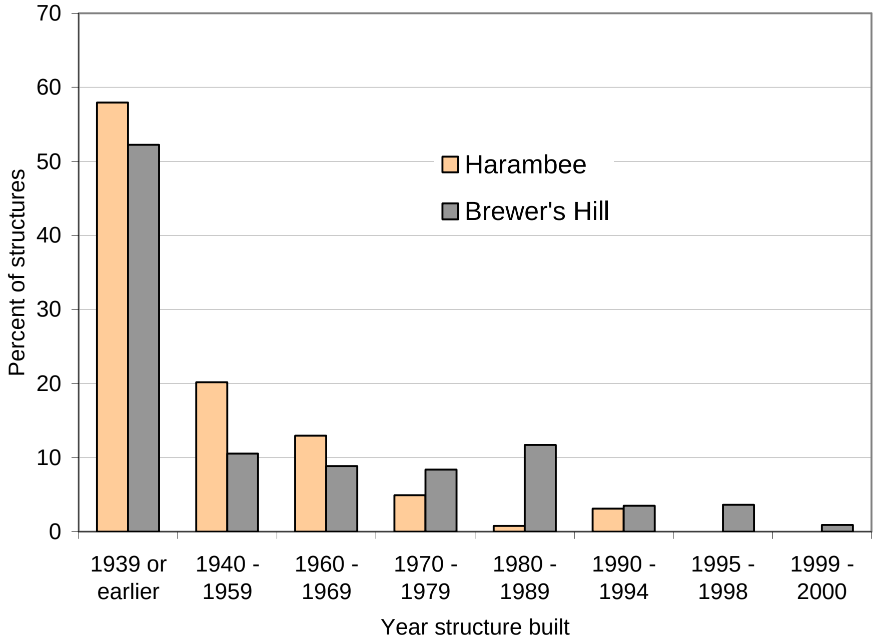


Figure 3.11: Age of houses (and other buildings). In both areas, more than half of the homes date to the early settlers (US Census Bureau, Census 2000 Summary File 3, tract-level data covering an area about twice the size of the thesis sites).

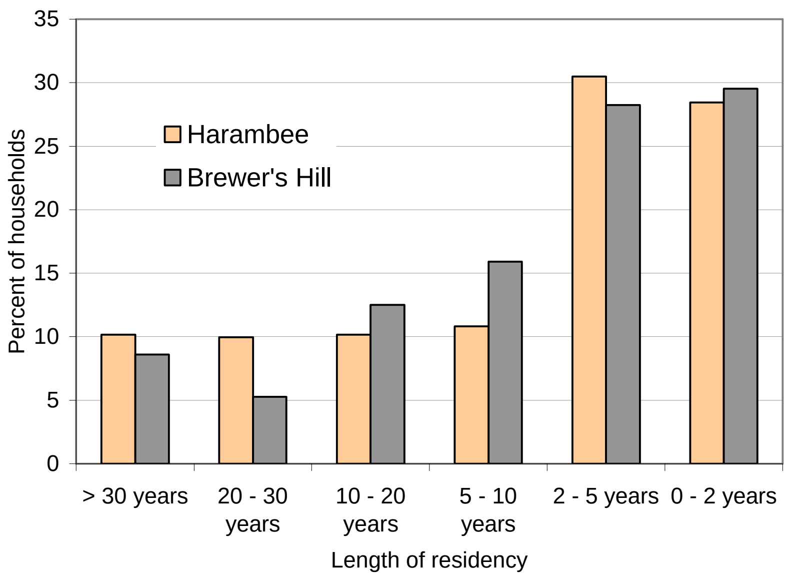


Figure 3.12: Length of residency. In Harambee, 20% of the residents have lived here for more than twenty years; in Brewer's Hill, nearly 15% (Census tract-level data).

The difference in ethnic makeup of the two neighborhoods does not seem important to the potential success of an oak savanna neighborhood; one hopes that the many facets of identity of a neighborhood and its residents can be expressed in their living environment, whatever the whole story of identity may be. In Harambee, the combination of predominantly African American residents with the Malcolm X Academy immersion curriculum does suggest an opportunity to collaborate with the school in incorporating African American culture strongly in the aesthetic of designed landscapes. In Brewer's Hill, aesthetics could be influenced by ethnic diversity, or could be most strongly related to other aspects of identity, such as the settlement and industrial history. In any case, individuality provides another layer of richness in expression.

Wisconsin geographer Yi-Fu Tuan says Milwaukee "has always been more a conglomeration of ethnic neighborhoods than one great cosmopolitan center in which peoples and cultures mix indiscriminately". From historic divisions based on survival, the "instant, unquestioning help that only kinsfolk can reliably provide" and "a profound need for the familiar", Tuan sees an optimism in a present-day shift in attitudes in this patchwork, from introverted and defensive to open and inviting – because of a broad presumption of transcultural commonality (Tuan 1997).

Two other aspects of demographics are significant: the number of children and elderly, and a pattern of long-time residency. Figures 3.8 and 3.12 show the number of households and families with children, and the length of residency. A combination of high numbers in both seems advantageous for an oak savanna neighborhood. Children, and the school, could be the first active participants in rehabilitation; learning and development of stewardship progresses from young to old and vice versa. Based on census data, it is likely that a number of children will stay in the neighborhood as adults, providing continuity in the rehabilitation process and in an inter-generational environmental ethic.

In both neighborhoods the majority of homes are rented; owner occupation is less than half (see Appendix B). This is a relevant factor in the adoption of oak savanna, because of questions of consent for residents to act on the land, and of the residents' sense of stewardship of the property. Ideally, landlords should endorse the rehabilitation effort and be invested in its success. This thesis does not address this issue further, but it is significant in the development of rehabilitation plans.

City involvement

At present, there is demonstrated city government interest in neighborhood revitalization near the thesis study area, as well as the larger central city. The city's goals include increasing home ownership rates, adding central city residences, broadening the local job market, and strengthening the urban environment – within a foundation of "equity, economy, and ecology" (Milwaukee 2003). To give an indication of the range of civic activities and degree of interest, six city programs are noteworthy and are further described below: Near West Side Neighborhood Plan, the Renewal Community, Community Development Block Grants, Beer Line "B", Mayor's Urban Design Awards, and Milwaukee Makes Place (Milwaukee 2003). Programs like these could function as a financial foundation and neighborhood catalyst for the planning, implementation, and ongoing learning processes needed to sustain the larger than usual scale of landscape rehabilitation being proposed.

Near West Side Neighborhood Plan

Just southwest of the thesis study area is the Department of City Development's Near West Side Neighborhood Plan, currently in its initial stages. This is a community-motivated, city-assisted comprehensive plan, whose objectives include providing implementation strategies that emphasize community involvement, high quality design, and *adding long-term* *value* (emphasis mine). At this stage, residents, business owners, and other stakeholders are participating in a written survey of priorities and a visual preferences survey, including images in four categories: residential character, commercial character, public space, and parking. The images in all categories have a fairly wide range of urban vegetation – none, turf, park-like, street trees, planters and flowerpots, river buffers, and wilder edges. Most of the images reflect multiple factors with possibly conflicting values, and it will be interesting to see how often complexity is preferred over homogeneity from people in neighborhoods who represent that very complexity. When completed, the plan will be formally adopted as part of the larger Milwaukee Comprehensive Plan, which guides all land use and zoning decisions.

Renewal Community

The Harambee neighborhood is one of several in the city designated as part of the "Renewal Community" through 2009, a federally-funded locally-designed tax incentive program to "lure prospective employers, help existing companies with expansion plans and provide job opportunities". HUD requires eligible areas to have unemployment rates greater than 9.4%, poverty rate of at least 20%, and 70% of households with incomes below 80% of median income. HUD also requires local government to collaborate with community organizations. The emphasis is economy and jobs; but, interestingly, also includes promoting the giving, or selling below fair market value, of surplus property. This presumably includes certain vacant lots.

Community Development Block Grants

All of the thesis study area is part of the Community Development Block Grant program, applying federal funding to central city neighborhoods for community programs. In

2003, nearly half the proposed funding is for city-administered activities through several city departments, including neighborhood cleanups, graffiti abatement coordination, façade improvements, brownfield remediation, abandoned building demolition, vacant lot grass cutting and snow removal, and improvement of recreational facilities.

Beer Line B

Beer Line "B" is a redevelopment study for the area adjacent to Brewer's Hill, the former industrial corridor along the west side of the Milwaukee River. The community-involved study recommends redevelopment as "a high quality residential and commercial neighborhood", and includes priorities for public access to the river and recreational space. Brewer's Hill, and Riverwest to the north, are both neighborhoods consciously struggling with the issues of the pace, scope, and scale of rehabilitation and potential losses of economic, ethnic, and age diversity. Over 300 new housing units (multi-unit buildings) have been built in the area. One touted commercial development, a retail center built on North Avenue just west of the river, has had a controversial story. Some residents complained about the scale of development (and the pressure on "mom & pop" retail); environmentalists argued against its construction in what should be a protected river buffer. Ironically, public awareness of river issues has increased since the city has taken environmentally bold and positive steps to improve the Milwaukee River, including the dismantling of the nearby dam and accompanying floodplain restoration. "Seven years ago, I'd get only a handful of complaints per year about Milwaukee River pollution. Virtually no one cared. Now, even though its water quality has measurably improved, I get dozens of complaints each month about the river. People now consider it an asset worth improving" (Norquist 1998).

Mayor's Design Awards

2003 will be the seventh year of the Mayor's Design Awards established during the tenure of the current mayor Norquist. The recipients "have added value to their neighborhoods by restoring, constructing, or enhancing their properties in a way that respects the urban fabric and contributes to the character of their surroundings" (Milwaukee 2003). A handful of recipients have been in or near the study area, and include this small store, across from a freeway exit: "This remodeled storefront makes a big impact on Locust Street. Large new windows and colorful signage energize the neighborhood and create an inviting presence on this highly visible corner" (Milwaukee 2003). It is encouraging to see the recognition of small-scale projects and the emphasis on urban community texture.

Figure 3.13: 7th St. Foods, one of 2001 Mayor's Design Awards

Milwaukee Makes Place

Brian Reilly of the Department of City Development initiated the Milwaukee Makes Place project in 2002, "to strengthen communities through truly diverse dialogues around places" (Reilly 2002). This is a public art project in a very broad sense. Initially, five placemaking projects are proposed, in five of Milwaukee's oldest neighborhoods: the Menomonee Valley, Walker's Point, the Near West Side (adjacent to my study area), the Fond du Lac corridor and Historic North Avenue. Reilly references Dolores Hayden (Hayden 1994) and ideas of public culture finding larger common themes while respecting and acknowledging diversity, history, and different kinds of identity. For each project, individuals from the “communities of place”, for example, residents, business owners, and teachers at local schools, and “communities of interest”, e.g. art professionals, scholars, and historical groups, will form a purposefully diverse team of ten people. This team will select and partner with an artist, to choose sites, design and install projects “to explore, envision, project and enliven (community and place) stories in bold and enduring forms” (Reilly 2002).

Selection of site

With a slight advantage in projected feasibility, the Harambee / Malcolm X Academy site is used in detailed comparisons of neighborhood and oak savanna characteristics in Chapter 4, and for design concepts in Chapter 5. The higher numbers of children in households, the somewhat higher stability and longevity of occupancy in the neighborhood, and the availability of unbuilt vacant residential lots, indicate an increased chance, qualitatively and preliminarily, for success of the proposals in this thesis. The character of the neighborhood is illustrated in the panoramic photographs of Figures 3.15 and 3.16. The Harambee site perhaps best represents the issues considered by this thesis in addressing whether oak savanna can coexist with city neighborhoods. However, the Brewer’s Hill site, and probably many other neighborhoods in the general area, are reasonable candidates as well.

Figure 3.14: Harambee neighborhood graphic sign. Displayed in the MLK Library meeting room.

The next chapter considers opportunities for the integration of oak savanna with neighborhood.

Figure 3.15: Harambee neighborhood site general character

Figure 3.16: Harambee neighborhood site, view from hill to the north.
Malcolm X Academy is at the left;. view faces south toward downtown.

Chapter 4: Fit and Feasibility

Several aspects of meshing city neighborhood and oak savanna are considered, including those associated principally with the oak savanna, like structure, light gradient, and species composition; and those primarily of neighborhood, like vacant lots, boundaries, public places, and aesthetics. Assessment of these characteristics provides support for the coexistence of neighborhood and oak savanna, suggests ways to strengthen their integration, brings to mind opportunities for the development of stewardship by residents, and sometimes defines challenges to the process. This understanding informs a proposal for evaluation of feasibility at the end of this chapter, as well as design concepts in the next chapter.

Figure 4.1: Harambee neighborhood today

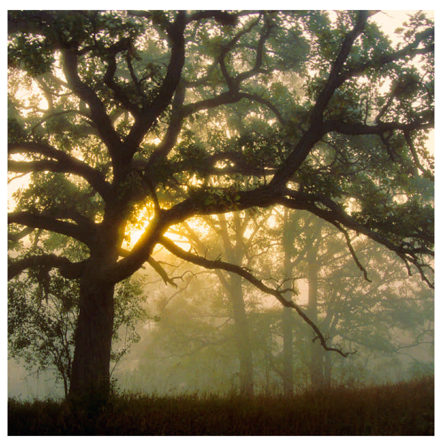


Figure 4.2: Oak savanna remnant (photo courtesy Jason Lindsey, Chain O'Lakes oak savanna restoration, northeast Illinois)

Oak savanna structure

The idea of widely spaced bur oaks with a predominantly herbaceous groundlayer has an immediate sense of compatibility with a city grid, which is typically vegetated by street trees and lawn. Houses and other buildings have the strongest structural role in the neighborhood; they act as visual mass, and also determine the patterns of sunlight on the ground around them. The following diagrams compare the patterns provided by current buildings and larger trees (as digitally documented by the city), in comparison to patches of uninhabited oak savanna. These oak savannas are parts of two areas in northern Illinois, which are presently part of savanna restoration projects.

The drawings capture the savanna reasonably well, but not precisely. The tree patterns are approximated from aerial photographs at the same scale, but there are problems with limited resolution and shadows on the photographs. In addition, tree canopies in both the case study neighborhood and savanna are shown in the range of thirty to forty feet wide; a range of sizes is not represented in these symbolic drawings (there are old bur oaks in Milwaukee with canopies over sixty feet wide).

Notice how the absence of drawn property boundaries (which need little physical realization) makes the neighborhood's comparable spatial arrangement more imaginable.

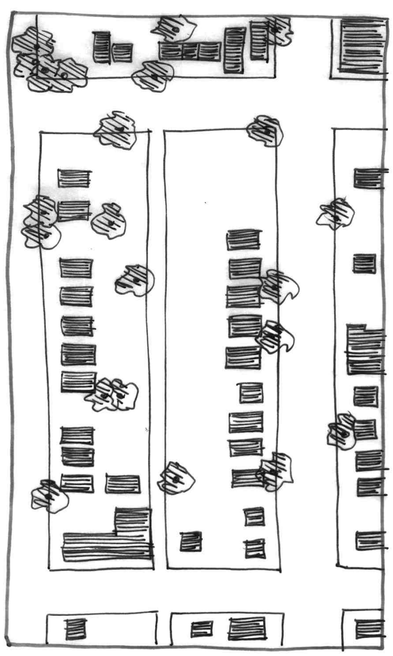


Figure 4.3: City patterns; the block southwest of Malcolm X Academy.

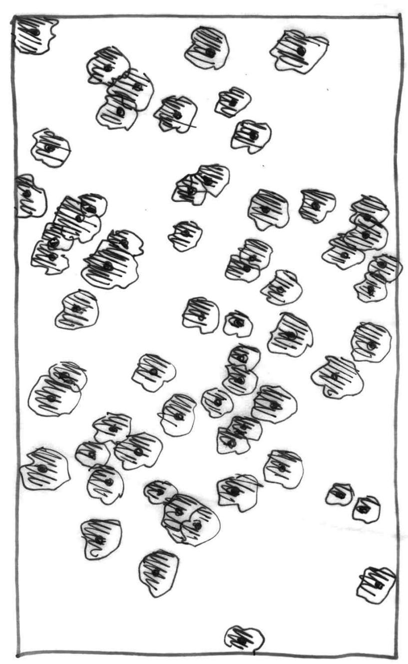


Figure 4.4: Funk's Grove savanna patterns; just south of Bloomington, Illinois.

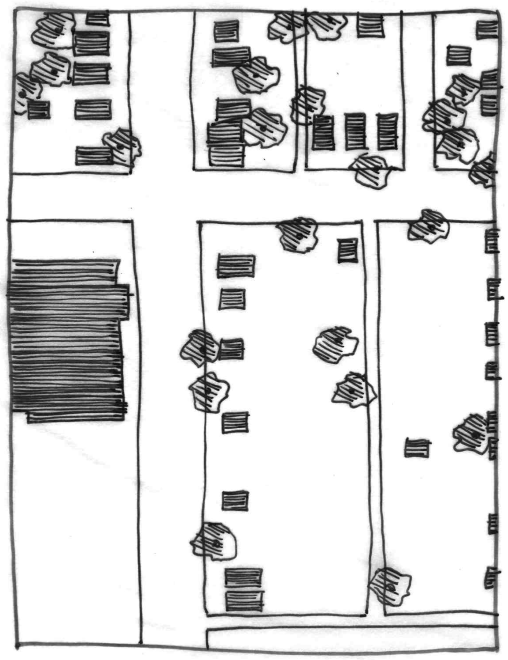


Figure 4.5: City patterns; the block east of Malcolm X Academy.

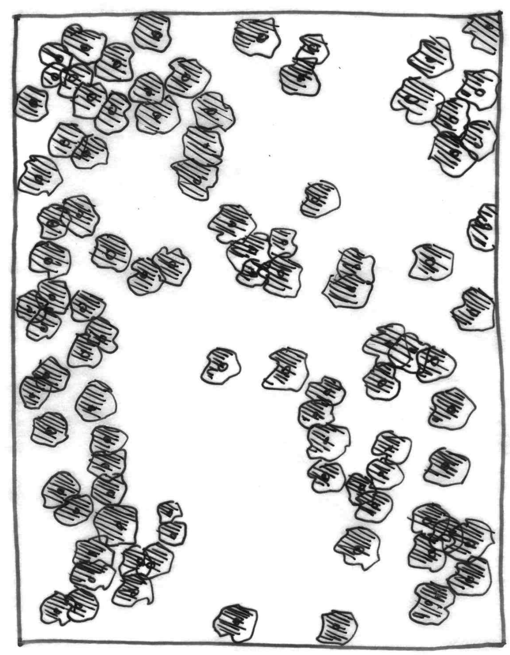


Figure 4.6: Illinois Beach State Park savanna patterns; just south of the state border, on Lake Michigan.

These pattern studies could help determine the addition of trees to a neighborhood, including a gradual adjustment of species mix toward bur oak savanna, and tree planting in patterns reflecting the savanna, using a combination of street trees of highly-varied spacing and trees on privately owned land.

Patterns of light

Houses aren't trees, of course, but they do determine sunlight patterns on the ground around them. Savanna groundlayer species have a characteristically strong composition shift along light gradients, as discussed earlier. Many species require the partial sunlight of savanna conditions, but the savanna structure provides a large variation in degree of sunlight. It's shady directly under the trees for most of the day in summer; very sunny in open areas, and the species composition changes accordingly.

The sun in Milwaukee, at roughly 43° north in latitude, reaches just over 70° in elevation on the summer solstice at noon. On that day, the sun also has its widest azimuth range, rising approximately 30° north of east, then positioned nearly directly south at noon, and setting 30° north of west. The following diagrams compare shade patterns at houses and under oak trees; there is both a spatial and density difference, of course. Neighborhood houses, typically two-story, are drawn as 20x40' in area with a peaked roof thirty feet high, and trees sixty feet tall.

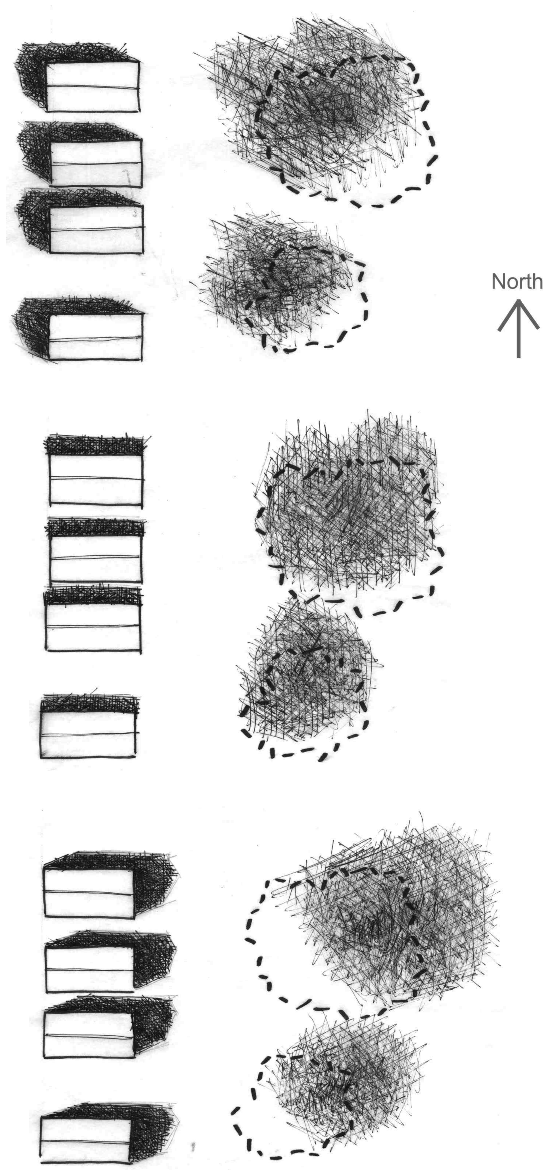


Figure 4.7: Shadows, June 21st, Milwaukee.

(a) 10 am
(60° elevation, 121° azimuth)

(b) noon
(70° elevation, 185° azimuth)

(c) 2 pm
(57° elevation, 243° azimuth)

The intensity of shadow cast by the house is different from that under the oak tree, and even more so seasonally. In spring, before the trees are leafed out, the ground under the trees receives light; in late summer, the ground under the oaks will be very shady. The shadows of the houses vary seasonally only in length and slightly in angle. The north side of the house, which remains shaded, cannot support species requiring spring sunlight to warm the ground, even if they need shade later.

The majority of the houses in these blocks are oriented facing east or west; the smallest spaces are between the houses, where shade is strongest. These between-houses spaces could, perhaps, symbolically represent the adjacent forest, as in the example of one nearby garden in Figure 4.8. The between-houses space could also represent the most deeply shaded parts of the savanna at the base of the oaks, with certain sedges and a few other herbaceous species – ones that also often occur in forests. The choice of landscape in this quirky space is a personal response to living within the oak savanna, and that response could evolve over time.

Figure 4.8: Between-houses vegetation (photographed with permission of Vince Bushell, who has described these as city canyons and wonderful garden spaces in a community newsletter, and encourages vertical use of the walls).

Soils and seed banks

A study of the urban soils is beyond the scope of this thesis, but a few general characteristics should be noted. Grading and movement of topsoil during past development has likely changed the depth as well as the composition of soil in these neighborhoods. The proximity of commercial corridors has probably added soil contaminants. General differences in urban soils include: a mineral content with contributions from the degradation of building materials (including increased nitrogen); contaminants settling from rain or air and street salts; compaction, lowered groundwater levels, and desiccation, changing deep-rooted plants' ability to find water by capillary action (Boehmer 1976). A study of a few urban lots in Milwaukee found relatively high pH from 7.3 to 7.9, from soils with 40% clay to 77% sand (Janik 1984). In these sites, described by Janik in perpetual secondary succession, exotic ruderal species (including many annuals) dominate, and continue by virtue of long-lived and/or widely dispersed seeds. Some such species have seeds viable for more than 30 years (Janik 1984 p. 59). Experiments conducted with *Solidago gigantea* suggested that vegetative cloning, such as that found in some species of the composite family, might be an urban advantage, as a way of "dispersing and diluting toxic substances, or as a means of transferring water" (Boehmer 1976).

Native perennial species should out-compete the ruderal exotics eventually; however, site-specific soil analysis and experimentation with savanna groundlayer species should be part of the restoration, management and reevaluation process.

Fire and alternatives

Bur oak savannas are fire-evolved, as discussed earlier. Fire has ecological effects – it prevents encroachment by fire-intolerant woody species; by burning the above-ground biomass, it makes nutrients (aside from nitrogen compounds, which are volatilized) water-soluble and available for plant uptake; it allows more sunlight and warmth to reach the ground, which, in prairies in spring, can favor warm-season grasses (Morrison 1998).

Mowing is an alternative used in some restorations, which mimics certain aspects of fire – especially, removing biomass to allow more light to reach the ground. In an urban setting, a combination of spring mowing and hand-control of woody species can substitute for much of fire. However, burns are also conceivable at small scales; some individual members of Wild Ones, a native plant landscaping group, conduct small permitted burns on their own properties; and regional restoration and landscape architecture firms have been successful in prescribed burns for clients in suburban neighborhoods. Bob Grese, on the landscape architecture faculty at the University of Michigan, invites his neighbors for an annual burn of his small urban yard of native prairie grasses and forbs, and has made a celebratory (and quietly educational) event of the prescribed burn (Grese, personal communication).

Ecological services

Rainfall infiltration, vegetation propagation and succession, and increasing biotic diversity in insects and birds are among the functions expected in a restoration of oak savanna, even at this degree of integration with human structures and activities. Compared to shallow-rooted turf, the deep roots of oak savanna groundlayer flora allow the infiltration of significantly more rainfall. Because of dependencies between indigenous plant and insect species, a mosquito-dominated turf yard should shift to a more balanced insect population in the restored oak savanna; in turn, the insects and the grass and forb seeds provide food for an increasing diversity of bird species. The genetically diverse plant species will self-propagate, both vegetatively and by the natural dispersal of viable seed. In addition to the gradual replacement of exotic ruderal species, even within the oak savanna flora there will be some succession of ruderal species to conservative species over time. Over much longer periods of time, as bur oaks die or young bur oaks grow old, and patterns of light change, the groundlayer species composition will shift. Human perception of change in these processes would be gradual; education and participation can enhance that perception.

Street trees

In the Harambee neighborhood, there is a mix of young and middle-aged street trees; this probably reflects the loss of elms (*Ulmus americana*): 160,000 elms in the city in 1956 dominated the street tree population prior to Dutch elm disease devastation (Whitford 1972).

The City of Milwaukee Forestry Department has a plan designed to increase species diversity of street trees (information from personal communication with Jeff Boeder, District Manager of Forestry). A "windshield" inventory in 2000 in the city showed an approximate distribution of 55% maple (mostly Norway maple, or *Acer platanoides*), 20% ash, and 15% honeylocust (the lesson of the elms is still being learned). Among the trees presently grown at the city of Milwaukee's municipal nursery in Franklin, WI, are bur oak (*Quercus macrocarpa*), swamp white oak (*Quercus bicolor*), shingle oak (*Quercus imbricaria*), and English oak (*Quercus robur,* an exotic species). Bur oaks are lately considered "good" street trees because they tolerate the higher pH of urban soils. There does not seem to be a preference toward native species, or plant community concepts; rather, species are chosen entirely for perceived and experienced survivability (in a variety of urban situations and conditions), and an aesthetic component (including color of leaves and fruit, and "leaf retention" into winter).

The city grows the majority of its trees at the municipal nursery, but also supplements from commercial nurseries. Nearly all trees are grown by grafting onto root stock, for two reasons: first, for consistent above-ground characteristics (particularly size limits, because of nearby buildings and utilities), and second, for faster propagation. A consequence of grafting is the fact that the trees are genetically identical, limiting the trees' resistance to unanticipated pests or environmental conditions.

In one case, a cultivar of green ash (*Fraxinus pennsylvanica*) is grown because it is male (the species is dioecious) and hence no fruits are produced; the samara seeds of the normally prolific straight species are deemed problematic and “messy”. This makes one realize that oaks, by chance, have a pretty good co-evolution with people – they’re a charismatic megaflora; everybody likes acorns. This common truth has led children to correct adults who misidentify an acorn-bearing tree as an “oak tree”, since as all children know, “really, they’re acorn trees” (personal communication with Jana Aten, then age 5).

For street trees, there is not a planting schedule, per se; rather, the forestry department operates a regular inspection and pruning schedule, and replaces those it thinks necessary. The city also has a program called “Greening Milwaukee”, somewhat analogous to the nearby Trees Atlanta, which provides trees for planting on private property.

All this information points to systemic and fiscal opportunities for collaboration. The resources of the municipal nursery could include support for oak savanna species. The forestry department’s goal of increased species diversity introduces the potential for broadening that goal to include plant community associations and genetic diversity. Bur oaks have a good urban survivability, tolerating higher pH, salts, ozone, drought, and a wide range of soil textures; they’re also slow growing, reaching at most 25’ in twenty years. The love of oaks is an advantage toward cultural acceptance of this particular plant community. The Greening Milwaukee program could become a proponent and partner of the city “adopting” oak savanna.

And, there are challenges to the adoption of oak savanna. Cultural acceptance of street tree diversity in the fullest ecological sense of the word remains elusive. The ability to plant trees into new locations will be important for mimicking the savanna structure, and injecting some amount of dynamism into the developing restoration over decades and longer; so the existing street tree replacement policy is potentially an issue, since not only should species change, but individual trees should be replaced in some cases at a different location (to mimic the savanna’s irregular spacing).

Species availability and propagation

The University of Wisconsin Arboretum staff have recently created a groundlayer oak savanna species list to guide restorations, amassed through historic literature, research, and field work of recent decades (Bader 2001). The list covers light and soil gradients found within and among various oak savanna types, and includes 95 graminoid species, 332 forbs and ferns, and 57 shrubs and vines.

Considering only those species of this list from the middle of the moisture/soil gradient (wet-mesic, mesic, and dry-mesic, excluding wetland and dry species), the seed and plant lists of two Milwaukee-area native plant nurseries have been compared with the UW Arboretum list, to provide a sample of availability. Prairie Future Seed Company provides reliably-local genotype for grasses, sedges, and forbs; Johnson's Nursery provides often-local genotype for woody species.

Table 4.1: Oak savanna species availability at two local nurseries. Compared to UW Arboretum list, which defines the sunlight categories. Note that many oak savanna species overlap light categories.

Nursery	Type	total # species provided	# shade species	# partial shade species	# full sun species
PFS Co.	Graminoids	**23**	5	16	20
PFS Co.	Forbs and ferns	**153**	21	120	136
Johnson's	Shrubs and vines	**25**	12	24	14

The majority of grasses, sedges, and forbs are available as seed only; some are available both as plants and seeds from Prairie Future Seed Company. In addition, Johnson's Nursery carries all of the characteristic bur oak savanna trees, including bur oak (*Quercus macrocarpa*), white oak (*Quercus alba*), shagbark hickory (*Carya ovata*), and white ash (*Fraxinus americana*). There are other local native plant nurseries that can probably supplement this species availability. The considerable species selection, just from these two nurseries, bodes well for the establishment of a semblance of oak savanna.

Straight species, rather than cultivars, are important from an ecological perspective, and, further, so is local genotype; both should be specified in the oak savanna rehabilitation. The reasons these are important in classic ecological restoration – for genetic diversity and regional expression of a mutually-evolved plant community – hold in cities, too.

At present in Milwaukee, the municipal nursery propagates species for city plantings, including woody and herbaceous species. A portion of the nursery could be devoted to oak savanna species, but it is important to understand the different requirements and results when propagating native species from seed. The nursery currently propagates trees by grafting, as well as growing some amount of annual herbaceous species. Both of these allow a faster turnover of plants. Growing native species from seed is a slower process – the expression "sleep, creep, leap" conveys a typical three-year process before there is significant above-ground vegetation in herbaceous species. In addition, many savanna groundlayer species are deep-rooted; hence they need to be transplanted while young, or ideally, grown from seed in their ultimate location. In part, these differences indicate a practical need for more nursery space and longer plan-ahead time; but in part, they indicate a difference in human experience of the landscape and restoration process, which should be considered in design and planning components.

Vacant lots

That it is ecologically sound for people to live in cities is presumed. It is a reasonable argument that in cities, infill and density matter most for overall planet health; that actual yards, and vacant lots, are environmentally costly. There are a number of vacant lots in this neighborhood, and the question of appropriate use arises. The intermingling of larger spaces with front and back yards, street rights of way, and school playgrounds, provides a useful analog for the variability in oak savanna tree density.

Figure 4.9: Harambee neighborhood study area topography, with vacant lots. 2' elevation increments (Milwaukee County Automated Mapping and Land Information System).

Such larger spaces could be functionally important for the initial development of ecological services described earlier; for example, it seems likely that the quantity of plants and diversity of species provided in a vacant lot would be important in the establishment of insect diversity.

A vacant lot, or a part of the school grounds, is also educationally and logistically important in the early stages of the neighborhood oak savanna rehabilitation. Developed as a demonstration site, it provides a space in which to focus the first wave of people's interest and energy, through a school project, for example. It sets an example for expectations of the possible landscape aesthetic, as well as for the time required for establishment of flowering plants and shading trees. In Milwaukee, with city codes and enforcers that stress mowing and neatness, a city- or neighborhood-owned designed demonstration site, as part of an educational program, can be a neutral place for critics to develop an understanding of the rehabilitation's goals and benefits. In the most practical sense, the vacant lot or school grounds will, after the first two to three years, serve as a source of seeds for residents' own landscapes.

A way of quantifying desirable amounts of vacant lots can be developed during the experimentation of restoration. To provide occasional larger landscape patches for savanna trees, and to make those noticeable, start with planting one lot per side per block where available (something between 5-8% of neighborhood lots). Chapter 5 includes suggestions incorporating the use of vacant lots, and in considering their value as a changing one over time.

Granularity

The language of oak savanna could be communicated at different scales, and different degrees of integration with human habitation – are people *of* the savanna, or next to it; is it a repeated reminder, or an encompassing experience?

In this thesis, I propose that there is an opportunity for people to feel that they are *of* the landscape, in a very local sense, and that for this to happen, it must begin at their doorstep and extend throughout the neighborhood.

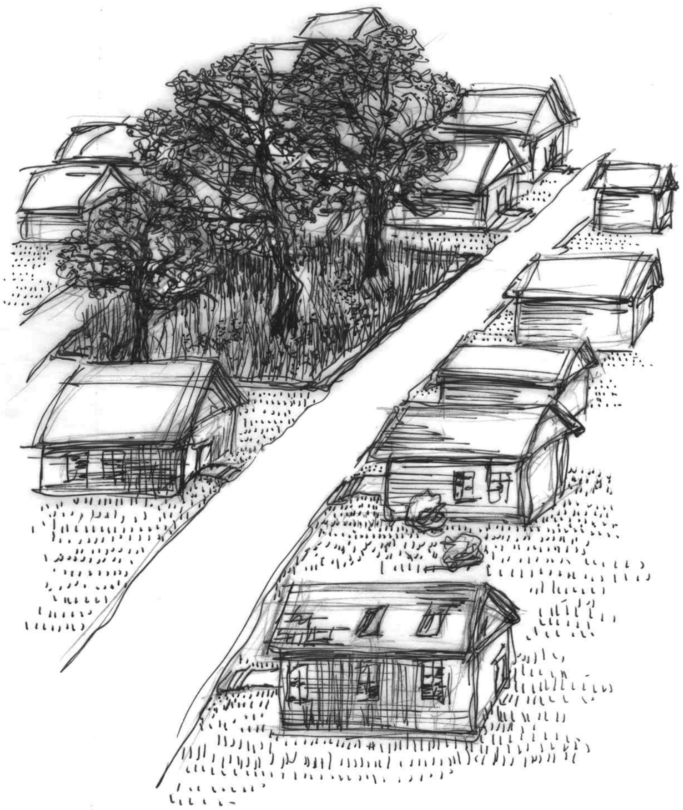


Figure 4.10: Granularity and integration: after Time Landscape (Alan Sonfist, NYC).

In this case, the savanna lot draws attention and focus, and there is value and potentially a wealth of communication in that experience… but the savanna is seen as someplace else, rather than a shared and integral landscape.

Figure 4.11: Granularity and integration: an alternative.

The savanna neighborhood; individual expression encouraged, and an active, rather than passive, relationship with environment.

Visual continuity is important to the sense of belonging to the oak savanna. The oak savanna plant palette, and its diversity, is key to this continuity. Personal expression in form and arrangement is desirable as a celebration of individuality; visual wholeness can be sustained through the connecting threads of bur oak canopy and the associations of plant species. As the oak savanna context becomes clearer over time, those personal expressions might evolve with a developing sense of belonging.

Aesthetics

"Naturalness is a concept that has no specific appearance in form" (Nassauer 1992 p. 240). In neighborhood oak savanna restoration, ecology dictates biotic community, species and site compatibility; design influences the human experience and also allows a wide range of individual expression.

In Milwaukee, there are examples of strong individual landscape expression. There is a prairie front yard (Annette Alexander's) among the lawns of the upscale Lakeshore Drive neighborhood, planted as a personal plea for peace several years ago in response to the first Gulf War. There is the well-known Farwell garden in a bohemian east-side neighborhood (Figure 4.12) on a primarily commercial street. The artistry of gardening encourages individuality, and an oak savanna landscape provides such opportunities too. Darrel Morrison has described garden design as Ecological Art: "the creative synthesis of ecological understanding with spatial art in the formation of landscapes that are experientially rich" (Morrison 1999). Could the Farwell garden be re-imagined in an oak savanna neighborhood? Its gardener likes many different species and blooms all season; both are characteristic of the oak savanna species palette. Although it seems possible that this gardener could choose to fully adopt the oak savanna, it is easier to imagine him initially adopting only certain species into his blend, and that could be just fine within the larger neighborhood.

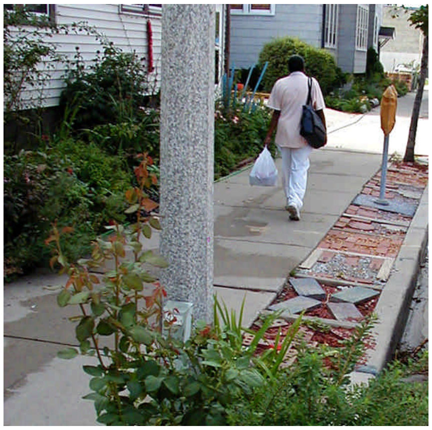


Figure 4.12: Fanciful paving by private gardener on public street – “the city said that they liked what he had done so far, so they’d let it be”. Gardener Ron Hauch: “I tossed it up: flowers, phone bill, flowers, phone bill. It ended up flowers” (Schulz 2002).

Cultural richness provides aesthetic inspiration. The Lloyd Street School murals, not far from the Harambee neighborhood (Figure 4.13), are a visual, cultural and social expression of elementary school children; think of the possible expression if they had plants and space to work with.

Figure 4.13: Lloyd Street School murals. Students have painted colorful murals, some with social messages, affixed to the chain-link fences surrounding the school. The school website says, “art is EVERYWHERE!”.

Fragmentation and fences

Property boundaries create varying degrees of a physical barrier that will influence the continuity of oak savanna landscape. In this neighborhood, chain-link fences four feet high are most common – for security, from habit, for dogs. Chain-link fences do not block air, sight, water, seed dispersal, insects, most birds, or human conversation; for the oak savanna, this is a distinct advantage over other kinds of boundary markers (the dense evergreen screens or solid wood fences common in suburbs are rare here). This type of fence does provide a structure offering interesting possibilities for artistic expression.

Figure 4.14: Chain-link boundaries

Private and public spaces

The subject neighborhood is without particularly private outdoor spaces; it is a neighborhood where, especially in the summer, people are on porches, sidewalks, and streets. Shared public spaces are already valued. Design can support individual expression, and individual participation, within a larger shared landscape.

Figures 4.15 and 4.16 show two gardens of the area: a private garden of the past, and a community garden of the present. In the present day, private spaces might be arranged around back entrances or front porches as in the 1925 garden (although on a smaller scale), as a way of fitting into the larger landscape. Notice the vitality of these gardens. There is a connection, in urban places, between personally protected or stewarded spaces and their vitality. The community garden, Garden Park, has a classic and complex story of neighbors reclaiming a vacant previously-commercial lot. The garden was conceived, designed, implemented, and is managed through a completely grass-roots effort of a group of neighbors, including one or two key residents. Note that this grass-roots effort chose native plants: a significant portion of the garden is a prairie recreation. The neighbors have recently solicited the help of Milwaukee Urban Gardens and the city in efforts toward remediation of this brownfield site.

Figure 4.15: Immigrant garden, c. 1925 (Milwaukee County Historical Society)

Figure 4.16: Garden Park on Locust. A respite on a busy corner; the site of popular markets.

> “Community gardens have a messy vitality that some find appealing; and, like an occasional flower growing in a rocky field, they exist against all odds, especially in inner-city neighborhoods, where they are expressions of collective vision, artful inventiveness, sustained effort, an investment of hard-won resources. They may not always be Art, but, in the eyes of their authors, they are beautiful.” (Spirn 1998)

The processes by which community gardens come into being and are maintained are relevant to the rehabilitation of oak savanna. “Since these gardens develop incrementally, operating without a predetermined time frame, their evolution can reflect both immediate and future circumstances” (Methvin 2002). An incremental and experimental process, and one which is continually and casually reevaluated, is participatory, and vice versa.

Schools

Schools have provided a successful organizing focus for community outdoor spaces and gardens. Trees Atlanta, a non-profit organization conserving and planting trees, has a neighborhood program, where schoolchildren lead the project: the students talk to neighbors, together choose trees, and help to plant them. Wild Ones, a native landscaping organization, has funded dozens of school projects, including a vacant lot in urban Detroit, where design and implementation has been done by elementary school students with the help of adult neighborhood volunteers. The "Edible Schoolyard" in Berkeley turned an asphalt schoolyard into an organic garden now combined with a school kitchen-classroom. Examples of school and schoolchildren participation abound. Schools can provide a powerful combination of resources. First, the school provides land – part of the larger landscape, but by virtue of size and being a center of activity, a prominent visual landmark. Second, the school's students have imagination and energy to apply to restoration projects – and youth, with hope for multi-generational landscape stewardship. Third, there is potential for the long-term participation and sponsorship by the institution, in terms of curriculum and other resources.

Time

The fourth dimension of landscapes, time, has been mentioned in several contexts. Ecological restoration itself takes a long time; plants from seed are slow to grow; the transformation of landscape in restoration is gradual, taking years, and decades. There are opportunities provided by time, for incremental steps, for experimentation, for unexpected changes, for awareness of small things, for learning. "…We must reformulate static landscape design in favor of a design that grows from process and change… Given time and encouragement, insignificant increments of change can take hold in significant ways" (Methvin 2002).

Proposal for evaluating feasibility

Based on the characteristics of oak savanna and neighborhood just discussed, a set of factors is proposed for evaluating the feasibility of oak savanna restoration in a particular neighborhood. This is a qualitative proposal, but is based on consideration of the Harambee neighborhood. In practice, it could be developed over time with experience from restoration experiments.

1. Minimum plantable land of perhaps 10-15% of the area. Considering the bur oak savanna with a characteristic canopy of 10-30% cover, and allowing buildings to visually replace some of that sense of canopy, there should still be space for trees creating 10% cover. Although this tree can survive with a fraction of that as planting space in a street situation, ideally it has earth at its feet, and its surface roots spread to the whole canopy width. The city neighborhoods themselves leave at *most* 40% land available; a moderately dense neighborhood like Harambee has approximately 25% streets, 25% buildings, and 10% other unavailable area (parking, play lots, etc.).
2. Predominantly residential neighborhood pattern, with few large buildings. The interruption of large buildings would change the potential for establishing the savanna structure.
3. Few densely shaded or heavily vegetated yards, or yards with an intensive use incompatible with planting oak savanna flora. An oak savanna rehabilitation will be least disruptive if it does not necessitate the removal of much existing woody or ornamental vegetation.

4. A tolerant landscape aesthetic, with existing indications of support for individual expression; for example, varied kinds of vegetable or flower patches, smallness of lawns, or outdoor sitting areas in close proximity with a house.
5. Few boundary barriers. Property boundary barriers blocking sight and air, either fencing or plantings, and especially those that are substantial, are significant restoration obstacles.
6. Available larger patches of land, perhaps one in twenty lots. This can be shared space, such as schoolgrounds, or a vacant lot, or an easement on private property. The larger spaces provide key visual indicators and demonstration sites for the neighborhood – explored further in the next chapter.
7. Nearby school or other institution, particularly of children, with the potential to collaborate as an organizing social entity.
8. A permanent organization to support the rehabilitation over decades… to initiate the project and help establish the workers; and then commit to ongoing long-term support – not necessarily financial support, but help in finding it. This organization helps to make sure the project sustains itself. It could be a government department (like Forestry or City Development); a non-profit (like the nearby Urban Ecology Center, which already has extensive participatory educational programs); even an active philanthropic entity like the Milwaukee Foundation.
9. A key resident or two, motivated by environmental stewardship, who will act as liaison for the neighborhood, and can commit to this role for a number of years.

The next chapter proposes some design ideas, and suggests ways in which success could be evaluated.

Chapter 5: A Speculative Proposal at Neighborhood Scale

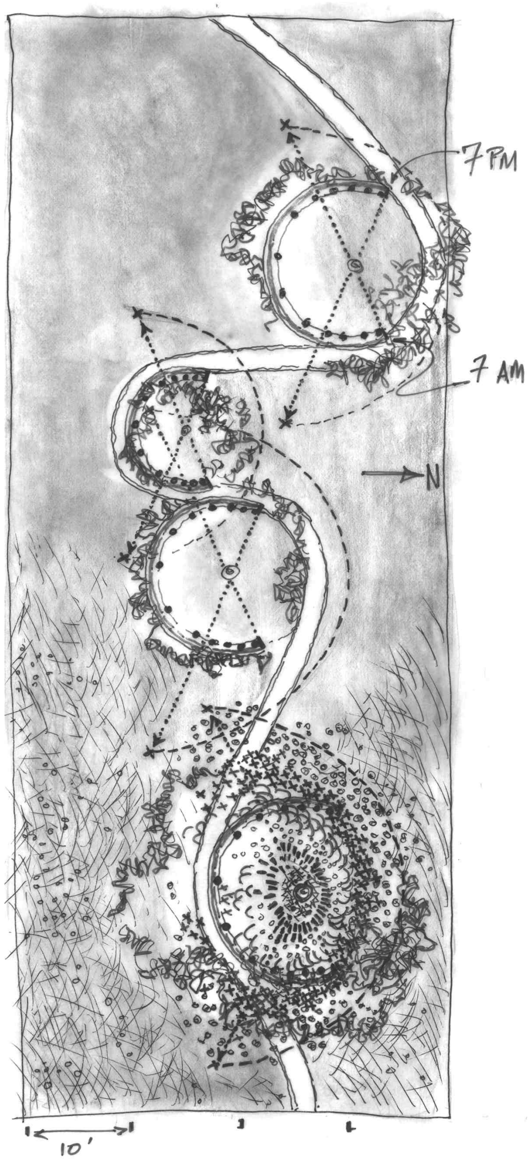
The question can be fairly asked: what design intervention is appropriate in restoring oak savanna to the neighborhood? If a change of the neighborhood is incremental and gradual, with unpredictable occurrences, individual expressiveness, an attention to both detail and context, then what design brings is guidance, facilitation, communication, and inspiration. If the basis of change is ecological, then design should make the reminders of ecological context effective and lasting. Through an understanding of both ecological workings and aesthetic essences, design is an opportunity to illuminate small moments and places; for people to see the forest (or savanna) *because of* the trees.

Neighborhood change founded in principles of ecology and restoration means an especial importance for design early on, to have success of the eventual landscape later. And, what is success in this context? Clearly the ecological function of the oak savanna with the neighborhood – but this will require the active participation and care of the people, and so success is measured in human terms as well.

Providing sketches in this chapter is deliberate; the form of design communication carries a message. For the process to be participatory, initial design concepts need to invite discussion, prompt tangential ideas, and encourage personal response.

Vacant lot as demonstration garden

Education is really learning; education is not top-down, but happens through experiences. Interpretive signs are sometimes used, sometimes quite effectively, to explain, or remind, or draw attention to, something of significance in the landscape. In an attempt at



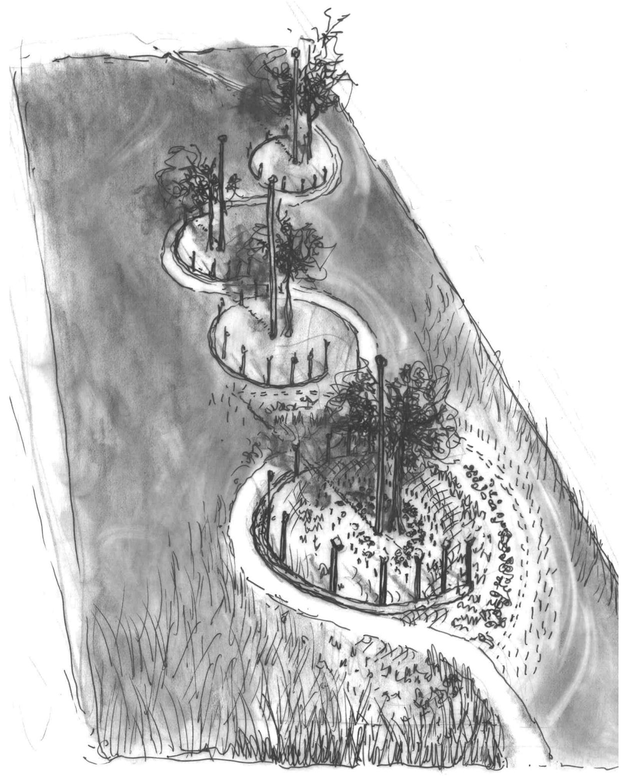


Figure 5.1: A vacant lot savanna solstice garden, in plan. This garden is based on the sun patterns on the summer solstice. An arc representing the azimuth of the sun from 7 am to 7 pm June 21st is demarcated on the ground around each bur oak, perhaps with a line of stone or narrow paving. Plant species are arranged in concentric arcs from the tree by degree of required sunlight and sunlight actually received under and through the growing bur oak. The arcs are elongated to reflect change in elevation of sun and length of shadow.

The remainder of the garden receiving sun is planted with sunny oak savanna species.

Figure 5.2: A vacant lot savanna solstice garden, bird's-eye view. The hours are marked with posts, with a positioned prism as a finial, from which one looks toward the tree trunk to align the shadows. A tall post planted with the tree marks eventual height while the tree is growing.

7 am shadows are shown. In the partially shadowed portions, the groundlayer species are obviously arranged in arcs, loosely corresponding to light gradient response; this will eventually be naturally amended as the tree grows but can be accelerated by gardener intervention.

integration of savanna with neighborhood, one wishes for the "signs" to be *in* the experience, not at the edge of it. A demonstration garden in a vacant lot, or as part of the school grounds, can be both *of* the landscape, and a visually compelling element *within* it. It shows off the oak savanna; it is an example of the experience of oak savanna; it contains the details of plants and compositions that are needed; it should be participatory itself (changed deliberately); and it can be ephemeral. With judicious location of planted trees, a demonstration garden in a vacant lot can accommodate a house as infill development at some time in the future.

Chain-link savanna art

Chain-link fences are ecologically-friendly (well, perhaps some openings are needed for ground mammals…), but aesthetically unloved. This fence, though, is an opportunity to let the aesthetic of the savanna blend with the cultural influences of the people in a very simple way: with grasses from the savanna, and other vernacular materials of the artist, woven through the chain links.

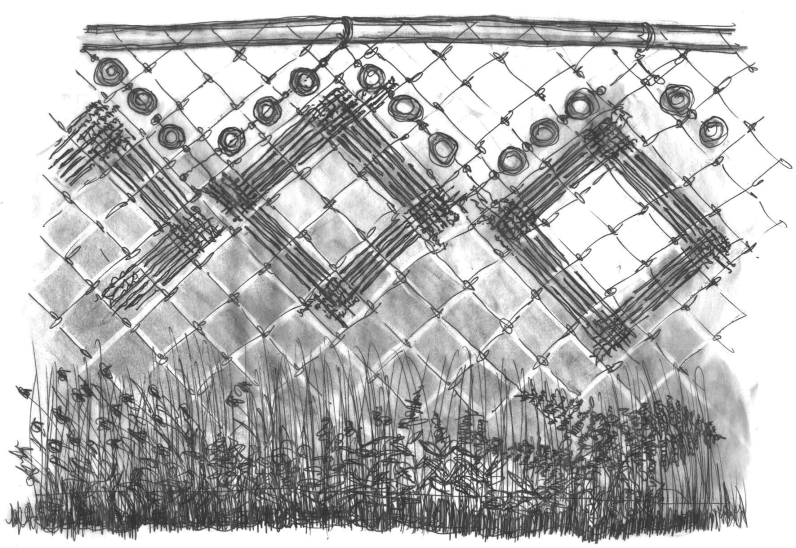


Figure 5.3: Re-imagined chain-link fence. The weavings could be at a particular spot only, as an emblem for the family at this residence.

The neighborhood transect

In yards, individual expression is encouraged, but an overall plan for shifting the present tree species composition and supplementing the numbers of trees is needed. Too often, static plan-view drawings are made for designed landscapes which reflect neither the passage of time, the incremental nature of implementation, nor the inherent reevaluation which should adjust plans on an ongoing basis. A plan for the neighborhood oak savanna, to be collectively adopted by neighbors and city, would include goals of tree canopy cover (10-30%), spatial patterning (as in studied bur oak savanna remnants), species composition (as suggested by Curtis, Bray, Pruka, and others), and the time periods over which those are accomplished. Each sketch in an eventual series, developed with time and reassessment, would illustrate the next steps toward the rehabilitation goals. Figure 5.4 is one such sketch, showing a possible arrangement of bur oak savanna canopy trees to be added in the neighborhood, and the sketch facilitates visualization of the desired spatial pattern.

The more important part of this sketch, though, is the neighborhood transect. In an ecological restoration, permanent sampling quadrats are typically established by which such quantitative measurements as changes in species diversity, plant density, and extent of unwanted exotic species are made. Those measurements are used to reevaluate the restoration process, and then make those unanticipated and incremental changes toward improving the effectiveness of the restoration – supplemental seeding or planting, adjustments in management such as the timing or frequency of fire or mowing, management to control exotic species. Those issues are equally relevant in this situation, but the interwoven human population provides additional opportunities. First, the learning experience of conducting the restoration sampling and evaluation could be affiliated with the school's science classes. Second, sampling quadrats should be located throughout the neighborhood, at different residences, and this suggests an opportunity for group involvement

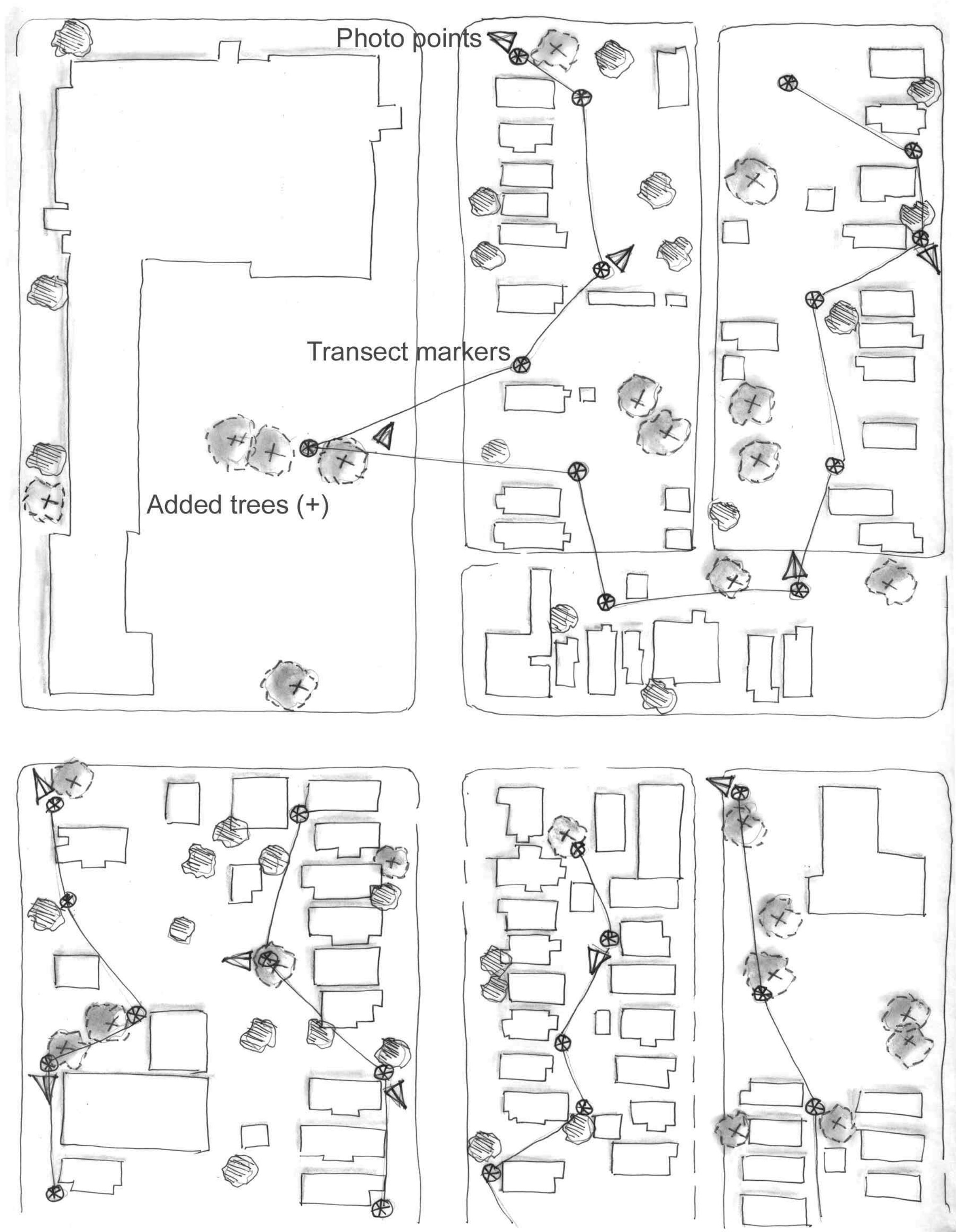


Figure 5.4: Neighborhood transect. This is a portion of the neighborhood site, with Malcolm X Academy at upper left. Transect markers (realized with stakes), photo monitoring locations and direction, and added trees (for a possible phase of restoration) are noted.

by making a physical connection between sampling sites. In each yard, a sample point is randomly located and marked with a permanent stake. At the time of evaluation, transects are drawn from stake to stake, yard to yard, and line sampling is done. This will start to involve the residents, at the beginning simply by granting permission for others to follow the transect.

Photo-monitoring points are a final element of the neighborhood transect. It is common practice for a land trust to develop baseline documentation of the lands under stewardship (at acquisition or easement time), which is used during annual monitoring as a reference for comparison. By establishing a similar baseline in the neighborhood – locations, angles, and depth of field for photographs – landscape change in the neighborhood can be documented and shared. When change is gradual and uneven, periodic snapshots document the cumulative effect, which is itself revealing. Positive change, as well as issues for restoration, can be noted.

Empathetic entrances

Figures 5.5 and 5.6 are illustrative examples of personal entrances, with empathy for the encompassing oak savanna. The historic houses of the neighborhood are of significant value for the community; choice of materials and forms for entrance spaces should be sensitive to the house, responsive to the residents, and belong with oak savanna.

Where would privacy be in an oak savanna? It would be for smaller creatures, in the grasses and forbs. Perhaps the enclosure around entrances is meant for smaller human creatures, the children; privacy for grownups is on porches. And so, these entrance gardens, catching east morning or west afternoon light, are imagined as “short” spaces – the dividing elements are no taller than the savanna flowers and grasses, and maintain the oak savanna visual continuity.

Figure 5.5: Possible house entrance 1. Small garden spaces (an allowance for favored cultural plants) and a sweep of play space for small children are tucked near the house, behind low narrow curved walls separating the areas from the more natural savanna.

Figure 5.6: Possible house entrance 2. Narrow raised vegetable garden plots, easily accessible from front walk, are made of materials compatible with the house and the pillars of the porch.

Back yard circles

Although many houses have front porches with seating for enjoying a bit of a rest or socializing outdoors, additional space could be accommodated too, in an appropriate blend of community and privacy. This could be as simple as a closely-mown circle completely enclosed by taller and exuberant savanna grasses and flowers. From a distance, the circle barely interrupts the expanse of savanna. Spaces like these encourage a personal connection with the savanna.

All of these sketches are speculative; they provide initial ideas that will lead to others, as suited to a particular place or particular person.

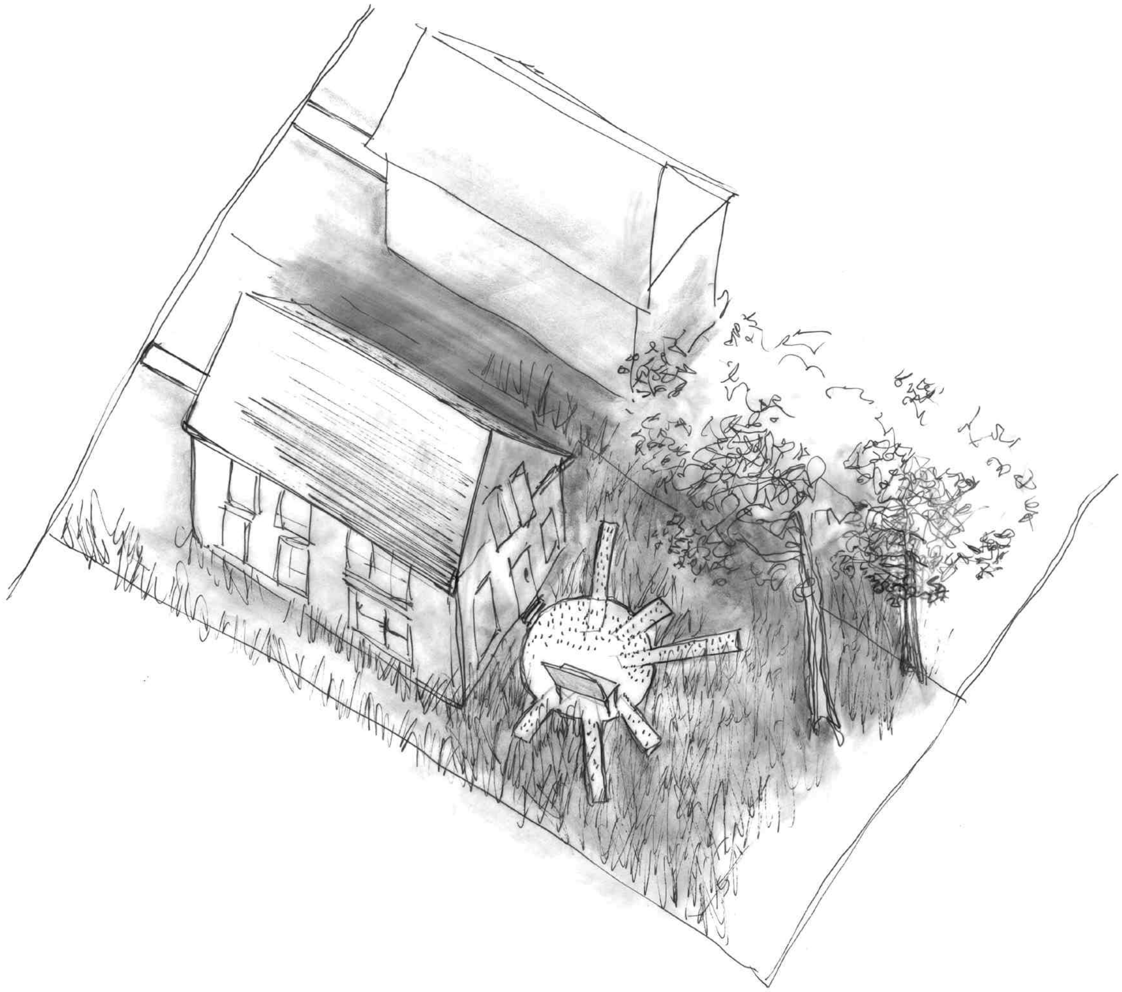


Figure 5.7: Back yard socializing circles. This pattern of mown area is inspired by a children's quilt square with sunburst designs, on display at the Martin Luther King Library.

A vision of neighborhood

The neighborhood in a decade might have a number of added trees, mostly bur oaks but including other savanna tree species; the groundlayer is generally seen as a continuous visual sweep of savanna flowers and grasses. A plant nursery occupies some available space; as does a savanna solstice demonstration garden very near the school.

Ecological success is determined by factors such as the infiltration of rainfall and reduced load in the storm sewers; an increase in insect species diversity and possibly eventually bird diversity; and self-propagating and gradually shifting oak savanna groundlayer species composition. The neighborhood transect serves as one way to measure ecological factors. This quantitative measurement would compare defined numeric goals to (increasing) numbers and species of the oak savanna groundlayer flora along the transect, and (decreasing) numbers of exotic species. Quantitative plans for a shift in tree species composition toward the bur oak savanna species are also measurable.

Figure 5.8: Bird's-eye view of neighborhood, after some time. View is from the hill at the north edge of the neighborhood site, looking south.

Remembering that the rehabilitation process is gradual and subtle, social success could be indicated by, for example, the incorporation of oak savanna in Malcolm X Academy's curriculum, perhaps through science or art classes; a future children's project at the Martin Luther King Library inspired by the oak savanna; or a measurable change in the quantity and character of phone calls to the city about weed control, toward knowledge of, and appreciation for, the oak savanna landscape.

Chapter 6: Conclusions

A city neighborhood oak savanna takes some imagining. It's not the trees and grasses and plants that need imagination, but a suspension of the completely human and societal difficulties imposed by habit, expectation, unfamiliarity, and reluctance. These can be made inconsequential when people collaborate, proceed incrementally, find common cares, and have enough support.

Figure 6.1: An integration of city neighborhood and oak savanna
(oak savanna photo courtesy Jason Lindsey; it is superimposed on a neighborhood photo).

Wildness, different from wilderness, can be a common care. Landscape architect Steve Martino paused a moment, in a recent lecture on the University of Georgia campus, then looked up and said, almost as an afterthought, "neatness obscures truth"… neatness in the sense of oversimplification without thought; truth as ecology, or revelation, or soul. There is both a scientific element of wildness, "in terms of … ecological and evolutionary context … habitual relationships to other organisms and the surrounding environment" (Waller 1998), and an aesthetic element, where it is like exuberance. Wildness in this sense has no particular aesthetic form, but represents spirit, vitality, revelation, and reverence for the complex natural world of which humans are an intertwined, interdependent part.

Imagine the city of Milwaukee adopting oak savanna. The municipal nursery propagates the plants, and so do schoolchildren in the neighborhood, in demonstration gardens managed by science classes, and in their yards. The mayor's on-foot police force are cross-trained on exotic weeds, and help out now and then with weeding on their walking, talking beat (remember, this is an imagination unfettered by habit). On Arbor Day, *Quercus macrocarpa*, *Ceanothus americanus*, *Corylus americana*, and *Prunus americana* are handed out. The staff of Greening Milwaukee look at the sky and sunlight patterns when helping residents choose the spot for a bur oak. When middle school classes study the neighborhood past and present, the oak savanna is a part. Oak savanna, like any other neighborhood identity, is an inspirational source for cultural projects.

The oak savanna is a historically, ecologically, relevant model for parts of Milwaukee. The experiences and writings of early settlers, including the studies of Increase Lapham, define oak savanna as a rich layer of urban history, and of relevance to urban future – a precursor to housing style, cultural practices and social patterns, whose roots have been buried deep.

Ecological rehabilitation attempts to understand natural processes and repair ecological function. The imposition of highly fragmented property boundaries and land uses in cities impairs ecological processes, which would otherwise not respect property ownership. The pattern of human habitation and the city grid can perhaps coexist with oak savanna both structurally, and to some extent functionally; this integration could help to repair processes such as rainfall infiltration, air movement, respiration, and vegetation propagation.

Landscape architects, whose work it is to design human environments, have traditionally functioned, or acted, for a single property owner at a time. Planners, landscape ecologists and restorationists act at different and larger scales, but typically accept property ownership boundaries as a separation of land uses; this means the forest, or savanna, or river, has to exist between other properties. Landscape architects could think, instead, of the ecosystem first, and of re-forming and rehabilitating the shapes of the lives of people as part of that system. Privacy becomes articulated in residence and entrance sequences, and the rest of the land would belong, in the sense of natural processes, to the community.

The near-northwest neighborhoods of Milwaukee, including Harambee and Brewer's Hill, have a dense urban residential texture that seems compatible with oak savanna structure. The large numbers of children in Harambee, coupled with the 20% of residents who've lived there for more than twenty years, indicates both an energy force (the children), a patience for results (the grownups and the elderly), and a basis for the sustenance of inter-generational stewardship. The lack of intensive ornamental gardening is probably associated with the economics of the neighborhood, and this is helpful from the perspective of feasibility of oak savanna restoration.

Two neighborhood aspects not addressed in this thesis should be mentioned. First, I don't live in the neighborhood or the central city, and I am white; however, if pursing a project like this, I know of leaders in the neighborhood with whom I could work, as a way of beginning to establish my own credibility and ability to participate. Second, clearly the involvement of residents and schoolchildren from the beginning is important, starting with early surveys of opinions before even proposing the project. Such research was simply outside the scope of this thesis, but it needs to be done.

In comparison of oak savanna and city neighborhood, some symbiotic characteristics have been described. Structurally, the pattern and mass of houses and trees in the city grid, with occasional vacant lot or public space, compares favorably to the savanna's arrangement of space. Street trees arranged in savanna rhythm are an important component. Seeds and plants to establish the oak savanna flora are already available from local native plant nurseries. Signs of creative cultural aesthetics in the area, and appreciation for small details, as in the Mayor's Design Awards, are a positive sign for acceptance and even embracing of the savanna groundlayer flora in individual yards as material for expression. Ecologically-friendly chain-link fences can even be integrated in the savanna. The arrangement of an experimental neighborhood oak savanna centered around a school presents possibilities, successfully proven elsewhere, for the school's stewardship of the neighborhood and vice versa. The patient, incremental pace of ecological restoration is right in sync with the organic development of cities, both defined by a "momentum of process" (Methvin 2002).

A number of challenges have been discussed. The degree of ecological viability is certainly not clear, but can be better understood through experimentation. Cultural and societal acceptance of a shared landscape (in the broad sense) is uncertain. The methods for establishing a truly collaborative process are hazy, but maybe a good starting point is the acceptance of uncertainty; or as landscape architect Grant Jones has said, to get comfortable with the idea of getting lost; to plan for piecemeal change.

Early educational components can help respond to critics who would be wary of a "weedy" aesthetic. Arguments can be made for the importance of the ecological basis of the rehabilitation to health and livability in the city, as overriding concerns over pure aesthetics. And, transitional strategies toward acceptance of the visual character of the oak savanna flora are possible – for example, there are a couple of hundred flowering plants to choose from, with varying bloom times through the season; it would be possible to begin with some of the more familiar flowers, in a more tended planting. And, deliberate signs of care in home landscapes, including mown edges, and small signposts (with a neighborhood oak savanna logo), can help in the persuasive process, and are possible interim strategies.

Feasibility criteria, design concepts, and evaluation techniques have been sketched as a starting point. An instigating organization, just bold enough to think it can do this, would gather an initial team; evaluate existing conditions and circumstances; develop a framework for neighborhood involvement; facilitate the development of concepts, plans, and demonstration sites; put in place the city connections for plants, seeds, and support; further enlist the school's direct involvement; and publish the processes and steps on an ongoing basis.

The bur oak savanna is an appropriate rehabilitation strategy for these Milwaukee neighborhoods. A successful initial neighborhood project could be followed with similar endeavors in other nearby neighborhoods, within the supportive framework of the same long-term organization. What of farther away neighborhoods in Milwaukee, those of historically deciduous forest? An important part of this thesis is the use of appropriate indigenous plant communities reconsidered in the city grid; bur oak savanna is only appropriate where historically and ecologically valid. To transfer this concept to other kinds of plant communities requires a somewhat different imagination. In Athens, GA, home of deciduous piedmont forests, the city neighborhoods have the structural feeling of forest, but are dominated in the understory by shiny broadleaved evergreens, like exotic Chinese hollies and the omnipresent invasive exotic Chinese privet, with dark green monotypic plantings of "groundcovers" such as exotic English ivy and vinca species. In this case, one imagines a neighborhood piedmont forest rehabilitation as a gradual shift toward native forest understory and diverse groundlayer species, subtly altering the fall season to one of changing color at lower heights as well as canopy, and visually re-introducing the character of the winter piedmont forest, of tree form, trunk colors, and branching patterns. The point is to deepen the sense of place, a combination of natural history and cultural layers, which belongs here and nowhere else.

Hope

The immersion of a Milwaukee neighborhood with an oak savanna challenges accepted practice, and is in many ways far-fetched. Looked at another way, free of the restraints of accepted practice, it is also eminently logical. This thesis, although a study of feasibility, and an attempt to evaluate rather than advocate, is clearly also an expression of personal hope. As David Quammen wrote, about an environmental ethic, "To despair of the entire situation is another reasonable alternative. But the unsatisfactory thing about despair, in my view, is that besides being fruitless it's far less exciting than hope, however slim." (Quammen 1996).

Appendix A: Lapham's Milwaukee Floras

Lapham species lists (Lapham 1836; Lapham 1838) with notation of inclusion in Pruka oak savanna indicator species lists (Pruka 1995). Species marked "?" are unclear from Lapham latin/common names and habitat. Vouchers not checked. Headings are Pruka indicator category (BP 1995), and Lapham flora inclusion by year (IL 1836, 1838, 1940). Leftmost column indicates exotic species.

	Latin (PLANTS database)	Common (PLANTS database)	BP	IL	IL	IL	*Lapham's Latin (sic)*	Lapham's Common
	http://plants.usda.gov		95	36	38	40	*Eaton's Manual of Botany*	(sic)
							1836	
	Acer rubrum	Red Maple		x			*Acer rubrum*	Red maple
	Acer spicatum	Mountain Maple				x	*Acer spicatum*	Mountain maple
	Achillea millefolium	Common Yarrow		x			*Achillea millefolium*	Milfoil
	Acorus calamus	Calamus			x		*Acorus calamus*	Sweet flag
	Actaea pachypoda	White Baneberry		x			*Actaea alba*	White cohosh
	Adiantum pedatum	Northern Maidenhair		x			*Adiantum pedatum*	Maiden hair
	Agalinis tenuifolia	Slenderleaf False Foxglove			x		*Gerardia tenuifolia*	
	Ageratina aromatica	Lesser Snakeroot		x			*Eupatorium aromaticum*	
	Agrimonia eupatoria	Churchsteeples		x			*Agrimonia Eupatoria*	Agrimony
	Alisma plantago-aquatica	American Waterplantain				x	*Alisma plantago*	Water plantain
	Allium canadense	Meadow Garlic		x			*Allium Canadense*	Meadow garlic
	Allium cernuum	Nodding Onion	2			x	*Allium cernuum*	
	Allium tricoccum	Wild Leek				x	*Allium tricoccum*	
	Alnus serrulata	Hazel Alder			x		*Alnus serrulata*	Alder
ex	*Alopecurus geniculatus*	Water Foxtail				x	*Alopecurus geniculatus*	
	Ambrosia artemisiifolia var. *elatior*	Annual Ragweed				x	*Ambrosia eleator*	Hog weed
	Ambrosia trifida	Great Ragweed			x		*Ambrosia trifida*	Bitter weed
	Amorpha canescens	Lead plant	2	x			*Amorpha canescens*	Lead plant
	Amphicarpaea bracteata	American Hogpeanut			x		*Amphicarpa monoica*	Wild bean
	Andropogon gerardii	Big Bluestem	2			x	*Andropogon furcatus*	
	Anemone virginiana	Tall Thimbleweed	1	x			*Anemone Virginiana*	Wind flower
	Angelica atropurpurea	Purplestem Angelica				x	*Archangelica atropurpurea*	
ex	*Anthemis cotula*	Stinking Chamomile			x		*Anthemis cotula*	May weed
	Apios americana	Groundnut			x		*Apios tuberosa*	Indian potatoe
	Apocynum androsaemifolium	Spreading Dogbane			x		*Apocynum androsaemifolium*	Dog bane
	Apocynum cannabinum	Indianhemp		x			*Apocynum cannabinum*	
	Aquilegia canadensis	Red Columbine		x			*Aquilegia Canadensis*	Wild columbine
	Arabis canadensis	Sicklepod			x		*Arabis Canadensis*	sickle pod
	Arabis hirsuta	Hairy Rockcress			x		*Arabis hirsuta*	
	Arabis laevigata	Smooth Rockcress			x		*Arabis laevigata*	
	Arabis lyrata	Lyrate Rockcress				x	*Arabis lyrata*	
	Aralia nudicaulis	Wild Sarsaparilla		x			*Aralia nudicaulis*	Wild sarsaparilla
	Aralia racemosa	American Spikenard		x			*Aralia racemosa*	Spikenard
ex	*Arctium lappa*	Greater Burrdock		x			*Arctium lappa*	Burr dock
	Arctostaphylos uva-ursi	Kinnikinnick			x		*Arbutus uva-ursi*	Bear berry
	Argentina anserina	Silverweed Cinquefoil		x			*Potentilla ansera*	Tansey cinquefoil
	Arnoglossum atriplicifolium	Pale Indian Plantain	1			x	*Cacalia atriplicifolia*	
	Asarum canadense	Canadian Wildginger			x		*Asarum Canadense*	False colt foot
	Asclepias exaltata	Poke Milkweed	2	x			*Asclepias phytolaccoides*	
	Asclepias incarnata	Swamp Milkweed			x		*Asclepias incarnata*	

	Asclepias syriaca	Common Milkweed		x			*Asclepias Syriaca*	Milk weed
	Asclepias tuberosa	Butterfly Milkweed	2	x			*Asclepias tuberosa*	Butterfly weed
ex	*Asparagus officinalis*	Garden Asparagus			x		*Asparagus officinalis*	Asparagus
	Astragalus canadensis	Canadian Milkvetch	1			x	*Astragalus Canadensis*	Milk vetch
	Astragalus neglectus	Cooper's Milkvetch				x	*Phacca neglecta*	
	Baptisia alba	Wild White Indigo			x		*Baptisia alba*	Prairie indigo
	Betula papyrifera	Paper Birch		x			*Betula papyracea*	Canoe birch
	Betula pumila	Bog Birch			x		*Betula pumila*	Dwarf birch
	Betula pumila var. *glandulifera*	Bog Birch				x	*Betula grandulosa*	Scrub birch
	Bidens frondosa	Devil's Beggartick			x		*Bidens frondosa*	Burr marygold
	Botrychium virginianum	Rattlesnake Fern		x			*Botrychium virginicum*	Rattle snake fern
ex	*Brassica nigra*	Black Mustard			x		*Sinapis nigra*	Mustard
	Bromus ciliatus	Fringed Brome	2	x			*Bromus ciliatus*	
	Bromus purgans	Hairy Woodland Brome				x	*Bromus purgans*	
	Calamagrostis canadensis	Bluejoint			x		*Calamagrostis Canadensis*	
	Calla palustris	Water Arum			x		*Calla palustris*	Water arum
	Caltha palustris	Yellow Marsh Marigold		x			*Caltha palustris*	American cowslip
	Calystegia sepium	Hedge False Bindweed		x			*Convolvulus repens*	
	Calystegia sepium ssp. *angulata*	Hedge False Bindweed			x		*Convulvulus repens*	Field bind weed
	Calystegia spithamaea	Low False Bindweed	1	x			*Convulvulus spithameus*	Dwarf morning glory
	Campanula rotundifolia	Bluebell Bellflower		x			*Campanula rotundifolia*	Hair bell
	Campanulastrum americanum	Small American Bellflower		x			*Campanula Americana*	
ex	*Capsella bursa-pastoris*	Sheperd's Purse			x		*Capsella bur a-pastoris*	Sheperd's purse
	Cardamine bulbosa	Bulbous Bittercress			x		*Arabis rhomboidea*	Spring cress
	Cardamine concatenata	Cutleaf Toothwort			x		*Dentaria laciniata*	
	Cardamine pensylvanica	Pennsylvania Bittercress			x		*Cardamine Pennsylvanica*	
	Cardamine pratensis	Cuckoo Flower				x	*Cardamine pratensis*	
	Carex albicans	Whitetinge Sedge			x		*Carex varia*	
	Carex aurea	Golden Sedge			x		*Carex aurea*	
	Carex buxbaumii	Buxbaum's Sedge			x		*Carex Buxbaumii*	
	Carex deweyana	Dewey Sedge			x		*Carex Deweyana*	
	Carex disperma	Softleaf Sedge			x		*Carex disperma*	
	Carex eburnea ?	Bristleleaf Sedge				x	*Carex alba*	
	Carex gracillima	Graceful Sedge			x		*Carex gracillima*	
	Carex granularis	Limestone Meadow Sedge			x		*Carex granularis*	
	Carex hystericina	Bottlebrush Sedge				x	*Carex hystriciana*	
	Carex lacustris	Hairy Sedge			x		*Carex lacustris*	
	Carex laxiflora	Broad Looseflower Sedge		x			*Carex anceps*	
	Carex leptalea ?	Bristlystalked Sedge			x		*Carex polytrichoides*	
	Carex limosa	Mud Sedge				x	*Carex limosa*	
	Carex lupulina	Hop Sedge		x			*Carex lupulina*	
	Carex muehlenbergii	Muhlenberg's Sedge		x			*Carex Muhlenburgii*	
	Carex nigra	Smooth Black Sedge			x		*Carex acuta*	
	Carex pellita	Woolly Sedge		x			*Carex pellita*	
	Carex pseudocyperus	Cypresslike Sedge				x	*Carex pseudo-cyperus*	
	Carex retroflexa ?	Reflexed Sedge				x	*Carex retoflexa*	
	Carex rosea	Rosy Sedge		x			*Carex rosea*	
	Carex stipata	Owlfruit Sedge			x		*Carex stipata*	
	Carex straminea	Eastern Straw Sedge			x		*Carex straminea*	
	Carex tetanica ?	Rigid Sedge		x			*Carex tentaculata*	
	Carpinus caroliniana	American Hornbeam		x			*Carpinus Americana*	Blue beech
	Castilleja coccinea	Scarlet Indian Paintbrush	1	x			*Euchroma coccinea*	Painted cup
	Caulophyllum thalyctroides	Blue Cohosh		x			*Caulophyllum thalyctroides*	False cohosh
	Ceanothus americanus	New Jersey Tea	1	x			*Ceanothus Americana*	New Jersey tea
	Celastris scandens	False bitter-sweet				x	*Celastris scandens*	False bitter-sweet
	Chelone glabra	White Turtlehead		x			*Chelone glabra*	Snake head
	Chenopodium capitatum	Blite Goosefoot		x			*Blitum capitatum*	Indian strawberry

	Cicuta bulbifera	Bulblet-bearing Water Hemlock				x	*Cicuta bulbifera*	
	Cicuta maculata	Spotted Water Hemlock				x	*Cicuta maculata*	
	Cinna arundinacea	Sweet Woodreed				x	*Cinna arundinacea*	
	Circaea alpina	Small Enchanter's Nightshade		x			*Circaea alpina*	
	Circaea lutetiana	Broadleaf Enchanter's Nightshade		x			*Circaea lutetiana*	Enchanter's night-shade
	Claytonia virginica	Virginia Springbeauty			x		*Claytonia Virginica*	Spring beauty
	Clematis virginiana	Devil's Darning Needles		x			*Clematis Virginica*	Virgin's bower
	Clintonia borealis	Bluebead			x		*Dracaena borealis*	Wild lily of the valley
	Collinsia verna	Spring Blue Eyed Mary			x		*Collinsia verna*	
	Comarum palustre	Purple Marshlocks		x			*Comarum palustre*	Marsh five finger
	Conopholis americana	American Squawroot				x	*Orobanche Americana*	
	Conyza canadensis	Canadian Horseweed		x			*Erigeron Canadense*	Flea bane
	Coptis trifoliata	Threeleaf Goldthread			x		*Coptis trifoliata*	Gold thread
	Coreopsis palmata	Stiff Tickseed	2		x		*Coreopsis palmata*	
	Cornus canadensis	Bunchberry Dogwood		x			*Cornus Canadensis*	Low dogwood
	Cornus racemosa	Gray Dogwood		x			*Cornus paniculata*	Bush dogwood
	Corylus americana	American Hazelnut		x			*Corylus Americana*	Hazle nut
	Crataegus chrysocarpa	Fireberry Hawthorn				x	*Crataegus coccinea*	
	Crataegus punctata	Dotted Hawthorn				x	*Crataegus punctata*	Thorn apple
	Cryptotaena canadensis	Canadian Honewort				x	*Cryptotaena Canadensis*	
	Cuscuta gronovii ?	Scaldweed		x			*Cuscuta Americana*	Love vine
	Cynoglossum virginianum	Wild Comfrey				x	*Cynoglossum Virginicum*	
	Cyperus diandrus	Umbrella Flatsedge				x	*Cyperus diandrus*	
	Cypripedium acaule	Moccasin Flower			x		*Cyprepedium acaule*	Low ladies' slipper
	Cypripedium candidum	White Lady's Slipper				x	*Cypripedium candidum*	White ladies slip'r
	Cypripedium pubescens	Greater Yellow Lady's Slipper	1	x			*Cyprepedium pubescens*	Ladies' slipper
	Dalea candida	White Prairie Clover	2		x		*Petalostemon candidum*	
	Danthonia spicata	Poverty Oatgrass				x	*Danthonia spicata*	
ex	*Datura stramonium*	Jimsonweed		x			*Datura stramonium*	Jamestown weed
	Dichanthelium dichotomum	Cypress Panicgrass		x			*Panicum nitidum*	Panic grass
	Dichanthelium latifolium	Broadleaf Rosette Grass	2	x			*Panicum latifolium*	
	Dichanthelium scoparium	Velvet Panicum		x			*Panicum scoparium*	
	Dicranum scoparium	Dicranum Moss			x		*Dicranum scoparium*	Moss
	Dicranum undulatum	Undulate Dicranum Moss			x		*Dicranum undulatum*	
	Diervilla lonicera	Northern Bush Honeysuckle		x			*Diervilla Canadensis*	Bush honeysuckle
	Dioscorea villosa	Wild Yam			x		*Dioscorea villosa*	Yam root
	Dirca palustris	Eastern Leatherwood			x		*Dirca palustris*	Leatherwood
	Dodecatheon meadia ?	Shooting Star	1	x			*Dodecatheon integrifolium*	Shooting star
	Drosera rotundifolia	Roundleaf Sundew			x		*Drosea rotundifolia*	Sun dew
ex	*Echinochloa crus-galli*	Barnyardgrass			x		*Panicum crus-galli*	Barn grass
	Elymus canadensis	Canada Wildrye			x		*Elymus Canadensis*	
	Elymus hystrix	Eastern Bottlebrush Grass		x			*Elymus hystrix*	
	Elymus virginicus	Virginia Wildrye	1			x	*Elymus Virginicus*	Wild rye
	Enemion biternatum	Eastern False Rue Anemone			x		*Isopyrum thalyctroides*	
	Epifagus virginiana	Beechdrops			x		*Epiphegus Virginianus*	Beech drop
	Epilobium palustre	Marsh Willowherb		x			*Epilobium lineare*	
	Epilobium palustre	Marsh Willowherb		x			*Epilobium palustre*	
	Equisetum arvense	Field Horsetail			x		*Equisetum arvense*	Horse tail
	Equisetum fluviatile	Water Horsetail				x	*Equisetum limosum*	
	Equisetum hymale	Scouringrush Horsetail		x			*Equisetum hymale*	Scouring rush
	Equisetum palustre	Marsh Horsetail			x		*Equisetum palustre*	
	Erigenia bulbosa	Harbinger of Spring			x		*Erigenia bulbosa*	
	Erigeron philadelphicus	Philadelphia Fleabane			x		*Erigeron purpureum*	
	Erigeron pulchellus	Robin's Plantain	1		x		*Erigeron bellidifolium*	Robert's plantain
	Erigeron strigosus	Prairie Fleabane		x			*Erigeron strigosum*	
	Erythronium albidum	White Fawnlily			x		*Erythronium albidum*	
	Erythronium americanum	Dogtooth Violet			x		*Erythronium Americanum*	Adder's tongue

	Euonymus atropurpurea	Eastern Wahoo				x	*Euonymus atropurpureus*	Spindle tree
	Eupatorium perfoliatum	Common Boneset		x			*Eupatorium perfoliatum*	Thorough wort
	Eupatorium purpureum	Sweetscented Joepyeweed	2	x			*Eupatorium purpureum*	Trumpet weed
	Euphorbia corollata	Flowering Spurge	2	x			*Euphorbia corollata*	
	Eurybia macrophylla	Bigleaf Aster		x			*Aster macrophyllus*	
	Fagus grandifolia	American Beech			x		*Fagus ferruginea*	Red beech
ex	*Fagus sylvatica*	European Beech			x		*Fagus sylvatica*	White beech
	Festuca paradoxa	Clustered Fescue			x		*Festuca nutans*	
	Floerkea proserpinacoides	False Mermaidweed			x		*Floerkea uliginosa*	False mermaid
	Fragaria virginiana	Virginia Strawberry			x		*Fragaria Virginiana*	Wild strawberry
	Fraxinus americana	White Ash		x			*Fraxinus acuminata*	White ash
	Fraxinus nigra	Black Ash		x			*Fraxinus sambucifolia*	Black ash
	Galearis spectabilis	Showy Orchid			x		*Orchis spectabilis*	Gay orchis
	Galium aparine	Stickywilly			x		*Galium aparine*	Goose grass
	Galium asprellum	Rough Bedstraw		x			*Galium asprellum*	Rough bed straw
	Galium boreale	Northern Bedstraw	2	x			*Galium boreale*	
	Galium lanceolatum	Lanceleaf Wild Licorice				x	*Galium lanceolatum*	
	Galium tinctorium	Stiff Marsh Bedstraw		x			*Galium tinctorium*	
	Galium trifidum	Threepetal Bedstraw			x		*Galium trifidum*	Bed straw
	Galium triflorum	Fragrant Bedstraw		x			*Galium triflorum*	
	Gamochaeta americana	American Everlasting		x			*Gnaphalium Americanum*	
	Gaultheria hispidula	Creeping Snowberry				x	*Gaulthera hispidula*	
	Gaultheria procumbens	Eastern Teaberry			x		*Gaultheria procumbens*	Winter green
	Gentiana saponaria	Harvestbells		x			*Gentiana saponaria*	Soap gentian
	Gentianella quinquefolia	Agueweed	2	x			*Gentiana quinquefolia*	
	Gentianopsis crinita	Greater Fringed Gentian		x			*Gentiana crinata*	Fringed gentian
	Geranium carolinianum	Carolina Geranium		x			*Geranium Carolinianum*	
	Geranium maculatum	Spotted Geranium		x			*Geranium maculatum*	Crane's bill
	Geum aleppicum	Yellow Avens			x		*Geum strictum*	Avens
	Geum rivale	Purple Avens				x	*Geum rivale*	
	Geum triflorum	Old Man's Whiskers	2			x	*Geum triflorum*	
	Geum virginianum	Cream Avens		x			*Geum Virginianum*	
	Goodyera pubescens	Downy Rattlesnake Plantain				x	*Goodyera pubescens*	
	Habenaria bracteata	Longbract Frog Orchid				x	*Habenaria bracteata*	
	Habenaria huronensis	Huron Green Orchid			x		*Habenaria huronensis*	
	Hamamelis virginiana	American Witchhazel		x			*Hamamelis Virginica*	Witch hazle
	Helenium autumnale	Common Sneezeweed		x			*Helenium autumnale*	False sunflower
	Helianthus strumosus	Paleleaf Woodland Sunflower			x		*Helianthus strumosus*	Wild sunflower
	Hepatica nobilis var. acuta	Sharplobe Hepatica		x			*Hepatica acutiloba*	Liverwort
	Heracleum maximum	Common Cowparsnip			x		*Heracleum lanatum*	Cow parsnip
	Heuchera americana	American Alumroot	1	x			*Heuchera Americana*	Alum root
	Hieracium gronovii	Queendevil				x	*Hieracium Gronovii*	
	Hieracium Kalmii	Kalm's Hawkweed			x		*Hieracium Kalmii*	
	Hierochloa hirta	Northern Sweetgrass				x	*Hierochloa borealis*	Seneca grass
ex	*Hippophae rhamnoides*	Seabuckthorn			x		*Hippophae Canadensis*	Sea buck thorn
	Humulus lupulus	Common Hop				x	*Humulus lupulus*	Hop
	Huperzia lucidula	Shining Clubmoss			x		*Lycopodium lucidulum*	Ground pine
	Hydrastis canadensis	Goldenseal		x			*Hydrastis Canadensis*	Orange root
	Hydrophyllum virginianum	Shawnee Salad		x			*Hydrophyllum Virginicum*	Burr flower
	Hypoxis hirsuta	Common Goldstar	1		x		*Hypoxis erecta*	Star grass
	Ilex verticillata	Common Winterberry			x		*Prinos verticillatus*	Winter berry
	Impatiens capensis	Jewelweed		x			*Impatiens fulva*	Jewel weed
	Impatiens pallida	Pale Touch-me-not				x	*Impatiens pallida*	
	Iris lacustris	Dwarf Lake Iris			x		*Iris lacustris*	
	Iris versicolor	Harlequin Blueflag		x			*Iris versicolor*	Blue flag
	Jeffersonia diphylla	Twinleaf			x		*Jeffersonia diphylla*	Twin leaf
	Juglans cinerea	Butternut			x		*Juglans cinerea*	Butternut

	Juglans nigra	Black Walnut		x			*Juglans nigra*	Black walnut
	Juncus tenuis	Poverty Rush			x		*Juncus tenuis*	
	Juniperus communis	Common Juniper			x		*Juniperus communis*	Juniper
	Juniperus virginiana	Eastern Redcedar		x			*Juniperus Virginiana*	Red cedar
	Koeleria macrantha	Prairie Junegrass			x		*Koelaria nitida*	
	Laportea canadensis	Canadian Woodnettle		x			*Urtica Canadensis*	
	Larix laricina	Tamarack		x			*Pinus pendula*	Tamarack
	Lathyrus japonicus var. *maritumus*	Beach Pea		x			*Lathyrus maritumus*	Beach pea
	Lathyrus palustris	Marsh Pea			x		*Lathyrus myrtifolius*	
	Lathyrus venosus	Veiny Pea	2			x	*Lathyrus venosus*	
	Leersia oryzoides	Rice Cutgrass				x	*Leersia oryzoides*	Rice grass
	Leersia virginica	Whitegrass	2			x	*Leersia Virginica*	
	Lemna minor	Common Duckweed				x	*Lemna minor*	Duck's meet
	Lemna trisulca	Star Duckweed				x	*Lemna trisulea*	
	Lepidium virginicum	Virginia Pepperweed		x			*Lepidium Virginicum*	Wild pepper grass
	Lespedeza capitata	Roundhead Lespedeza				x	*Lespedeza capitata*	
	Liatris scariosa	Devil's Bite				x	*Liatris scariosa*	
	Liatris spicata	Dense Blazing Star				x	*Liatris spicata*	
	Lilium canadense	Canada Lily		x			*Lilium Canadense*	Nodding lily
	Lilium philadelphicum	Wood Lily	1	x			*Lilium Philadelphicum*	Red lily
	Linnaea borealis	Twinflower		x			*Linnaea borealis*	Twin flower
	Lithospermum canescens	Hoary Puccoon	2	x			*Batschia canescens*	Puccoon
	Lobelia cardinalis	Cardinalflower			x		*Lobelia cardinalis*	Cardinal flower
	Lobelia inflata	Indian-tobacco		x			*Lobelia inflata*	Indian tobacco
	Lobelia siphilitica	Great Blue Lobelia		x			*Lobelia siphilitica*	
	Lonicera flava	Yellow Honeysuckle				x	*Lonicera flavens*	
	Lupinus perennis	Sundial Lupine				x	*Lupinus perennis*	Wild lupine
	Luzula acuminata	Hairy Woodrush				x	*Luzula pilosa*	
	Lycopodium complanatum	Groundcedar				x	*Lycopodium complanatum*	
	Lycopus virginicus	Virginia Water Horehound		x			*Lycopus Virginicus*	Bugle weed
	Lysimachia ciliata	Fringed Loosestrife		x			*Lysimachia ciliata*	Money wort
	Lysimachia quadrifolia	Whorled Yellow Loosestrife	1	x			*Lysimachia quadrifolia*	
	Lysimachia thyrsiflora	Tufted Loosestrife				x	*Lysimachia thrysiflora*	
	Lythrum hyssopifolia	Hyssop Loosestrife			x		*Lythrum hyssopifolium*	Grass poley
	Maianthemum canadense?	Canada Mayflower			x		*Majanthemum bifolium*	
	Maianthemum racemosum	Feathery False Lily of the Valley		x			*Convallaria racemosa*	
	Maianthemum stellatum	Starry False Lily of the Valley		x			*Convallaria stellata*	
	Maianthemum trifolium	Threeleaf False Lily of the Valley			x		*Smilacina trifoliata*	
	Malus coronaria	Sweet Crabapple		x			*Pyrus coronaria*	Crab apple
	Marchantia polymorpha	Liverwort			x		*Marchantia polymorpha*	Brook liverwort
	Melampyrum lineare	Narrowleaf Cowwheat			x		*Melampyrum Americanum*	Cow wheat
	Menyanthes trifoliata	Buckbean			x		*Menyanthus trifoliata*	Buck bean
	Milium effusum	American Milletgrass			x		*Milium effusum*	Millet
	Mimulus ringens	Allegheny Monkeyflower		x			*Mimulus ringens*	Monkey flower
	Minuartia michauxii var. *michauxii*	Michaux's Stitchwort				x	*Arenaria stricta*	
	Mitchella repens	Partridgeberry		x			*Mitchella repens*	Partridge berry
	Mitella diphylla	Twoleaf Miterwort		x			*Mitella diphylla*	Currant leaf
	Moehringia lateriflora	Bluntleaf Sandwort	2		x		*Arenaria lateriflora*	
	Mollugo verticillata	Green Carpetweed			x		*Mollugo virticillata*	Carpet weed
	Monarda didyma	Scarlet Beebalm		x			*Monarda didyma*	Wild balm
	Monotropa uniflora	Indianpipe		x			*Monotropa uniflora*	Indian pipe
	Muhlenbergia tenuiflora	Slender Muhly				x	*Agrostis tenuiflora*	
	Myriophyllum verticillatum	Whorl-leaf Watermilfoil		x			*Myriophyllum verticillatum*	Water milfoil
ex	*Nepeta cataria*	Catnip				x	*Nepeta cataria*	Cat nip
	Nuphar lutea	Yellow Pond Lily		x			*Nuphar advena*	Yellow water lily
	Nymphaea odorata	American White Waterlily		x			*Nymphaea odorata*	White pond lily
	Oenothera biennis	Common Evening-primrose	1	x			*Oenothera biennis*	Scabish

	Oligoneuron riddellii	Riddell's Goldenrod		x			*Solidago Riddellii*	
	Oligoneuron rigidum	Stiff Goldenrod			x		*Solidago rigida*	
	Onoclea sensibilis	Sensitive Fern				x	*Onoclea sensibilis*	Sensitive fern
	Orbexilum onobrychis	French-grass				x	*Psoralia onobrychis*	
	Orthilia secunda	Sidebells Wintergreen				x	*Pyrola secunda*	
	Oryzopsis asperifolia	Roughleaf Ricegrass			x		*Oryzopsis asperifolia*	Mountain rice
	Osmorhiza claytonii	Clayton's Sweetroot		x			*Uraspermum Claytonii*	Sweet cicily
	Osmunda cinnamomea	Cinnamon Fern				x	*Osmunda cinnamomea*	
	Osmunda claytoniana	Interrupted Fern			x		*Osmunda interrupta*	
	Ostrya virginiana	Hophornbeam		x			*Ostrya Virginica*	Iron wood
	Oxalis stricta	Common Yellow Oxalis			x		*Oxalis stricta*	Wood sorrel
	Packera aurea	Golden Ragwort			x		*Senecio aureus*	Rag wort
	Panax trifolius	Dwarf Ginseng			x		*Panax trifolia*	Ground nut
	Panicum capillare	Witchgrass		x			*Panicum capillare*	
	Parietaria pensylvanica	Pennsylvania Pellitory				x	*Parietaria Pennsylvanica*	
	Parnassia glauca	Fen Grass of Parnassus		x			*Parnassia Americana*	
	Parthenocissus quinquefolia	Virginia Creeper		x			*Ampelopsis quinquefolia*	Creeper
ex	*Pastinaca sativa*	Wild Parsnip			x		*Pastinaca ativa*	Parsnip
	Pedicularis canadensis	Canadian Lousewort	1	x			*Pedicularis Canadensis*	Louse wort
ex	*Pennisetum glaucum*	Peal Millet			x		*Penisetum glaucum*	Fox tail panic grass
	Penthorum sedoides	Ditch Stonecrop			x		*Penthorum sedoides*	Virginia orpine
	Phlox divaricata	Wild Blue Phlox			x		*Phlox divaricata*	
	Phryma leptostachya	American Lopseed			x		*Phryma leptostachya*	Lop seed
	Physocarpus opulifolius	Common Ninebark		x			*Spiraea apulifolia*	Nine bark
	Physostegia virginiana	Obedient Plant		x			*Dracocephalum Virginianum*	dragon head
	Pilea pumila	Canadian Clearweed				x	*Urtica pumila*	
	Pinus strobus	Eastern White Pine			x		*Pinus strobus*	White pine
	Piptatherum racemosum	Blackseed Ricegrass				x	*Piptaterum racemosum*	
	Plantago cordata	Heartleaf Plantain		x			*Plantago cordata*	Water plantain
	Plantago major	Common Plantain		x			*Plantago major*	Plantain
	Platanthera ciliaris	Yellow Fringed Orchid			x		*Habenaria ciliaris*	Orchis
	Platanthera grandiflora	Greater Purple Fringed Orchid		x			*Habenaria fimbriata*	
	Platanthera orbiculata	Lesser Roundleaved Orchid				x	*Platanthera orbiculata*	
	Platanus occidentalis	American Sycamore			x		*Platinus occidentalis*	Sycamore
ex	*Poa pratensis*	Kentucky Bluegrass			x		*Poa pratensis*	Spear grass
ex	*Poa trivialis*	Rough Bluegrass			x		*Poa trivialis*	Pasture grass
	Podophyllum peltatum	Mayapple		x			*Podophyllum peltatum*	May apple
	Polemonium reptans	Green Valerian	1		x		*Polemonium reptans*	
	Polgonatum biflorum	Solomon's Seal			x		*Polgonatum multiflorum*	Solomon's seal
	Polygala senega	Seneca Snakeroot	1	x			*Polygala Senega*	Seneca snake root
	Polygonatum biflorum	Smooth Solomon's Seal		x			*Convallaria bifolia*	
	Polygonum amphibium	Water Knotweed				x	*Polygonum amphibicum*	
	Polygonum amphibium var. *emersum*	Longroot Smartweed			x		*Polygonum coccineum*	Lake knot weed
ex	*Polygonum aviculare*	Prostrate Knotweed		x			*Polygonum aviculare*	Knot grass
ex	*Polygonum convolvulus*	Black Bindweed				x	*Polygonum convolvulus*	
	Polygonum persicaria	Spotted Ladysthumb			x		*Polygonum persicaria*	
	Polygonum punctatum	Dotted Smartweed				x	*Polygonum punctatum*	Smart weed
	Polygonum virginianum	Jumpseed				x	*Polygonum Virginianum*	
	Polymnia canadensis	Whiteflower Leafcup		x			*Polymna Canadensis*	White leaf cup
	Polytrichum commune	Polytrichum Moss				x	*Polytrichum commune*	
	Populus grandidentata	Bigtooth Aspen				x	*Populus grandidentata*	
	Populus tremuloides	Quaking Aspen		x			*Populus tremuloides*	White poplar
	Potamogeton gramineus	Variableleaf Pondweed				x	*Potamogeton gramineum*	
	Potamogeton zosteriformis	Flatstem Pondweed				x	*Potamogeton zosterifolium*	
	Potentilla arguta	Tall Cinquefoil	2			x	*Potentilla arguta*	
	Potentilla canadensis	Dwarf Cinquefoil		x			*Potentilla Canadensis*	Five finger
	Potentilla norvegica	Norwegian Cinquefoil				x	*Potentilla Norwegica*	

	Prenanthes alba	White Rattlesnakeroot	1		x		*Prenanthes alba*	White lettuce
	Prunella vulgaris	Common Selfheal		x			*Prunella vulgaris*	Heal all
	Prunus americana	American Plum			x		*Prunus Americana*	plum
	Prunus serotina	Black Cherry			x		*Prunus serotina*	Choke cherry
	Prunus virginiana	Chokecherry			x		*Prunus Virginiana*	Wild cherry
	Ptelea trifoliata	Common Hoptree			x		*Ptelia trifoliata*	
	Pulsatilla patens ssp. *multifida*	Cutleaf Anemone	2			x	*Anemone patens*	
	Pycnanthemum virginianum	Virginia mountainmint	2	x			*Pycnanthemum Virginianum*	Thyme
	Pyrola americana	American Wintergreen		x			*Pyrola rotundifolia*	Shin leaf
	Quercus alba	White Oak		x			*Quercus alba*	White oak
	Quercus macrocarpa	Bur Oak			x		*Quercus macrocarpa*	Burr oak
	Quercus rubra	Northern Red Oak			x		*Quercus rubra*	Red oak
	Quercus velutina	Black Oak		x			*Quercus tinctoria*	Black oak
	Ranunculus abortivus	Littleleaf Buttercup		x			*Ranunculus abortivus*	
	Ranunculus fascicularis	Early Buttercup	1			x	*Ranunculus fascicularis*	
	Ranunculus pensylvanicus	Pennsylvania Buttercup				x	*Ranunculus Pennsylvanicus*	
	Ranunculus recurvatus	Blisterwort			x		*Ranunculus recurvatus*	
	Ranunculus repens	Creeping Buttercup				x	*Ranunculus repens*	
	Ranunculus rhomboideus	Labrador Buttercup	1		x		*Ranunculus rhomboideus*	
	Rhamnus alnifolia	Alderleaf Buckthorn				x	*Rhamnus alnifolius*	
	Rhus glabra	Smooth Sumac		x			*Rhus glabra*	Sumach
	Rhus typhina	Staghorn Sumac				x	*Rhus typhina*	
	Ribes lacustre	Prickly Currant			x		*Ribes lacustris*	Goose berry
	Ribes oxycanthoides	Canadian gooseberry				x	*Ribes oxycanthoides*	Smoothe gooseberry
	Ribes triste	Red Currant				x	*Ribes rubrum*	Wild red currant
	Rubus idaeus	American Red Raspberry		x			*Rubus ideus*	Raspberry
	Rubus idaeus ssp. *strigosus*	Grayleaf Red Raspberry			x		*Rubus strigosus*	Red raspberry
	Rubus trivialis	Southern Dewberry		x			*Rubus trivialis*	Dew berry
	Rudbeckia hirta	Blackeyed Susan		x			*Rudbeckia hirta*	
	Rudbeckia laciniata	Cutleaf Coneflower			x		*Rudbeckia laciniata*	Cone flower
	Rudbeckia pinnata	Pinnate Prairie Coneflower		x			*Rudbeckia pinnata*	
ex	*Rumex acetosella*	Common Sheep Sorrel				x	*Rumex acetocellus*	Sorrel
	Rumex altissimus	Pale Dock				x	*Rumex Britannicus*	
ex	*Rumex crispus*	Curly Dock				x	*Rumex crispus*	Dock
	Salix humilis	Prairie Willow			x		*Salix conifera*	Cone gall willow
	Sambucus nigra ssp. *canadensis*	Common Elderberry		x			*Sambucus Canadensis*	Elder
	Sanguinaria canadensis	Bloodroot		x			*Sanguinaria Canadensis*	Blood root
	Sanicula marylandica	Maryland Sanicle		x			*Sanicula Marylandica*	Sanicle
	Saxifraga pensylvanica	Eastern Swamp Saxifrage		x			*Saxifraga Pennsylvanica*	Water saxifrage
	Schizachne purpurascens	False Melic				x	*Trisetum purpurascens*	
	Schizachyrium scoparium	Little Bluestem	2			x	*Andropogon scoparius*	
	Schoenoplectus acutus	Hardstem Bulrush				x	*Scirpus lacustris*	
	Schoenoplectus heterochaetus	Slender Bulrush			x		*Scirpus tenuis*	
	Scirpus atrovirens	Green Bulrush				x	*Scirpus atrovirens*	
	Scrophularia marylandica	Carpenter's Square		x			*Scrophularia Marylandica*	Fig wort
	Scutellaria galericulata	Marsh Skullcap			x		*Scutellaria galericulata*	Scull cap
	Scutellaria lateriflora	Blue Skullcap		x			*Scutellaria lateriflora*	Mad dog scull cap
	Scutellaria ovata	Heartleaf Skullcap		x			*Scutellaria cordifolia*	
	Scutellaria parvula	Small Skullcap			x		*Scutellaria parvula*	
	Silene antirrhina	Sleepy Silene			x		*Silene antirrhina*	Sleepy catch fly
	Silene caroliniana ssp. *pensylvanica*	Pennsylvania Catchfly				x	*Silene Pennsylvanic*	
	Silphium perfoliatum	Cup Plant			x		*Silphium connatum*	
	Silphium terebinthenaceum	Prairie Rosinweed			x		*Silphium terebinthenaceum*	Prairie dock
	Sisyrinchium angustifolium	Narrowleaf Blue-eyed Grass		x			*Sisyrinchium Bermudianum*	
	Sium latifolium	Wideleaf Waterparsnip		x			*Sium latifolium*	Water parsnip
	Smilax herbacea	Smooth Carrionflower				x	*Smilax herbacea*	

	Solanum nigrum	Black Nightshade		x			*Solanum nigrum*	Deadly night shade
	Solidago caesia	Wreath Goldenrod		x			*Solidago axillaris*	
	Solidago canadensis	Canada Goldenrod		x			*Solidago Canadensis*	Golden rod
	Solidago flexicaulis	Zigzag Goldenrod		x			*Solidago latifolia*	
	Solidago gigantea	Giant Goldenrod				x	*Solidago gigantea*	
	Sorghastrum nutans	Indiangrass	2		x		*Andropogon nutans*	Beard's grass
	Sphagnum capillifolium	Sphagnum			x		*Sphagnum acutifolium*	Peat moss
	Spiraea salicifolia	Willowleaf Meadowsweet			x		*Spiraea salicifolia*	Meadow sweet
	Spiranthes cernua	Nodding Ladies'-tresses			x		*Neottia cernua*	Ladies' tresses
	Spiranthes lacera var. *gracilis*	Northern Slender Ladies'-tresses				x	*Neottia gracilis*	
ex	*Stachys sylvatica*	Whitespot		x			*Stachys sylvatica*	
	Stellaria palustris	Meadow Starwort		x			*Stellaria palustris*	Stitch wort
	Streptopus lanceolatus	Twistedstalk				x	*Streptopus roseus*	
	Symphoricarpos albus var. *albus*	Common Snowberry		x			*Symphoria racemosa*	Snowberry
	Symphyotrichum cordifolium	Common Blue Wood Aster				x	*Aster cordifolius*	
	Symphyotrichum laeve	Smooth Blue Aster	2			x	*Aster laevis*	
	Symphyotrichum novae-angliae	New England Aster		x			*Aster nova-Angliae*	
	Symphyotrichum novi-belgii	New York Aster		x			*Aster novi-Belgii*	
	Symphyotrichum puniceum	Purplestem Aster			x		*Aster puniceus*	
	Symphyotrichum sericeum	Western Silver Aster	2			x	*Aster sericeus*	
	Symphyotrichum shortii	Short's Aster	2	x			*Aster Shortii*	
	Symplocarpus foetidus	Skunk Cabbage		x			*Ictodes foetida*	Skunk cabbage
	Taraxacum officinale	Common Dandelion			x		*Leontodon taraxacum*	Dandelion
	Taxus canadensis	Canada Yew			x		*Taxus Canadensis*	Dwarf yew
	Teucrium canadense	Canada Germander			x		*Teucrium Canadense*	Germander
	Thalictrum dioicum	Early Meadow-rue		x			*Thalyctrum dioicum*	Meadow rue
	Thalictrum revolutum	Waxyleaf Meadow-rue		x			*Thalyctrum revolutum*	
	Thalictrum thalictroides	Rue Anemone	2		x		*Anemone thalyctroides*	Rue anemone
	Thuja occidentalis	Arborvitae		x			*Cupressus thyoides*	White cedar
	Tilia americana	American Basswood		x			*Tilia glabra*	Brss wood
	Tofieldia glutinosa	Sticky Tofieldia			x		*Tofieldia glutinosa*	
	Toxicodendron pubescens	Atlantic Poison Oak				x	*Rhus toxicodendron*	
	Toxicodendron vernix	Poison Sumac			x		*Rhus ve nix*	Poison vine
	Tradescantia virginiana	Virginia Spiderwort		x			*Tradescantia Virginica*	Spider wort
	Trientalis borealis ssp. *borealis*	Starflower		x			*Trientalis Americana*	Chick winter green
	Trillium erectum	Red Trillium			x		*Trillium erectum*	Birth wort
	Trillium nivale	Dwarf White Wakerobin			x		*Trillium nivale*	
	Triosetum perfoliatum	Feverwort	1		x		*Triosetum perfoliatum*	Horse gingeng
	Triosteum angustifolium	Yellowfruit Horse-gentian			x		*Triosetum angustifolium*	
	Typha latifolia	Broadleaf Cattail			x		*Typha latifolia*	Cat tail
	Ulmus americana	American Elm			x		*Ulmus Americana*	Elm
	Ulmus rubra	Slippery Elm			x		*Ulmus fulva*	Slippery elm
	Urtica dioica	Stinging Nettle		x			*Urtica dioica*	Nettle
	Uvularia grandiflora	Largeflower Bellwort		x			*Uvularia grandiflora*	
	Vaccinium macrocarpon	Cranberry				x	*Oxycoccus macrocarpus*	Cranberry
	Vallisneria americana	American Eelgrass				x	*Vallisneria spiralis*	Tape grass
ex	*Verbascum thapsis*	Common Mullein				x	*Verbascum thapsis*	Mullein
	Verbena hastata	Swamp Verbena		x			*Verbena hastata*	Vervain
	Verbena urticifolia	White Vervain				x	*Verbena urticifolia*	
	Veronica anagallis-aquatica	Water Speedwell		x			*Veronica anagalis*	Brook pimpernel
	Veronica peregrina	Neckweed		x			*Veronica peregrina*	Purslane speedwell
	Veronica scutellata	Skullcap Speedwell				x	*Veronica scutellata*	
	Veronicastrum virginicum	Culver's Root	1	x			*Leptandria Virginica*	Culver's physic
	Viburnum acerifolium	Mapleleaf Viburnum		x			*Viburnum acerfolium*	Dockmackie
	Viburnum dentatum	Southern Arrowwood		x			*Viburnum pubescens*	
	Viburnum opulus var. *americanum*	American Cranberrybush			x		*Viburnum oxycoccus*	High cranberry
	Viburnum prunifolium	Blackhaw			x		*Viburnum prunicifolium*	Black hawe

Vicia americana	American Vetch			x		*Vicia Americana*	
Vicia cracca	Bird Vetch			x		*Vicia cracca*	Tufted vetch
Viola blanda	Sweet White Violet			x		*Viola blanda*	
Viola cucullata	Marsh Blue Violet		x			*Viola cucullata*	Blue violet
Viola palmata	Early Blue Violet			x		*Viola palmata*	
Viola pubescens	Downy Yellow Violet		x			*Viola pubescens*	Yellow violet
Vitis riparia	Riverbank Grape		x			*Vitis vulpina*	Frost grape
Xanthium strumarium	Rough Cockleburr				x	*Xanthium strumarium*	Clott burr
Zanthoxylum americanum	Common Pricklyash		x			*Xanthoxylum fraxineum*	Prickly ash
Zizania aquatica	Annual Wildrice		x			*Zizania aquatica*	Wild rice
Zizia aurea	Golden Zizia	1	x			*Zizia aurea*	Alexanders
?			x			*Acer saccharinum*	Sugar maple
?			x			*Anemone acontifolia*	
?				x		*Anemone nemerosa*	Low anemone
?				x		*Aronia arbutifolia*	Red choke berry
?				x		*Aronia botryapium*	June berry
?			x			*Arum tryphyllum*	Indian turnip
?				x		*Asclepias obtusifolia*	
?			x			*Aspidium angustum*	
?				x		*Aspidium asplenoides*	
?				x		*Aspidium bulbosum*	
?			x			*Asplenium angustifolium*	
?			x			*Asplenium thelypteroides*	
?				x		*Aster amygdalinus*	
?					x	*Aster corymbosum*	
?					x	*Aster ledifolius*	
?			x			*Bidens chrysanthemoides*	Beggar ticks
?				x		*Cacalia lanceolata*	
?			x			*Campanula erinoides*	Prickly bell flower
?				x		*Carex bullata*	
?					x	*Carex stellulata*	
?			x			*Carya alba*	Shag bark hickory
?			x			*Carya sulcata*	Shell bark hickory
?				x		*Chenopodium rhombifolium*	
?					x	*Chrysopsis alba*	
?				x		*Cistus Canadensis*	rock rose
?			x			*Cnicus discolor*	
?					x	*Cnicus muticus*	
?					x	*Conioselinum Canadense*	
?			x			*Convallaria multiflora*	
?				x		*Corydalis Canadensis*	
?					x	*Corydalis cucullaria*	Colic weed
?			x			*Cucubalus stellatus*	
?				x		*Cyprepedium spectabile*	Moccasin flower
?			x			*Dicksonia pilosiusulca*	
?			x			*Epilobium spicatum*	Willow herb
?					x	*Equisetum uliginosum*	
?					x	*Eriophorum polystachyon*	Cotton grass
?					x	*Eryngium aquaticum*	Rattle snake master
?					x	*Euchroma grandiflora*	
?			x			*Eupatorium verticillatum*	Joe Pye's weed
?					x	*Glycera fluitans*	
?					x	*Gnaphalium polycephalum*	
?					x	*Gymnandra Houghtoniana*	
?					x	*Gyroma Virginica*	
?			x			*Hedysarum acuminatum*	
?				x		*Hedysarum Canadense*	Bush trefoil

	?				x		*Helianthus altissimus*	
	?			x			*Heliopsis laevis*	Ox eye
	?				x		*Hordium jubatum*	Squirrel tail grass
	?					x	*Hypericum corymbosum*	
	?				x		*Hypnum spendens*	Moss
	?				x		*Hypnum triquetrum*	
	?				x		*Hyssopus scrophularifolius*	
	?				x		*Juncus polycephalus*	
	?					x	*Koelaria truncata*	
	?			x			*Krigia amplexicaulis*	
	?					x	*Lactuca elongata*	Wild lettuce
	?				x		*Lathyrus albidus*	Wild pea
	?			x			*Liatris quarrosa*	
	?				x		*Limnetis cynosaurides*	Salt grass
	?			x			*Lobelia claytoniana*	
	?				x		*Lonicera parviflora*	Honey suckle
	?				x		*Lupinus decumbens*	Wild lupine
	?				x		*Luzula campestris*	
	?				x		*Lycopodium apodium*	
	?			x			*Lysimachia revoluta*	
	?				x		*Mentha borealis*	Mint
	?				x		*Mitella cordifolia*	
	?				x		*Momordica echinata*	Prickly cucumber
	?					x	*Muhlenbergia erecta*	
	?					x	*Nasturtium hispidum*	
	?				x		*Pentstemon pubescens*	Beard's tongue
	?					x	*Petalostemon violaceum*	
	?				x		*Phlox aristat*	
	?			x			*Physalis viscosa*	Ground cherry
	?				x		*Poa nervata*	
	?				x		*Poa serotina*	
	?					x	*Polygala purpurea*	
	?					x	*Polypogon racemosum*	
	?			x			*Potamogeton nutans*	Pond weed
	?			x			*Potentilla hirsuta*	
	?			x			*Pteris aqualina*	Break
	?			x			*Pteris atropurpurea*	Rock break
	?				x		*Ranunculus fluviatilis*	
	?				x		*Ranunculus hirsutus*	Butter cup
	?				x		*Ranunculus multifidus*	
	?				x		*Ribes floridum*	Wild black currant
	?					x	*Rochella lappula*	
	?				x		*Rosa parviflora*	Wild rose
	?					x	*Rubus triflorus*	
	?			x			*Rubus villosus*	Back berry
	?			x			*Sagittaria sagitifolia*	Arrow head
	?					x	*Scirpus capitatus*	
	?				x		*Scirpus lineatus*	
	?					x	*Scirpus triqueter*	
	?				x		*Silphium gumniferum*	
	?				x		*Sisymbrium canescens*	
	?				x		*Sisyrinchium anceps*	Blue eyed grass
	?				x		*Smilax peduncularis*	Jacob's ladder
	?				x		*Solidago lanceolata*	
	?					x	*Sparganium ramosum*	
	?				x		*Sphagnum latifolium*	
	?				x		*Stipa juncea*	

	?					x	*Thaspium cordatum*	
	?					x	*Thesium umbellatum*	
	?				x		*Trichodium laxiflorum*	
	?					x	*Trillium pendulum*	
	?					x	*Triticum pauciflorum*	Wild wheat
	?					x	*Troxymon cuspidatum*	
	?					x	*Udora Canadensis*	Ditch moss
	?			x			*Uraspermum hirsutum*	
	?			x			*Utricularia ceratrophylla*	Hooded milfoil
	?				x		*Vaccinium Pennsylvanicum*	Whortleberry
	?					x	*Vaccinium resinosum*	Black whortle berry
	?					x	*Valeriana Samplesii*	
	?				x		*Viola muhlenbergiana*	
	?				x		*Xylosteum ciliatum*	Fly honey suckle
	?				x		*Zizia integerrima*	

Appendix B: Census Data

U.S. Census Bureau, Census 2000	Harambee	Brewer's Hill
Summary Files 1 and 3		
BLOCK-LEVEL	Tract 82 Blks 1000-1004, 2000-2002; Tract 81 Blks 1003-1004, 2003	Tract 105 Blks 2005-2007; Tract 106 Blk 2011; Tract 114 Blks 1003-1010
# Housing units	407.0	304.0
% Owner-occupied	28.9	40.8
% Rented	71.1	59.2
% Presently occupied	84.0	85.5
% For rent or sale	11.6	12.2
% Vacant unused (not for rent/sale)	4.4	2.3
Householder		
% One race	97.1	98.8
% Two or more races	2.9	1.2
% White	3.5	48.8
% Black or African American	89.8	45.8
% American Indian or Alaska Native	1.5	0.4
% Asian	0.0	1.5
% Native Hawaiian and other Pacific Islanders	0.0	0.0
% Other	2.3	2.3
	100.0	100.0
% Hispanic or Latino (of any race)	3.2	5.4
Head of household		
% Age 15-24	8.2	8.5
% Age 25-34	24.0	29.2
% Age 35-44	24.6	24.2
% Age 45-54	17.5	17.7
% Age 55-64	10.8	8.8
% Age 65-74	7.6	6.9
% Age 75-84	5.6	4.2
% Age 85+	1.8	0.4
	100.0	100.0

% 1-person household	26.6	43.5
% 2-person household	23.1	25.8
% 3-person household	16.1	15.0
% 4-person household	11.1	8.1
% 5-person household	9.4	3.8
% 6-person household	5.8	1.5
% 7+-person household	7.9	2.3
	100.0	100.0
Total population	1055.0	572.0
Ave household size	3.1	2.2
% Households are family	68.1	40.8
% Married-couple family	21.9	23.5
% Male head of family	5.6	1.2
% Female head of family	40.6	16.2
% Non-family	31.9	59.2
	100.0	100.0
% Families with children	71.3	54.7
% Households with children	48.5	22.3
% Children <6 only	20.0	32.7
% Children <6 &6-17	29.3	28.6
% Children 6-17 only	50.7	38.8
	100.0	100.0
TRACT-LEVEL	Tracts 81, 82	Tracts 105, 106, 114
School enrollment (pop >= 3 yrs)	1117.0	1062.0
% Nursery school, preschool	3.7	7.7
% Kindergarten	9.8	6.8
% Elementary school (grades 1-8)	56.0	40.6
% High school (grades 9-12)	19.2	18.7
% College or graduate school	11.4	26.2
	100.0	100.0
Educational attainment (pop >= 25 yrs)	1279.0	1602.0
% Less than 9th grade	15.2	11.4
% 9th to 12th grade, no diploma	32.4	20.3
% High school graduate (includes equivalency)	27.5	26.1
% Some college, no degree	13.6	18.9
% Associate degree	3.4	4.6

% Bachelor's degree	4.8	14.5
% Graduate or professional degree	3.0	4.1
	100.0	100.0
% High school graduate or higher	52.5	68.2
% Bachelor's degree or higher	7.9	18.6
Household income - # households	903.0	1116.0
% Less than $10,000	29.8	20.6
% $10,000 - $14,999	11.6	7.7
% $15,000 - $24,999	24.8	20.6
% $25,000 - $34,999	7.3	14.4
% $35,000 - $49,999	11.0	14.3
% $50,000 - $74,999	9.2	14.5
% $75,000 - $99,999	2.8	5.2
% $100,000 - $149,999	2.8	1.6
% $150,000 - $199,999	0.8	0.0
% $200,000 or more	0.0	1.0
	100.0	100.0
Year structure built - # houses/buildings	1094.0	1364.0
% 1999 - March 2000	0.0	1.0
% 1995 - 1998	0.0	3.7
% 1990 - 1994	3.1	3.5
% 1980 - 1989	0.8	11.7
% 1970 - 1979	4.9	8.4
% 1960 - 1969	13.0	8.9
% 1940 - 1959	20.2	10.6
% 1939 or earlier	58.0	52.3
	100.0	100.0
Length of residency - # households	935.0	1176.0
> 30 years	10.2	8.6
20 - 30 years	9.9	5.3
10 - 20 years	10.2	12.5
5 - 10 years	10.8	15.9
2 - 5 years	30.5	28.2
0 - 2 years	28.4	29.5
	100.0	100.0

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