A New American Green

An Ecologically Guided Approach to Designing Urban Open Space

68

by

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A NEW AMERICAN GREEN

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A Practicum submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF LANDSCAPE ARCHITECTURE

Abstract

Given the present environmental crisis it is prudent to re-examine our relationships with the environment and strive to be more environmentally sensitive in everything we do. This includes the way we design and use the open spaces of our cities.

This practicum proposes the use of an ecologically guided process for the design of urban open space. It involves the careful coordination of the physical environment, biological factors, and the human functions that are desired. The hypothesis is that by designing to accommodate the functioning of ecological processes, urban open space can be made more sustainable.

The study examines the benefits of using an ecologically guided design process, and describes the process in detail. The application of the process is then demonstrated through the development of a proposal for a community park in Olympia Fields, Illinois in the "New American Green" design competition.

The proposed design consists of an environmental education and research centre, several existing active recreation areas, and a collection of three ecological communities that are based on indigenous ecosystems of the region. If implemented, it would be a vibrant, constantly changing, and ecologically diverse landscape.

The study concludes by recommending the establishment of regional data bases of potential ecosystems, the evaluation of implementation techniques, and the monitoring of how ecosystems respond to various human activities to aid in future applications of this design process.

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To my friends - Ute, Jim, and my loving wife Carolle - for all your assistance, encouragement, and undying moral support.

And finally, to the three *Ailanthus altissima* that grew out of that crack in the pavement on the corner of McCaul and Stephanie - my inspiration.

Thank you.

What ever befalls the Earth befalls the sons of the Earth. Man did not weave the web of life; he is merely a strand in it. What ever he does to the web, he does to himself.

Chief Seattle, 1853

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1. Introduction

> "Every plant has its fitness and must be placed in its proper surroundings so as to bring out its full beauty. Therein lies the art of landscape."
>
> Jens Jensen, *Siftings* [1]

The Problem

At present, many of the open spaces[2] in our cities are unsustainable.[3] These landscapes are maintenance intensive places that contribute to the growing global environmental crisis and do little to stabilize the relationship between humanity and the rest of the environment.[4] This situation exists due to a lack of consideration for ecological processes.[5]

There has been a prevalence in our society to view humanity as a separate and often superior entity from the rest of nature.[6] Nature was seen to exist to serve us. We subdued, controlled, and exploited it without realizing that we were dependent upon it. Until recently we have only been concerned with the 'here' and 'now', lulled into a false sense of security in the belief that science and technology would be able to resolve any obstacle we encountered.[7] We have become so adept at using and altering our environment to suit our current needs and desires, that we alienated ourselves from the processes that govern the existence of all life on Earth.[8] So today, as we awake to reality, we find ourselves paying dearly for our past extravagance and ignorance, and trying desperately to correct the problems we have created[9] as we hurtle towards the twenty-first century with our world, our home, on the brink of environmental disaster.[10]

We are finally beginning to realize that humanity is part of nature and that everything is both related to, and dependent on, everything else in a complex, dynamic web. This study contends that once we see the world as a holistic living system, we will be in a better position to understand how our actions affect the world around us, and this will enable us to make more environmentally sound choices in the way we do things.[11]

Many steps towards restoring the environment's health have already been taken: the establishment and election of political parties, such as the 'Green Party' in Europe, which

Figure 1.1 Unsustainable open space in Winnipeg, Manitoba (C. Koziak Roberts)

hold environmental concerns as their central platforms; the signing of the *Montreal Protocol on Substances that Deplete the Ozone Layer* by 24 countries from around the world (1987); the signing of the *U.S. - Canada Memorandum of Intent to Develop a Bilateral Agreement on Trans-Boundary Air Pollution and Acid Rain* (1980); the development of *Canada's Green Plan* (1990); and the formation of the World Commission on Environment and Development to establish a global strategy for sustainable development (1987). At local levels, recycling and energy conservation efforts, are becoming common household and community activities.

In terms of urban planning and design, many communities are beginning to recognize "the importance of nature and green space to both the environmental and social health of the city and the physical and mental health of its people."[12] Recent studies by the World Watch Institute show that if the health and stability of our planet are to be ensured, natural urban areas must be restored.

As an effort to improve the health of urban environments, this study proposes the use of an ecologically guided process for the design of open space. The hypothesis is that by designing in a way that accommodates the functioning of ecological processes, urban

Figure 1.2 An example of open space that was designed to acccomodate ecological processes: William Curtis Ecological Park, London (S. McAndrews)

open space can be made more environmentally sound thereby improving the quality of the urban environment and in turn, that of the world as a whole. It will also serve as a mechanism for the further development of awareness and appreciation of the environment by the public.

Objectives

This study has two objectives:

1. Explore the benefits of accommodating ecological processes in the design and management of urban open space
2. Present an ecologically guided process for the design of urban open space and demonstrate its application

Process

The process used for this study was very straight forward. It was initiated with the preconception that accommodating ecological processes in the design of open space is not only beneficial to society, but is essential in maintaining the environment's health.

Once the objectives and key issues that pertain to them were identified, the project progressed through four more stages:

1. Examining the benefits of using this type of design process
2. Developing the process in detail
3. Demonstrating the process through the development of a proposal for a community park in Olympia Fields, Illinois in the "New American Green" design competition
4. Discussing the strengths and weaknesses of the process in terms of the design developed in the demonstration

The majority of the research for this study consisted of analyzing the theories, strategies and examples of other authorities in the field; most notably, Malcolm Emery, Michael Hough, and Anne Spirn.

1 Jen Jensen, *Siftings*, (Chicago: Ralph Fletcher Seymore, 1939), p. 41.

2 Open space is considered to be any area in the urban environment that is not presently occupied by buildings or any other infrastructure, together with the air and sky above it - Don Gill and Penelope Bonnett, *Nature in the Urban Landscape: A Study of City Ecosystems*, (Baltimore: York Press , 1973), p. 110.

3 Gill and Bonnett; Michael Hough, *City Form and Natural Process: Towards a New Urban Vernacular*, (New York, Routledge, 1989); and Anne Whiston Spirn, *The Granite Garden: Urban Nature and Human Design*, (New York: Basic Books, 1984).

4 Ibid.

5 Hough, *City Form;* Spirn, *Granite Garden;* and Ian Laurie, *Nature in Cities: The Natural Environment in the Design of Urban Green Space*, (New York: John Wiley and Sons, 1979).

6 Murray Bookchin, *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy*, (Montreal: Black Rose Books, 1991); René Dubos, *The Wooing of Earth: New Perspectives on Man's Use of Nature*, (New York: Charles Scribner's Sons, 1980); William Leiss, *The Domination of Nature*, (New York: George Braziller, 1972); Lynn White jr. "The Historical Roots of Our Ecological Crisis", *Science*, vol. 155, no. 3767 (Mar. 10, 1967), pp. 1203 - 1207.

7 Bookchin; Dubos; and White.

8 Leiss; and Richard Wagner, *Environment and Man*, (New York: W.W. Norton and Co. Inc., 1971).

9 In Canada alone, millions of dollars are spent every year to fund research to repair the damage we had done to the environment. The Conservative Government's *Green Plan*, for example, is a three billion dollar plan that contains over 100 initiatives that are to be initiated by the year 1997. Government of Canada, *Canada's State of the Environment*, (Ottawa, 1991), p. 4.24.

10 Spirn, *Granite Garden*, p. 9; and David Wann, *Biologic - Environmental Protection By Design*, (Boulder: Johnson Publishing Co., 1990), p. 1.

11 Bruce Allsopp, *Ecological Morality*, (London: Muller, 1972), p. 38; and White, p. 1207.

12 *Canada's State of the Environment*, p. 13.9.

2. Ecologically Guided Design

Intentions

An ecologically guided design process is intended to be an environmentally sensitive method for the design of urban open space.[1] It is a method of developing designs that accommodate ecological processes rather than repressing or drastically altering them. As a result, the input of energy and resources in the creation, use, and management of open space will be minimized, as will other negative environmental impacts.[2] The process involves the careful coordination of the physical environment (soil, micro-climate, precipitation, etc.), biological factors (species composition, interrelationships, nutrient cycles, etc.), and the human functions that we desire the site to accommodate (active recreation, passive recreation, flood prevention, climate amelioration, beautification, bird watching, etc.), while striving to create a meaningful, aesthetically pleasing and experientially rich design.

The goal is to create a framework in which a stable ecosystem (or ecosystems) will develop.[3] But, it is unrealistic to think that one could actually create an entire ecosystem. The objective is to establish a basic structure in which one will evolve over time. Furthermore, these ecosystems must be appropriate for the contexts in which they are set (i.e., they should respond harmoniously to the environment and be as self-regulating, self-maintaining, and self-regenerating as possible).[4] To this end, the full cycle of life - birth, germination, growth, maturity, reproduction, regeneration, death, decay, decomposition - should be allowed to occur.[5]

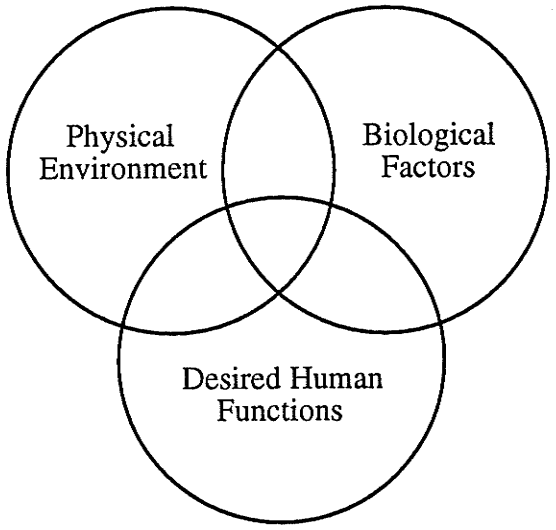


Figure 2.1 Elements of ecologically guided design

The design should always be considered as an integrated living system. Each species needs to be appropriate for the conditions into which they are put. This includes being compatible with the other species that will make up the community, and since humans will be part of that community too, it is important to consider compatibility with us and

our activities as well. At the same time we need to consider whether or not the functions we desire can be accommodated on the site in an environmentally sensitive fashion.

This process is not about replicating the wilderness or trying to recreate communities that existed prior to human settlement. While in some instances these ecosystems may have value as a basis for the potential ecology, this approach recognizes that in many cases those communities may no longer be appropriate or possible for a site due to changes that have occurred in micro-climate, soil conditions, moisture regimes, etc. Appropriateness is essential to this process. For this reason it is quite conceivable that a landscape designed in this way will have an ecology that is unique in its regional context.

Benefits

> "To the body and mind which have been cramped by noxious work or company, nature is medicinal and restores their tone."
>
> Emerson, *Nature*[6]

Using an ecologically guided design process can be very beneficial, both to society and the environment. The benefits discussed here fall into four general categories: environmental, economic, social, and educational. While they are discussed in isolation from one another, it is important to keep in mind that they all interact and influence each other. For example, environmental education may result in efforts to reduce pollution to improve air quality. This is not only beneficial to the health of society and the environment, but also provides economic benefits in terms of reducing the costs of restoring lakes and forests that are damaged by acid rain. Health care costs may even be lower, as a result of a reduction in the incidence of respiratory illness. This in turn benefits society who can use these funds to further enrich their lives, possibly through additional environmental improvements.

The remainder of this chapter examines each category in more detail.

Environmental Advantages

The existence of many open spaces is often dependent upon the input of enormous quantities of resources and energy.[7] Large amounts of these commodities are consumed through the processes of:

- growing plant material in nurseries
- extracting topsoil and peat from the earth
- transporting plant material and soil to the site
- providing supplemental water for plants that can not survive on the amount of moisture available naturally in the site
- producing and applying chemical pesticides, herbicides, and fertilizers
- producing and using lawn mowers, pruning tools and other maintenance devices[8]
- removing 'debris' from mowing and pruning
- removing and replacing plant material once it dies

Most of these activities, especially the production and application of fertilizers, pesticides, and herbicides, also pollute the environment, and in most cases the practice of watering endangers the hydrology of the region.[9]

Fortunately these activities are not always necessary. Open space can be nurtured without the need of nursery grown plants or soil augmentation. Over time, small whips will grow into forests, and seeding can be used to establish grassland within one growing season. Many species will more than likely colonize a site from adjacent properties as well. Careful selection of species to suit the existing soil and micro-climate will preclude any need to augment the soil with topsoil or fertilizers, or to provide supplemental water, and an emphasis on establishing balanced ecological communities would make the use of pesticides and herbicides inappropriate.

Given that as much as one sixth of all commercial fertilizers produced in North America are used to produce greener grass, not food; that in the United States, sprinkling triples water consumption during the summer months, thus compelling many cities to tap into additional water resources; and that as much as 40% of all pesticides are applied to lawns and gardens, these benefits of accommodating ecological processes could be very significant.[10]

With proper planning, open space should not require much maintenance either. Since decomposition is an integral part of ecology, removal of dead wood and leaf litter would be, in most cases, counter productive. Similarly, mowing should also be unnecessary other than as a possible means of grassland management. Given that in most areas this would only need to be done once a year, the scale of a typical mowing operation would still be drastically reduced. In Niagara Falls, Ontario, three parks were redeveloped using an ecologically guided design process. This resulted in enormous reductions in the number of hours per acre spent on maintenance. Figure 2.2 compares the number of

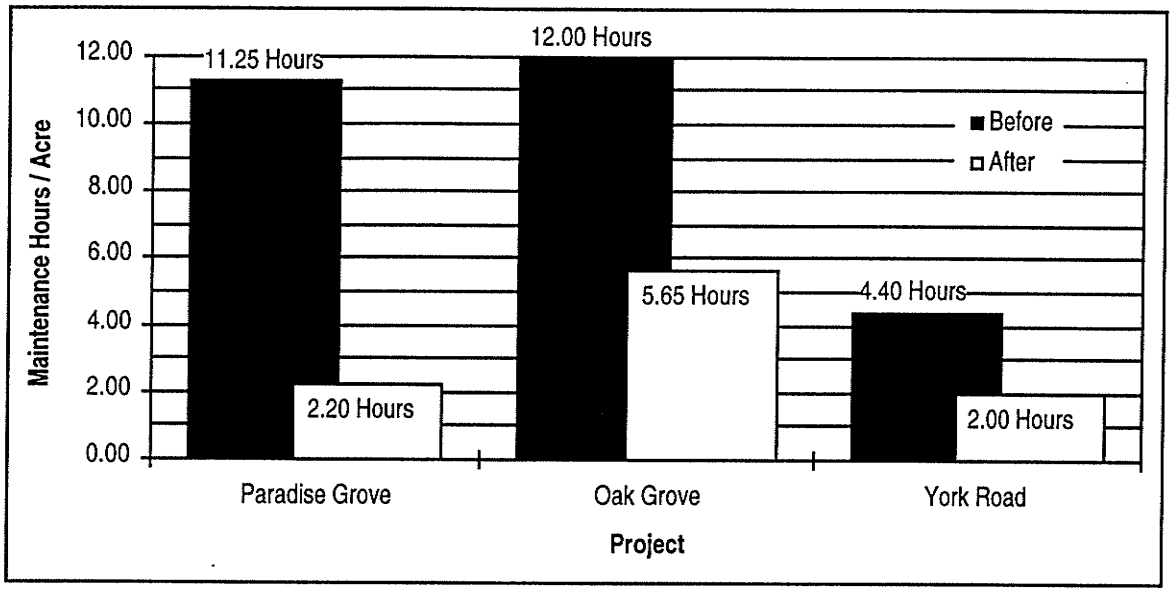


Figure 2.2 Comparison of maintenance hours per acre before and after development

maintenance hours per acre before and after the redevelopment, for each of the three sites.

On a grand scale, reductions in maintenance intensity could also reduce the amount of maintenance equipment that a given community would need to possess. This means that like fertilizers and pesticides, less equipment would need to be manufactured, resulting in additional savings of energy and resources while reducing pollution as well.

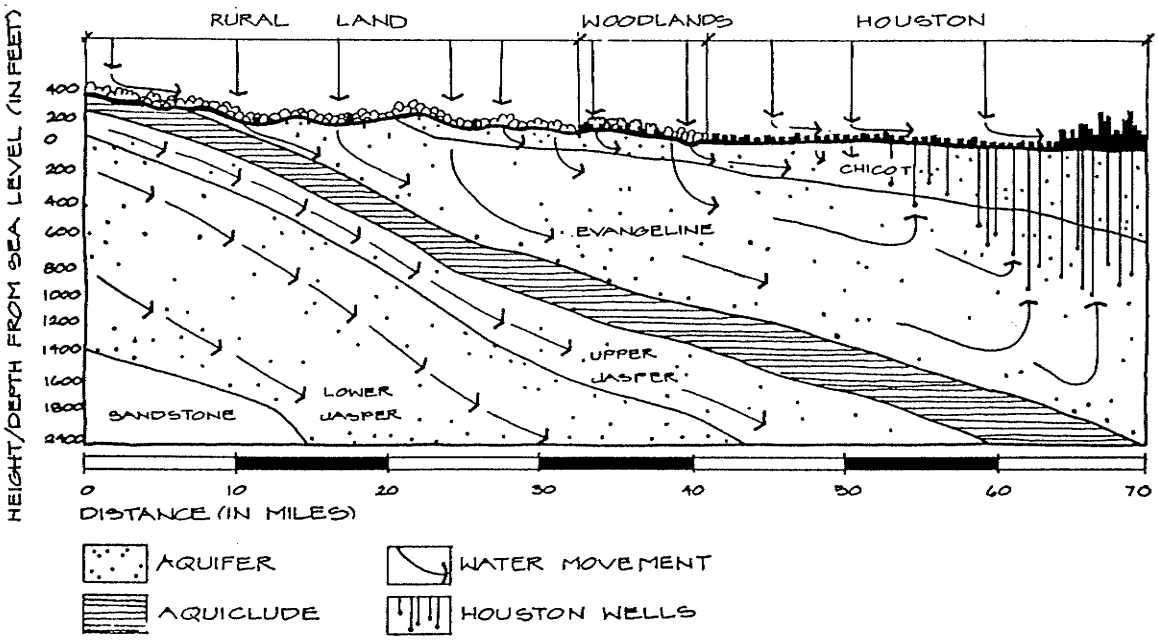


Figure 2.3 Section Woodlands to Houston (A. W. Spirn)

Finally, accommodating ecological processes in the design of open space can minimize the extent of damage caused in the event of natural disaster. For example, failure to respect natural drainage patterns and altering run off coefficients could result in flooding or contamination of surface and ground water. In Woodlands, Texas, the ecologically guided design of the community and its open space system preserved the existing wetland areas and tributaries instead of implementing a conventional underground storm sewer system.[11] In doing so, the threat of increased flooding in downstream Houston was significantly reduced.[12] Comparing the Woodlands development with that of a typical suburban area around Houston revealed that the ecological design had a 70% lower increase in peak flow rates.[13] This scheme also preserved the region's water quality by protecting important aquifer recharge areas.[14]

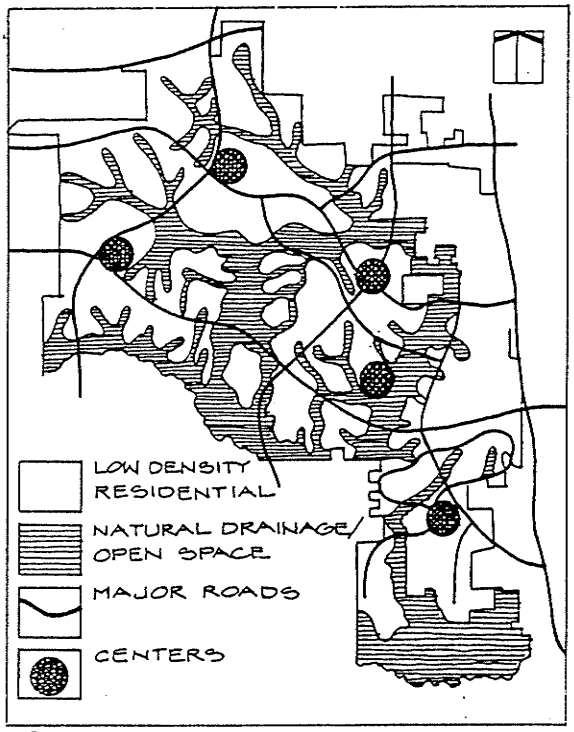


Figure 2.4 Plan of Woodlands, Texas (A. W. Spim)

Economic Benefits

The economic benefits of this process are closely tied to the environmental benefits. In general, for each environmental benefit, there is a corresponding economic benefit.

Landscapes that are dependent upon energy and resource intensive construction and maintenance practices, are increasingly expensive.[15] When designed with an ecologically guided process, open space can be considerably more cost effective. Since they often require less maintenance, labour costs associated with their upkeep are much less. These projects also provide numerous opportunities for community involvement.[16] Depending on the size of the project, much of the maintenance could actually be managed by the surrounding community to reduce those costs even further.[17] Similarly, utilizing the community during the construction phase could significantly reduce the initial development costs. Careful consideration of the requirements of potential ecosystems and the resources that are available to the community will allow the design of a landscape that the community can afford to maintain on its own.[18]

Additional savings are found through eliminating expenditures on fertilizers, pesticides, herbicides, additional maintenance equipment, fuel, acquisition of supplemental water resources, and replacement of dead plant material.[19]

In North York, Ontario the costs of developing and maintaining open space designed using an ecologically guided process were recently compared to those of a more typical open space in a study of two one acre sites.[20] In this example, the ecologically guided site, cost 67% less[21] (see Figure 2.5).

The protection of the environment that results from respecting ecological processes in the design of open space can yield even greater savings. Using Woodlands, Texas as an example again, it is estimated that preserving the existing wetlands and tributaries in the design of the community and its open space network has saved the community and the surrounding area millions of dollars.[22] While the cost of preserving the natural drainage system was shown to be equivalent or only slightly less than implementing a conventional system of underground sewers, the real savings came from preventing the flooding, erosion, and water quality problems that would have resulted had a conventional sewer system been used.[23] Over time, the savings from this one project may become immeasurable.

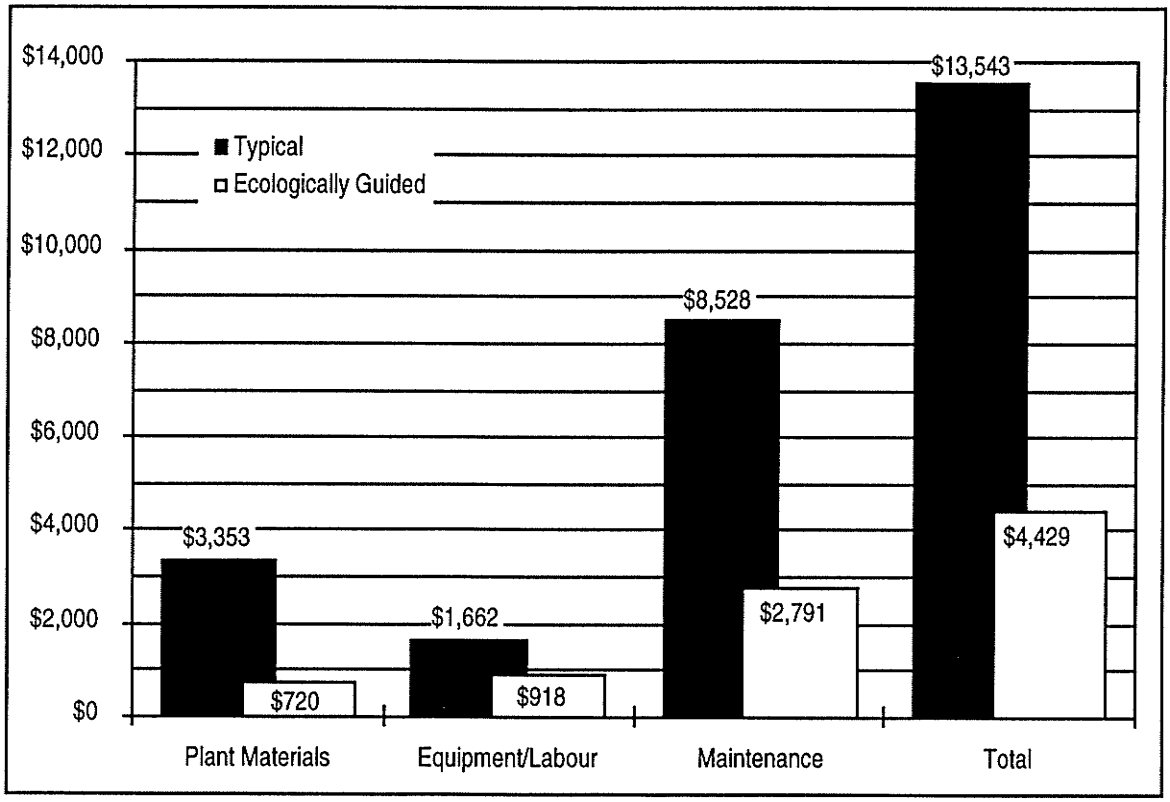


Figure 2.5 Comparison of costs associated with typical and ecologically guided design processes

Finally, on a more speculative note, the development of open space in this way often gives the residents of a neighbourhood the desire to remain in the community longer as is discussed in the next section. This results in the development of a more permanent population and makes the community a more desirable place to live, thereby creating an increase in property values.[24]

Social Values

Open space designed using an ecologically guided process has proven to be very beneficial socially. At the most basic level these spaces can provide "new opportunities for sightseeing and other outdoor activities."[25] More significantly though, the development or redevelopment of a local open space provides a unique opportunity to bring a community together. The public participation this process encourages can substantially enhance the social climate of the community and the quality of life of the urban dweller. In England, involvement in creating open spaces during the 1980's . . .

> " . . . led to feelings of pride and achievement, learning new skills, increased awareness of local history, getting to know people better, developing a team and common community spirit, and increased levels of responsibility in individuals. (The participants) enjoyed the physical exercise and feelings of freedom. They were able to 'escape' from the city environment to retreat peacefully and repair battered emotions and to 'get back to nature' and appreciate its richness and variety. Long term effects of involvement with the projects included increased community interest, cooperation between teenagers, increased confidence, a feeling amongst adults of setting down roots, and often significant changes in lifestyle towards areas of public service or environmental improvement. . . Stimulating people to care more for wildlife areas increases the care they show for one another."[26]

In Sheffield, another project also 'influenced residents' development of identity with place and community.

Caring for one another, the desire to stay in the area, and the sense of belonging also serve to unify the community and make it a safer,[27] more desirable place to live.[28] This is because once the residents get to know each other, they begin to look out for each other and their neighborhood. In a sense, the boundaries of their homes expand to encompass the whole community. Following the creation of the space, public involvement in its maintenance can help sustain this renewed community spirit well into the future.

On a less tangible level, this process can result in the creation of open spaces that enrich the human spirit by "providing the urban dweller with refreshment from the complexities and rigors of urban life."[29] As our cities grow and our lives become increasingly complex the need to provide more places in our cities for this purpose will increase immensely.

"The reawakened awareness of the wholeness of nature that these places can instill can also help enhance ones own sense of self and enrich ones deepest personal relationships."[30] In a sense, a renewal in our awareness of our connection to our environment can give us a broader sense of reality as we begin to perceive ourselves as part of 'the big picture'.[31] For some, this helps build confidence in the future and gives life more meaning.

Educational Opportunities

An ecologically guided design process also has enormous educational value because the resultant open spaces are rich in opportunity for adventure and discovery.[32] In England studies have shown that children who have access to these kinds of places for recreation, exhibit high levels of inventiveness in play.[33] Since "the greatest learning potential occurs on sites one is familiar with and experience on a day to day basis,"[34] the frequent intimate encounters with nature that these open spaces can afford makes them powerful environmental education tools. The inclusion of interpretive or more formal educational facilities in the design of these areas will increase this value even more.

At Ecology Park, in Toronto, Ontario, visitors could learn about ecological restoration, urban food production, organic gardening, and providing for urban wildlife.[35] The facility was set up by the Pollution Probe Foundation as a community park where ecological approaches to urban landscaping could be demonstrated. The main objective was to broaden public awareness and exposure to environmentally sensitive alternatives to conventional urban landscaping.

For young and old alike, the first hand experience these open spaces can provide is far superior to any classroom or book, but it should be stressed that the educational value of these places does not lie solely within their artifact. It also includes the process of their development. Direct involvement in the creation and maintenance of these places can provide unique learning opportunities that go beyond what a site that has already been developed can give. This was the case with Ecology Park where a major component of its educational program involved the actual creation of the park. The majority of labour

for its construction was supplied by volunteers from the surrounding community. Between 1985 and 1987, over 120 volunteers put more than 1,000 hours of labour into the construction of the park.[36] In participating, these volunteers learned a lot about the world around them in addition to acquiring some new skills and simply having an enjoyable time.

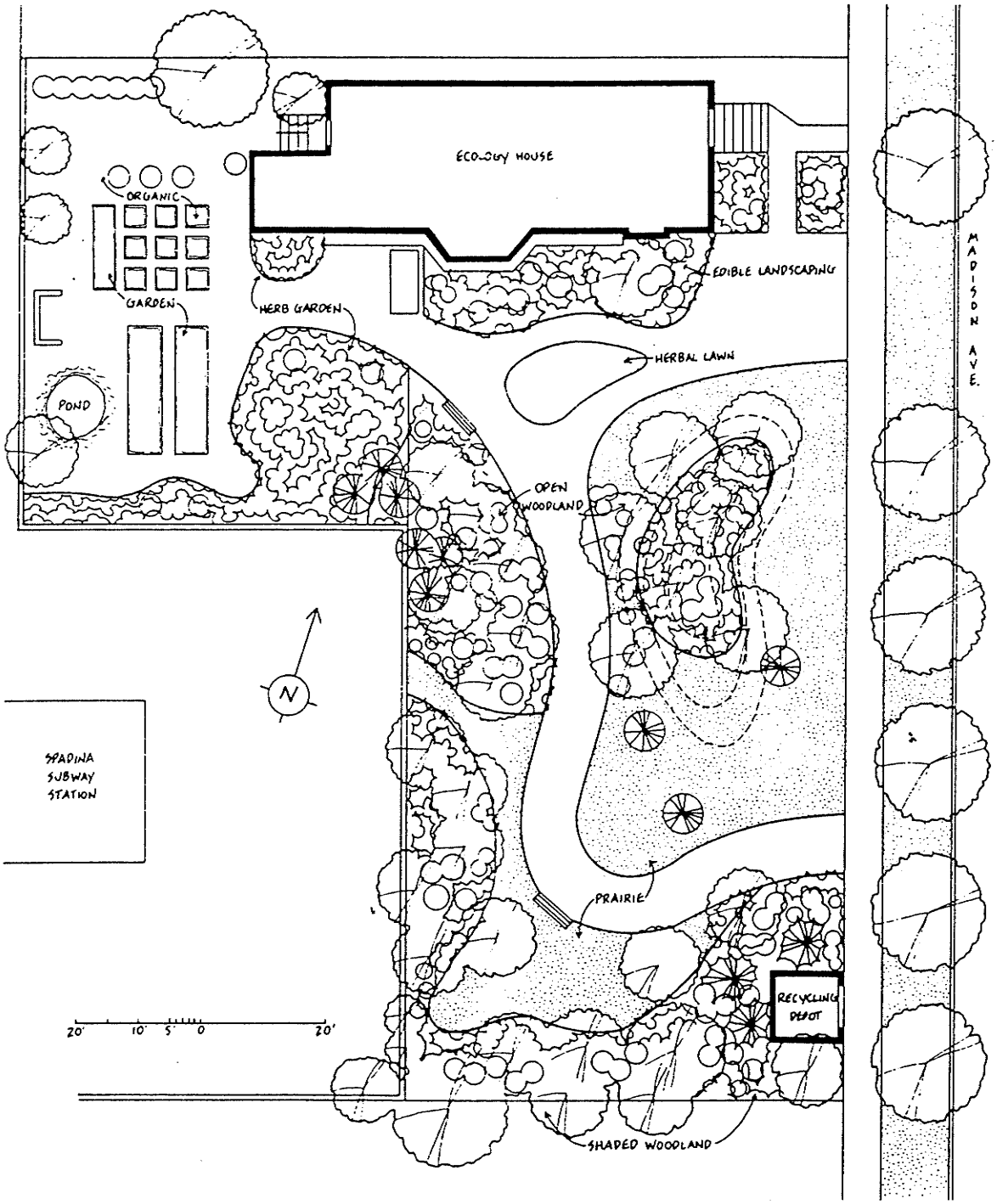


Figure 2.6 Ecology Park, Toronto, as built plan (D. Gordon)

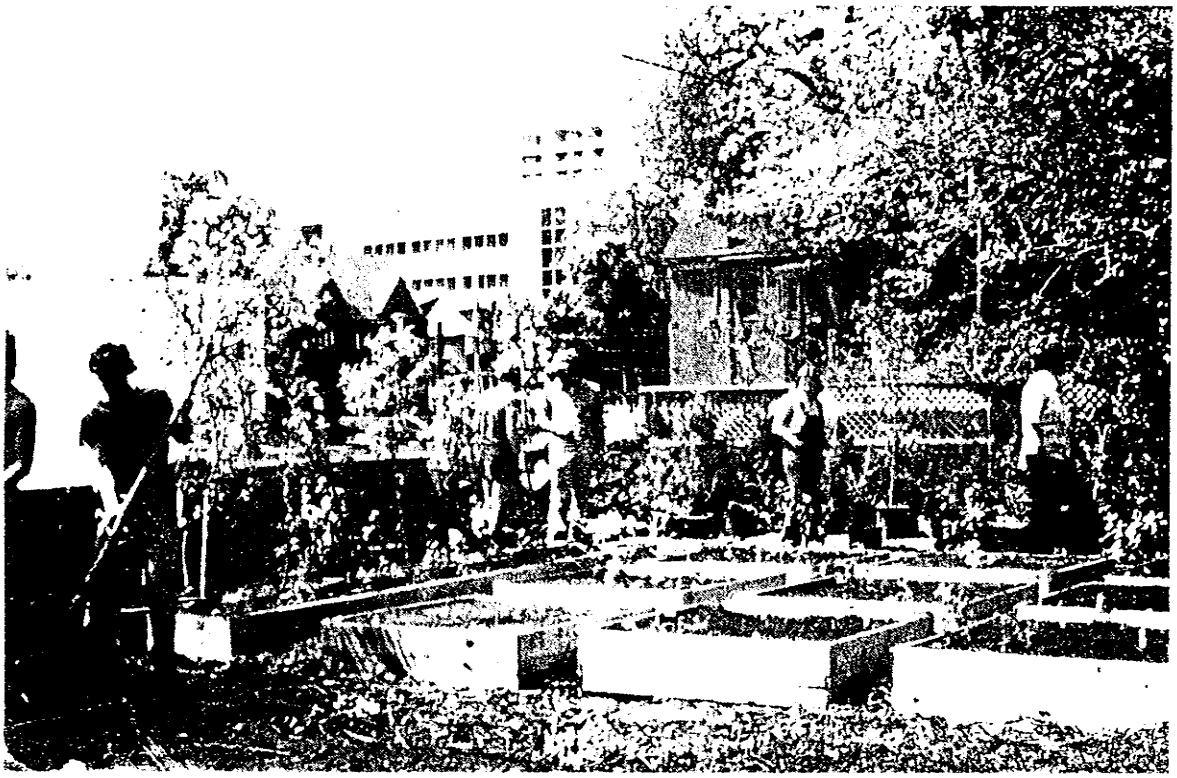


Figure 2.7 Ecology Park, Toronto (D. Gordon)

To many, environmental education that employs an ecological framework within which all studies can be taught is considered to be the main hope for a change in social values towards the environment. For this reason greater attention should be paid to creating open spaces where ecological processes can be witnessed to their fullest extent.[37] An ecologically guided design process is a very powerful tool in this regard.

Summary

The use of an ecologically guided approach to the design of open space is important in the interest of making our society more environmentally sensitive. Not only can it help restore the environment's health, but it can also produce many other environmental, economic, social and educational benefits, and may even serve as a catalyst for additional efforts to improve the environment's health.

When developing an open space, ecological processes must be accommodated. For this reason it is important to establish ecosystems that are appropriate for the site, its context, and the human functions that are desired of it.

The next chapter discusses this process in more detail.

1 While in the end, the demonstration component of this study focused on suburban park space, the ideas proposed here are intended to be equally applicable (with some modification of course) to utility and road right-of-ways, boulevards, and any other designed public or private out door areas in the urban environment.

2 Michael Hough, *City Form and Natural Process: Towards a New Urban Vernacular*, (New York, Routledge, 1989), pp. 60 - 63.

3 Owen Manning, in Ian Laurie, ed. *Nature in Cities: The Natural Environment in the Design of Urban Green Space*, (New York: John Wiley and Sons, 1979), p. 31.

4 Ibid.

5 Emery, p. 133; Manning, p. 12, 31; and Don Gill and Penelope Bonnett, *Nature in the Urban Landscape: A Study of City Ecosystems*, (Baltimore: York Press, 1973), pp. 121 - 122.

6 Ralph Waldo Emerson, *Nature*, pp. 20 - 21.

7 Gill and Bonnett, p. 4.

8 John Diekelmann and Robert Schuster, *Natural Landscaping - Designing With Native Plant Communities*, Toronto: McGraw-Hill, 1982), p. 7.

9 Anne Whiston Spim, *The Granite Garden: Urban Nature and Human Design*, (New York: Basic Books, 1984), p. 13.

10 Diekelmann and Schuster, p. 3.

11 Detailed discussions of this project can be found in: Michael Hough, *City Form and Natural Process: Towards a New Urban Vernacular*, (New York: Routledge, 1989), pp. 98 - 100; and Spim, pp. 163 - 166.

12 Hough, *City Form*, p. 99.

13 Spim, p. 166.

14 Ibid., p. 163.

15 Diekelmann and Schuster, p. 3.

16 Emery, p. 19.

17 Ibid., p. 131.

18 Spim, p. 206.

19 "In North America, an estimated 40 million lawn mowers consume 200 million gallons of gasoline annually." Diekelmann and Schuster, p. 3.

20 Hough Stansbury, p. 9. This work was carried out under the supervision of William Granger, Arborist Supervisor for the City of North York. Refer to "Naturalizing Existing Parklands", by Granger in *Green Cities*, for more detail on his work.

21 With the simpler maintenance requirements of this site, it was possible to utilize volunteer labour to carry out the work.

22 Spim, p. 163.

23 Hough, *City Form*, p. 100.

24 Emery, p. 23.

25 Peter Berg, et al. *A Green City Plan for the San Francisco Bay Area and Beyond*, (San Francisco: Planet Drum Books, 1989), p. 48.

26 Emery, p. 19 - 20.

27 This issue is discussed in detail in: Jane Jacobs, *The Death and Life of Great American Cities*, (New York: Random House, 1961), chapter 3.

28 "Unified neighbourhoods are less vulnerable to crime, litter and other problems of urban blight." Berg et al, p. 2.

29 Emery, p. 19.

30 Brian Tokar, *The Green Alternative, Creating an Ecological Future*, (San Pedro, California: R and E Miles, 1987), p. 149.

31 René Dubos, *The Wooing of Earth: New Perspectives on Man's Use of Nature*, (New York: Charles Scribner's Sons, 1980), pp. 7 - 8.

32 Hough, *City Form*, p. 139.

33 Emery, p. 20.

34 Hough, *City Form*, p. 262.

35 David Gordon, *Green Cities: Ecologically Sound Approaches to Urban Space*, (Montreal: Black Rose Books, 1990), p. 196, 198.

36 Ibid., p. 208.

37 Gill and Bonnett, p. xii.

3. A Design Process

The process described here was largely derived from Emery, Hough, and Spirn's theories. As demonstrated in the next chapter, it is not unlike any other landscape design process. However as noted in the previous chapter,[1] emphasis is placed on ensuring that ecological processes are accommodated. To this end, the objective of developing ecosystems that are appropriate for the site, its context, and its intended functions is paramount.

The process involves six stages:

1. Identification of goals and objectives
2. Analysis of the site and its context
3. Evaluation of goals and objectives
4. Detailed site analysis
5. Identification of potential ecosystems
6. Design development

This chapter discusses each of these stages individually.

Goals and Objectives

The first step, before any analysis or concept development is done, is to identify the goals and objectives of the project. As already noted, the main objective is to create ecosystems that are appropriate for the site. Additionally, in the interest of trying to improve or protect the environment further, there are a number of initiatives that should be pursued when appropriate. At the broadest level, consider how the design of site could:[2]

- improve micro-climate
- improve air quality
- improve water quality
- conserve and / or restore resources (biological, geological and hydrological)
- prevent and / or mitigate potential hazards (i.e., flooding, drought, pollution, landslides)

At a more local level, consider how the design of the site could:

- help the community to be more self sufficient - consider the site's potential to
    - facilitate energy and food production (wind mills, gardens, etc.)
    - provide opportunities for passive energy conservation to reduce demand for supplemental heating and cooling
    - aid in recycling of wastes (composting facilities, or potential to treat waste water)

- be incorporated into a network of open spaces to enhance public access and provide wildlife corridors and larger habitat areas[3]
- provide physical, visual and psychological relief from the hard urban landscape[4]

Every project will also have a series of objectives that are specific to it and a list of desired functions, uses, and facilities.[5]

In the next four stages the site will be studied to identify an ecosystem, or ecosystems that will work with it and to determine how, or whether or not the project specific objectives can be met within that framework. Throughout this process, many other issues regarding the development of the specific site may be revealed, resulting in additions or revisions to the initial set of goals and objectives. Always consider the requirements for each goal, objective, function, or facility and make sure it is practical to try to accommodate it on the site.[6] Be realistic in your expectations.

Analysis of Site and Context

This stage is the first of two analyses that will be conducted on the site. This analysis concentrates on developing an understanding of the site in relation to its context. The goals are to begin identifying potential ecosystems for the site and to identify any environmental issues or problems that are facing the site and its surrounding area that should be, or need too be, addressed in the design. This analysis should include:

- Regional and Site History

  This part of the analysis concentrates on the major forces that shaped the sites present condition. An understanding the site's past will reveal important clues as to what the site may become.[7]

  - examine the geological and natural histories of the region to develop an understanding of how the landscape of the region developed
  - examine the cultural history, or history of human use, and try to assess any changes that have occurred to the ecology of the site and its context as a result of human interaction; also take note of present human activities in the area and identify those that may have an impact on the site, especially those that may conflict with it

- Climate[8]

  The climate of the region has a significant influence on the types of ecosystems the area can support because it is a major determinant in species distribution.

- determine the seasonal ranges of temperature and precipitation, and variations in wind speeds and direction
- note the extremes that any proposed species must be able to tolerate

- Indigenous Regional Ecosystems[9]

  These ecosystems are important to the region's identity.[10] As well, one of the simplest ways of identifying communities that the site will be able to support is to look at what lives and grows around it.

  - identify the indigenous ecosystems that may have previously existed on or near the site, and take note of the relationships that exist between the species and their physical and biological environment
  - pay particular attention to those ecosystems whose context has similarities with the existing condition of the site

- Local Hydrology[11]

  Significant environmental degradation can occur if existing hydrological cycles, are disrupted or altered. Hydrological patterns are also major determinants in species distribution. Therefore it is important to understand the hydrology of the area around the site.

  - identify the local drainage patterns, and note the location of flood prone areas and aquifer recharge zones

- Context

  An understanding of the site's context will assist in the development of a design that fits in with its surroundings.[12] As well, examining the context will reveal any external forces that may affect the site.

  - determine the present land use patterns around the site (i.e., urban, rural, industrial, commercial, residential, agricultural, vacant, undeveloped, wilderness, etc.)
  - consider any impacts these land uses may have on the site, for instance:[13]
    - pollution of air
    - contamination of soil
    - contamination of surface or ground water
    - wind buffering or tunneling
    - heat island effects
    - increase or decrease in runoff or stream flow
    - reduced solar exposure

- Demographics

  Understanding the lifestyles, needs, and desires of the potential users will help identify any goals or objectives that were overlooked in the first stage, and will give an indication of the role people will play in the new ecology of the site. This information may be found by:

  - examining local demographic statistics
  - surveying those who live and work in the area
  - providing direct community participation in the design process[14]

Evaluation of Goals and Objectives

This is more of an on going activity than an isolated stage. As more is learned about the site and its context, review the goals and objectives to confirm that each is still feasible and compatible with the site. If there are any objectives that are not compatible, a decision must be made to either reconsider them, or to try to find another site.

Detailed Site Analysis

This analysis concentrates on the specific attributes of the site. In carrying it out, care must be taken not to disturb the existing ecology, as it may be desirable to retain it. In this analysis examine:[15]

- Adjacent Land Use and Potential Access Points
  - identify the present uses of the land surrounding the site
  - study the existing ecological communities around the site and assess their potential as sources for colonization
  - examine circulation patterns (sidewalks, roads, paths, etc.) of the surrounding neighbourhood to identify locations where access points should be made
- Present Land Use and Existing Facilities
  - identify the functions the site presently facilitates
  - identify any facilities, structures, or physical, biological or architectural features including any utilities or subterranean features, that already exist on the site
  - assess the roles the existing functions and facilities have in the existing ecology of the site
- Present Biological Condition
  - locate / identify any communities that may exist
  - identify dominant species - at the very least identify the existing vegetation - from

this, approximations of the faunal and micro-organic components can be made

- assess the stability of each community - note any evidence of regeneration, or potential for regeneration - these communities or species are significant as their ability to reproduce indicates their appropriateness for the site's existing conditions

- Topography
  - analyze the existing topography of the site noting percentages of slope, drainage patterns, and any topographical or geographical features (i.e., hills, valleys, depressions, ridges, unstable slopes, etc.
- Soils
  - identify the major soil classifications that exist on the site
  - note pH levels, moisture capacity, rates of air and water movement, nutrient availability, etc.
  - assess the degree of disturbance or compaction if applicable
- Micro-climate
  - record any deviations from regional norms

Throughout this analysis keep the requirements of the desired functions and facilities in mind. This will enable any conflicts they may have with the site to be quickly identified. Some of the factors that may limit the sites suitability for a particular function may be that it is too small, steep, flat, wet, or rocky. Again, if there are any incompatibilities, either reconsider the incompatible function or facility, try to find a way of implementing it in a way that is compatible, or try to find another site.

Identification of Potential Ecosystems

The objective of this stage is to identify ecosystems that could develop on the site given its particular micro-climate, context, size, topography, and soil characteristics, and the functions and facilities it is expected to accommodate. From the detailed site analysis, examine the existing biological condition of the site. The species and communities that presently exist are primary indicators of the types of ecosystems the site can support.

Next compare the indigenous ecosystems of the region with the site and note any similarities, especially in topography and soil conditions. The indigenous ecosystems are important points of reference for assessing any disturbances and subsequent successional processes that have shaped the site's present condition. While in most situations it will be unrealistic to try to recreate these systems,[16] the species that make up these systems

are relevant from a global ecological perspective. Presently, virtually all cities throughout the world with similar climates are home to essentially the same limited collection of plant species at the expense of the diverse range of native species that previously existed.[17] When one considers the amount of diverse wilderness consumed by all these nearly identical landscapes and the land occupied by their support infrastructure (i.e., nurseries, implement and chemical factories, gas stations, topsoil and peat farms, etc.) this tragedy takes on enormous proportions. By choosing species from native communities as much as possible, global genetic diversity can be preserved. Drawing from these communities will also give the site a regional identity and a stronger sense of place.

Also, look at the potential of future colonization of the site by species from adjacent or nearby properties. It is important to remember that no ecosystem is static. They are constantly fluctuating and adapting in response to external factors and the conditions that are created within themselves. Over time the site will be colonized by species from the surrounding area, and similarly the surrounding area will become colonized by species from the site. It is important to anticipate this and consider the effects it may have.

Finally, consider the role humans will play in the new ecosystem. On one hand, the ecology of the site needs to be compatible with the desired human functions and facilities (i.e., it must be able to withstand the impacts of the human interactions). At the same time, the desired functions and facilities need to be appropriate for the site (i.e., it must be possible to implement and manage them in environmentally sensitive and sensible ways).

By compiling all this information, it should be possible to develop a framework of an ecosystem that could be developed on the site. Again, as noted in chapter 2, the objective here is to provide a basic structure in which an ecosystem, or collection of ecosystems, will evolve over time. If necessary, any gaps in the framework could be filled by interpolating from systems in the region that are similar in other aspects (i.e., dominant species, micro-climate, soil characteristics, topography, etc.).

Design Development

In this stage the potential ecology and the desired functions and facilities are brought together in a design for the site. The objective is to fit them to the site in a way that minimizes the input of energy and resources in their creation, use, and management. Effort should be made to minimize disturbance to the existing ecological processes in the area, and repair any disruptions that may have occurred to them in the past.

Additionally, the design should:

- maximize public access and ease of circulation through the site while keeping in mind issues of safety and the need to protect sensitive habitats[18]
- celebrate the 'genius loci' of the site and region through use of the sites distinctive micro-climate, and geological, hydrological, and biological character[19]
- exploit the aesthetic qualities of water without wasting it and increase its visibility and accessibility when, and where appropriate[20]
- incorporate interesting land forms, geological, architectural, or archeological features that exist on the site or around it[21]
- utilize the traditional design tools (use of colour, shade / shadow effects, scents, water features, time / change, etc.) to maximize the experiential qualities of the site[22]

If an interpretive / educational program is included in the design, this program should:[23]

- be appropriate for all ages
- be designed to create positive attitudes toward protecting the environment
- focus on encouraging an awareness of the human role in the biosphere
- emphasize the responsibility of each individual to press for the establishment of stable systems that optimize energy and material usage and satisfy as many levels of human needs as possible

The Final Product

Upon completion of the process an appropriate, buildable, design concept should have been produced. This concept should:

- designate the overall layout of the site including the major habitat areas or ecosystems, and the key features and facilities
- list the major species that are to establish the proposed communities
- designate the layout of and details for pathways, signage, benches, decks, and other site furnishings.

This process has concentrated on developing the design concept. To actually develop a site the next steps would be to develop plans for implementation and maintenance, and then carry them out. But, there are many other steps involved such as:

- acquiring the site to be developed, or at least getting permission to do so; this may involve some negotiation and litigation
- raising funds for the project

- forming a community group to facilitate better community consultation and participation
- acquiring approval for the construction of the final design from both the public and the required governing bodies; this may require negotiating zoning variances

These steps go beyond the scope of this study though. The focus here is on the design process. An application of this process is demonstrated in the next chapter.

1 See page 5.

2 Anne Whiston Spirn, *The Granite Garden: Urban Nature and Human Design*, (New York: Basic Books), 1984, pp. 86 - 87, 125 - 126, 167 - 168, 205 - 206, 261.

3 Don Gill and Penelope Bonnett, *Nature in the Urban Landscape: A Study of City Ecosystems*, (Baltimore: York Press, 1973), p. 119.

4 Malcolm Emery, *Promoting Nature in Cities and Towns: A Practical Guide*, (Dover, New Hampshire: Croom Helm, 1986), pp. 132 - 133.

5 Emery, p. 77.

6 Ibid., p. 80.

7 Ibid., p. 128.

8 Spirn, p. 85 -87.

9 Ibid., 225 - 226.

10 Michael Hough, *City Form and Natural Process: Towards a New Urban Vernacular*, (New York, Routledge, 1989), p. 117.

11 Spirn, p. 160 - 168.

12 This idea of fitting in with the surroundings is a central concept of Norberg-Schulz's theory of *Genius Loci*, and is supported by Emery, p. 132.

13 Refer to Spirn, pp. 43 - 55, 102 - 104, 130 - 138, and Hough, pp. 32 - 34, 44 - 46, 70, 90 - 93, 204.

14 Emery, p. 25.

15 Emery's chapter four provides excellent guidance for this analysis.

16 This is especially true on sites that have been severely disturbed, as is the case in most urban and suburban contexts.

17 Spirn, p. 13.

18 Emery, p. 132.

19 Owen Manning, in Ian Laurie, ed. *Nature in Cities: The Natural Environment in the Design of Urban Green Space*, (New York: John Wiley and Sons, 1979), p. 31; and Spirn, p. 261.

20 Spirn, pp. 167 - 168.

21 Emery, p. 133.

22 Manning, p. 31.

23 Gill and Bonnett, p. 154.

4. Demonstration: A Plan for Olympia Fields, Illinois

Introduction

The "New American Green Competition" for the design of a local community park in suburban Chicago was chosen as the vehicle to demonstrate the design process proposed in this study. The competition entailed the development of a proposal for the redesign and expansion of an existing park in this upper-middle income suburb of Chicago.

The site in question was 7.87ha (19.43 acres) in area, of which 4.05ha was an existing park, and 3.82ha was a nursery. In 1991 the community acquired ownership of the nursery property thereby prompting the move to expand and redevelop the existing park.

The objective as put forward in the competition brief was to "develop a new type of public park that fits into the emerging character of today's suburbs."[1] Given our awakening environmental awareness, a park designed using an ecologically guided process seemed to be an appropriate response. With this in mind, work began on developing a proposal.

Goals and Objectives

In addition to the goals and objectives associated with this design process, there were a number of objectives that were set out by the competition. The main requirements for the proposal were that the new park:[2]

- be exciting and appealing to families
- embody ideas and opportunities that will serve the community and its surrounding area well into the next century
- be innovative, avoiding the conventional patterns of passive and active recreation
- serve as a major public space that becomes an exciting social focus for the community / create new common ground for the areas residents
- be economically feasible (the implementation budget was set at one million dollars to be dispersed over the course of five to ten years)
- have high functional quality with passive recreation as its primary use

Additional requirements were to:

- include a plan to preserve and restore the existing historic buildings (the house was to become a Park District Office and the barn was to serve as a large public gathering space)

- provide a two thousand square foot maintenance equipment building
- provide parking for ten employees and sixty visitors.

Other than this, the competition was open for personal expression. Although the brief did suggest that most people would approach the park by car along Western Avenue, and that there were no plans for adding sidewalks to the streets surrounding the site, nor were there plans for additional transit, bicycle paths or pedestrian links to the site from other locations (including from the synagogue).[3] It also recommended that the existing recreation facilities should remain in place if possible.

After an initial evaluation, it seemed that most of these objectives and requirements could be accommodated within the parameters set out by the design process. However, the suggestion that most visitors would access the site by car seemed to contravene the idea of an environmentally sensitive design. This only seemed to emphasize a need to make the site as pedestrian accessible as possible so that the residents of the area might be encouraged to walk to the site. It was acknowledged that in this way the parking requirement could probably be reduced in size, if not eliminated altogether. The maintenance building could also be slightly smaller given the potential lower key maintenance requirements.

Above all, the most important requirements for this proposal were that:

- the proposed ecosystems be appropriate, and that
- the design facilitates: - passive recreation, and
  - larger public gatherings.

Analysis of Site and Context

Regional and Site History

The site is located on the edge of the Morainal and Chicago Lake Plain Sections of the North Eastern Morainal Region of Illinois. The retreat of the Wisconsinan glacier left this region covered by a thick dissected plain of till.[4] As glacial Lake Chicago subsided, a flat poorly drained plain of lake bed sediments was left in the north-east portion of the region.[5] Subsequently, a variety of forest, prairie, and wetland habitats developed in the region. These are discussed in more detail in the 'Indigenous Ecosystems' section of this analysis.

Following European colonization, the area, as part of the Chicago region, followed the typical development pattern. As the region was settled the forests were harvested, the

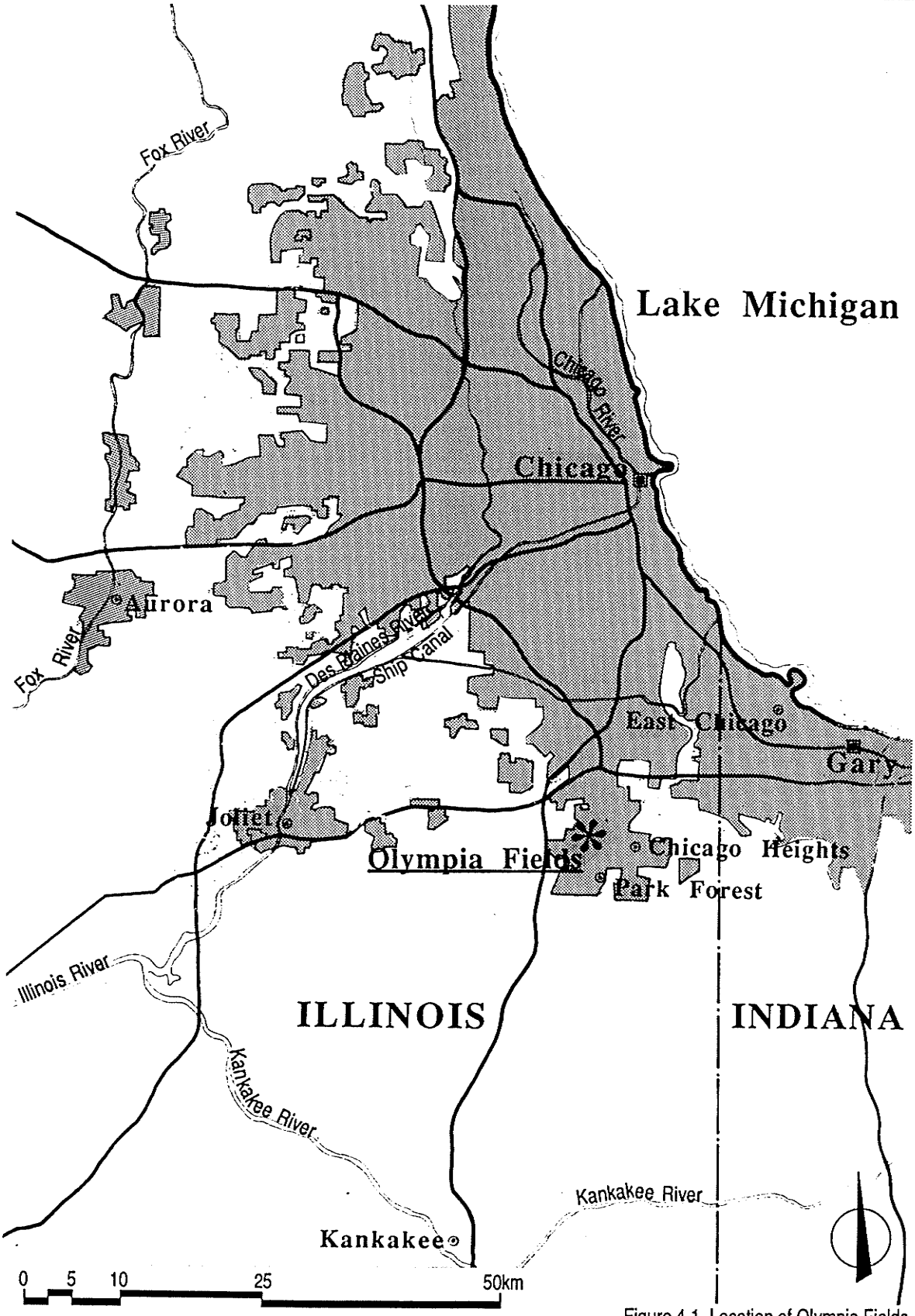


Figure 4.1 Location of Olympia Fields

prairies fell way to cultivation and the wetlands were drained, filled and channeled into ditches and culverts. Then, as the population grew, the farmland became enveloped by suburbs like Olympia Fields.

Located thirty miles south of downtown Chicago on the Illinois Central Rail Line, Olympia Fields is one of the oldest suburban communities in the region. It began in 1910 as a prestigious bedroom community that was centred around a commuter train station and a large country club that contained four golf courses. This development was part of a trend in the United States to locate private parks and recreation facilities in suburban areas within easy access of major business and social centres.[6]

In 1956 the Olympia Fields Park District was organized to "provide quality leisure facilities and programs for adults and children and to preserve open space throughout the community in the form of parks."[7] At present the District has acquired twelve sites totaling 115 acres, most of which is manicured park space, except for areas along Butterfield Creek. This is also the case for the golf courses and the public spaces in the adjoining communities of Chicago Heights, Park Forest, Matteson and Flossmore.

The history of the site itself is somewhat vague. During the 1880's it was cleared and settled as a farmstead. Then, at some point as the village grew up around it, the farm ceased operation and was replaced by a nursery. Subsequent to this, the land was subdivided and the western half was acquired by the Park District who recently developed it as a fairly typical suburban park with a collection of active recreation facilities in it. The eastern half remained in the possession of the nursery which stayed in operation until 1992, when it too was acquired by the Park District.

Climate

Climatic data for Park Forest and Chicago's Midway Airport formed the basis for the climatic analysis. Park Forest which is located just south of the site, was used for the temperature and average precipitation data, and Midway, whose records were more detailed, was used for the rest.[8]

The region is affected by westerly or south-westerly winds for most of the year, with south-south-west winds marking the transitional periods of the year. Cool winter and spring winds are normally westerly and average 18.6 kilometres per hour (11.6 mph). This flow is interrupted in May when warmer air begins to come in from the south-south-west and the temperature begins to stay above freezing. June, July, and August are the hottest months of the year and are marked with slightly more gentle (approx. 13.8 km/h /

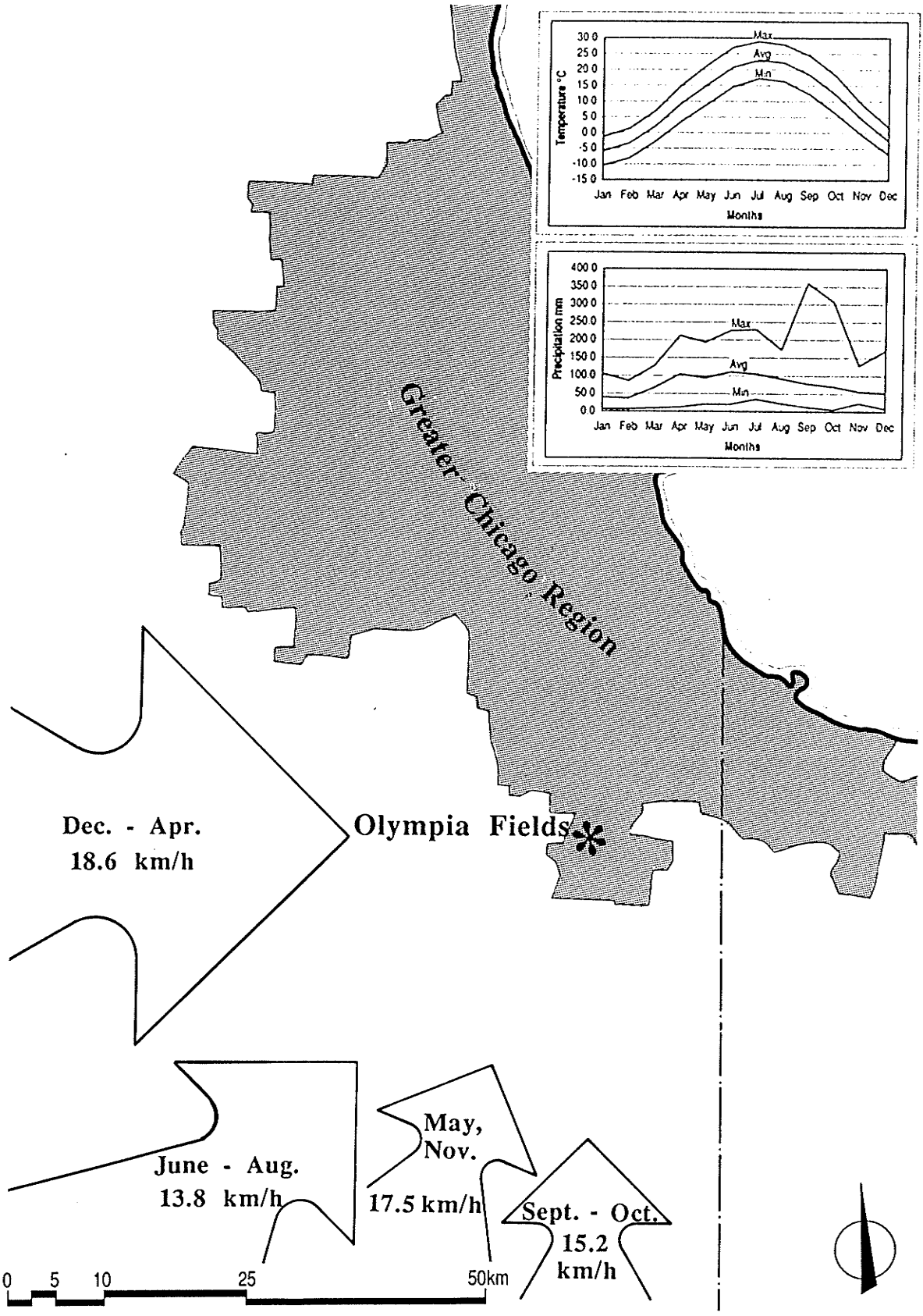


Figure 4.2 Climate

8.6 mph) south-west winds. As temperatures begin to drop off through September and October, winds become southerly again. November marks the return of below freezing temperatures and the winds shift towards south-west and finally to west by December. There is a 50% likelihood that the temperature will fall below 0ŻC (32ŻF) by October 26 and the last record below freezing will have occurred by April 20. The normal heating season is from mid-September until early June, with 94% of the normal heating load occurring between October 1 and April 30, and 55% occurring between December and February. The normal air conditioning season runs from mid-June until early September.

Average monthly precipitation ranges between 4.06 cm (1.6 inches) in February to 10.24 cm (4.03 inches) in June while monthly minimums range between 0.51 cm (0.20 inches) in October to 3.38 cm (1.33 inches) in July. On the other hand monthly maximums hover around 20 cm (eight inches) from April until August and then climb to 35.56 cm (fourteen inches) and 30.48 cm (twelve inches) for September and October before dropping down to 15.24 cm (six inches) for November and December and 10.16 cm (four inches) between January and March.

Indigenous Ecosystems

It is important to realize that much of the region has been disturbed by human activities, and as a result, only remnants of the original ecosystems still exist. In any case, as previously noted, the site is located on the edge of the Morainal and Chicago Lake Plain Sections of the Northeastern Morainal Division of Illinois (see Figure 4.3). This edge coincides with the edge of the Beech - Maple Forest and Prairie Peninsula Section of the Northern Oak - Hickory Forest Regions of eastern North America.[9] Therefore, the forests that still remain in the area tend to be a combination of maple and oak - hickory. Beech, which is normally associated with the Maple Forests is noticeably absent in this area due to a gap in its natural distribution.[10] It is however widely planted in urban areas. Successional development in the area tends to lead from oak - maple towards a dominantly maple forest.[11]

Prior to settlement it is estimated that 60% of the Northeastern Morainal Division was covered by tall grass prairie.[12] At that time dry, mesic, and wet prairies were all present in the area. Marshes were also very common due to the poorly drained soils. Fens, sedge meadows and bogs could also be found in this area. However, they are less common and can be considered to be more specialized communities.

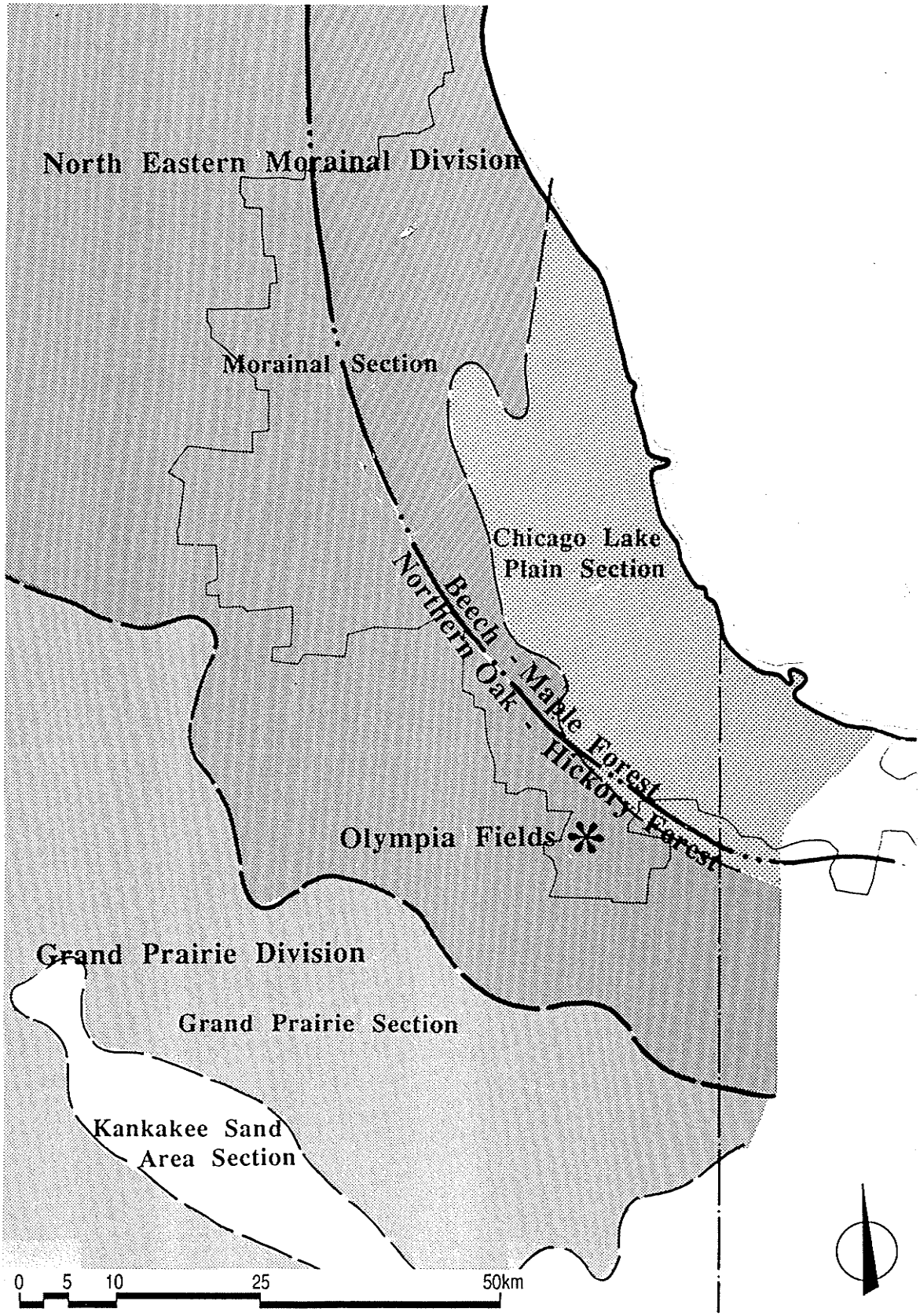


Figure 4.3 Indigenous Ecosystems

Species lists of two typical forest communities in the region were found in Braun's *Deciduous Trees of North America.* Similar lists for a variety of typical southern Wisconsin plant communities were found in Curtis' *Vegetation of Wisconsin.* These lists also included soil profiles. All of these lists are included in the appendix, and were used later in the demonstration to identify the potential ecosystems.

Local Hydrology

Throughout the region there are a number of small creeks and rivers. Many of them have been channeled. However, there are significant portions that have been left in a more natural state. Within the community, storm water run off is handled by a system of open ditches and culverts. Over flow from the ditches is collected by catch basins which feed into the sanitary sewers, as is the case in many North American cities. This could pose a health threat if the system reaches peak capacity and cause the sanitary sewers to back up. Spring flooding should not be of much concern in this area since snow usually melts away within a few days after falling resulting in generally negligible accumulations over the course of the winter. However, the peak in maximum precipitation in September and October when the plants are not actively taking up moisture makes fall flooding a real possibility. In examining the topography of the region it appears that the possibility of flooding in the immediate vicinity of the site is remote. In the north-west corner of the site there is a storm water detention area that is part of the region's 100 year flood management plan. This area is subject to periodic flooding throughout the year. However, for more substantial flooding to occur on the site the water level of Butterfield Creek would have to rise by more than 40 feet.

Context

Olympia Fields is located in a large suburban belt that encompasses the Greater Chicago Region. In general, this area is typical of most suburban areas throughout the United States and Canada. It is a predominantly residential landscape with some agricultural land mixed in between the closely knit built up areas. The residential areas are punctuated with large regional malls, strips of commercial development, open space in the form of parks, play grounds, golf courses and cemeteries, and numerous institutions; generally schools, churches, and synagogues. The typology of the commercial strips is similar to that of Pembina Highway or Regent Avenue in Winnipeg, Manitoba, and the open spaces, as noted, are generally manicured. In the residential areas the streets are devoid of any curbs or sidewalks.

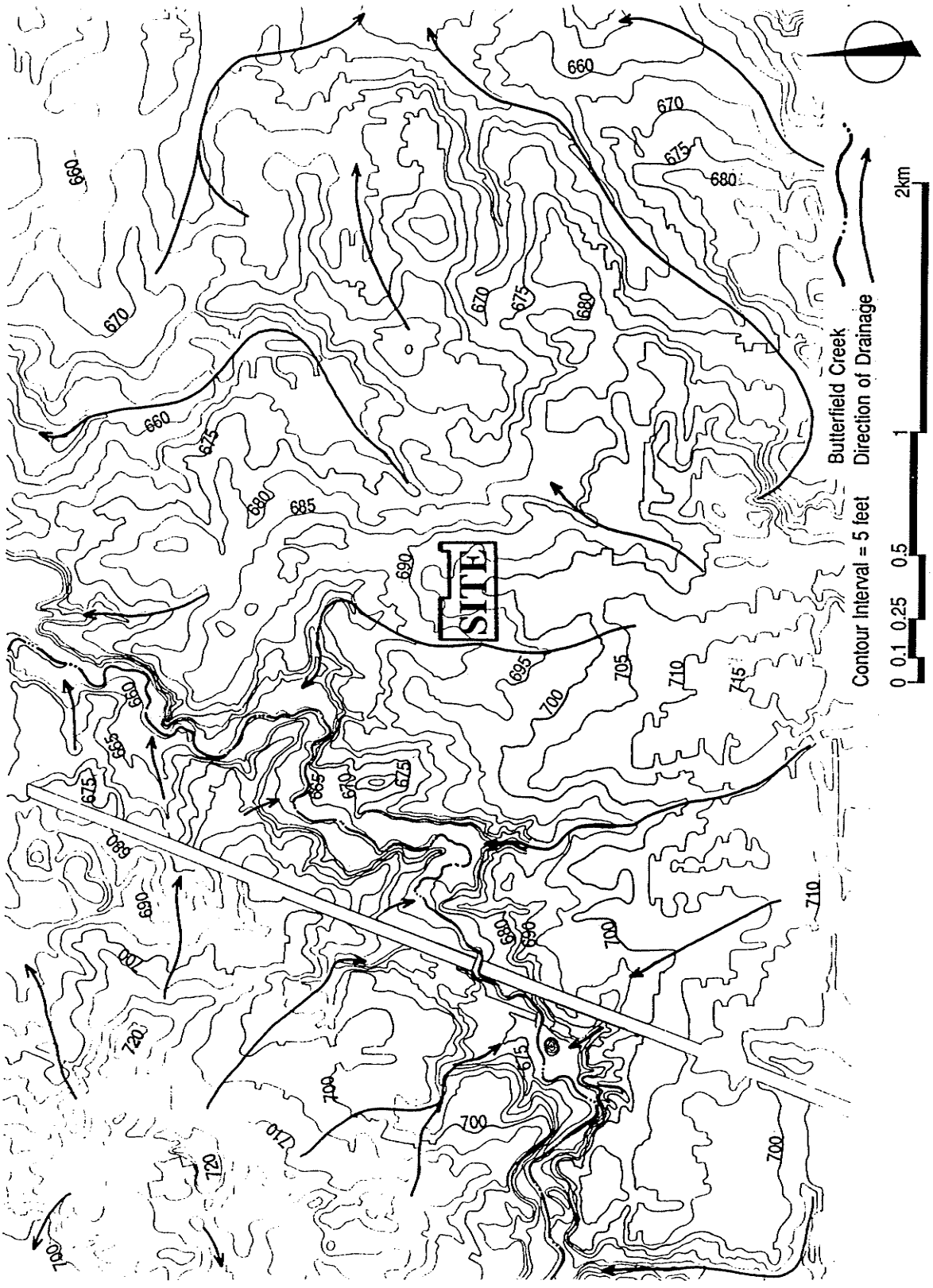


Figure 4.4 Local Drainage Patterns

There are no major industrial sites in the area. These are typically located closer to Chicago, or in the more western and northern sections of the suburban belt. Any industrial land that does exist is generally occupied by water towers, sewage disposal sites, or electrical substations.

In terms of population density, Olympia Fields is quite low with an average of 1.5 dwellings per acre. Most residences are single family dwellings with an average lot size of about 100 by 200 feet. Many lots are over an acre in size. This means that almost all residents have immediate access to some form of outdoor space as part of their residential environment.[13] On the large lots in the north part of the village, much of the original hardwood forest has been retained, or has at least regenerated (see Figure 4.8). However, closer to the site, more manicured landscapes are predominant around most residences (see Figure 4.9). In addition to these private landscapes, all of the residents live within walking distance to one or more of the village's twelve designated park spaces. The country club and many of the parks in the adjoining communities are also easily accessible.

There is also a band of wilderness preserves that winds its way along some of the streams and creeks that still exist in the region. Smaller patches of wilderness also exist in the midst of some communities. In Olympia Fields itself, three of these areas for a total of over 51 acres are included in the holdings of the Park District.[14] Although most of this is probably destined to be developed into more traditional manicured open space. There are also several stretches of wilderness along the fairways of the country club.

Demographics[15]

Olympia Fields is an upper-middle income community.[16] In 1983 the median family income was $25,694 and only 1.3 % of the population was living below poverty. The present population is about 4,500 with 32% falling between the ages of 45 and 65. The other significant age groups are 0 to 14, and 25 to 44 years with 24% of the population each. The average resident is very well educated with 94% of population over the age of 25 having completed high school and 53% having graduated from college.

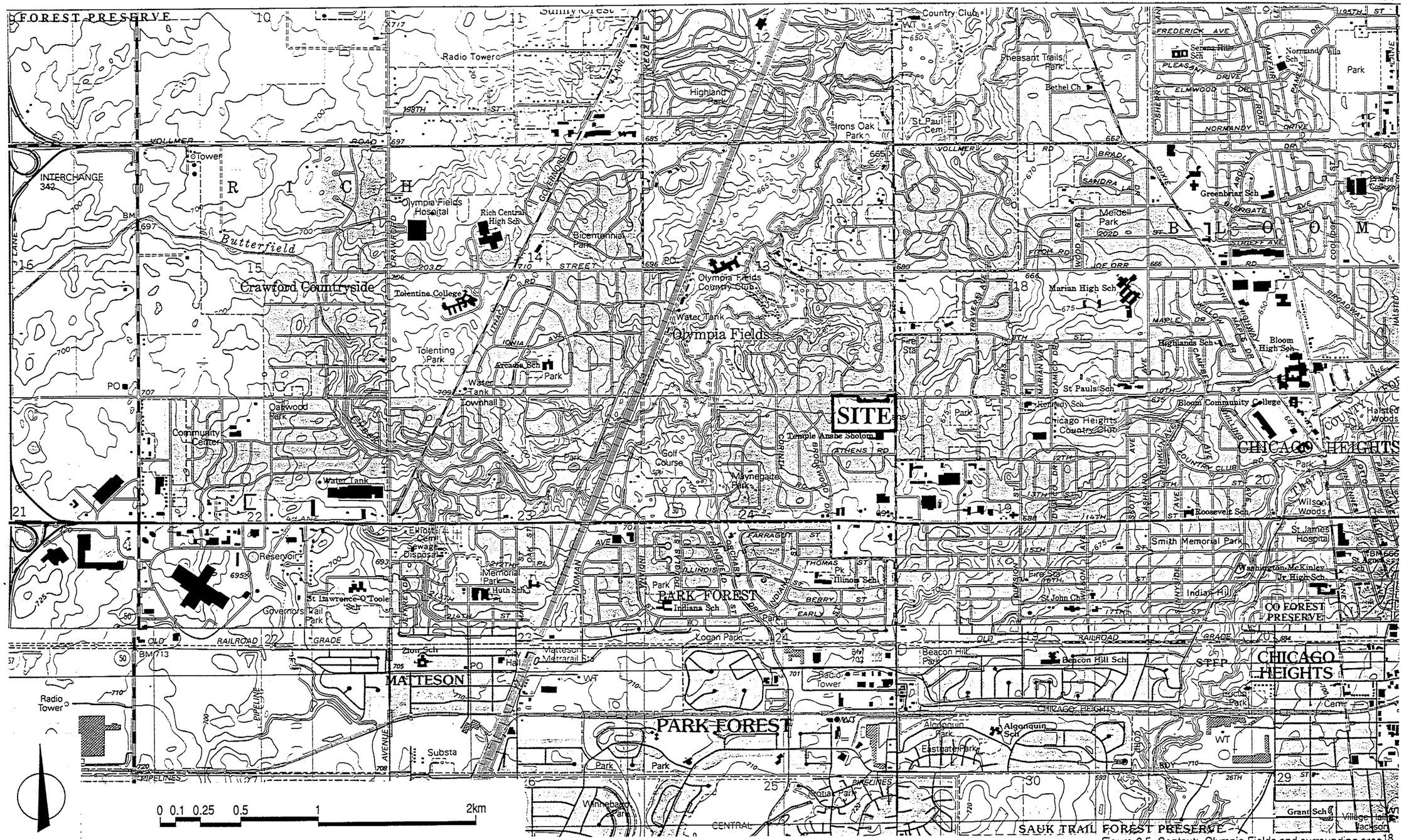


Figure 6.5 Context: Olympia Fields and surrounding area

Figure 4.6 Landscape character just west of Olympia Fields (C. H. Thomsen)

Figure 4.7 Landscape character just west of Olympia Fields (C. H. Thomsen)

Figure 4.8 Typical residential lot in northern part of village (C. H. Thomsen)

Figure 4.9 Typical residential lot near study site (C. H. Thomsen)

Evaluation of Goals and Objectives

The present condition of the site encapsulates many phases of the regions history, (i.e., the transformation of the indigenous landscape into farmland and then suburbia). There is potential to capitalize on this, which could have enormous interpretive value.

In examining the site with respect to climate it was clear that a park of this size would have a rather limited effect on ameliorating the climate of the region. However, with some planning it could provide some beneficial effects for the community in its immediate vicinity. For example, heavy tree planting along the periphery of the site could aid in reducing air speed around the homes adjacent to it to help reduce heat loss in winter months. Using primarily deciduous species will provide shade in the summer months, yet will allow heat gain in the winter. Deciduous species are also more in keeping with the botanical character of the region.

The variation in precipitation will have a profound effect on the survival of plant species. Obviously, the use of native and naturalized species will be of enormous benefit in this respect. It will be important to consider local conditions such as soil profiles and topography to select plants of the proper moisture regime (i.e., dry, mesic or wetland).

While the threat of on site flooding is relatively small, consideration should be given to methods of containing run off on site to reduce the threat of flooding downstream. The existing detention area already does this for half of the site, and has the potential to used to sustain a permanent water feature on the site.

The existence of wilderness preserves in the region makes the potential to establish linkage into wildlife corridors quite high. However, since the site is surrounded by private property, this linkage would have to come about through the initiative of the residents.

The absence of side walks and curbs in the area, while helping the ditch based storm water drainage system to function, has the potential to limit the value of providing pedestrian access. Unless the residents feel comfortable walking along the street, they will be more apt to drive their cars. This issue needs to be addressed in a general plan for the whole community.

Sources of pollution in the area are generally small and isolated. In addition to sewage disposal sites, the other major pollution source in the region is the automobile. Higher concentrations of pollutants can be expected on major arterials during periods of peek

traffic flow. The one location where this may be a factor is along the eastern edge of the site which abuts Western Avenue.

The prevalence of manicured landscapes in the community seems to indicate that it has become an accepted landscape design standard there. Since ecologically guided design makes a fairly radical departure from that norm, the decision was made to develop at least part of the site as an interpretive facility to promote this new way of designing. While there may be other sites in the region that would have greater potential for demonstrating this process, this site is a prime candidate it is already slated for redevelopment, and its adjacency to the school makes it an excellent choice for an intensive interpretive program. Given that most of the older residents are already fairly well educated, the program for adults can be more advanced. It will be important to balance this with a very solid program for youngsters who make up a quarter of the potential users.

Detailed Site Analysis

Adjacent Land Use and Potential Access Points

The site is surrounded by residential lots on three sides, and by a synagogue and school to the south. Like the residences, the majority of the synagogue's property is covered by mowed turf and a few mature specimen trees. It also has two large parking areas.

The site's eastern boundary and half of its north, are separated from the adjacent properties by streets. 207th Street to the north, is a divided residential road, while Western Avenue the east, is classified as a suburban collector where the speed limit is set at 40 miles per hour (65 km/h). There is little definition along the rest of the residential edges (see Figure 4.10) except where drainage ditches become sufficiently deep and along some lots that face 207th Street where some owners have used 4x4's to delineate their property. In contrast, the southern boundary is strongly delineated by a mature wind break (see Figure 4.11).

Given the environmental focus of this proposal, it seemed important to provide pedestrian linkage between the site and the community despite the suggestion in the competition brief that most people would drive to the site. Linkage between the synagogue and the site was deemed to be particularly important as it is also a school. While a ditch between the two properties makes this linkage from the front entry to the synagogue difficult, easier access is possible towards the west end of the building near the rear entrance where the terrain levels out. The north-west and south-west corners of the site and the end of

Figure 4.10 Residential lots back onto site (B. Roberts)

Figure 4.11 Wind break separates site from synagogue property (B. Roberts)

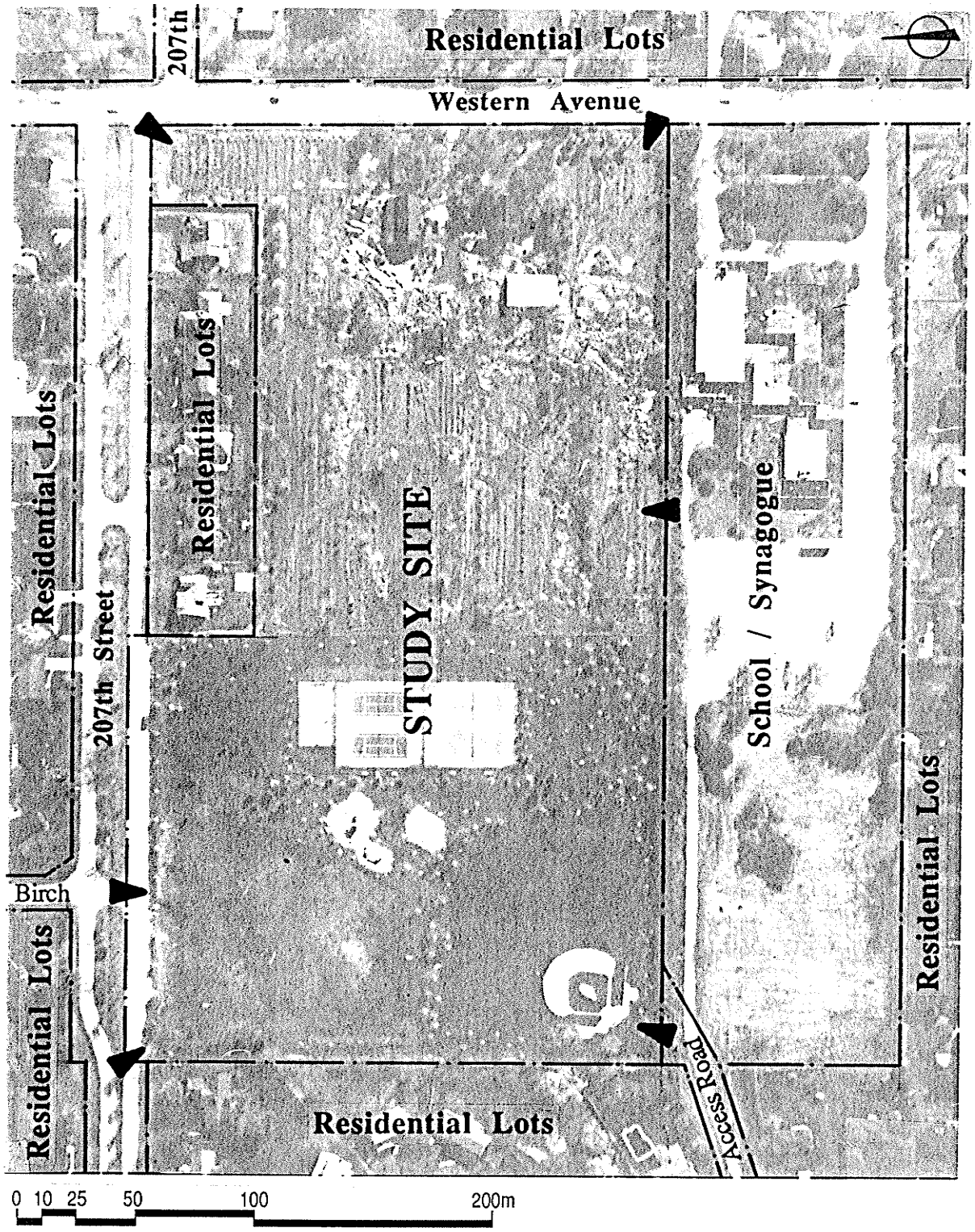


Figure 4.12 Adjacent Land Use / Potential Access Points

Figure 4.13 Western Avenue: a dangerous place for pedestrians (C. H. Thomsen)

Birch Lane were also identified as primary entry points.

The north and south-east corners of the site would be the primary access points for those residents living in the adjoining communities of Chicago Heights and Park Forest. Serious consideration of public safety would be necessary in the design of these potential entries due to the high traffic speed and volume and lack of sidewalks along Western Avenue.

Present Land Use and Existing Facilities

As noted in the 'Historic Analysis', the west half of the site is traditional park space and the east half was operated as a nursery until 1992. The storm water detention area is located in the north-west corner of the park area (see Figure 4.15), and a high quality baseball diamond complete with portable benches, full backstop, pitchers mound, and skinned base lines, lies in the south-west corner. Separating the ball diamond from the detention area is a large mound, with a collection of three play structures clustered around its eastern base (see Figure 4.16). The play structures consist of a swing set with six swings, a miniature train, and a climbing structure. Each one is set in a flat area of sand

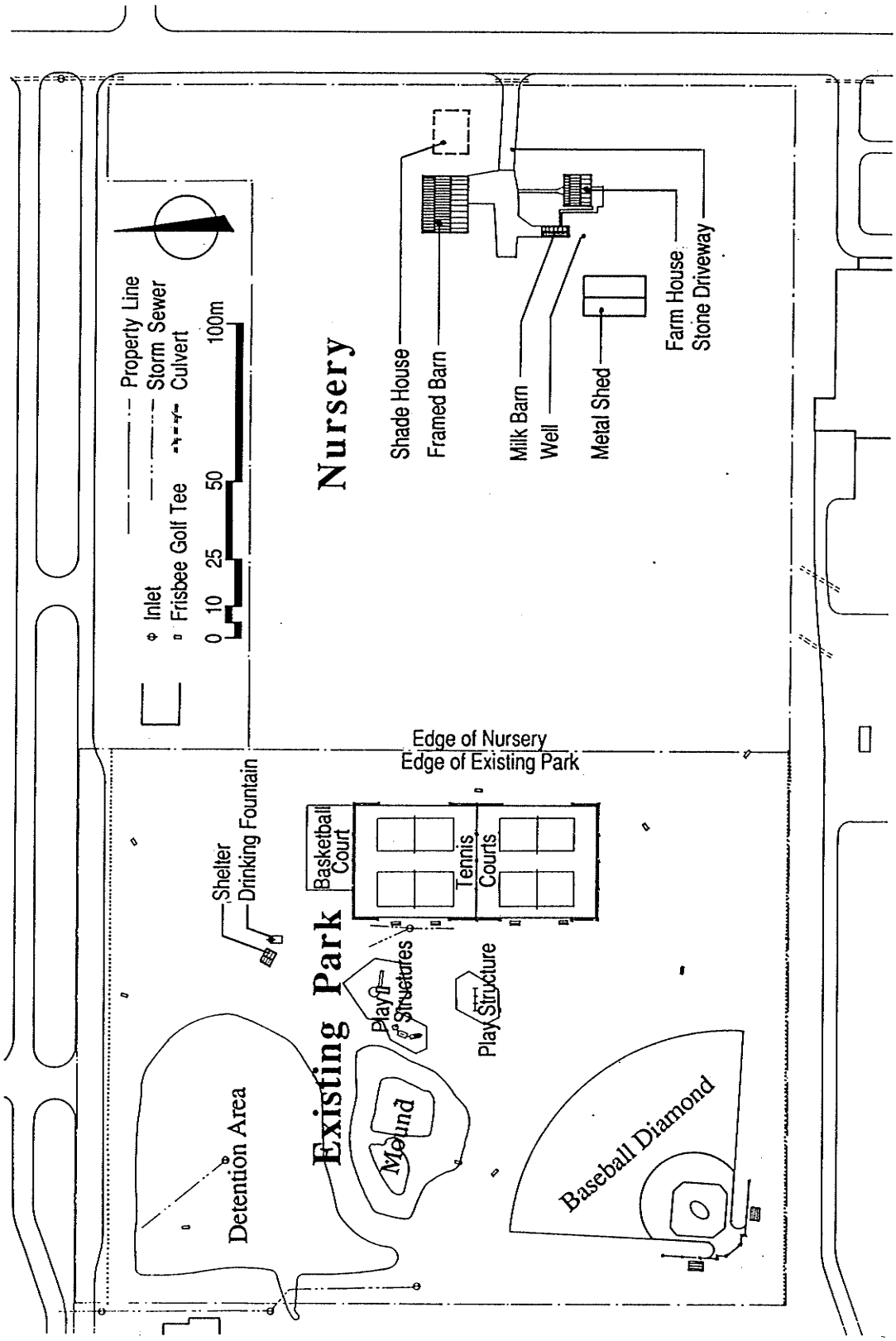


Figure 4.14 Present Land Use / Existing Facilities

Figure 4.15 Storm water detention area and mound (C. H. Thomsen)

Figure 4.16 Play structures (B. Roberts)

that is contained by 4x4 landscape ties. Four tennis courts and a basket ball court lie to the east of the play structures near the boundary between the park and the nursery (see Figure 4.17). Like the ball diamond, these facilities are of high quality. They are paved with coloured asphalt, and the chain link enclosures are vinyl coated. Rounding out the list of recreational facilities is a frisbee golf course that winds its way through the park. Each tee off site is designated by a small concrete pad. Additionally, near the basket ball court there is a shelter with a steep pitched roof that is used for picnics and community events. Adjacent to it is a drinking fountain. Most of these facilities, especially the ball diamond which is used regularly for league games, apparently receive moderate to heavy use throughout the summer months. Other features that exist on the west side of site consist of a few underground culverts that aid in drainage and 4x4 posts placed at five foot (1.5 m) intervals that line the north and south boundaries.

The eastern half of the site is completely undeveloped (Figure 4.18) expect for the old farm yard which contains three historic buildings, a large metal shed and a shade house. The shed and the shade house will be removed by the nursery, and the other buildings, which consist of an 1880's farm house (Figure 4.19) with an adjacent milk barn (Figure 4.20) and a large framed barn (Figure 4.21), are slated for preservation.

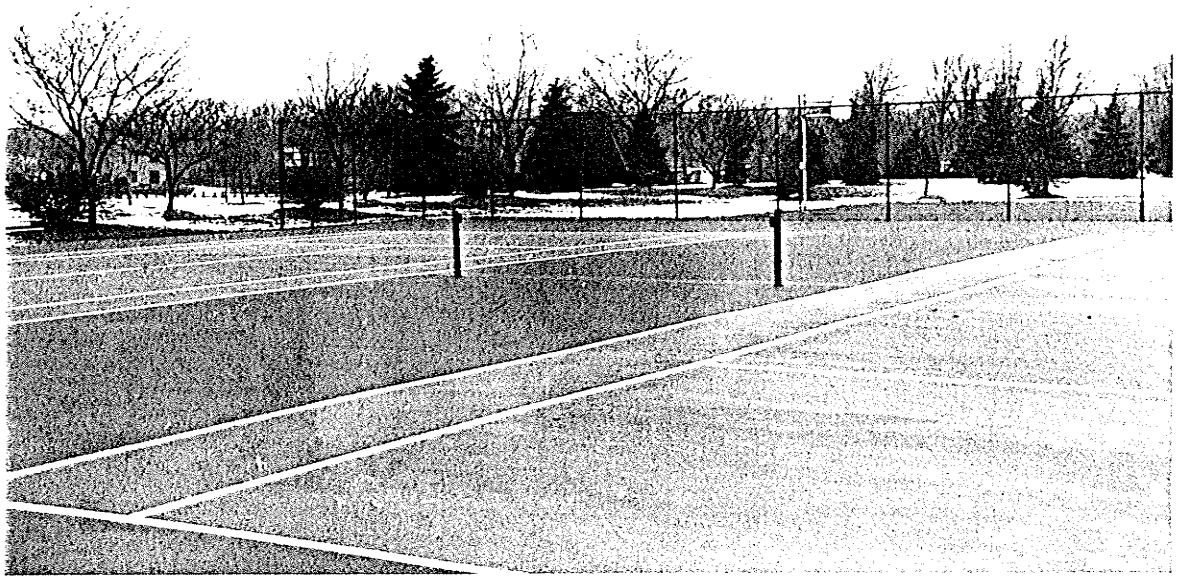


Figure 4.17Tennis courts (B. Roberts)

Figure 4.18 Existing condition of eastern half of site (B. Roberts)

Figure 4.19 Farm house (B. Roberts)

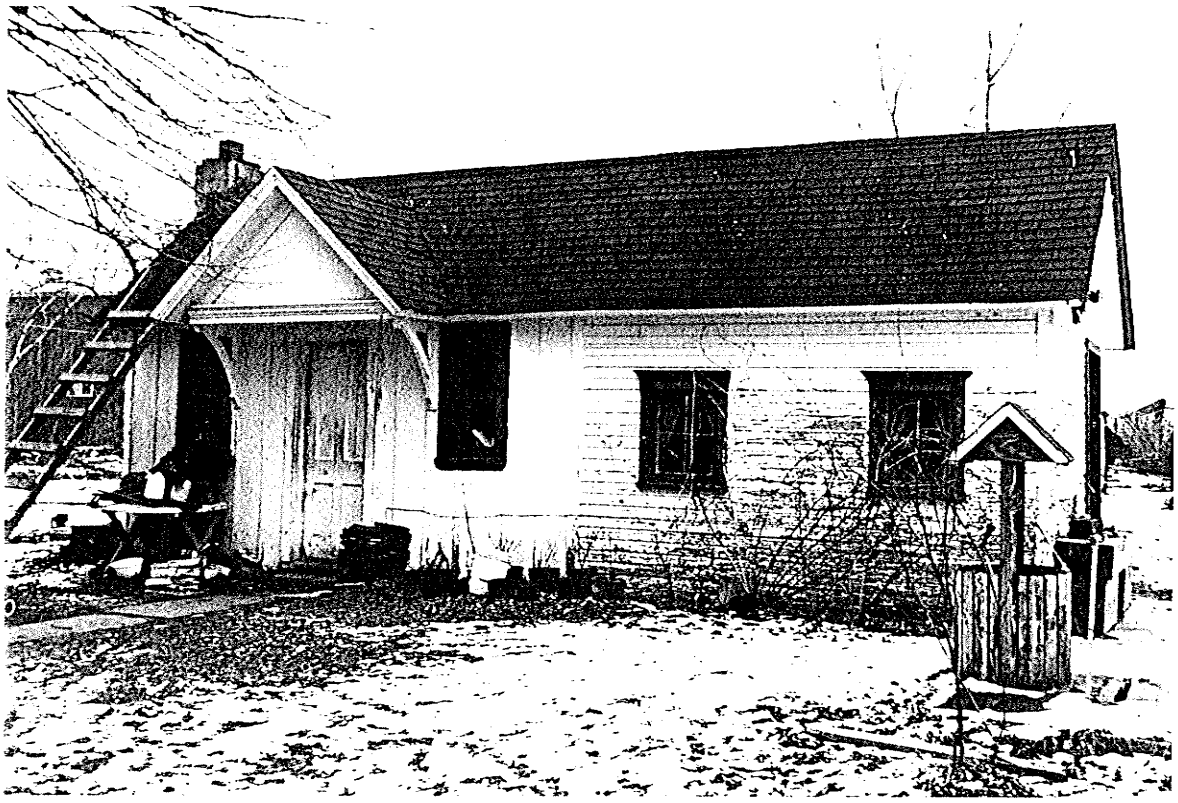


Figure 4.20 Milk barn (B. Roberts)

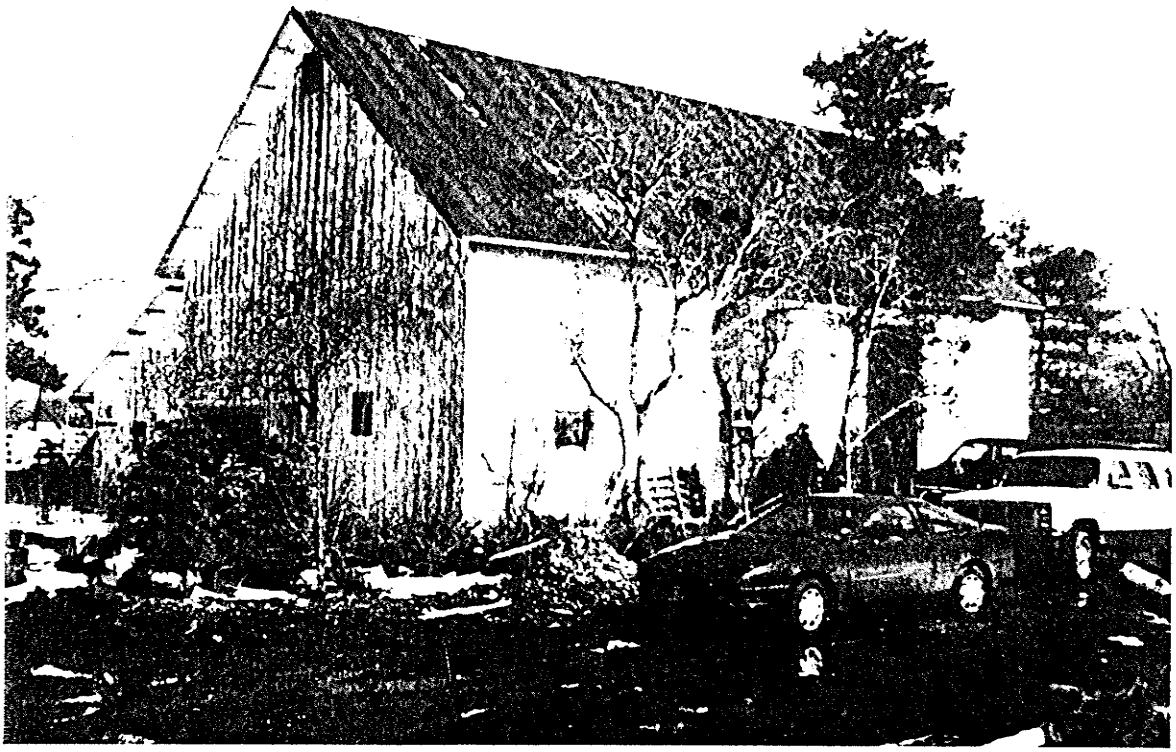


Figure 4.21 Framed barn (B. Roberts)

> "The house was built with square nails and full sized 2x4's and 2x6's and the barn, although built in 1917, is an excellent example of nineteenth century heavy timber construction: the beams are mortised and tenoned, and then plugged with wood dowels. No nails were used in its construction. All three buildings are structurally sound and are illustrative of the life of the area at the turn of the century."[17]

The farm also has a stone driveway and there is a well at the south end of the milk barn. The rest of the site contains many rows of nursery stock and several large piles of stumps, dead trees and other debris.

Present Biological Condition - Existing Vegetation

The resources to carry out a detailed assessment of the sites biological condition were not available, however it was possible to conduct a survey of the existing vegetation. This is denoted on Figure 4.23. While maple (*Acer sp.*) and oak (*Quercus sp.*) dominated the tree population on both sides of the site, the present uses of the site have resulted in the existence of two distinct vegetation zones. The park half of the site is essentially composed of specimen trees that are arranged in loose informal groupings on a uniform carpet of turf (see Figure 4.22).

Figure 4.22 Character of existing vegetation on west half of site (B. Roberts)

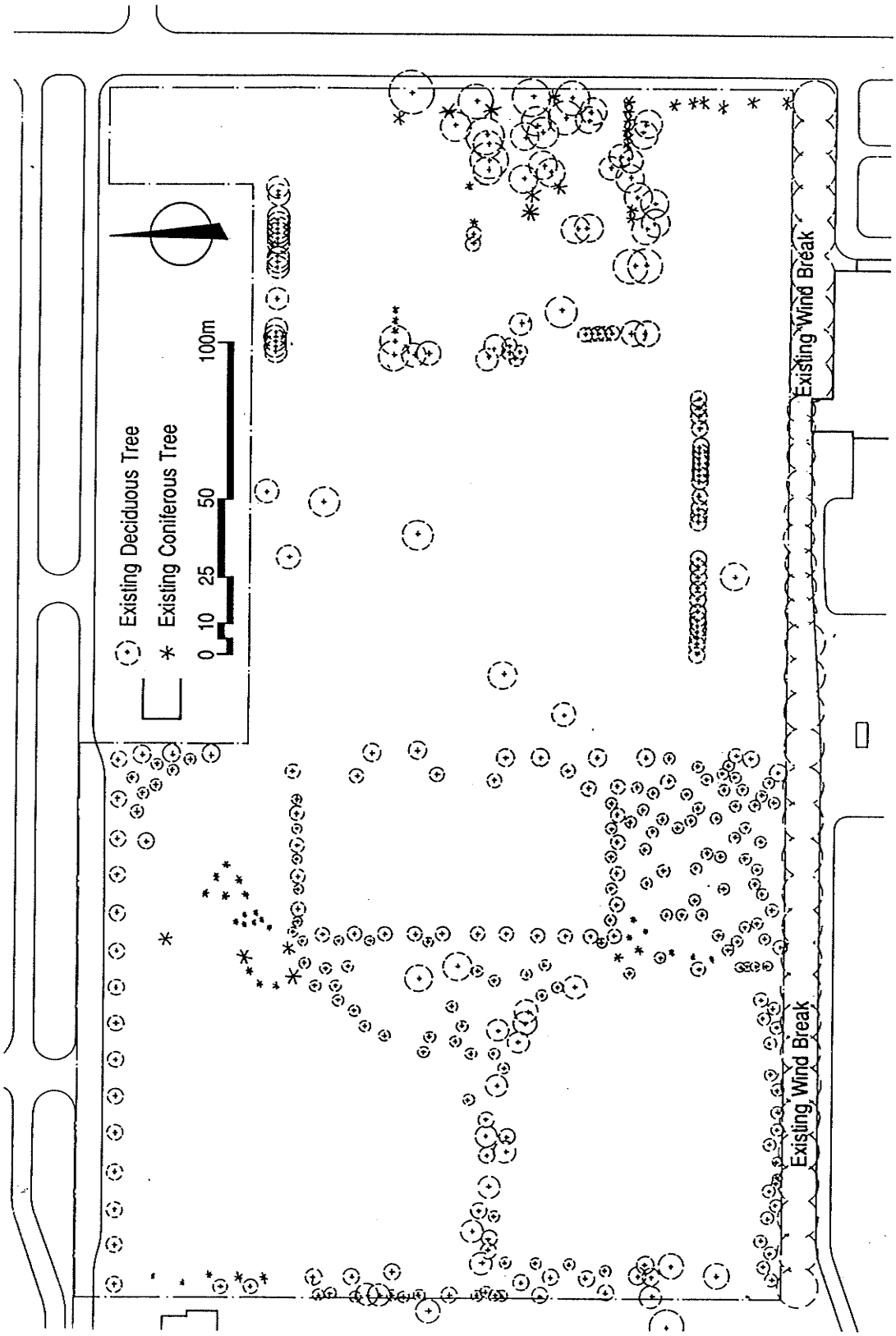


Figure 4.23 Existing Vegetation

Figure 4.24 Character of existing vegetation on east half of site (B. Roberts)

Figure 4.25 *Phragmites sp.* growing in ditch along 207th Street (B. Roberts)

The character of the vegetation on the eastern half of the site, being a nursery, is in striking contrast to that of the park (see Figure 4.24). At the time of the site visit, most of the planting was arranged in rows of single species without any understory or ground cover . The competition brief noted that most of these plants, other than those near the historic buildings of the farm yard, would not remain.[18] For this reason it was assumed that other than the very large specimens which would be difficult to move and the ones in the farm yard, the site would be in an essentially denuded condition at the start of construction. The notable exception to this was the ditches, which due to their location and steeply sloping sides, were spared from tilling operations and bore an abundance of herbaceous wetland species (see Figure 4.25). The large specimens which will probably remain have been shown on Figure 4.23.

The planting strategy used for the farm yard was similar to that of the park area, except it was more mature. Evergreen material was also more dominant and the organization of the peripheral areas was more structured owing to the traditional farm yard aesthetic of the wind break. Figure 4.26 illustrates the character of the planting in this area.

Figure 4.26 Existing vegetation around old farm yard (B. Roberts)

Figure 4.27 Row of maples (*Acer sp.*) along 207th Street (B. Roberts)

Other significant vegetative features on the site include the wind break on the southern property line (see Figure 4.11), a row of fourteen trees along the eastern half of the northern property line, and a row of maples along 207th Street (see Figure 4.27).

Given the sites present uses, it was assumed that the biological stability on both sides of the site was quite low, with little opportunity for reproduction or self-regeneration of the existing species to occur. On other hand, the disturbed condition of the site, especially on the nursery half, makes potential of colonization by new species quite high.

Topography

With the exception of the mound and retention areas, the site is fairly flat with most slopes ranging between zero and three percent. Six percent slopes occur in a few localized areas such as off the south east corner of the tennis courts and the east side of the farm yard. The mound and the retention areas are significantly steeper areas with slopes ranging between twelve and twenty percent.

On the eastern half of the site, a high point at the west end of the farm yard acts as a divide where the ground slopes away to the north-east and south-east. Unlike the west side of the site where runoff is collected in the detention area, runoff on the east side is

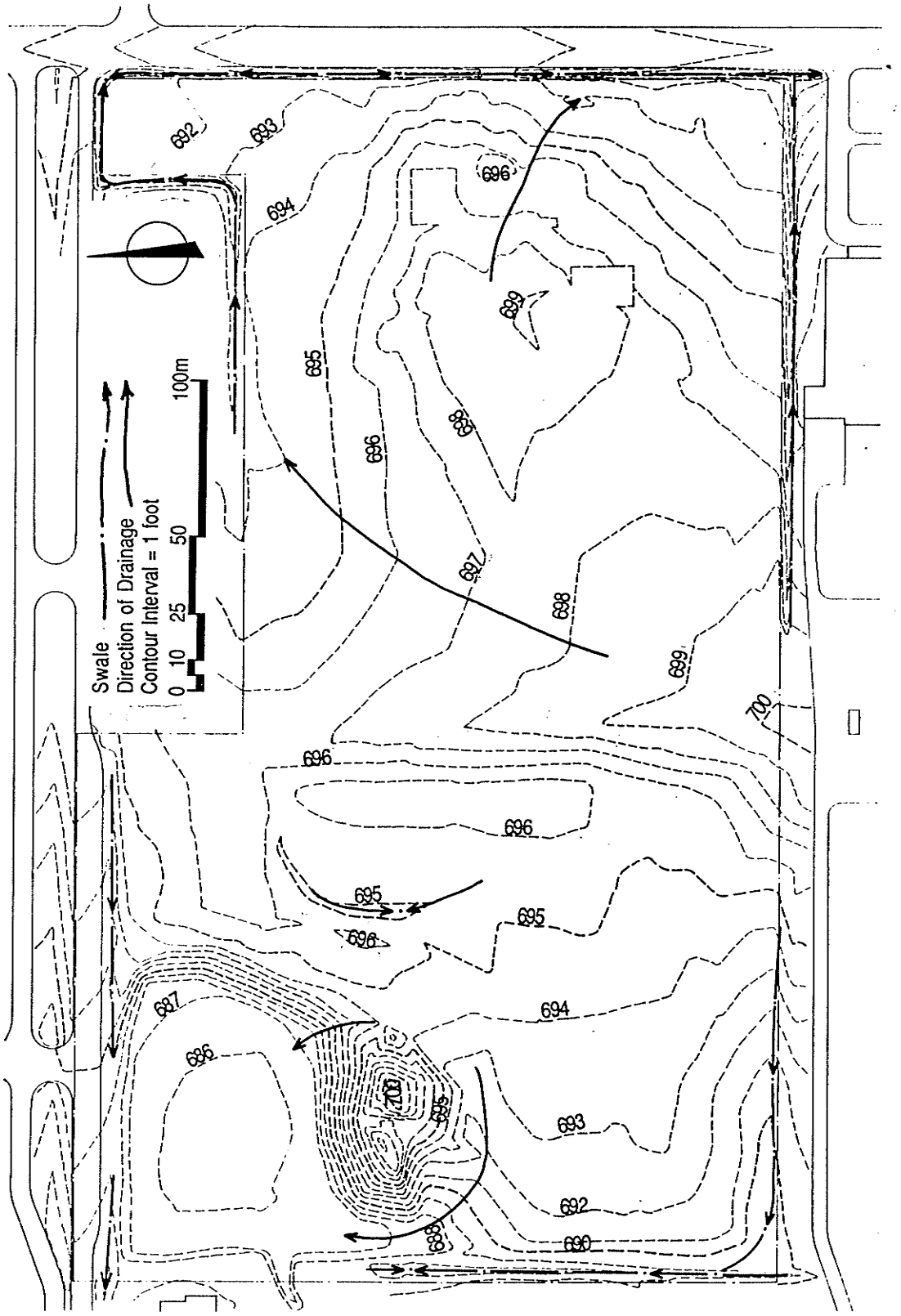


Figure 4.28 Topography / Drainage

collected in the ditches and flows off site immediately.

Even though the detention area is the only area on the entire site where a substantial amount of water can collect, very little flows into it directly. Most of it is collected into swales and then enters the detention area via a series of underground pipes. Runoff from the surrounding neighbourhood also enters the area in the same way.

Soils

While the soil analysis provided in the competition brief is quite extensive, it does not indicate how or when the samples were collected. The key points that were made in the analysis are that much the soil has moderately slow air and water movement, and medium to slow surface run off which means the soil may take some time to dry out. Consequently, the water capacity is said to be moderate over most of the site except along the western edge where it is high. In terms of pH levels the profile changes from slightly acid to neutral on the surface, to moderate to strongly acidic in the upper subsoil (except along the western edge where it is neutral to mildly alkaline), to mildly to moderately alkaline in the lower subsoil. These conditions are consistent with those of most of the forests and prairies in this region.[19]

Figure 4.29 maps the three soil types that can be found on the site.[20] All of them are reported to be able to produce good turf, however it is easily damaged when wet, especially in the Ashkum silty clay loam and Beecher silt loam. The analysis report recommends the surfacing of paths in these areas since they are particularly slow drying. On the other hand, the Markham silt loam in the central areas of the site only stays wet for brief periods of time, and therefore rates higher in terms of recreational suitability.

Given the site's history it is assumed that the soil profiles have been altered from their original state. Through the agricultural operations, the 'A' and 'B' horizons would have been mixed together over most of the site. In a few areas the profiles would have been completely transformed. It is likely that those of the detention area and the mounds consist of a maximum of 10 - 15 cm. of organic material lying over a base of underlying parent material, and obviously the area occupied by the tennis courts is now an impervious surface. Despite these changes, it is likely that the micro-organic processes continue to function in over most of the site, but just at lower rates than they had in the past.

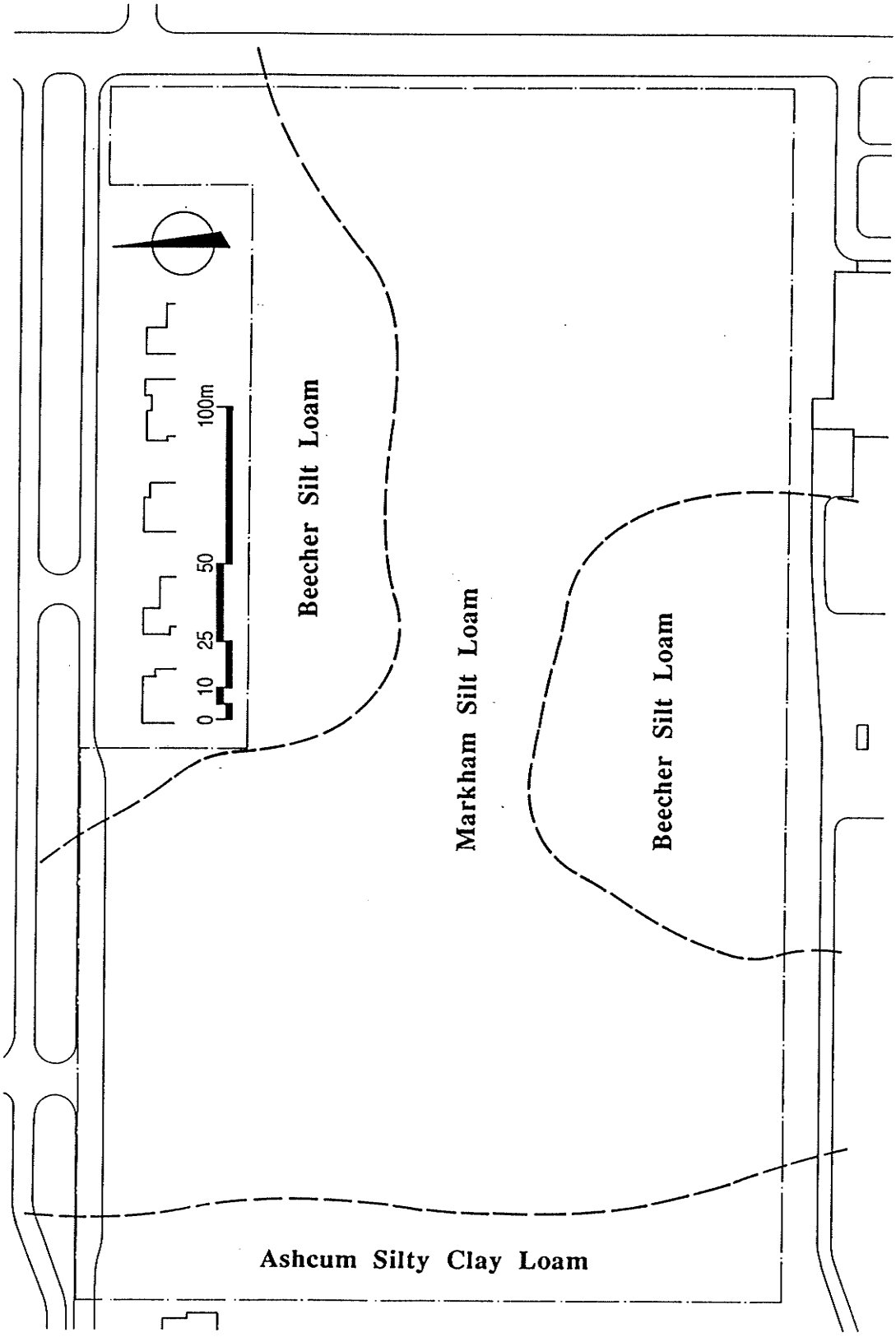


Figure 4.29 Soils

Micro-Climate

It was assumed that the overall temperature and precipitation regimes would not be any different from those recorded at Park Forest, given the proximity of the community to the site. However, certain areas of the site could have milder or more severe micro-climates. The heavy shading from the mature vegetation and the buildings in the farmyard will have a cooling effect in this area. The shelter these features provide will also reduce wind speeds. As a result, higher humidity can be expected here. However, due to the number of large trees in this area, moisture availability will probably still be lower.

A zone along the windbreak on the southern property line will have a similar micro-climate to the farmyard, although it will be windier at times. The existing mounds will also have distinctive micro-climates with the south slopes being warmer and drier, and the north slopes being cooler and wetter. Finally, an area around the tennis courts will be subject to higher albedo and warmer and drier conditions due to the reflective and heat absorbing qualities of asphalt.

Potential Ecosystems

From the preceding analyses, four different ecosystems were identified as having potential applicability in the redevelopment. Despite past disturbances, the physical attributes of the majority of the site, particularly its climate, soil, and topography, seemed to be most consistent with those of the oak - maple forest and tall grass prairie communities identified in the analysis of regional ecosystems. It is surmised that in the absence of further intervention, the site would evolve from its present state into a grass land community, and over time progress to open then closed scrub, until ultimately climaxing as a hard wood forest. Each of these successional stages seemed compatible with the primary human uses of passive recreation and environmental education. Therefore, these communities were chosen as the main ecosystems to base the ecology of the site on. Additionally, the topography and function of the existing detention area suggested that this area could support a small wetland community. The soil characteristics and water source (i.e., surface run off) indicate that a cattail marsh would be the most appropriate community to base this ecosystem on. The fourth ecosystem would be the active recreation areas. This ecosystem will be the most characteristically human of the four in that a high percentage of its ecological functions will continue to be facilitated or controlled through intensive human intervention. For example, the grass in the baseball diamond will continue to be mowed.

Species composition for each community will vary according to moisture conditions, which range from somewhat dry or dry - mesic on the mounds, to wet - mesic or wet in the detention area. The majority of the site is considered to be mesic or somewhat wet - mesic. From Braun's data (see p. 83) the main canopy species of the forest should be a mixture of oak and maple, with *Quercus alba* (White Oak) having dominance in dry or dry - mesic conditions, *Quercus rubra* (Red Oak) and *Acer saccharum* (Sugar Maple) becoming co-dominant in more mesic conditions, and *Tilia americana* (American Basswood) and *Ulmus americana* (American Elm) developing some presence in wetter areas. The main understory plant species would be selected from Curtis' data for communities of Southern Wisconsin (see pp. 84 - 85). This data was the most detailed available, and the sites proximity to southern Wisconsin should make it reasonably transferable. In practice, data from more local communities would be desirable, however for the purposes of this exercise Curtis' data was deemed to be sufficient.

The main plant species for the prairie and marsh areas would also be selected from Curtis' data. Depending how the site is actually designed and the degree of human impact the area will be subject to, much of the site may develop a higher percentage of colonizing species than their native counterparts. In fact colonization by many so called 'weed' species such as *Taraxacum officinale* (dandelion), *Trifolium sp.* (clover) and *Medicago sativa* (alfalfa) can be expected. While they could be called weeds when present in one's yard, they will have their place in these communities. At this point in the demonstration the specific understory, prairie, and marsh species that would be used were not identified. It seem appropriate to wait until the design was more developed so that species could be matched to the specific moisture conditions and human uses. Curtis' data will be useful in this respect, because it provides lists of the prevalent species in each of a wide range of conditions. From this it will be possible to choose an appropriate collection of species for each of the conditions present.

The active recreation areas will retain their existing ecology. This will provide a dynamic contrast to the other more 'wild' ecosystems, thereby enriching the experiential quality of the site. To make these areas less energy and resource dependent, alternative, more sustainable maintenance strategies may be employed, however this is more an issue of management than of design.

Detailed Design

Once potential ecosystems had been identified an overall layout for the site (Figure 4.30) fell into place quickly. The main access points of were already identified in the 'Detailed Site Analysis'. To tie the park in with its surrounding context (at least visually) it seemed appropriate to develop a forest community around the periphery of the site.

Since the barn was slated to become a public gathering space, the old farm yard was identified as a major focal point in the site. Given the ecological focus of this proposal and the desire to include an interpretive program in the design, the barn was seen as having enormous potential for being converted into an interpretive facility. A facility similar to Fort Whyte Centre in Winnipeg was envisioned. This lead to the decision to develop the old farm yard as a formal interpretive centre where more intensive group environmental education could take place. In recognition of the potential educational value for explaining the cultural history of the site and region, the agricultural character of this part of the site would be retained as much as possible, keeping in mind the objective of minimizing inputs of energy and resources.

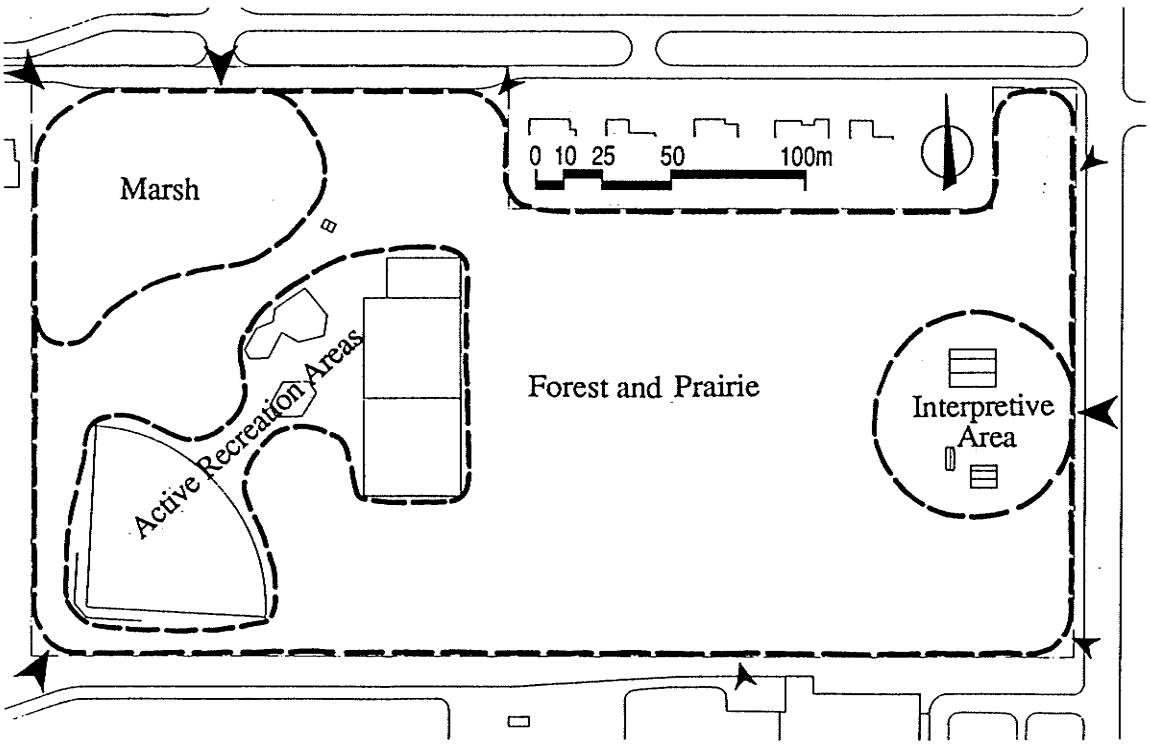


Figure 4.30 Site Organization: Main ecosystems and access points

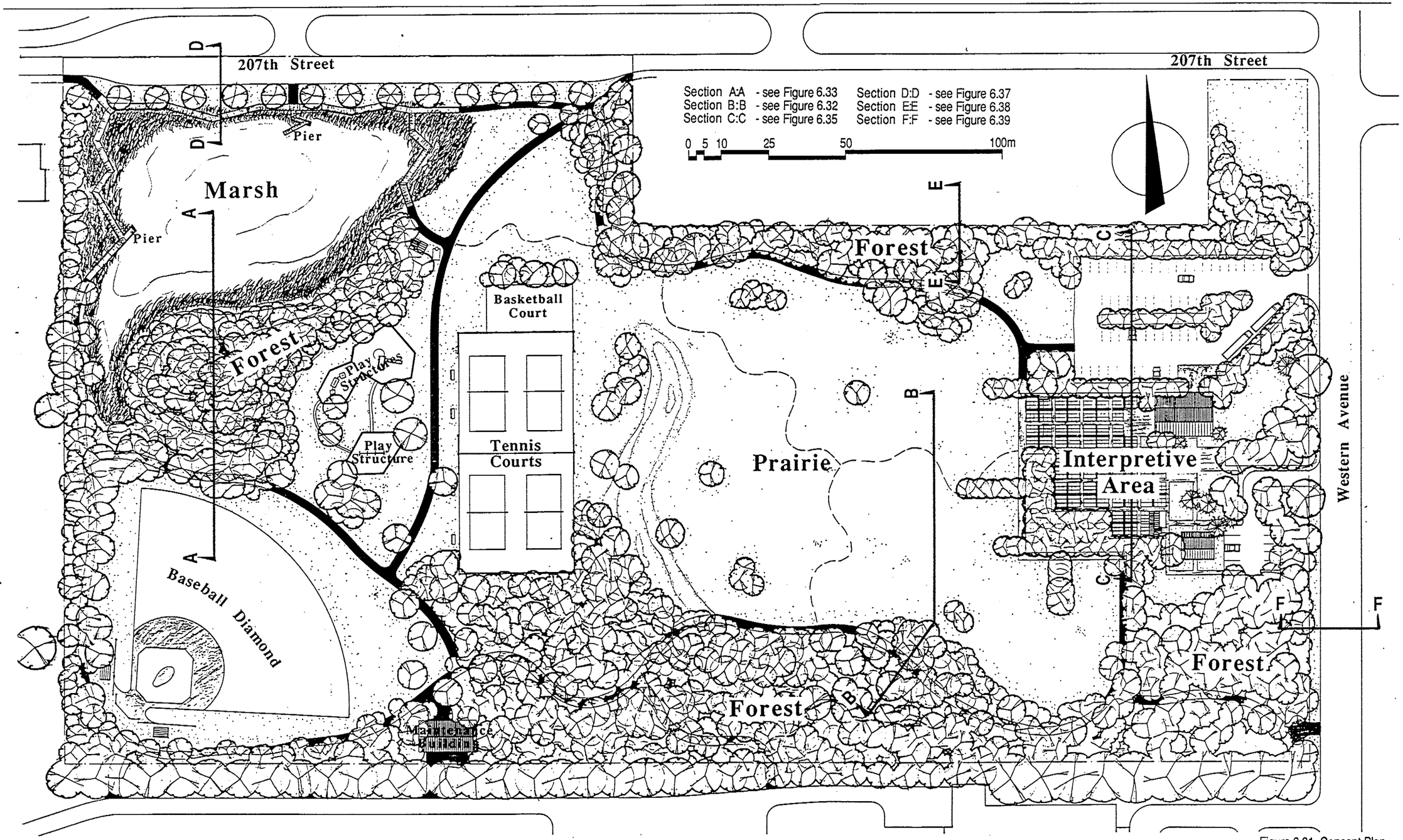


Figure 6.31 Concept Plan

With the existing recreation facilities remaining in place, and the detention area being designated as a potential cattail marsh, the centre of the site would be left open to become a tall grass prairie meadow. A network of pathways would then be developed to connect the various areas of the site and guide visitors through each of the proposed ecosystems.

Having established a general program and layout for the site the next step was to consider the scheme in more detail. This involved:

- further developing the form and character of each area of the site
- establishing a framework for the interpretive program.
- developing the system of circulation through the site
- detailing the edges of the site
- considering potential linkage with the surrounding community

Throughout this phase the objectives set out in the strategy (see pp. 17 - 18, 23) formed the primary decision making criteria. Figure 4.31 illustrates the design that resulted from this process. The remainder of this section discusses each of the components in more detail.

The Prairie

The main prairie meadow is located at the centre of the old nursery, from where it spreads out like a carpet, filling in the voids between the forest, marsh and interpretive area. The active recreation areas then form islands within the midst of it.

Figure 4.32 depicts a typical cross section through the prairie area and illustrates the structure that this ecosystem would have. The majority of the community will be wet - mesic in character in response to the existing soil conditions. Presumably, there will be some localized areas where the character tends to be more mesic or more wet in response to slight variations in the soil or topography.

A list of potential plant species was developed by taking the five most frequent species from Curtis' lists of prevalent species in wet, wet - mesic, and mesic prairies (see p. 88). Selecting species from each of the three prairie types ensured that there would be a variety of species for each of the conditions that were present on the site. This would also give the community some ability to respond to long term precipitation cycles.

In the interest of preserving this community as part of the interpretive program, this habitat would require some form of management. Without any management, it would progress from open to closed scrub until it was completely transformed into forest. At

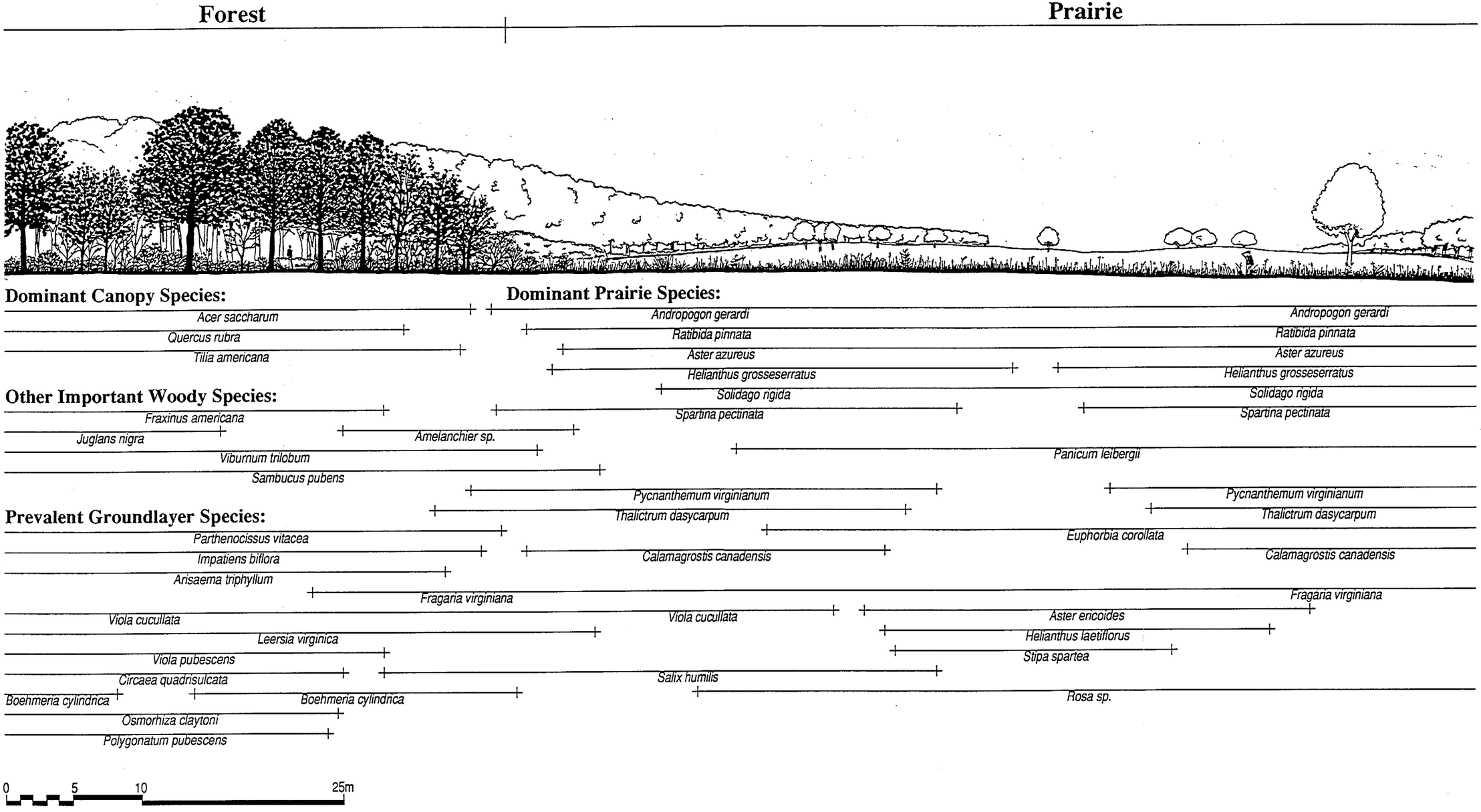


Figure 6.32 Forest and Prairie Ecosystems: Typical Transect

the very least it will require one mowing each year. This would eventually result in a fairly consistent community that changed very little from year to year. An alternative would be to introduce a burning program. One possible scenario would be a rotational annual burn, where the prairie area would be divided into five to eight zones, and a different one burned each year. In this way the maintenance of this ecosystem could become an annual ritual, perhaps as part of a fall festival, thereby serving to further restore the community's ties with the land. By only burning a portion of the prairie each year the amount of smoke produced would be limited, and a higher level of species diversity would be maintained in the community since several stages of succession could exist at once.

The Forests

As noted in the 'Potential Ecosystems' discussion, the main canopy species in the this community would be a mixture of oak and maple, with *Quercus alba* (White Oak) dominating in dry - mesic conditions, *Quercus rubra* (Red Oak) and *Acer saccharum* (Sugar Maple) co-dominanting in more mesic conditions, and *Tilia americana* (American Basswood) and *Ulmus americana* (American Elm) developing some presence in wetter areas. Figure 4.32 depicts a typical cross section through a fairly flat area of the site. In these areas the forest would be wet - mesic in character. In contrast, a cross section though the hill between the baseball diamond and the marsh area is depicted in Figure 4.33. Here the community at the top of the hill and down the south facing slope would be dry/mesic in character, with the north facing slope progressing from wet/mesic to wet at the base of the hill near the marsh. As with the prairie community Curtis' listings of prevalent species were used to develop a list of ground layer plants for this community. Here the five most frequent species from the wet, wet - mesic, mesic, and dry - mesic forest lists were chosen (see p. 86).

For implementation, this proposal recommends planting the forest areas with a variety of sizes of specimens in several of the patterns proposed by Emery.[21] Each area could then be monitored as part of an on going management program to see which system works the best in the interest of advancing the technological aspects of ecologically guided design. Other than this monitoring, little maintenance is proposed for this habitat, except for keeping back the grasses and other herbs that will grow around the young trees for the first couple of years. Once the plants become established the intent is to leave this community alone and let it evolve into a closed canopy forest where the individual specimens will complete their life cycles including, propagation, death, decomposition

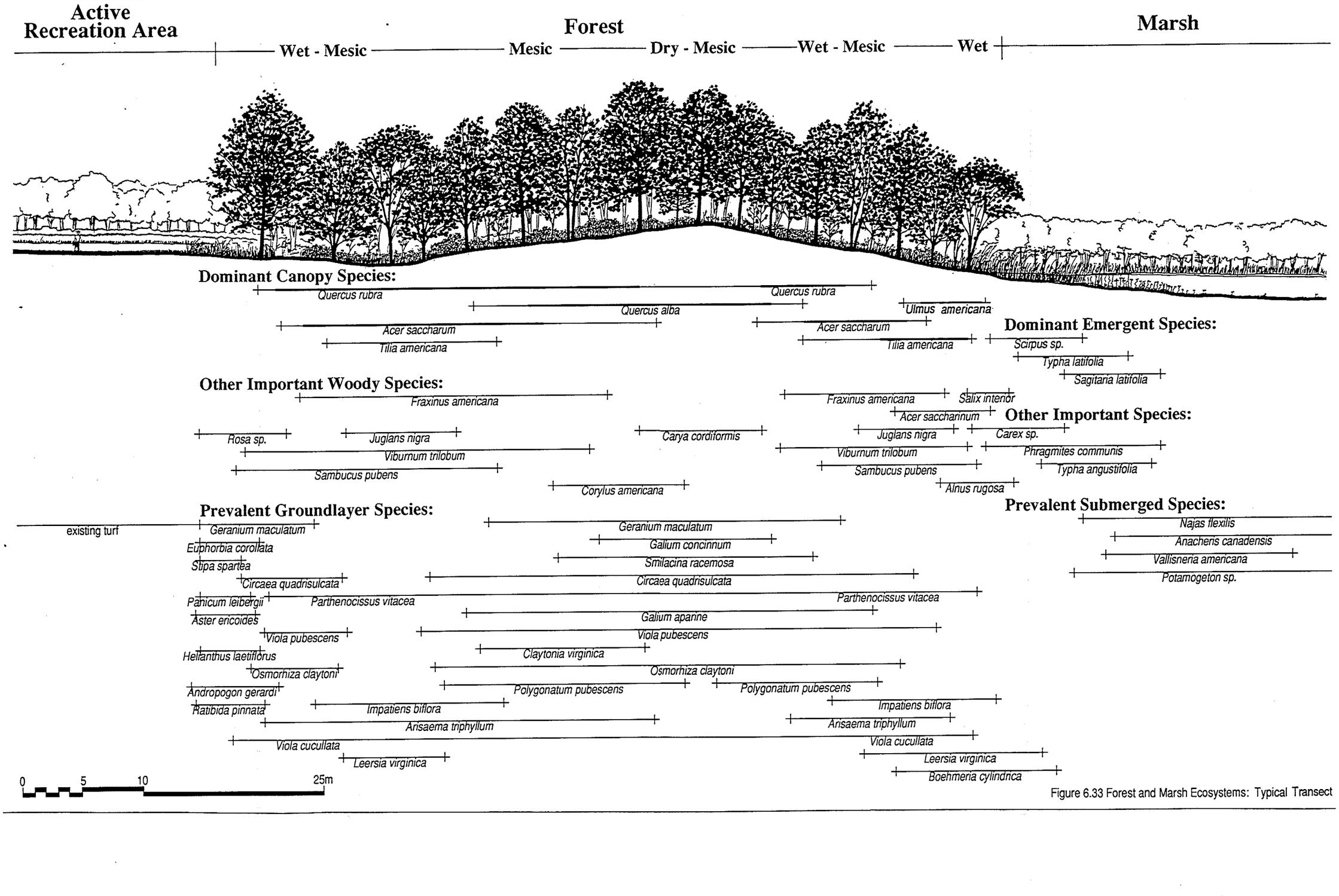


Figure 6.33 Forest and Marsh Ecosystems: Typical Transect

and regeneration. The observance of this cycle could then constitute an important component of the interpretive program of this community. Alternatively, mature specimens could be harvested as part of a community wide urban forestry program, although this may diminish the impact of the lesson that death and decomposition are integral parts of the cycle of life. It will be necessary to make a decision on this issue at some point when developing the maintenance program.

The Marsh

A typical cross section of the marsh ecosystem is illustrated in Figure 4.33. Like the other communities that have been described so far, Curtis' data was used to develop the potential plant lists for this area (see pp. 88 - 89).

To establish this community, while retaining the sites present storm water detention capacity, the existing detention area would be deepened, expanded and turned into a retention pond. In the process, the form would be modified slightly to create a more irregular shape. This would include sculpting the bottom into a series of irregular shelves or steps, instead of the original even gradual slope, to create a variety of water levels in response to the differing needs of the various species that will colonize this ecosystem. The excavated material would be retained on site and used with the piles of debris left behind by the nursery to expand and soften the form of the existing hills and to create another hill on the east side of the tennis courts. The new hill will screen the view of the tennis courts from the prairie meadow and interpretive areas and create the illusion that the meadow is larger than it is thereby capturing the expansive character of the prairie.

Transplanting plant material from existing wetlands in the region, including from the north-east corner of the site, will provide a vector for the introduction of many of the tiny micro-organisms that are so important to this community. This technique would be useful in the other communities as well. The implementation process could also include stocking the marsh with several species of fish, frogs and other fauna.

The marsh's connection to the ditches, will result in periodic flooding from rainstorms which will fluctuate water levels and aid in circulating the water in the system.

As component of the interpretive program, part of the marsh will be encompassed by a boardwalk that crosses back and forth between the water and the deep grasses that surround it to allow the visitor to study the full spectrum of the marsh community.

To preserve the marsh as an integral component of the series of ecosystems that make up the park, and maintain its storm water retention capacity, it will probably require dredging every five to ten years to prevent it from filling in. The rich biomass that is harvested could then be used in soil rehabilitation projects throughout the region. A less energy intensive alternative would be to allow the marsh to fully drain over the course of a summer and then simply burn it that fall. In either case, water depth and accumulation of biomass should be monitored on an annual basis to determine an appropriate cycle for these activities.

Active Recreation Areas

As previously noted, all of the existing recreation facilities, the ball diamond, tennis and basketball courts, and the play structures, will be kept in place. Their new setting will greatly enhance the experience of the uses of these facilities by increasing the diversity of environments they encounter on their visits to the site.

The only area that would require frequent maintenance would be the baseball diamond which would require mowing once or twice per week during the growing season depending on the frequency of its use. Still, by limiting maintenance only to those areas that really require it the input of energy and resources into this system will be kept to a minimum.

Given the close proximity of the prairie, it is reasonable to assume that over time the lawn area will be invaded by what would be considered to be weed species. However, as acceptance of ecologically based design grows, hopefully the users will come to accept this new type of lawn.

Finally, in response to the competition requirements the two thousand square foot storage shed was located at the end of the first base line of the baseball diamond. This was seen as being the most logical location since the baseball diamond was the only part of the site that would require frequent use of machinery for its maintenance.

The Interpretive Area

From a design perspective, the interpretive area is the most complex component of the whole scheme. Figures 4.34 and 4.35 illustrate this area in more detail. Set in the old farm yard, it consists of an interpretive centre which is set in the old barn, an interpretive garden, a series of outdoor gathering spaces, and the visitor parking lot. In addition, the milk barn would be renovated to serve as a small research lab, and the old farm house

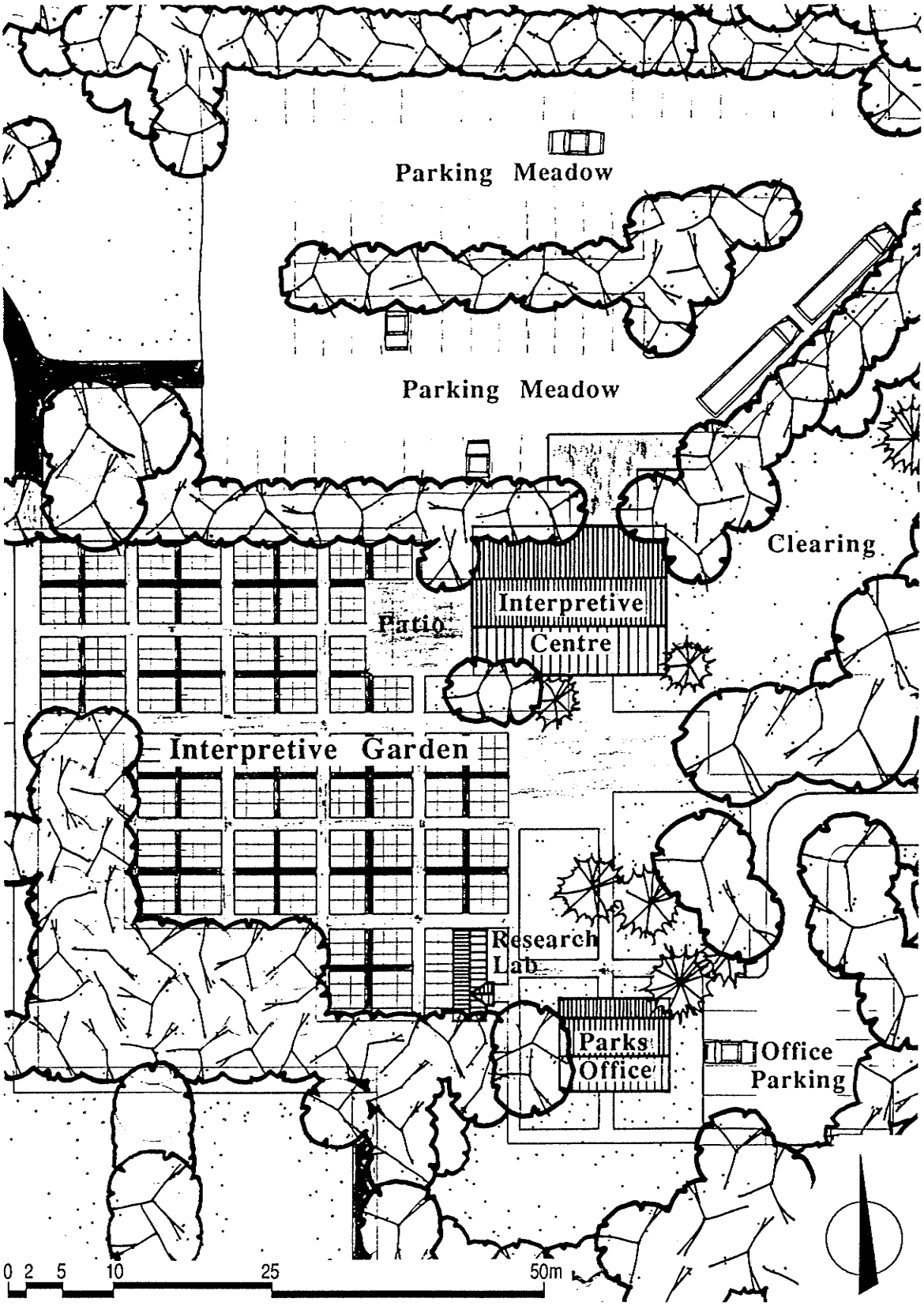


Figure 4.34 Interpretive Area: Plan

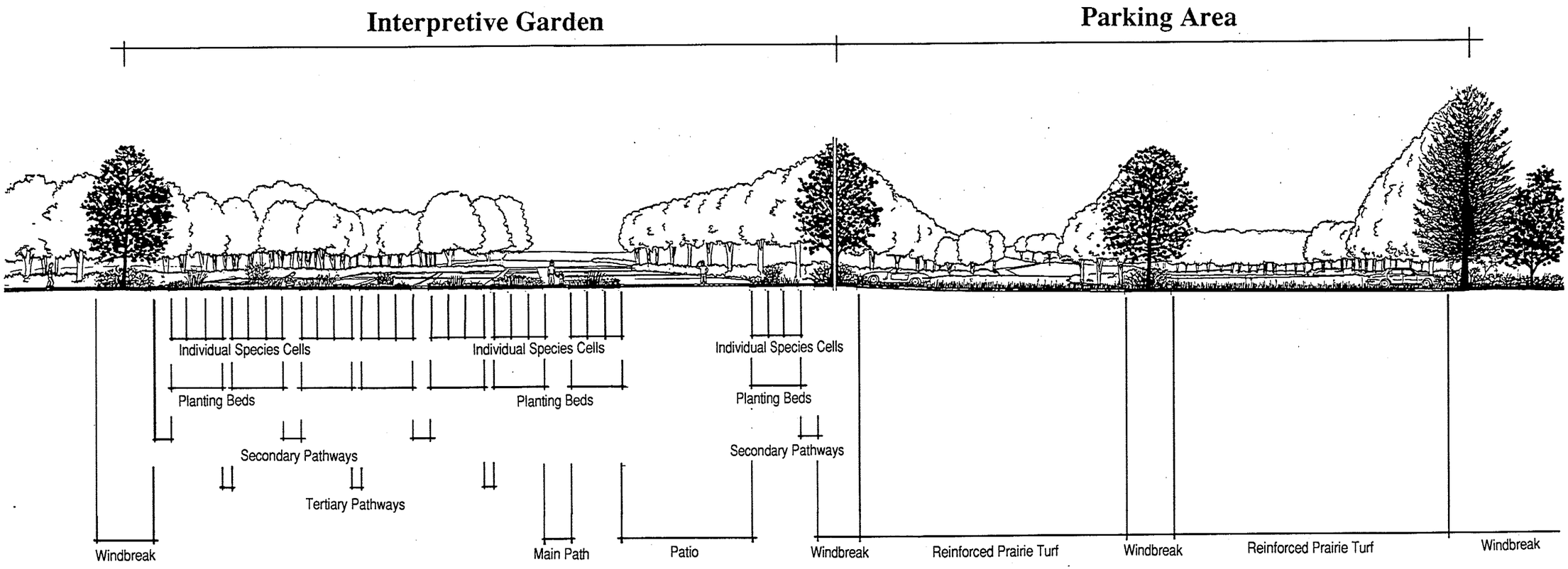


Figure 6.35 Interpretive Area: Section

would be converted into a Park District Office, with the clearing to the east of it being developed as its parking area.

The interpretive centre would house exhibits, instruction / discussion spaces, an information counter, and a park archive. The archive would hold records of the site's history, a maintenance plan, documentation as the site evolves from year to year, information about the environment and ecology, information about any research that has been done in the facility, etc. It would also contain a record of each species, plant, animal, etc., that is identified on the site. As part of the exhibits, when a new species is identified on the site, pictures and information about it (what it is, its characteristics, where it is typically found, and the role it plays in the community, etc.) would be displayed in the interpretive centre.

The interpretive garden is intended to serve as a plant identification guide for the visitor to become acquainted with the various herbaceous and ground cover species they will encounter around the site. Trees and shrubs would also be labeled identification in other key areas of the site. The garden is located right on the edge of the prairie meadow, and is composed on a twelve foot square grid, with each square being divided into nine four foot square cells of a single species. The grid was chosen as the structure for the garden as an echo of the geological survey grid in reference to the agricultural history of the site. The species would be maintained as monocultures in each small square in keeping with agricultural concept and to ease identification. This would make it a fairly high maintenance area. However, with its limited size, it should be able to be maintained by the staff of the interpretive centre.

The garden could also be used to demonstrate companion planting and other gardening techniques that do not require the use of chemical pesticides, herbicides or fertilizers.

The rest of the area between the interpretive centre and the parks office would serve as gathering or outdoor instruction spaces. The visitor parking lot on the north side of the centre would have much the same character as the rest of the area. It would not be paved. Instead it would be constructed of reinforced prairie turf to create the impression of parking in a field. This construction was chosen over hard pavement because as a community based park, hopefully the users will walk rather than drive, to the site, thereby limiting the need for a high impact surface here. Still, as a relatively new concept and being the first ecological park in the region, it will attract visitors from a fair distance away, so it will be important to accommodate them. For the same reason, the 'parking field' was designed to accommodate school buses.

It was anticipated that the office parking lot will be subjected to considerably more use. Therefore, it will be paved. However, it will utilize small unit pavers which are much more environmentally benign than other hard pavement since they can be re-laid if it becomes necessary to excavate. The existing stone driveway will be integrated into the access route to this parking area as an effort to conserve resources and in recognition of its historic value as a remnant from the site's past usage.

Most of the existing planting in the interpretive area will be retained, and any new planting will be done in keeping with the rectilinear agricultural theme. Remnants of the old nursery will extend out in straight rows into the prairie entwining the two areas together and firmly entrenching the heritage of the site into its future.

The Interpretive Program

To supplement the interpretive centre and its accompanying garden, there would be a system of signage placed at key locations throughout the site. The intent is to make the site interpretable by the individual without the constant need for an interpretive guide. Through the interpretive centre, guides could conduct regular tours of the site, however visitors would also be able to experience and learn about the site on their own to develop a more personal relationship with the environment.

The interpretive centre will also be involved in monitoring succession, colonization, and the interactions between the different site types and the impact of human activity upon each of them. In this way the function of this park as a didactic landscape will expand to include service as a centre for on going environmental research.

Circulation

The main path system through the park would be laid out in a loop that essentially follows the edge of the forest community and serves as a means of moving directly through the site or from one part of the site to another (see Figure 4.36). The path would be about eight feet (2.5 m) wide to allow sufficient room for cyclist and pedestrian movement and would be surfaced with woodchips. This route carries the visitor past all of the main destinations and through each ecological community. To experience a more personal connection with the ecosystems, visitors would also be free to move off the trail to explore the site on their own.

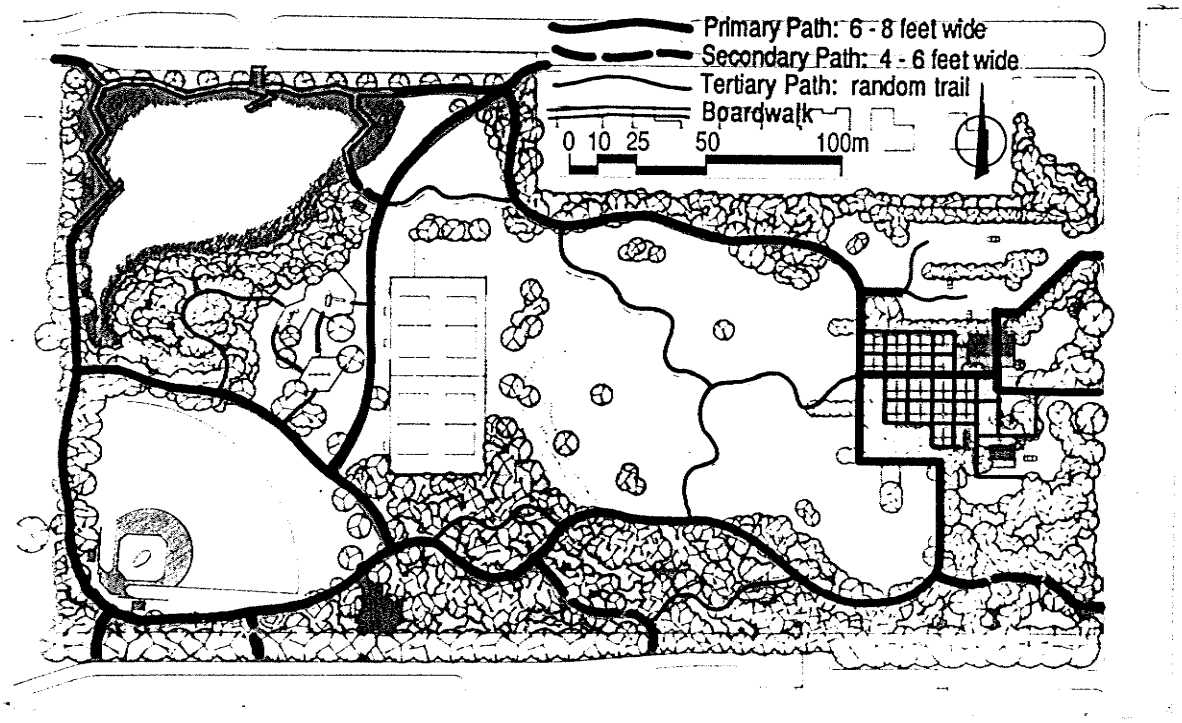


Figure 4.36 Circulation

Edges

With the exception of the area along 207th street, the site is enclosed by the forest community. This serves to contain the site and create the sensation of being out in the wilderness. It also provides shelter and summer shading for the adjoining residential properties and ties the site in with the surrounding context that is dominated by remnants of the hardwood forest. Unfortunately there is often the risk that these types of sites will be interpreted as being messy and unkept.[22] Since this site makes a radical departure from the landscapes around it, it is important at least initially, to denote a boundary to the ecologically based area so that the site also fits in the more manicured character of the adjoining properties. The delineation of the edge will demonstrate respect for the existing context and serve as a strong visual cue that the design and consequent appearance of the site is intentional.

Along the edge of 207th Street the existing row of maples would be retained along with the turf which would be mowed up to the row of 4X4 posts. At this point the turf species would give way to the prairie and marsh ecosystems. A similar condition would be

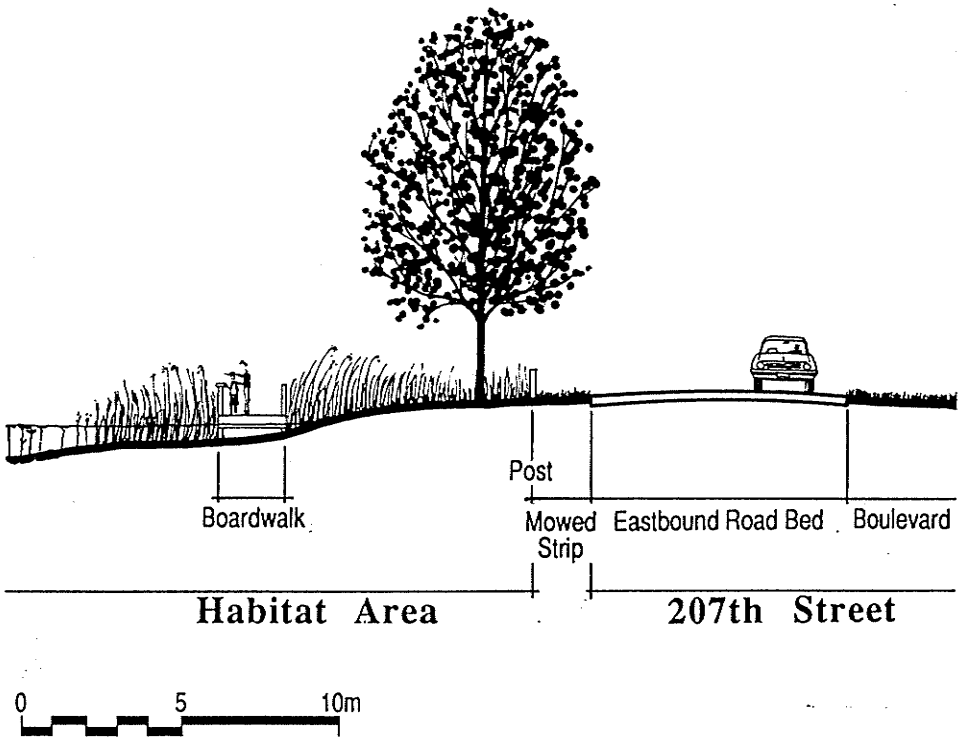


Figure 4.37 Edge Condition: 207th Street

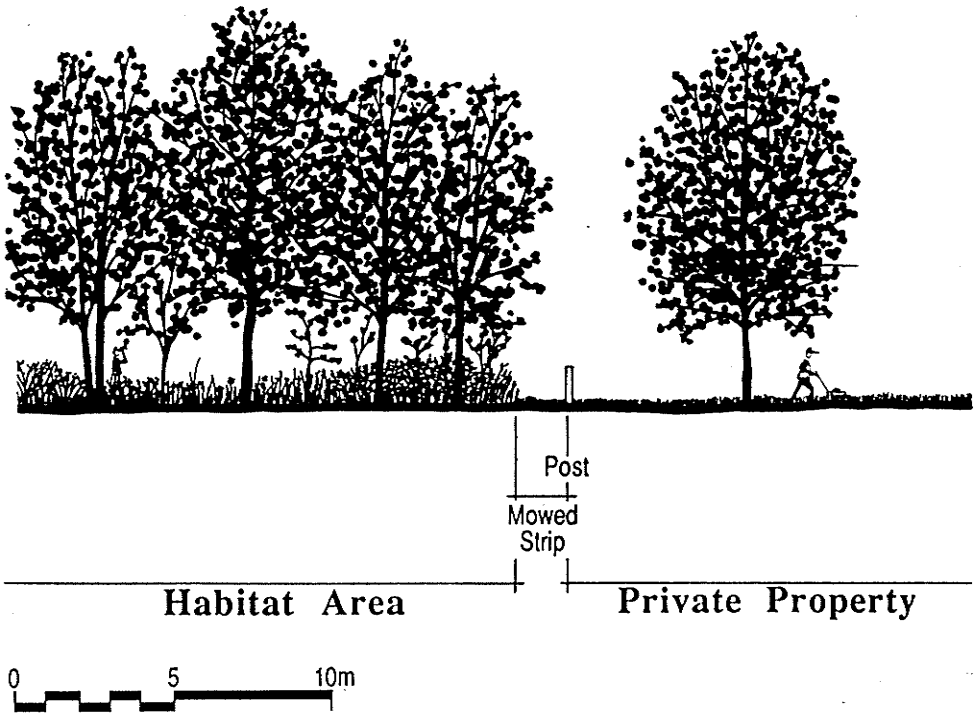


Figure 4.38 Edge Condition: Private Property

maintained along Western Avenue, where the easement would be cut periodically, from the edge of the pavement up to the property line. This property line would also be delineated by 4X4 posts.

Along the adjoining properties, the forest would flow right up to the property line, which would be delineated by a mowed strip and more 4X4 posts.

Eventually the community may decide that it no longer needs to maintain these mowed edges. Some residents may adopt this design process in developing their own yards. At that point the communities in the park could be allowed to flow right up to and possibly beyond the edge of the road ways or adjacent property. Then as more residents adopt this method of landscape design, the communities set up in this park may reach out and connect with other wilderness areas and wildlife corridors in the region (see Figure 4.40). In this way this small 7.87ha park could serve as a catylst for the establishment of a broad network of ecological communities.

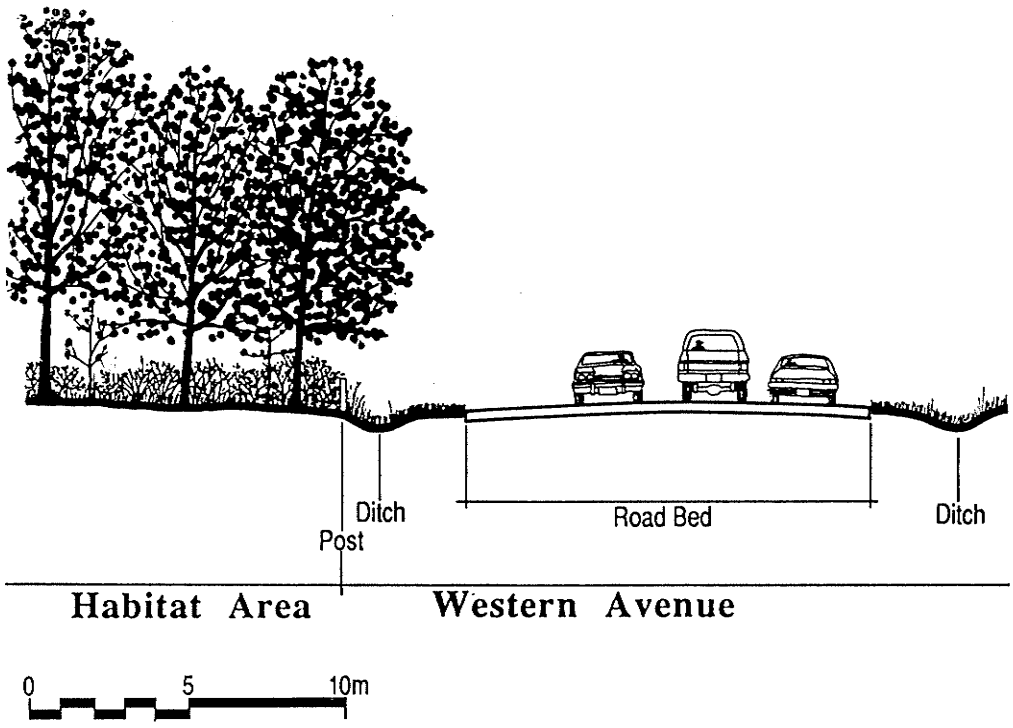


Figure 4.39 Edge Condition: Western Avenue

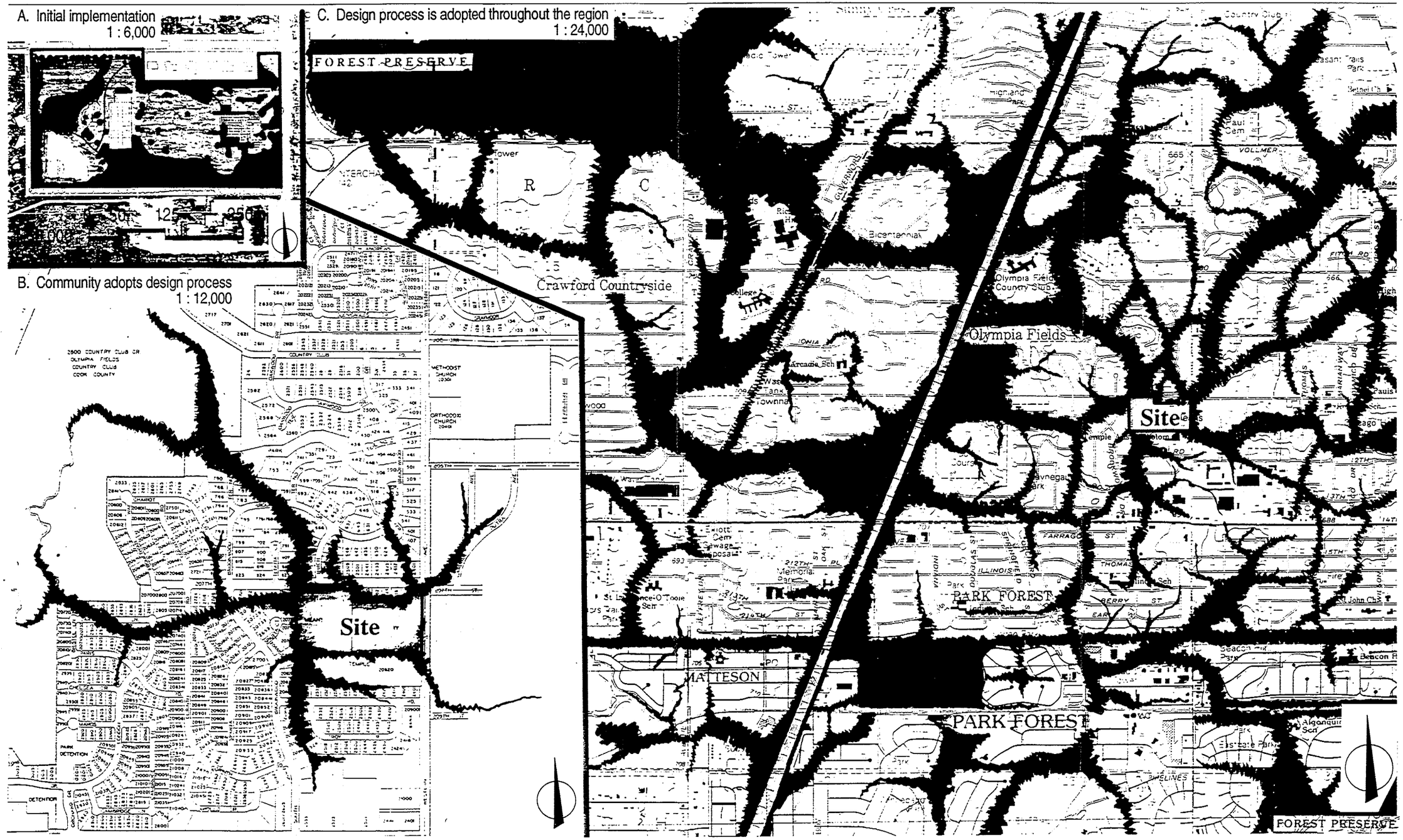


Figure 6.40 Potential Future Expansion into an Ecological Network

1 Jeffrey Ollswang and Lawrence Witzling, *Design Competition for A New American Green - Program*, (Olympia Fields Park District, 1991), p. 3.

2 Ibid., pp. 3, 8.

3 Jeffrey Ollswang and Lawrence Witzling, *Response to Inquiries*, (Olympia Fields Park District, 1992), p. 3.

4 Robert Mohlenbrock, *Guide to the Vascular Flora of Illinois*, (Southern Illinois University Press, 1975), p. 1.

5 Ibid., p. 14.

6 Ollswang and Witzling, *Program*, p. 2.

7 Ibid., p. 2.

8 The climatic data used in this study is given the Appendix.

9 Lucy Braun, *Deciduous Forests of North America*, (New York: Hafner Publishing Co., 1967), pp. 492 - 493, and map 1950.

10 Ibid., p. 323.

11 Ibid.; and John Curtis, *Vegetation of Wisconsin - An Ordination of Plant Communities*, (Madison: University of Wisconsin Press, 1959).

12 Mohlenbrock, p. 12.

13 Ollswang and Witzling, *Response to Inquiries*, p. 2.

14 Ollswang and Witzling, *Response to Inquiries*, p. 6.

15 The demographic data used in this study is given the Appendix.

16 Ollswang and Witzling, *Response to Inquiries*, p. 2.

17 Ollswang and Witzling, *Program*, p. 3.

18 Ibid., p. 2.

19 Curtis, p. 518.

20 Profiles for each soil type are included in the Appendix.

21 Malcolm Emery, *Promoting Nature in Cities and Towns: A Practical Guide*, (Dover, New Hampshire: Croom Helm, 1986), p. 197.

22 Chris Baines, *The Wild Side of Town*, (Elm Tree / Hamish Hamilton Ltd., London, 1986).

5. Discussion

The demonstration in the previous chapter is an example of an application of the process outlined in chapter three of this study. The proposed design consists of an environmental education and research centre, several existing active recreation areas, and a collection of three ecological communities that are based on indigenous ecosystems of the region: oak - maple forest, tall grass prairie, and cattail marsh. This new landscape would be incredibly dynamic. It would be vibrant, constantly changing (both seasonally, and from year to year), and spatially and ecologically diverse; all of which would make it an exciting place to visit.

The proposal accommodates the original functions of active recreation, passive recreation, and storm water detention, in addition to facilitating environmental education and research, and additional opportunities for passive recreation. Furthermore, if implemented, ecological processes would for the most part proceed unabated by energy and resource intensive management. This is not to say that the landscape would be completely free from human intervention. On the contrary, intervention would remain an integral part of the ecology, particularly in the prairie, marsh, and active recreation areas. While one of the objectives of this design process is to create self-sustaining ecosystems, it is important to recognize that humans are a dominant species in the urban environment, and as such, we play a significant role in the functioning of the ecosystems within it regardless of whether we intend to or not. For instance, without any direct intervention the prairie community in the proposal would eventually evolve into forest since we have virtually eliminated fire and other natural regenerative mechanisms from the urban environment. Therefore if we desire to have these communities within our cities, as is the case in the proposal, it is necessary to provide alternative mechanisms for their regeneration. In these situations some direct intervention may be required. The key is to choose methods that have minimal energy and resource requirements such as the proposed use of controlled burning in the prairie areas of the demonstration project. However, if a method with minimal energy and resource requirements can not be identified, then it is advisable to reconsider the decision to include the particular community in the design. In some cases it may simply be a question of scale. For example, while it may not be feasible to maintain the entire demonstration site as a mown turf community, limiting mowing activities to only those areas where it is absolutely necessary (i.e., the active recreation areas) could bring the energy and resource requirements down to acceptable levels. In others situations it may be more appropriate

to consider an alternate ecosystem.

In developing the proposal two major challenges were encountered. First, given the site's history, and its present condition, it seemed feasible to base the potential ecology on the indigenous ecosystems of the area. Unfortunately little data on the structure of those communities could be found. While Curtis' data for Wisconsin was deemed sufficient for this as an academic endeavor, the actual applicability of this data to the site is questionable given the distance of Curtis' sample sites from the demonstration site. Even though the sites are in the same geographical region, it is difficult to ascertain how much variation in ecological structure and species composition there would be between the two areas without sampling a few sites closer to Olympia Fields.

The development of regional databases for the range of ecosystems that could evolve under a given set of conditions would significantly ease the identification of appropriate potential ecosystems. Sites where the proposed design process is employed should be monitored to augment these databases. Additionally, techniques of implementation and establishment, and the response of various ecosystems to human activities should be evaluated for each project to advance the more technical aspects of this design method.

The other challenge encountered in the demonstration was the lack of community involvement. While it was not practical accommodate community participation within the scope of this practicum, it meant that there was little insight into the specific needs and desires of the community, the end users of the facility. Consequently even though the scheme meets the requirements and fulfills the objectives set out by the competition organizers, it is unclear whether it would meet the needs of the community it is intended for. It would have been useful to have at least known the daily routines of the residents in order to understand the role the park plays in their lives. In practice, the use of a community participatory design process would serve as a mechanism to address this issue and as noted in chapter two, it would also promote greater community interaction while providing a unique environmental education experience for those involved.

Since the proposal was not implemented its success can only be speculated upon. Still, the park as proposed could make a valuable contribution to its community and the environment through its focus on environmental education, and if managed in an appropriate fashion, its minimal requirements for the input of energy and resources.

To conclude this discussion, it should be noted that while the demonstration concentrated on the use of the ecologically guided design process to develop a proposal for a suburban park, this process is equally applicable to other parts of the urban environment. With the appropriate modifications, it should be possible to use this process in many other areas such as industrial sites, office parks, right-of-ways, and even residential yards. In this way the functioning of ecological processes could be restored throughout our cities to make them considerably more sustainable. Therefore, future research should also be directed to adapting the process proposed in this study for use in the rest of the urban ecosystem.

6. Conclusion

This study has presented a process for designing open space that accommodates the functioning of ecological processes, examined the benefits of using it, and demonstrated its application in the development of a proposal for the redesign and expansion of an existing suburban park. The process is intended as an environmentally sensitive method of designing urban open space. It involves the careful coordination of the physical environment, biological factors, and the human functions that the site is to accommodate. The goal is to create a framework in which stable, self-sustaining ecosystems will develop so that the inputs of energy and resources required for their long term existence are minimized. To this end the proposed ecosystems need to be appropriate for the site, its context, and the intended functions.

The process has six stages:

1. Identifying the goals and objectives of the particular project and the functions and facilities that are desired of the site
2. Analyzing the site in relation to its context
3. Evaluating the feasibility of meeting the goals and objectives as more is learned about the site
4. Analyzing the specific attributes of the site
5. Identifying potential ecosystems that could develop on the site given its specific micro-climate, context, size, topography, and soil characteristics, and the functions and uses it is expected to accommodate
6. Developing the design by fitting the potential ecology and the desired functions and facilities to the site

The benefits of using this process can be summarized as follows:

- conservation of energy and resources
- reduction in environmentally hazardous practices
- potential mitigation of damage in the event of natural disaster
- reduced costs in long term maintenance and potentially in initial implementation
- enhanced social climate and quality of life for the urban dweller
- great potential for environmental education

While the proposal for Olympia Fields was never implemented, it would be a very dynamic landscape, and if managed appropriately would have minimal requirements for the input of energy and resources.

Having conducted the demonstration, three recommendations that will aid future applications of this design process can be made:

1. In the interest of improving the ease of identifying potential ecosystems, regional databases for the range of ecosystems that could evolve under given sets of conditions should be set up.
2. Sites where the proposed process is employed should be monitored to augment the potential ecosystem databases.
3. Techniques of implementation and establishment, and the response of various ecosystems to human activities should be recorded and evaluated for each project to advance the more technical aspects of this design method.

Additionally, the incorporation of community participation in the design process is encouraged to ensure that the concerns and needs of the end users are met, thereby ensuring that the facility will be adopted by the community, not abandoned. Furthermore, by involving the community in the actual development phases the costs of implementation could be significantly reduced.

Finally, in the interest of making our cities more sustainable as a whole, future endeavors should also be directed into adapting the proposed design process for use in the rest of the urban ecosystem.

During this era of awakening environmental awareness, it seems appropriate to re-examine the way we use and interact with the rest of the environment. We need to recognize that we are part of the ecological communities we live in. We are not mere spectators; we live in them; interact with them both directly and indirectly; we have impacts on them and they impact on us. In some instances we are essential for their well-being, and in many ways they are essential to ours. Accommodating the functioning of ecological processes in the design of open space is one step we can make in renewing our ties with nature and restoring the environment's health. By making sensible choices about the ecosystems we develop today, we can rejuvenate and develop our urban environments as healthy, ecologically diverse and sustainable ecosystems that can be enjoyed by generations to come.

Appendix

Appendix

Climate Data

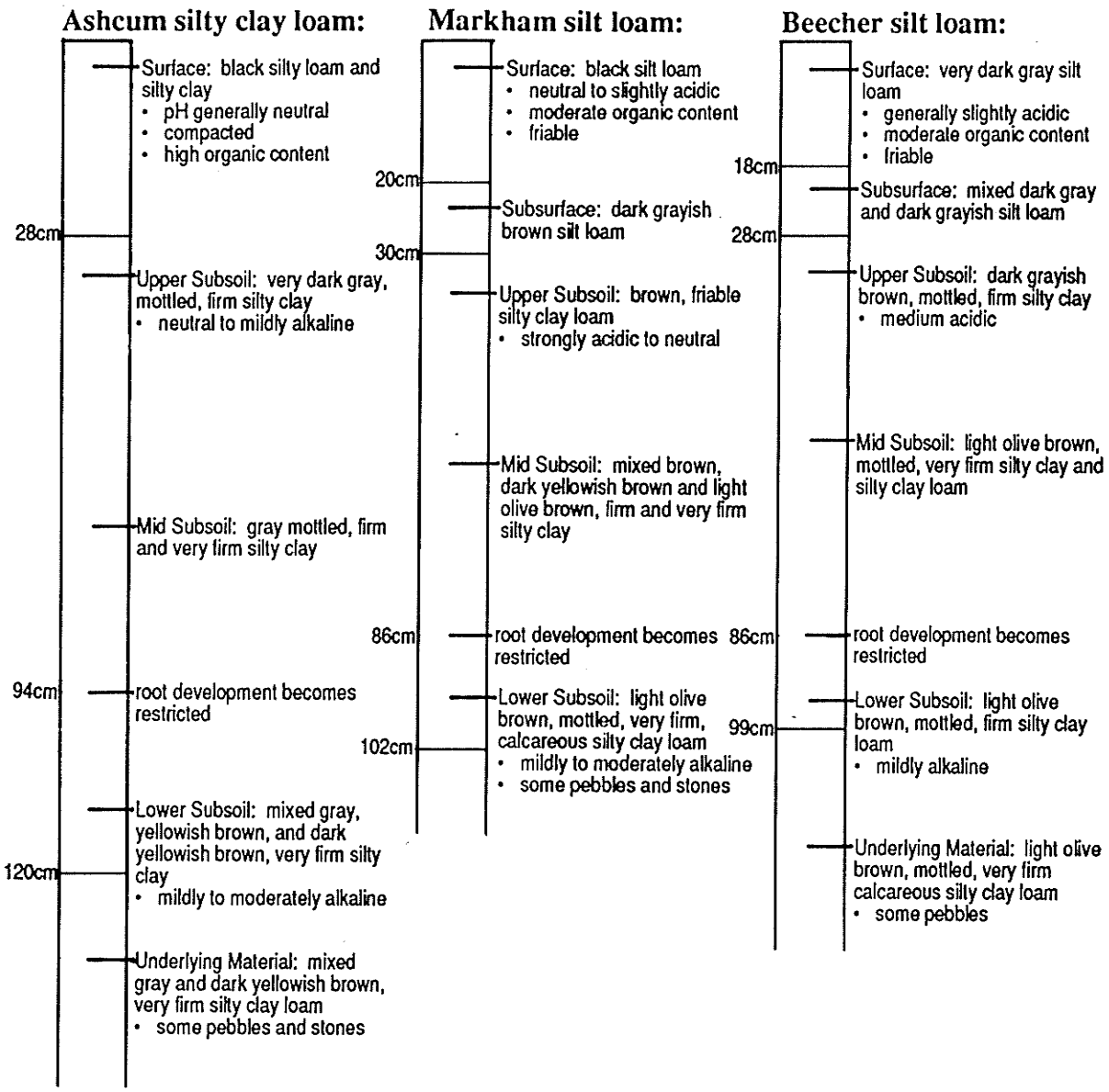
Park Forest:[1]

Temperature °C	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean	-5.9	-3.4	2.1	9.3	15.2	20.8	23.0	22.1	18.3	12.0	4.2	-2.5	9.6
Max	-1.3	1.3	7.0	15.0	21.4	27.0	28.8	27.9	24.3	18.0	9.0	1.8	15.0
Min	-10.5	-8.2	-2.8	3.5	9.0	14.6	17.2	16.3	12.2	6.0	-0.7	-6.8	4.2
Precipitation mm	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Avg	38.9	36.1	65.5	103.4	93.0	110.0	104.6	90.7	77.0	68.8	55.4	51.8	895.1

Chicago Midway Airport (1941 - 70):[2]

Precipitation mm	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Max Monthly	103.9	85.1	127.0	211.6	192.8	225.8	228.1	172.5	359.9	306.3	128.3	169.4	359.9
Min Monthly	6.6	6.4	8.4	11.4	19.8	19.8	33.8	21.6	11.7	5.1	22.6	7.6	5.1
Max 24 Hour	72.6	39.1	63.5	103.6	92.2	116.3	158.5	97.3	93.5	143.0	74.4	70.9	158.5
Days > 2.5mm	11.0	10.0	13.0	13.0	12.0	11.0	9.0	8.0	9.0	8.0	10.0	11.0	123.0
Days > 25.0mm	3.0	3.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	3.0	12.0
Snow mm	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Max Monthly	734.1	571.5	271.8	5.1	0.0	0.0	0.0	0.0	0.0	111.8	363.2	845.8	845.8
Max 24 Hour	502.9	210.8	363.2	271.8	5.1	0.0	0.0	0.0	0.0	111.8	218.4	317.5	502.9
Wind km/h	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Mean	18.3	18.7	19.2	19.0	16.7	15.1	13.4	13.0	14.5	15.8	18.2	17.9	16.6
Direction	W	W	W	W	SSW	SW	SW	SW	S	S	SSW	W	W
Max	80.5	82.1	86.9	80.5	86.9	80.5	74.0	86.9	77.2	72.4	96.6	80.5	96.6
Direction	W	SW	NW	NW	S	W	NW	NW	SW	S	SW	SW	SW
Sunshine	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
%Poss Sun	44	47	51	53	61	67	70	68	63	62	41	38	57
%Cover: Rise-Set	70	69	70	67	63	59	53	53	54	54	71	72	63
No. Clear Days	7	6	5	6	7	7	10	10	10	11	6	6	91
No. Part. Cld Days	6	6	9	8	10	11	12	12	10	9	7	6	106
No. Cloudy Days	18	16	17	16	14	12	9	9	10	11	17	19	168

Soil Profiles



General Notes:
- moderately slow water and air movement
- slow surface run off
- high available water capacity
- slow drying
- poor recreational suitability
- supports good tuff, but it is easily damaged when wet
- slippery when wet - paths commonly need surfacing

General Notes:
- moderately slow to slow water and air movement
- moderate available water capacity
- perched water table sits above slowly permeable material for brief periods in spring
- high recreational suitability
- supports firm turf, except when wet
- high suitability for trees, but also support grasses

General Notes:
- slow water and air movement
- slow surface run off
- moderate available water capacity
- slow drying
- fair to poor recreational suitability
- supports good tuff, but it is easily damaged when wet
- slippery when wet - paths commonly need surfacing
- high suitability for meadow and woodland

Potential Vegetation

Forest

Oak - Hickory Forest Region Canopy, Lisle Illinois[3]

	1	*2*	*3*	*4*
Number of canopy trees	85	89	121	88
Quercus alba	60.0	30.3	8.3	8.0
Quercus borealis maxima	18.8	31.5	28.9	22.7
Quercus macrocarpa	10.6	..	5.0	5.7
Quercus ellipsoidalis	5.9	..	..	..
Acer saccharum	..	13.5	18.2	26.1
Fraxinus americana	..	16.8	11.6	20.4
Tilia americana	..	4.5	6.6	12.5
Juglans nigra	2.3	1.1	5.0	3.4
Ulmus fulva	1.2	1.1	8.3	1.1
Ulmus americana	..	..	7.4	..
Carya cordiformis	1.2	..	..	..
Prunus serotina	..	1.1	.8	..

Composition of a series of forest communities of increasing mesophytism in Morton Arboretum, Lisle, DuPage County, Illinois; *1*, A white oak ridge; *2*, Slope; *3*, A lower flat; *4*, North slope.

Beech - Maple Forest Region Canopy, Harms Woods, Illinois[4]

	1	*2*	*3*
Number of canopy trees	70	85	130
Acer saccharum	5.7	..	48.5
Quercus borealis maxima	7.1	21.2	19.2
Tilia americana	31.4	18.8	16.1
Quercus alba	2.8	12.9	7.7
Fraxinus americana	7.1	4.7	3.8
Ulmus fulva	..	..	2.3
Ulmus americana	35.7	24.7	.8
Acer rubrum	..	9.4	.8
Prunus serotina	..	..	.8
Juglans nigra	4.3	..	..
Quercus macrocarpa	4.3	1.2	..
Populus deltoides	1.4	..	..
Carya ovata	..	5.9	..
Quercus ellipsoidalis	..	1.2	..

Composition of canopy of late developmental stages of *1*, flood-plain succession and *2*, wet glacial clay plain succession, both of which indicate trend toward the forest of moist but drained upland, *3*, which represents an approach to climax in the transitional area between beech–maple, oak–hickory, and maple–basswood (Harms Woods, west of Evanston, Illinois).

Prevalent Groundlayer Species of Dry - Mesic Forests in Southern Wisconsin[5]

Species	*Pres.*	*Av. freq.*
Adiantum pedatum*	81%	6.9%
Agrimonia gryposepala	43	1.0
Amphicarpa bracteata*	94	21.6
Anemone quinquefolia	65	6.2
A. virginiana*	41	0.8
Apocynum androsaemifolium	52	2.6
Aralia nudicaulis	76	11.9
A. racemosa*	61	1.2
Arisaema triphyllum*	81	17.2
Aster saggitfolius*	54	3.9
A. shortii*	61	4.7
Athyrium filix-femina*	74	7.6
Botrychium virginianum*	83	6.3
Brachyelytrum erectum*	67	7.2
Carex pensylvanica*	78	14.4
Caulophyllum thalictroides	65	3.3
Celastrus scandens*	67	7.8
Circaea quadrisulcata*	89	24.6
Cornus alternifolia*	48	1.6
C. racemosa	70%	11.5%
C. rugosa	43	2.2
Corylus americana	82	10.7
Cryptotaenia canadensis*	59	5.4
Desmodium glutinosum	93	7.9
Dioscorea villosa*	57	2.7
Fragaria virginiana	57	4.1
Galium aparine	50	10.1
G. concinnum*	93	26.0
G. triflorum	50	4.3
Geranium maculatum*	100	35.8
Geum canadense*	50	6.4
Helianthus strumosus	63	6.7
Hydrophyllum virginianum	44	5.5
Hystrix patula*	67	2.6
Lactuca spicata	52	2.0
Lonicera prolifera*	57	3.6
Osmorhiza claytoni*	94	23.6
Osmunda claytoniana*	46	3.9
Parietaria pensylvanica*	43	4.6
Parthenocissus vitacea	85%	23.9%
Phryma leptostachya*	83	15.0
Podophyllum peltatum	70	6.9
Polygonatum pubescens	44	4.7
Prenanthes alba*	80	4.0
Pteridium aquilinum	54	9.0
Ranunculus abortivus*	48	2.6
Rhus radicans	72	9.8
Ribes cynosbati*	74	3.6
Rosa sp.	56	1.6
Rubus allegheniensis	52	7.9
R. strigosus	48	9.5
Sambucus canadensis	44	0.8
Sanguinaria canadensis	65	12.8
Sanicula gregaria*	83%	15.1%
Smilacina racemosa	98	25.8
Smilax ecirrhata*	72	2.6
S. herbacea	61	2.1
Solidago ulmifolia*	59	6.8
Thalictrum dioicum*	72	9.4
Triosteum perfoliatum*	52	1.0
Uvularia grandiflora*	93	16.6
Veronicastrum virginicum	48	1.5
Viola cucullata*	70	11.1
V. pubescens	59	12.9
Vitis aestivalis*	69	4.5
Zanthoxylum americanum*	48	4.4

Prevalent Groundlayer Species of Mesic Forests in Southern Wisconsin[6]

Species	*Pres.*	*Av. freq.*
Actaea alba	38%	1.4%
Adiantum pedatum	43	4.0
Allium tricoccum*	78	9.3
Amphicarpa bracteata	35	4.9
Anemone quinquefolia	54	5.6
Arisaema triphyllum	57	12.9
Athyrium filix-femina	49	3.2
Botrychium virginianum	65	8.6
Brachyelytrum erectum	41	2.0
Carex pensylvanica	60	8.3
Caulophyllum thalictroides*	68	6.7
Celastrus scandens	38	1.9
Circaea quadrisulcata	65	12.5
Claytonia virginica*	38	20.8
Cryptotaenia canadensis	35	6.3
Galium aparine*	70	26.0
G. concinnum	54	7.6
G. triflorum	41	2.9
Geranium maculatum	78	15.7
Geum canadense	43	1.9
Hepatica acutiloba*	62%	15.3%
Hydrophyllum virginianum*	60	12.3
Laportea canadensis	43	7.7
Osmorhiza claytoni	89	19.8
Parthenocissus vitacea	65	12.8
Phryma leptostachya	46	3.8
Podophyllum peltatum*	84	14.8
Polygonatum pubescens	70	19.2
Prenanthes alba	41	3.0
Ribes cynosbati	46	3.1
Sanguinaria canadensis*	65	19.1
Sanicula gregaria	65	12.3
Smilacina racemosa	76	15.7
Smilax ecirrhata	49	2.5
Thalictrum dioicum	57	7.6
Trillium grandiflorum*	65	14.5
Uvularia grandiflora	54	10.4
Viola cucullata	65	15.4
V. pubescens*	65	23.4

Prevalent Groundlayer Species of Wet - Mesic Forests in Southern Wisconsin[7]

Species	*Pres.*	*Av. freq.*	*Species*	*Pres.*	*Av. freq.*
Amphicarpa bracteata	34%	10.1%	Menispermum canadense	34%	4.8%
Arenaria lateriflora	34	9.0	Onoclea sensibilis	56	6.9
Arisaema triphyllum	66	17.2	Osmorhiza claytoni	33	6.6
A. dracontium*	44	2.5	Parthenocissus vitacea	80	23.0
Aster lateriflorus	41	12.5	Polygonatum pubescens	33	6.2
Athyrium filix-femina	39	3.8	Ranunculus abortivus	47	5.0
Boehmeria cylindrica	47	7.6	Rhus radicans	59	6.7
Circaea quadrisulcata	34	8.8	Ribes americanum	48	6.8
Cryptotaenia canadensis	45	12.9	Sambucus canadensis	42	3.2
Cuscuta gronovii*	31	3.3	Sanicula gregaria	36	13.1
Dioscorea villosa	31	3.3	Smilacina stellata	34	5.5
Elymus virginicus	39	9.1	Smilax ecirrhata	41	4.7
Galium triflorum	44	6.4	S. herbacea	41	2.0
Geum canadense	61	11.5	Solanum dulcamara*	39	4.2
Glyceria striata	41	6.7	Solidago gigantea	34	6.3
Impatiens biflora	67	21.4	Steironema ciliatum*	57	10.2
Laportea canadensis	77	39.7	Viola cucullata	63	16.3
Leersia virginica	36	11.8	V. pubescens	36	11.2
Lycopus uniflorus	36	5.7	Vitis riparia	58	3.4
			Zanthoxylum americanum	36	3.9

Prevalent Groundlayer Species of Wet Forests in Southern Wisconsin[8]

Species	*Pres.*	*Av. freq.*	*Species*	*Pres.*	*Av. freq.*
Amphicarpa bracteata	44%	14.5%	Onoclea sensibilis	44%	4.1%
Arisaema dracontium	31	0.6	Parthenocissus vitacea	56	14.9
Aster lateriflorus*	44	12.3	Pilea pumila*	47	15.2
Boehmeria cylindrica*	50	16.1	Rhus radicans*	81	6.5
Carex typhina*	31	6.6	Rudbeckia laciniata*	31	3.5
Cinna arundinacea*	31	3.5	Sambucus canadensis	50	4.8
Cryptotaenia canadensis	50	14.5	Scutellaria lateriflora*	56	10.1
Elymus virginicus*	50	12.0	Solidago gigantea	56	11.1
Geum canadense	44	9.6	Stachys hispida*	31	2.6
Impatiens biflora	50	24.7	Steironema ciliatum	31	7.1
Laportea canadensis*	81	19.5	Teucrium canadense*	56	14.6
Leersia virginica*	56	35.3	Urtica dioica	47	11.7
Lycopus uniflorus	50	4.1	Viola cucullata	50	3.4
Menispermum canadensis*	44	1.6	Vitis riparia*	81	6.3
Muhlenbergia frondosa*	50	8.6			

Most Frequent Forest Ground Layer Species

Species	D - Mes %F	Mesic %F	W - Mes %F	Wet %F
Geranium maculatum - Wild Geranium	**35.8**	15.7	---	---
Galium concinnum - Bedstraw	**26.0**	7.6	---	---
Smilacina racemosa - False Spikenard	**25.8**	15.7	---	---
Circaea quadrisulcata - Enchanter's Nightshade	**24.6**	12.5	8.8	---
Parthenocissus vitacea - Virginia Creeper	**23.9**	12.8	**23.0**	**14.9**
Galium aparine - Bedstraw	10.1	**26.0**	---	---
Viola pubescens - Yellow Violet	12.9	**23.4**	11.2	---
Claytonia virginica - Spring Beauty	---	**20.8**	---	---
Osmorhiza claytoni - Sweet Cicely	23.6	**19.8**	6.6	---
Polygonatum pubescens - Solomon's Seal	4.7	**19.2**	6.2	---
Laportea canadensis - Wood Nettle *	---	7.7	**39.7**	**19.5**
Impatiens biflora - Jewel Weed	---	---	**21.4**	**24.7**
Arisaema triphyllum - Dragon Root	17.2	12.9	**17.2**	---
Viola cucullata - Blue Violet	11.2	15.4	**16.3**	3.4
Leersia virginica - Cut Grass	---	---	11.8	**35.3**
Boehmeria cylindrica - Bog Hemp	---	---	7.6	**16.1**

* While part of the indigenous community, this species would not be planted at the demonstration site because it irritates the skin if touched.

Prairie

Prevalent Species of Wet Prairies in Wisconsin[9]

Species	*Pres.*	*Species*	*Pres.*
Andropogon gerardi	68%	Lathyrus palustris	55%
Anemone canadensis	36	Liatris pycnostachya	32
Apocynum cannabinum	32	Lilium superbum*	50
Asclepias syriaca	64	Lobelia spicata	36
Aster novae-angliae	68	Monarda fistulosa	50
A. simplex	59	Muhlenbergia racemosa	36
Calamagrostis canadensis	91	Oxypolis rigidior*	73
Comandra richardsiana	36	Pedicularis lanceolata	32
Cirsium muticum*	50	Phlox pilosa	55
Desmodium canadense	50	Pycnanthemum virginianum	82
Dodecatheon meadia	41	Ratibida pinnata	36
Dryopteris thelypteris	55	Rudbeckia hirta	68
Equisetum arvense*	68	Salix humilis*	68
Erigeron strigosus	36	Saxifraga pensylvanica*	50
Eupatorium maculatum	41	Solidago gigantea*	73
Fragaria virginiana	77	Spartina pectinata*	91
Galium boreale	73	Spiraea alba	59
Gentiana andrewsii	36	Thalictrum dasycarpum	87
Helianthus grosseserratus	64	Tradescantia ohiensis	46
Heuchera richardsonii	41	Veronicastrum virginicum	73
Hypoxis hirsuta*	55	Viola cucullata	59
Iris shrevei	50	Zizia aurea*	73

Prevalent Species of Wet - Mesic Prairies in Wisconsin[10]

Species	*Pres.*	*Av. freq.*	*Species*	*Pres.*	*Av. freq.*
Achillea millefolium	58%	16%	L. venosus*	55%	12%
Ambrosia artemisiifolia	48	5	Lespedeza capitata	52	7
Amorpha canescens	42	4	Liatris pycnostachya*	48	30
Andropogon gerardi	97	40	Lilium superbum	45	4
A. scoparius	48	29	Lithospermum canescens	52	9
Anemone canadensis	45	24	Monarda fistulosa	77	7
Asclepias syriaca*	81	19	Oxypolis rigidior	52	4
Aster azureus	61	43	Panicum leibergii	55	18
A. ericoides	45	5	Phlox pilosa*	65	22
A. laevis	58	5	Prenanthes racemosa*	42	4
A. novae-angliae*	71	10	Pycnanthemum virginianum*	84	24
Calamagrostis canadensis	74	14	Quercus macrocarpa	55	5
Cicuta maculata*	42	5	Ratibida pinnata*	90	48
Cirsium discolor	65	1	Rhus glabra	52	4
Comandra richardsiana	77	30	Rosa sp.	81	30
Corylus americana	52	4	Rudbeckia hirta*	74	24
Desmodium canadense*	65	5	Salix humilis	55	23
Dodecatheon meadia*	61	19	Silphium integrifolium*	52	15
Elymus canadensis	65	5	S. terebinthinaceum*	55	31
Equisetum arvense	48	25	Smilacina stellata	45	6
E. laevigatum*	45	4	Solidago gigantea	48	35
Euphorbia corollata	74	15	S. graminifolia	42	20
Fragaria virginiana	81	13	S. rigida	77	38
Galium boreale	68	15	Sorghastrum nutans	48	12
Gentiana andrewsii*	48	8	Spartina pectinata	74	28
Geranium maculatum	52	4	Spiraea alba	48	18
Helianthus grosseserratus*	81	41	Sporobolus heterolepis	55	8
H. laetiflorus	42	4	Thalictrum dasycarpum	87	16
Heuchera richardsonii	48	12	Tradescantia ohiensis	71	12
Lactuca canadensis	42	4	Veronicastrum virginicum*	74	17
Lathyrus palustris	42	3	Zizia aurea	65	8

Prevalent Species of Mesic Prairies in Wisconsin[11]

Species	*Pres.*	*Av. freq.*	*Species*	*Pres.*	*Av freq.*
Achillea millefolium*	62%	3%	H. occidentalis*	44%	19%
Ambrosia artemisiifolia	51	23	Lactuca canadensis*	47	7
Amorpha canescens	73	32	Lathyrus venosus	51	2
Andropogon gerardi*	98	29	Lespedeza capitata	58	18
A. scoparius	69	28	Liatris aspera*	87	18
Anemone cylindrica	51	5	Lithospermum canescens	53	5
Antennaria neglecta	56	7	Monarda fistulosa	73	22
Apocynum androsaemifolium	42	6	Panicum leibergii*	62	46
Asclepias syriaca	76	13	Petalostemum purpureum	60	7
Aster azureus	56	16	Phlox pilosa	53	21
A. ericoides	76	44	Physalis virginiana	42	8
A. laevis*	89	35	Potentilla arguta	58	13
Baptisia leucophaea*	44	3	Quercus macrocarpa	40	2
Ceanothus americanus*	66	9	Ratibida pinnata	85	32
Cirsium discolor*	71	13	Rhus glabra	42	5
Comandra richardsiana	53	32	Rosa sp.*	91	36
Convolvulus sepium*	49	13	Rudbeckia hirta	44	3
Coreopsis palmata	76	34	Silphium integrifolium	40	3
Desmodium canadense	49	3	S. laciniatum*	78	8
D. illinoense*	64	20	Solidago missouriensis*	58	15
Dodecatheon meadia	53	3	S. rigida*	76	15
Elymus canadensis	42	5	S. speciosa*	62	11
Eryngium yuccifolium*	53	21	Sorghastrum nutans	58	13
Euphorbia corollata	86	75	Sporobolus heterolepis	64	35
Fragaria virginiana	56	16	Stipa spartea	69	58
Galium boreale	40	8	Tradescantia ohiensis	64	31
Helianthus grosseserratus	44	2	Viola pedatifida	42	13
H. laetiflorus*	87	40			

Most Frequent Prairie Species[12]

Species	Wet %P	W - Mes. %F	Mesic %F
Calamagrostis canadensis - Giant Reed Grass	**91**	14	---
Spartina pectinata - Cord Grass	**91**	28	---
Thalictrum dasycarpum - Meadow Rue	**87**	16	---
Pycnanthemum virginianum - Mountian Mint	**82**	24	---
Fragaria virginiana - Strawberry	**77**	13	16
Ratibida pinnata - Cone Flower	36	**48**	32
Aster azureus - Aster	---	**43**	16
Helianthus grosseserratus - Sunflower	64	**41**	2
Andropogon gerardi - Big Blue Stem	68	**40**	29
Solidago rigida - Goldenrod	---	**38**	15
Euphorbia corollata - Flowering Spurge	---	15	**75**
Helianthus laetiflorus - Sunflower	---	4	**40**
Aster ericoides - Aster	---	5	**44**
Stipa spartea - Porcupine Grass	---	---	**58**
Panicum leibergii - Panic Grass	---	18	**46**

Prominant Shrub Species in Prairie Communities

Species	Wet %P	W - Mes. %F	Mesic %F
Corylus americana - American Alder	---	4	---
Rosa sp. - Wild Rose	---	30	36
Salix humilis - Gray Willow	68	23	---
Quercus macrocarpa - Burr Oak	---	5	2

Marsh

Prevalent Species of Emergent Aquatic Communities in Wisconsin[13]

Species	*Pres.*	*Species*	*Pres.*
Eleocharis acicularis*	38%	S. americanus*	42%
Iris shrevei	29	S. validus*	49
Phragmites communis*	38	Sparganium eurycarpum*	51
Pontederia cordata*	51	Typha latifolia*	71
Sagittaria latifolia*	62	Zizania aquatica*	53
Scirpus acutus*	73		

Prevalent Species of Submerged Aquatic Communities in Wisconsin[14]

Species	*Pres.*	*Species*	*Pres.*
Anacharis canadensis*	42%	Potamogeton gramineus*	35%
Ceratophyllum demersum*	32	P. zosteriformis*	28
Eleocharis acicularis	26	Vallisneria americana*	39
Najas flexilis*	68		

Average Structure of Southern Cattail Marshes in Wisconsin[15]

Species	*Frequency*	*Density per sq. m.*	*Species*	*Frequency*	*Density per sq. m.*
Lemna minor	100%	210.0	Typha latifolia	20	0.3
Typha angustifolia	95	27.7	Apocynum cannabinum	17	0.5
Utricularia vulgaris	93	130.2	Calamagrostis canadensis	17	3.1
Equisetum fluviatile	65	3.6	Carex hystericina	17	4.5
Eleocharis elliptica	53	70.9	Leersia oryzoides	17	2.0
Cicuta bulbifera	45	10.2	Salix interior	15	0.8
Scirpus americanus	40	33.1	Galium trifidum	13	1.7
Carex aquatilis	32	10.6	Carex stricta	13	5.5
Sagittaria latifolia	32	10.3	Rumex orbiculatus	11	0.2
Carex trichocarpa	23	7.9	Scirpus acutus	7	1.9
Lycopus uniflorus	23	5.8	Phragmites communis	7	3.1
Carex lanuginosa	20	1.1	plus six other species		

Demographics[16]

Total Population (1984)	4,122
% Pop. Change (1980 - 1984)	-0.6
Median Family Income (1983)	$25,694

Age Distribution	Number	Percent
0 - 14	983	23.8
15 - 24	663	16.1
25 - 44	967	23.5
45 - 64	1,318	32.0
65+	191	4.6

Level of Educational	Number	Percent
High School	2,330	94.1
College	1,302	52.6

Economic Status	Number	Percent
Persons Below Poverty	54	1.3
Age 65+ Below Poverty	0	0.0
Public Aid Households	0	0.0

1 Source: National Climatic Center. *Climate Normals of the United States (Base 1951 - 80)*, Gale Research Co., Detroit, 1983, pp. 179, 183.

2 Source: Ruffner, James A. and Frank E. Bair eds. *The Weather Almanac, Second Edition*, Gale Research Co., Detroit, 1984.

3 Lucy Braun, *Deciduous Forests of North America*, (New York: Hafner Publishing Co., 1967), p. 191.

4 Ibid., p. 322.

5 John Curtis, *Vegetation of Wisconsin - An Ordination of Plant Communities*, (Madison: University of Wisconsin Press, 1959), pp. 526 - 527.

6 Ibid., p. 521.

7 Ibid., p. 532.

8 Ibid., p. 531.

9 Ibid., p. 561.

10 Ibid., p. 559.

11 Ibid., p. 557.

12 Note: %Frequency figures were not given for the wet prairie community so the top five species by presence were taken from this community instead.

13 Ibid., p. 585.

14 Ibid., p. 586.

15 Ibid., p. 585.

16 Based on 1984 data. Source: Ollswang, Jeffrey E. and Lawrence P. Witzling. *Design Competition for A New American Green - Response to Inquiries*, Olympia Fields Park District, 1992, p. 7.

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For ease of use this bibliography has been divided into two sections. The first lists all of the entries in alphabetical order, and the second lists them according to the subject matter they cover. In the alphabetical listing the category that each entry falls under in the second section is given in bold type.

With the growth of the environmental movement over the past few years, the topics referenced by this bibliography have received an incredible amount of attention by other researchers and authors. A good starting point for future research will be to conduct subject searches on the categories listed here.

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Annotated Listing

Ecological Surveys

The following sources survey the structure and of composition of ecosystems. Braun and Curtis' works examine indigenous ecosystems of eastern North America, with Curtis concentrating specifically on the State of Wisconsin. While both authors focus on the botanical component, they do discus the relationships of the communities and environmental conditions they exist in.

Gilbert's work focuses on urban ecosystems. This work is significant in that it discusses the city as a natural environment. It is very broad in its scope. It discusses urban flora, fauna, climate, soil, hydrology, and a variety of urban site types such as: industrial areas, railways, roads, parks, etc. It should be noted that the work focuses on the urban environments of southern England, so the applicability of some of the information to North America will be some what limited.

Dagg's work is a master's thesis. It is an inventory of north-eastern North American urban ecosystems. Unfortunately is it fairly limited in depth.

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Ecologically Guided Design - Principles and Theory

The key references here are Hough's *City Form and Natural Process*, and Spirn's *The Granite Garden*. Both are excellent guides on the principles of ecology as they function in the urban environment, and both promote the adoption of ecologically sound practices in urban design. They both discuss the city as an ecosystem; break it down in terms of it's climate, air and water quality, hydrology, botanical communities, and wildlife; and discuss ways of improving each. Many case studies and examples are given throughout the discussions. Spirn also examines urban soils while Hough considers the potentials in urban agriculture. Both of these works are well written, and well documented. Spirn's

bibliography is especially noteworthy. Hough is a bit stronger in technical information and techniques of implementation for various ecosystems, while Spirn is slightly broader based in her discussions and gives excellent planning strategies at the end of each section. Both of these works are highly recommended to anyone interested in urban design.

Nicholson-Lord's work is also quite important. It examines historic ideas about urbanism, nature and wilderness from the perspective of how they have been expressed in the landscape as a means of understanding urban decay and the rise of the present environmental movement. It then explores the impacts our spiritual beliefs have had on how we perceive, and respond to the environment, and concludes with a survey of recent efforts that have been made to bring the wilderness back into the city. This work is very well researched and very provocative. While you may not always agree with Nicholson-Lord, he will certainly make you think. Its philosophical and spiritual discussions expand on the theories presented by Spirn and Hough.

Gill and Bonnett's work is quite similar to Spirn and Hough's in its scope, although it doesn't go into as much depth. The Todd's present a design process similar to Hough and Spirn's but their theory has a stronger basis in bioregionalism and the need for social change.

Bradshaw et al, Gordon, and Laurie's works are all collections of papers and discussions on a wide range of topics pertaining to the use of ecological principles in urban design to make cities more environmentally sound. Much these works reiterate the theories presented by Hough and Spirn, however in doing so, they add depth and credibility to them. They also discuss additional case studies, such as Toronto's 'Ecology Park' in *Green Cities*, by Gordon.

Harrison and Parker's practica are examples of other studies that have been done in this field. Both propose ecologically based alternatives to the traditional turf based park design.

Boremann and Wann's works round out this section with further calls for environmentally sound design. Boremann is significant in its focus on 'the lawn', which is at the center of the drive to restore the functioning of ecological processes in so much the discussion here.

Bormann, F. Herbert, et al. *Redesigning The American Lawn: A Search for Environmental Harmony*, Yale University Press, New Haven, 1993. (Arch SB 433 B64 1993)

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Spirn, Anne Whiston. *The Granite Garden: Urban Nature and Human Design*, Basic Books, New York, 1984. (Arch HT 166 S638 1984)

Spirn, Anne Whiston. "The Poetics of City and Nature: Towards a New Aesthetic for Urban Design" in *Landscape Journal*, Fall 1988, pp. 108 - 126. (Arch Per 710 L2387 Jo)

Todd, Nancy Jack and John Todd. *Bioshelters, Ocean Arks, City Farming: Ecology as the Basis of Design*, Sierra Club Books, 1984. (Arch GF 50 T6 1984 + Pembina Trail 304.2 Tod)

Wann, David. *Biologic - Environmental Protection By Design*, Johnson Publishing Co., Boulder, 1990. (Arch TD 170 W36 1990)

Ecologically Guided Design / Landscape Restoration Handbooks

This collection of works outline methods of creating landscapes where the functioning of ecological processes is accommodated. In general each is intended for a specific audience. Baines' works are intended for the lay person. Diekelmann's is a bit more advanced and focuses on the re-creation of native communities. It is still fairly introductory and has a fairly Modernist (or reductionist as Koh would put it) view of ecology.

The Hawkers' and Evans' book is more suited for professionals in fields such as landscape design or land use management. It presents a method of landscape design that combines ecological restoration (defined as restoring an area to its pre-disturbance condition through replication of ecological communities - p. 41, 65), and natural landscaping (defined as capturing the spirit of nature in a design - p, 41). While the appropriateness of this strategy may be debatable, the methods they propose and their motives for doing so are in keeping with the objective of creating landscapes that are sustainable. Also of note is the use of Forman and Godron's patch-corridor-matrix model of ecology, rather than the typical reductionist view, and the very concise chapter on *Principles for Maintaining and Restoring Natural Diversity* . The most valuable part of this work is its first eighty pages, as the rest of it simply describes the dominant ecological communities in United States. Extensive lists of indigenous species for each are given.

Emery's work is a comprehensive manual for the development of parks that facilitate the conservation and restoration of ecological processes. It is divided into two sections. The first describes how to start up new sites and explains: a) how to establish a community group and involve them throughout the process; b) the legal considerations and constraints that are involved; c) how to survey and choose a site to develop; and d) how to design the site with particular emphasis on ecological principles, the implications of the potential uses, and the required management. The second describes how to actually develop a site. This section covers: a) techniques of establishment for grassland/meadow, scrub/woodland, and fresh water communities, as well as smaller 'wildlife gardens'; b) the management of grassland, woodland, and fresh water communities, including recommendations on how to develop a long term maintenance plan; and c) how to create, implement, and manage an interpretive program. While the essential part of Hawker's and Evan's work is very concise, this work is very thorough.

The other works in this section focus on the more technical aspects involved in restoration and as such they are useful as supplements to Harker et al, and Emery's works. Bradshaw and Chadwick concentrate on the reclamation of seriously degraded land. Berger focuses on the recreation of ecosystems, and gives many case studies and examples of different techniques of application.

Baines, Chris. *How to Create a Wildlife Garden*, Elm Tree / Hamish Hamilton Ltd., London, 1985. (Arch QL 59 B35 1985)

Baines, Chris. *The Wild Side of Town*, Elm Tree / Hamish Hamilton Ltd., London, 1986. (Arch QH 77 G7 B26 1986)

Berger, John, ed. *Environmental Restoration, Science and Strategies for Restoring the Earth*, Island Press, Washington DC, 1990. (Arch QH 541.15 R45 E58 1990)

Bradshaw, A. D. and M. J. Chadwick. *The Restoration of Land: The Ecology and Reclamation of Derilict and Degraded Land*, University of California Press, Berkeley, 1980. (Arch TC 805 B76 1980)

Diekelmann, John and Robert Schuster. *Natural Landscaping - Designing With Native Plant Communities*, McGraw-Hill, Toronto, 1982. (Sci Agri SB 472.32 U6 D53)

Emery, Malcolm. *Promoting Nature in Cities and Towns: A Practical Guide*, Croom Helm, Dover, New Hampshire, 1986. (Arch QH 541.5 C6 E44 1986)

Harker, Donald, Sherri Evans, Marc Evans, and Kay Harker. *Landscape Restoration Handbook*, Lewis Publishers, Ann Arbor, and The New York Audubon Society, 1993. (Arch SB 439 L36 1993)

Environmental Ethics / Ecology and Society

These works examine the more ethical and social issues that are involved in achieving a sustainable relationship with the environment. Most of them take the view that the alienation of humanity from nature is directly related to the development of social hierarchies and the biblical directive that man was given dominion over the earth The consensus is that the future of society is dependent upon creating a new world order based on the equality of all people, bioregionalism, decentralized democratic government and economy, and an awakened personal connection to the environment. The key references in this area are Bookchin's *Ecology of Freedom*, (a more refined publication of his ideas in *Towards and Ecological Society*), and the works of Leiss and White. Allsopp and Tokar's works are also significant in that they take the other's ideas and clearly articulate plans for change based on them. Livingston and Sullivan share a philosophy similar to the others and caution against conservation efforts where the value of conserving is evaluated in a cost - benefit scenario, arguing that there can be no bottom line in protecting the earth, it simply must be conserved.

Dubos provides an alternative viewpoint. He argues against the theory that the biblical doctrine of man's dominion is the root cause of our domination by citing evidence that many ancient cultures exhibited domination long before biblical times. In this work, the history of human physiological and spiritual evolution is traced in an effort to understand the ways in which we relate with the environment. There are many fascinating discussions on the role the environment has played in the development and evolution of religion, and further examples of how human activities have contributed to environmental degradation. Dubos concludes that it is our failure to anticipate the long term consequences of our activities that has resulted in the present crisis and stresses that because we can think about what we do before we do it, it is our responsibility to consider the welfare of the earth and the long term effects of our actions

Allsopp, Bruce. *Ecological Morality*, Muller, London, 1972. (Arch QH 541.A4)

Bookchin, Murray. *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy*, Black Rose Books, Montreal, 1991. (Centennial 901 BOO + Dafoe CB 19 B58 1991)

Bookchin, Murray. *Toward an Ecological Society*, Black Rose Books, Montreal, 1980. (Centennial 307.76 BOO + Arch HM 206 B66)

Chisholm, Anne. *Philosophers of the Earth, Conversations with Ecologists*, E.P. Dutton and Co., New York, 1972. (Arch QH 541 C38 1972)

Dubos, René. *The Wooing of Earth: New Perspectives on Man's Use of Nature*, Charles Scribner's Sons, New York, 1980. (Pembina Trail 304.28 Dub)

Gayton, Don. *The Wheatgrass Mechanism*, Fifth House Publishers, Saskatoon, 1990. (Arch and St. Johns QH 106.2 P6 G39 1990)

Livingston, John A. *The Fallacy of Wildlife Conservation*, McClelland and Stewart, Toronto, 1988. (Dafoe QL 82 L58)

Leiss, William. *The Domination of Nature*, George Braziller, New York, 1972. (Eng BD 581 L44 1972)

Sullivan, Arthur. "Is Nature Good" in *Places*, Vol. 6, No. 4, Summer 1990, pp. 82 - 87. (Arch Per 300 P69)

Tokar, Brian. *The Green Alternative, Creating an Ecological Future*, R and E Miles, San Pedro, California, 1987. (Dafoe QH 541 T64 1987)

Wagner, Phillip ed. *The Human Use of the Earth*, Collier MacMillan, Toronto, 1960. (Arch 301.3 W125 HU)

White, Lynn jr. "The Historical Roots of Our Ecological Crisis" in *Science*, Vol. 155, No. 3767 (Mar. 10, 1967), pp. 1203 - 1207. (Sci Per 505 S41)

Environmental Impacts of Human Activities

The works in this section assess the extent of the environmental crisis. They urge us to take action before it is too late. *Canada's State of the Environment* and *Man's Impact on the Global Environment* provide detailed assessments about the condition of the environment. Both are full of statistics about water quality, deforestation and the like. *Canada's State . . .* is particularly well documented and has many helpful charts and graphics which make it very easy to use. Its information is also more recent, although it doesn't address the global situation as well as *Man's Impact . . .*

Carson's classic, *The Silent Spring* , is as pertinent today as it was in 1962 in its warnings about how we are poisoning the earth and ourselves. It is important work in that its puts today's situation in perspective. As Weber explains, people are beginning to respond as evidenced by efforts in xeriscaping, the growing acceptance for native plant material, and a slight decrease in the use of pesticides and herbicides.

The other works in this section concentrate on issue of global warming. All three agree that while research indicates that global warming and fluctuations in atmospheric CO_2 concentrations are natural phenomena, the present increases are tied to human activities, particularly since the industrial revolution. Numerous gloomy predictions about the fate of life as we know it in the next century are made. All of these works are very well documented with scientific data and statistics. Fisher also examines the plight of further depletion of the ozone layer, and the threat nuclear war poses to the environment as we know it. Gribbin takes a fairly unique stand by discussing the greenhouse effect in relation to Lovelock's Gaia hypothesis. In this respect the work is fairly controversial, however it makes a significant leap in our attempts to understand the world around us.

Carson, Rachel. *The Silent Spring*, Houghton Mifflin, Boston, 1962. (Arch SB 959.C3 1962)

Fisher, David E. *Fire and Ice: The Greenhouse Effect, Ozone Depletion and Nuclear Winter*, Harper and Row, New York, 1990 (Dafoe TD 8883.1 F57 1990)

Government of Canada, *Canada's State of the Environment*, Ottawa, 1991. (Dafoe Gov Docs.Can 1 En 9.6 St 28 1992; and Sci TD 26 S77 1991)

Gribbin, John. *Hothouse Earth: The Greenhouse Effect and Gaia*, Grove Weidenfeld, New York, 1990. (Dafoe QC 912.3 G75 1990)

Oppenheimer, Michael and Robert Boyle. *Dead Heat, The Race Against the Greenhouse Effect*, Basic Books Inc., New York, 1990. (Sci QC 912.3 O66 1990)

Study of Critical Environmental Problems. *Man's Impact on the Global Environment*, M.I.T. Press, Cambridge, 1970. (Arch QH 541 S73 1970)

Wagner, Richard H. *Environment and Man*, W.W. Norton and Co. Inc., New York, 1971. (Arch QH 541.W244)

Weber, Cheryl. "Healing the Earth: How 20 Years of Environmentalism Have Changed American Gardening" in *Garden Design*, Spring 1990, Vol. 9, No. 1 pp. 30 - 35. (Arch Per 710.G167 Des)

Florae

Bailey, L. H. *Hotus Third: A Concise Dictionary of Plants Cultivated in the United States and Canada*, Macmillan, New York, 1976. (Sci SB 45 B22 1976)

Budd, Archibald C. *Budd's Flora of the Canadian Prairie Provences*, Publication 1662, Agriculture Canada, Ottawa, 1987. (Sci S 133 A346 no 1662 1987)

Scoggan, H. J. *Flora of Canada: Parts 1 - 4*, Botany Publication no. 7, National Museums of Canada, Ottawa, 1979. (Sci Ref QK 1 P84 no. 7 pt. 1 - 4)

Vance, Fenton. R., James. R. Jowsey and James. S. McLean. *Wildflowers Across the Prairies*, Western Produceer Books, Saskatoon, 1984. (Sci Ref QK 203 P7 V36 1984)

Inspiration

The following works were very inspirational to me over the course of this study. Asimov and Gibson's science fiction, and Calvino and Coupland's stories about life and society are incredibly rich works for the imagination; Huxley documents the beauty, diversity and amazing history humanity has had with the plant kingdom; Milne presents the reader with beautiful awe inspiring images of landscapes from around the world; Emerson and Jensen's works are poetic essays on the beauty of nature; and finally, Slawson's work explains the meaning behind traditional Japanese gardens and the beauty that can come out of a marriage between nature and art. In their own way, each of these works has caused me to stop and look at things differently and in doing so, has given me a new perspective on the world around me. These perspectives have been very influential in shaping my opinions and design philosophy.

Asimov, Issac. *The Foundation Trilogy*, Doubleday and Company, Garden City, New York, 1951 - 53.

Calvino, Italo. *Cosmi Comics*, Penguin, Toronto, 1982.

———— *Invisible Cities*, Pan Books Ltd. London, 1979.

———— *Marcovaldo*, Seder and Warburg, London, 1983. (Dafoe PQ 4809 A45 M131 1983a)

Coupland, Douglas. *Generation X : Tales for an Accelerated Culture*, St. Martin's Press, New York, 1991. (Dafoe and St. Johns PS 8555 O93626 G46 1991)

——————— *Shampoo Planet*, Pocket Books, New York, 1992. (St. John's PS 8555 O93626 S35)

——————— Life after God, Pocket Books, New York, 1994. (St. John's PS 8555 O93626 L54)

Emerson, Ralph Waldo. *Nature*, Science Research Associates, Chicago, 1968. (Dafoe PS 1613 A2 B47)

Gibson, William. *Virtual Light*, McClelland and Bantam Inc., Toronto, 1993.

Huxley, Anthony. *Green Inheritance, The World Wildlife Fund Book of Plants*, Collins, London, 1984.

Jensen, Jens. *Siftings*, Ralph Fletcher Seymore, Chicago, 1939. (Arch SB 470.J4 A3 1939)

Milne, Courtney. *The Sacred Earth*, Western Producer Prairie Books, Saskatoon, 1991. (Arch BL 580 M44 1991)

Slawson, David A. *Secret Teachings in the Art of Japanese Gardens, Design Principles, Aesthetic Values*, Kodansha International Ltd., New York, 1987. (Arch SB 458 S66 1987)

Jens Jensen

As one of the earliest proponents of a 'natural' or 'ecological' approach to landscape design, it seemed appropriate to include a section on Jens Jensen. Jensen, of Danish origin, practiced in the Chicago region around the turn of the century, and followed a design philosophy that revered the use of native plants in patterns and associations observed in nature. The key works in this section are Eaton's *Landscape Artist in America . . .*, a thorough survey of Jensen's life and work, Grese's *Jens Jensen: Maker of Natural Parks and Gardens*, a comprehensive study of Jensen's design techniques, and Jensen's own *Siftings*, a poetic treatise on the beauty of nature which reveals much about his personal design philosophy.

Caldwell, Alfred. "Jens Jensen: The Prairie Spirit" in *Landscape Architecture*, Jan. 1961, pp. 102 - 105. (Arch Per 712 L239)

Christy, Stephan F. "The Metamorphosis of an Artist" in *Landscape Architecture*, Jan. 1976, pp. 60 - 68. (Arch Per 712 l239)

Eaton, Leonard K. "Landscape Artist in America" in Progressive Architecture, Dec. 1960, pp. 145 - 150. (Arch Per 720 P37)

Eaton, Leonard K. *Landscape Artist in America, The Life and Work of Jens Jensen*, University of Chicago Press, 1964. (Arch 712.0973 E14 La)

Grese, Robert E. *Jens Jensen: Maker of Natural Parks and Gardens*, John Hopkins University Press, Baltimore, 1992. (Arch SB 470 J4 G74 1992)

Jensen, Jens. *Siftings*, Ralph Fletcher Seymore, Chicago, 1939. (Arch SB 470.J4 A3 1939)

Lake Douglas, William. "Jensen" in *The Oxford Companion to Gardens*, Oxford University Press, New York, 1986, pp. 302 - 303.

Ruff, Alan. "Ecology and Gardens" in *The Oxford Companion to Gardens*, Oxford University Press, New York, 1986, p. 153 - 154.

Landscape Design Concepts and Design Theory

While ecological principles are paramount in an ecologically guided design process, one cannot overlook the importance of having a good sense of basic landscape design principles and techniques. This includes sense of scale and degrees of enclosure; play of light and shadow and other temporal effects; use of colour; transition; safety; accessibility; social / cultural significance; etc. There are numerous excellent resources in this area. The following is a collection of some of my favorites. Grese's work on Jensen (see section on Jens Jensen) also covers a lot of this type of information, and has a stronger ecological bias. Norberg-Schultz and Koh's works are much more theoretical than the rest. Norberg-Schultz discusses the role of existentialism and phenomenology in giving meaning to design, and Koh proposes that a sense of aesthetics derived from natural beauty can enlighten the mind and raise the awareness and sensitivity of one's self and the environment, thereby raising the act of experiencing a design to a spiritual event.

Eckbo, Garrett. *The Landscape We See*, McGraw Hill, New York, 1969. (Arch SB 472 E223)

Fairbrother, Nan. *The Nature of Landscape Design as an Art Form, a Craft, a Social Responsibility*, Architectural Press, New York, 1974. (Arch SB 472 F3 1974)

Greenbie, Barrie. *Spaces, Dimensions of the Human Landscape*, Yale University Press, New Haven, 1981. (Arch GF 90 G73)

Koh, Jusuck. "An Ecological Aesthetic" *Landscape Journal*, Fall 1988, pp. 177-191. (Arch Per 710 L2387)

Koh, Jusuck. "Ecological Design: A Post-Modern Design Paradigm of Holistic Philosophy and Evolutionary Ethic" in *Landscape Journal*, Fall 1982, pp. 76 - 84. (Arch Per 710 L2387 Jo)

Lynch, Kevin. *What Time is This Place*, M.I.T. Press, Cambridge, 1972. (Arch CB 155 L95)

Moore, Charles W., William J. Mitchell and William Turnbull, jr. *The Poetics of Gardens*, M.I.T. Press, Cambridge, 1988. (Arch SB 472 M64 1988)

Norberg-Schulz, Christian. *Architecture: Meaning and Place, Selected Essays*, Rizzoli, New York, 1988. (Arch NA 27 N67 1988)

Norberg-Schulz, Christian. *Genius Loci: Towards a Phenomenology of Architecture*, Rizzoli, New York, 1980. (Arch NA 2542.4 N6713)

Science of Ecology

As the title of this section indicates, these sources discuss ecology as a science. Kormondy, Odum and Smith's works are good general texts. They discuss what ecology is and explain ecological processes and principles in fairly good detail. They also delve into some of the theory and philosophy behind ecological concepts. Of the three, Kormondy's is my favorite because it is the most concise and yet more advanced.

Forman and Godron's work is considerably more advanced. As noted in its forward, the central hypothesis of this work is that all landscapes share a similar structural model. It illustrates an excellent analytical process for examining ecosystems that can be applied in both 'natural' and 'disturbed' environments. This process is very useful for identifying ecological potential. The format of this work is that of a textbook, so the reader is carried through the process in a series of lessons. This makes it very comprehensible. This work is highly recommended to any who is seriously interested in the fields of ecology and landscape design.

Lovelock's work and the interview with him by West discuss an alternative concept of ecology known as the Gaia Hypothesis. This concept holds that the earth is one entire living organism. It takes the ecological principle of the interrelativity of all things to the extreme. Lovelock explains the concept in great detail, in fairly easy to understand terms. In my opinion, it is a very significant work.

Dawe's work is a bit of an anomaly here. It is an annotated bibliography that documents articles, reports, papers, and books on just about every urban environmental issue. Published in 1990, the work is already in need of an update (there has been so much more written about the urban environment is the past few years). It is a very good starting point though, since it covers so many topic areas.

Dawe, Gerald. *The Urban Environment: A Source Book for the 1990's*, Centre for Urban Ecology, Birmingham, 1990. (Arch Ref. HT 166 U733)

Forman, Richard and Michel Godron. *Landscape Ecology*, John Wiley and Sons, Toronto, 1986. (Arch QH 541.F67 1986)

Kormondy, Edward J. *Concepts of Ecology*, Prentice Hall, Englewood Cliffs, New Jersey, 1969. (Arch QH 541 K59 1969)

Lovelock, James. *The Ages of Gaia: A Biography of Our Living Earth*, W.W. Norton and Co. Inc., New York, 1988. (Arch QH 331 L688 1988)

Odum, Eugene. *Fundamentals of Ecology*, Sunders, Philadelphia, 1971. (Sci and Eng QH 541 03 1971)

Smith, Robert Leo. *Elements of Ecology*, Harper and Row, New York, 1986. (Arch QH 541 S6 24 1986)

West, Ross Evan. "She's Alive: A Conversation with James Lovelock", in *Orion Magazine*, Winter '89, pp. 58 - 64. (Dafoe Per 820.58 O69)

Sustainability - Sustainable Development

Today it seems impossible to discuss the future and the environment without encountering the term 'sustainable development' which is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (p. 43, *Our Common Future*). This concept of not compromising the environment for future generations is (or at least should be) central to the idea of developing environmentally sound open space. *Our Common Future*, the preeminent resource on sustainability, links environmental sustainability to economic and socio-cultural issues, and maintains a wholistic / global perspective. In many ways Schumacher's *Small is Beautiful*, could be considered a forerunner to this work. The remaining sources in this section examine how issues of sustainability could be made into policy at various governmental levels, with Beavis considering the ethics involved in the concept of sustainability as it pertains to urban development.

Beavis, Mary Ann ed. *Ethical Dimensions of Sustainable Development and Urbanization*, University of Winnipeg Press, 1990. (Arch QH 541.5 C6E835 1990)

Keating, Michael. *Towards a Common Future: A Report on Sustainable Development and Its Implications for Canada*, Minister of Supply and Services, Canada, 1989. (Dafoe GovDoc Can1 En9.7 T69 1989 and Sci HD K42 1989)

Manitoba Round Table on Environment and Economy. *Sustainable Development: Towards Institutional Change in the Manitoba Public Sector*, Sustainable Development Coordination Unit, Winnipeg, 1992. (Dafoe GovDoc Can6 Man1 PR22.7 SU78 T68 1992)

Manitoba Round Table on Environment and Economy. *Towards a Sustainable Development Strategy for Manitobans*, Sustainable Development Coordination Unit, Winnipeg, 1990. (Dafoe GovDoc Can6 Man1 PR22.7 SU78 T69 1990)

Schumacher, Ernst. *Small is Beautiful, Economics as if People Mattered*, Harper and Row, New York, 1973. (Dafoe HB 171 S384 1973)

World Commission on Environment and Development. *Our Common Future*, Oxford University Press, New York, 1988. (Dafoe HD 75.6 097 1987b)

Technical Information

The following sources were used to provide specific technical or statistical information for demonstration study.

Denmark, William L. "The Climate of Illinois", pp. 90 - 93.

Mohlenbrock, Robert H. *Guide to the Vascular Flora of Illinois*, Southern Illinois University Press, 1975. (Sci QK 157 M63 1975)

National Climatic Center. *Climate Normals of the United States (Base 1951 - 80)*, Gale Research Co., Detroit, 1983. (Dafoe Ref QC 983 C53 1983)

Ollswang, Jeffrey E. and Lawrence P. Witzling. *Design Competition for A New American Green - Program*, Olympia Fields Park District, 1991.

Ollswang, Jeffrey E. and Lawrence P. Witzling. *Design Competition for A New American Green - Response to Inquiries*, Olympia Fields Park District, 1992.

Ruffner, James A. and Frank E. Bair eds. *The Weather Almanac, Second Edition*, Gale Research Co., Detroit, 1984. (Dafoe Ref QC 983 R83 1984)

Urban Design Strategies

Restoring the functioning of ecological processes in the open spaces of our communities is one small step we can take to make our cities more sustainable. The works in this section take the pursuit of sustainability even further by proposing alternatives to typical urban/suburban development. Mixed use, energy efficiency - though building design and planning to reduce dependency on the automobile, compactness, self-sufficiency through the introduction of urban agriculture, and minimizing wastes are the key elements in each of these strategies.

Van der Ryn and Calthorpe give numerous case studies, and Gerecke and Berg document 'green city plans' that have been developed for New York and San Francisco respectively. Jacobs' classic work is also included here as her emphasis on a strong sense of community, social issues, diversity, safety, and minimizing the role of the automobile are ideas that have become central to the theories of good community form that the others propose.

Berg, Peter, Beryl Magilay and Seth Zuckerman. *A Green City Plan for the San Francisco Bay Area and Beyond*, Planet Drum Books, San Francisco, 1989. (Arch HT 243 U62 C234 1990)

Gerecke, Kent ed. *The Canadian City*, Black Rose Books, Montreal, 1991, pp. 239 - 243. (Arch HT 127 C335 1991)

Holloway, Dennis et al. *Winona: Towards an Energy Conserving Community*, University of Minnesota Press, Minneapolis, 1975. (Arch NA 2542.3 W55)

Jacobs, Jane. *The Death and Life of Great American Cities*, Random House, New York, 1961. (Arch 711.40973 De + Dafoe NA 9108 J3 1961b)

Registar, Richard. *Ecocity Berkeley, Building Cities for a Healthy Future*, North Atlantic Books, Berkeley, 1987. (Centennial 307.12 Reg)

Van der Ryn, Sim and Peter Calthorpe. *Sustainable Communities, A New Design Synthesis for Cities, Suburbs and Towns*, Sierra Club Books, San Francisco, 1986. (Centennial 307.14 Van)

Urbanization / History of The City

It is argued that humanities greatest achievements are the cities it has built. At the same time, the process of urbanization has had the greatest impact on the environment of all our activities. In order to make the city more sustainable, it is important to understand what made it unsustainable in the first place. These works document how cities have come to be what they are today, and through them, an understanding of the role urbanization has played in the rise of the environmental crisis can be gained.

While most of the authors discuss the events that have lead up to the modern day city in general, Whitehand presents of method examining individual cities to assess the specific forces that have resulted in their present states.

Chadwick and Sewell's works have a different focus. Chadwick examines the rise of parks and open space in the urban environment and the role they play in our society, and Sewell discusses the failings of modern residential development from a Canadian perspective. Although somewhat dated, this work is well documented with statistics.

Benevolo, Leonard. *The History of the City*, M.I.T. Press, Cambridge, 1980. (Arch HT 111 B4513 1980)

Chadwick, George F. *The Park and Town*, Architectural Press, London, 1966. (Arch SB 481 C5 1966)

Goode, Patrick, and Michael Lancaster. "Public Parks" in *The Oxford Companion to Gardens*, Oxford University Press, New York, 1986, pp. 456 - 457.

Laurie, Michael. *An Introduction to Landscape Architecture*, Elsevier, New York, 1986. (Arch SB 472 L38 1986)

Mumford, Lewis. *The City in History, Its Origins and Transformations*, Harcourt Brace Johenvich, New York, 1961. (Arch 323.352 M1919 Ci + Dafoe, St Pauls HT 111 M8)

Sewell, John. "Why Suburbia Hasn't Worked" in *City Magazine*, Vol. 2, No. 6, Jan. 1977, pp. 39 - 49. (Arch Per 300 C4989 Mag)

Whitehand, J.W.R. *The Making of the Urban Landscape*, Blackwell Books, Cambridge, 1992. (Dafoe HQ 166 W48 1992)