

# 미국 Huron-Clinton 대도시 공원체계의 공간적 특성에 관한 연구

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## A Study on the Spatial Characteristics of Huron-Clinton Metropark System in the United States

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### ABSTRACT

本 研究는 미국의 Huron-Clinton 大都市의 公園體系의 空間的 特性의 究明을 目的으로 한다. 이를 위하여 다음과 같은 因子들을 分析한다.

첫째 13개의 地域公園으로 構成되어 있는 Huron-Clinton 大都市 公園體系의 全體의 構成의 特性을 把握하기 위하여 本 公園體系의 立地의 地域空間的, 生態的 因子를 分析한다. 둘째, 公園體系를 構成하는 각 公園의 個別의 特性을 알아내기 위해 각 公園內의 施設의 類型, 크기, 多樣性을 分析한다. 셋째, 本 研究對象地域의 人口의 特性을 分析한다. 넷째, 人口의 特性과 公園體系의 空間的 特性을 相互對照 함으로써 그 地域의 人口와 公園體系간의 關係를 分析한다.

分析結果를 25人 造景專門家를 통해 評價함으로써 向後 大都市 公園體系의 計劃과 開發이 指向해야 할 方向의 設定과 構成의 合理的 指標를 設定한다.

#### 1. Introduction

This research aims at investigating the spatial characteristic of the Huron-Clinton Metropark system located in the outskirts of the Detroit metropolitan area in U.S.A. and thereby suggesting a prototype which serves as a guideline for future development of metropolitan park systems.

U.S.A. has accumulated a lot of experiences in planning of Metropolitan park systems since Charles Eliot proposed the Boston metropolitan park system in 1893(Newton, 1971). Huron-Clinton Metropark system is one of the finest metropolitan park systems in U.S.A.

Huron-Clinton Metropark system has been planned and implemented to meet greatly incre-

asing recreational needs of the growing population in the Detroit metropolitan area since Huron-Clinton Metropolitan Authority (HCMA) was created in 1942, to deal with planning, development and management of the metropark system.

The metropark system consists of thirteen regional parks as follows : Metro Beach, Wolcott Mill, Stony Cleek, Indian Springs, Kensington, Huron Meadows, Hudson Mills, Dexter-Huron, Delhi, Lower Huron, Willow, Oakwoods, and Lake Erie Metroparks.

A metropark system is designated and planned not only for preservation and conservation of valuable scenic landscape but also for development of landscape to meet recreational demand of people in a regional context.

According to the classification system of the supply of recreational opportunities by Clawson (1963) the metropark system belongs to the category of intermediate areas which lies in between user-oriented sites and the resource-based area. Therefore planning of the metropark system should deal with both development of recreational facilities and preservation and conservation of resource base of a given landscape which is well represented by its ecological attributes.

Generally a metropark system consists of a series of individual parks connected by parkways. As such, to identify spatial attributes of a metropark system, it is necessary to examine it not only in regional context but also at individual park level.

Although every metropark system is unique in its spatial organization, there are common principles of planning of a metropark system. In this study, planning principles and the general policy of the HCMA are employed as criteria to identify spatial attributes of the Huron-Clinton Metropark system and the 13 individual metroparks of the Metropark system. The planning principles and the general policy of the HCMA constitute the analytic framework of this study to investigate whether the metropark system and its individual

parks are fit to given regional and ecological context and whether they are effective to meet the goals of the general policy of the HCMA.

Factors considered in the analysis at the regional level are geographical location, population characteristics, existing land use, geology, soil, topography, climate, hydrology and vegetation whereas at individual park level, size, accessibility, recreational activities and facilities, and circulation pattern are included as primary factors.

Data concerning factors of the regional and ecological context and individual metroparks were gathered by ways of aerial photographs, maps, photographs and direct observation. The data were analyzed to identify spatial characteristic of the Metropark system by the analytic framework previously described.

The results of the analyses were shown and explained to a panel of experts which consisted of 25 landscape architects to evaluate the extent to which the Huron-Clinton Metropark system and the 13 individual parks meet the criteria of the general principles of planning of a metropolitan park system and the general policies of HCMA. A 10-point scale was used to evaluate the Huron-Clinton Metropark system (10=excellent, 5=neutral, 1=poor).

## 2. Principles of planning of Metropark system and planning policies of HCMA

As stated previously, planning of a metropark system should deal not only with development of recreational facilities but also with preservation and conservation of landscape resources. Hence principles of planning of a metropark system are related to development preservation and conservation of landscape resources.

The general principles of planning of a metropark system concerning positive development of recreational facilities are as follows :

1. Metroparks should be easily accessible via major

transportation network so that they can be accessed by automobile and public transportation (Jubenville, 1976) ;

2. There should be enough distance between the metroparks and major transportation arteries to minimize effects of sounds, sight and traffic on the safety and recreational enjoyment of visitors ;
3. For effective supply of recreational facilities, the size of the metropark should be well over moderate size to serve large numbers of people, i.e., a hundred to several thousand acres (SEMCOG, 1968)
4. Major types of recreational activities that a metropark system should offer are camping, picnicking, swimming, fishing, boating, outdoor sports, and nature walks ;
5. Major use occurs during day outings and weekends ;
6. Salient factors suitable for active recreation areas are beaches, expanse of water, riparian lands, flat lands, etc. ; and
7. It is required that the recreational development be harmonious with the landscape.

Ecological principles of planning of the metropark system for effective preservation and conservation of valuable resources of a given landscape are as follows ;

1. Natural processes inherent in ecosystem offer opportunities and constraints for human use of land and water resources ;
2. Values of natural processes are function of geology, soil, topography, climate, hydrology, vegetation and existing land use ;
3. Since water is a major limiting factor for ecological balance and soundness, the planning boundary of the metropark system should at least encompass watershed areas ; and
4. The salient factor suitable for preservation, conservation and passive recreational use of landscape resources are unique topographic

features, scenic water features, features of historic value, high-quality forests, high-quality marshes, scenic land features, unique geologic features, scarce ecological associations, etc.

Landscape planning based on ecological principles is more likely to create resilient and self-sustaining solutions : The nearer the solutions to ecologically-based planning the less likely they are to be ousted by nature and to require costly management to maintain them (McHarg, 1969 ; Forman and Godron, 1986). Thus it is a necessary step to examine the extent to which the Huron-Clinton Metropark system fits to the ecological principles stated above.

Planning policies of HCMA are reviewed to identify characteristics of the institutional framework for the Huron-Clinton Metropark system. The general planning policies of HCMA include goal setting projection into the future phase, development of course of action, coordination of action and flexibility of plans as to the metropark system. Among them policies closely related to spatial organization of the metropark system are stated as follows (SEMCOG, 1968) :

1. The Authority's Master plan of the metropark system should become a component part of the Regional Recreation Lands Plan as well as the Comprehensive Master Plan for the region ;
2. The Master plan should include the possible utilization of the natural valleys of the Huron and Clinton Rivers and their tributaries, the inland lakes of the area, and the waterfront on the Great Lakes system with a view to locating, acquiring and developing regional recreation areas of large capacity ;
3. The recreational areas should be large enough to serve large numbers of people from the Huron-Clinton Metropolitan Authority district, that is 1000 acres or more and ;
4. The scope of the development of the metropark system should be regional for economic opera

tion and maintenance ;

5. In preparing of the master plan coordination among Federal, State, regional county and local planning, park and recreational agencies operating within the Authority's district should be made to reach agreement on the plan and responsibilities whenever possible ;
6. Transportation network of Federal, State, county and local roads should be included in the master plan ;
7. For effective water quality control HCMA cooperates with the Michigan Water Resource Commission and all health authorities operating in the region ; and
8. The land and water acquisition for future recreational demand should be implemented according to a well planned program and such designated land and water should not be transformed to other uses.

The planning principles and the policies of HCMA provide for the frame of reference to identify spatial characteristics of Huron-Clinton Metropark system.

On the basis of previously stated general planning policies of HCMA and general planning principles of a metropolitan park system, the Huron-Clinton Metropark system and the 13 individual metroparks of the metropark system are examined to identify the spatial characteristics of the metropark system and each individual park.

### 3. Analysis

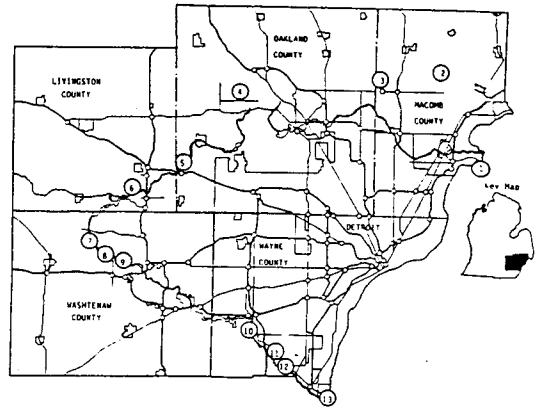
As stated previously, the metropark system is analyzed at both regional and individual park levels. At regional level, the regional context of the metropark system is analyzed in terms of geographical location, existing land use, population and ecology based on geology soils, topography, hydrology, climate and vegetation, whereas at individual park level, pattern of spatial organiz

ation of each individual metropark is analyzed in terms of recreational activities, facilities and circulation patterns.

#### Geographical Location

As shown in Figure 1, Huron-Clinton metropark is located in the vicinity of Detroit Metropolitan area across five Southeast Michigan counties ; Livingston, Macomb, Oakland, Washtenaw and Wayne counties.

Designated number from 1 to 13 in Figure 1



- |                  |                 |              |
|------------------|-----------------|--------------|
| 1 Metro Beach    | 6 Huron Meadows | 11 Willow    |
| 2 Wolcott Mill   | 7 Hucson Mills  | 12 Oakwoods  |
| 3 Stony Creek    | 8 Denter-Huron  | 13 Lake Erie |
| 4 Indian Springs | 9 Delmi         |              |
| 5 Kensington     | 10 Lower Huron  |              |

Figure 1. Location of Huron-Clinton Metropark System

refers to each individual metropark and its location in the region. The metropark system surrounds the Detroit Metropolitan area stretching from St. Clair Lake through Clinton and Huron rivers to Lake Erie.

The metroparks are highly accessible. They are within one hour drive range from the central district of the Detroit Metropolitan area and conveniently connected by scenic parkways.

#### Population Characteristics

Many of population characteristics such popu-

lation characteristics, age, size of familis have a direct bearing on planning of metroplitan park system (Satterthwaite and Marcou, 1968). The composition of the population as well as size has an important effect on future park system planning in terms of determining demand for recreation.

As of 1980 the total population of the region is 4,409,321[Table 1].

The population of the region during the decade 1970 to 1980 decreased by 87,309 primarily due to outmigration of population in Detroit wheras population of other counties increased.

The growth rate of Livingston county is the highest and the rest of the counties have similar growth rates ranging 10.9 % to 13.1 %. Overall the growth rate of the region during the decade is  $-0.022\%$ , and the annual growth rate is only  $-0.002\%$ . It indicates that total population has been stablized around 4,400,000.

Table 1. Population of the Region in 1970 and 1980.(U. S. Bureau of Census, 1970 ; 1980)

County	1970	1980	Population(%)
Livingston	58,967	100,289	+41,322(70.0)
Macomb	625,309	694,600	+69,291(11.1)
Oakland	907,123	1,011,793	+104,670(11.5)
Washtenaw	234,103	264,748	+30,645(13.1)
Wayne	2,670,368	2,337,891	-332,447(-12.4)
Total	4,496,630	4,409,321	-87,309

As shown in Table 2, the population in the region is aging. Except for the age brackets of over 65 of Livingston and Washtenaw counties, there has been a great increase of number in every shift from under 18 to 19-64 bracket and 19-64 bracket to over 65 bracket across the five counties.

In general one-half of the people living in the metropolitan area will use the metropark facility during a year. The park users survey found that

Table 2. Age Distribution in 1970 and 1980 (U. S. Bureau of Census, 1970 ; 1980)

COUNTY	1970			1980		
	0-18	19-64	over 65	0-18	19-64	over 65
Livingston	40.3%	51.8%	7.9%	27.4%	65.6%	7.0%
Macomb	39.9%	53.3%	6.8%	22.2%	70.1%	7.7%
Oakland	38.5%	54.7%	6.8%	19.8%	71.3%	8.9%
Washtenaw	35.1%	57.4%	7.5%	17.8%	75.8%	6.4%
Wayne	36.9%	55.6%	7.5%	16.6%	72.9%	10.5%

about 10 % of total population used the metroparks on an average summer sunday and about 4 % on an average weekday(SECOG, 1974). In the future, the use of the metroparks is expected to increase because of rising income, increased mobility and more leisure time.

#### Land Use

The size of the region is 8,573km<sup>2</sup> and the area of each county is shown in[Table 4].

Land use patterns include urban land, recreational use, agricultural land, wetlands and flood-

Table 4. Area of Five Counties

County	Area(km <sup>2</sup> )
Livingston	1,510
Macomb	1,246
Oakland	2,352
Washtenaw	1,857
Wayne	1,608
Total	8,573

plains, wood lands and other natural vegetative areas such as range land[Figure 2].

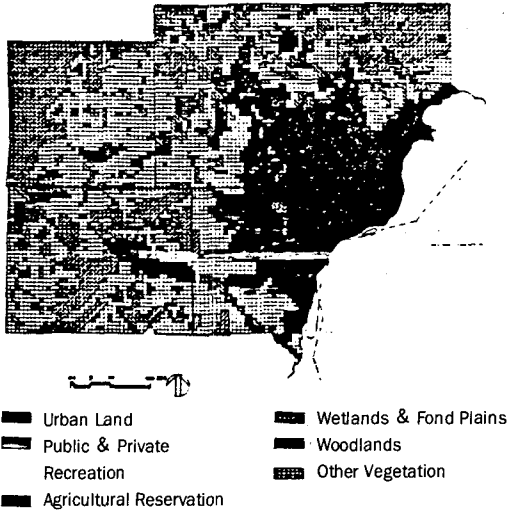


Figure 2. Land Use

The urbanized land covers the second largest portion of the land use(27%). The largest portion of the land use is the area of vegetative cover which consists of woodlands(10%) and areas of other forms of natural vegetation(34%). The third largest portion of the land use is the agricultural land(16%). The wetlands which consist of rivers, streams, lakes and the swamps cover the 8% of the area of the region. The public and private recreation areas occupy 5% of the region.

Natural features of the region are identified by analyzing six ecological factors. These are geology, topography, soils, climate, hydrography and vegetation.

### Geology

The region's surface geological features were greatly influenced by pleistocene glaciations and their corresponding water levels, which created two distinct glacial provinces in the region. The northwest section of the region, including Livingston and Washtenaw counties and most of Oakland county is part of the Thumb Upland.

The northeastern and southeastern counties including Macomb and Wayne, are in the Huron-Erie lowland[Figure 3].

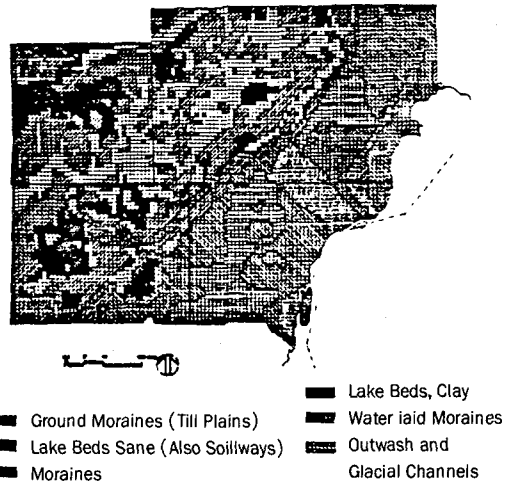


Figure 3. Surface Geology

The Thumb Upland is characterized by morainal ridges, till plains, glaciofluvial outwash channels and gravel plains. The till material in moraine and till plain deposits does not yield large quantities of water while glaciofluvial deposits of various sand and gravel are often major aquifers for domestic, municipal and industrial demands.

The surface geology of Huron-Erie lowland was created by changing levels of the Great Lakes during the pleistocene. The presence of the lake created low relief and, consequently, sluggish perennial streams and high water table levels as seen in portions of Wayne and Macomb counties.

The ancient lake levels are marked by sandy beach ridges which trend northeast-southwest. During each lake stage, the lake action deposited thick beds of lacustrine clay. At the highest lake levels, the Huron and Clinton rivers deposited large sand deltas. This sand is usually a thin veneer 4-8meters thick on the lakebed clay. Little or no groundwater is available from the thick lakebed clay deposits as it has very low permeability.

The bedrock geology in the region is characterized by thick layers of sedimentary rock formations [Figure 4].

The younger sandstones and shales subcrop

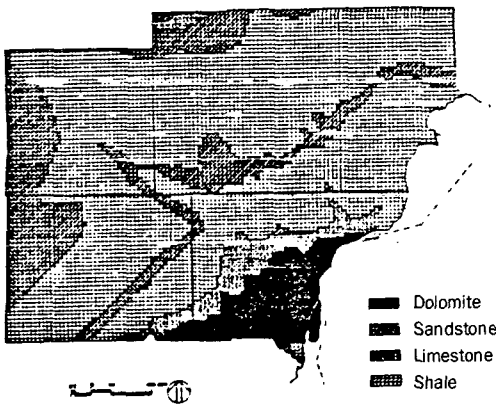


Figure 4. Bedrock Geology

beneath the glacial drift in Washtenaw, Livingston, Oakland and Macomb Counties. These are underlain by thick layers of shale with some sandstones. The next stratigraphic sequences are thick layers of Devonian limestones and dolomite. These are in southern Wayne (Dorr and Eschman, 1970).

**Topography**

The topography of the region was developed during the Wisconsin glaciation of the Pleistocene Era. Modern topography is the result of postglacial erosion and soil formation processes acting on glacial deposits.

Two different categories of landforms became prominent during the process. One is a rough morainic belt characterized by ridge-like hilly

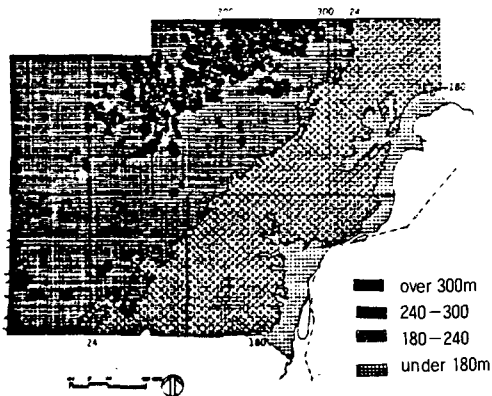


Figure 5. Topography

deposits interspersed with nearly level or gently rolling till plains or ground moraine, this trends in a northeast-southwest direction and encompasses the highest elevation in the region.

The other is generally broad, flat, sand gravel outwash features pitted with water-retaining depressions. Elevations range from about 300m in the upper land to 174m along Lake Erie [Figure 5].

**Soils**

The soils of the region are classified as gray-brown podzolic soils, which are formed in warmer climates under broadleaf deciduous forests of beech-maple, oak-hickory and similar associations (Smith, 1979). There are two contrasting soil zones in the region, corresponding closely to the two major topographic zones [Figure 6].

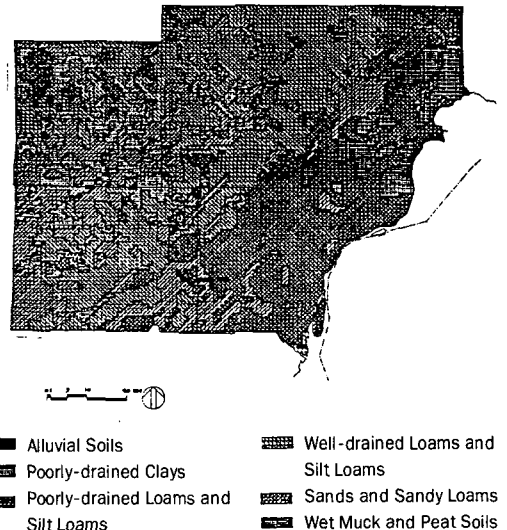


Figure 6. Soils of the Southeast Michigan Region

The lowland zone consists almost entirely of level, poorly-drained silt loam and clay on former lake bottom sediments. Isolated areas of level sandy soils are also found in the lowland zone as remnants of glacial river-deltas. Along the flood plains of major streams alluvial soils have developed. Although not naturally well-drained, the

level loam of the lowland zone are the most-productive in the region when tilled and properly managed.

In the upland zone, slopes vary from gently rolling to steep. Sandy loam is the predominant texture with sandy soils. These soils range from well-drained to overly dry for agriculture, as the coarse texture of the parent material permits rapid percolation of water.

**Climate**

The region has a mild-continent climate, that is common to Northeast United States. The area has distinct four seasons, characterized by hot summers and cold winters. The climate of the region is a function of its position relative to the Great Lakes and its topography(Eichenlaub, 1979).

The most important climatic factor is temperature. The temperature of the area increases along the northeast-southwest axis which is parallel to the coastline of Lake St. Clair and Lake Erie. The annual mean temperature ranges from 10.0°C (50°F) to 8.9°C (48°F).

Precipitation in the region is abundant but not excessive. The annual mean precipitaion locally varies from 711mm(28 inches) to 864mm(34 inches) [Figure 7]. Precipitatioin increases southeastward across the region although the increase

is not even, due to topography and lake effects.

Temperature effects are appropriately analyzed and identified in terms of plant growth, which is closely related to the number of days in the growing season, the number of days between the last frost in spring and the first frost in fall. In the area there are 160 to 170 days of growing season.

**Hydrology**

Hydrology is related to the movement and endless recycling of water between the atmosphere, the land surface and underground. Among the hydrologic cycles the surface runoff has most important implications for planning of a regional park system. The surface runoff is defined by topographic divides which separate surface flow between two water systems.

A watershed refers to the area drained by a river and its tributaries(Likens et al., 1977). Since water is a very critical factor in ecology(Odum, 1983), it is required that a planning boundary at least correspond to the boundaries of the watersheds.

The topography of the region divides the area into five distinct watershed areas[Figure 8]. The Huron-Clinton metropark system locates within the Huron and Clinton watersheds.

Water is a central factor in regional landscape

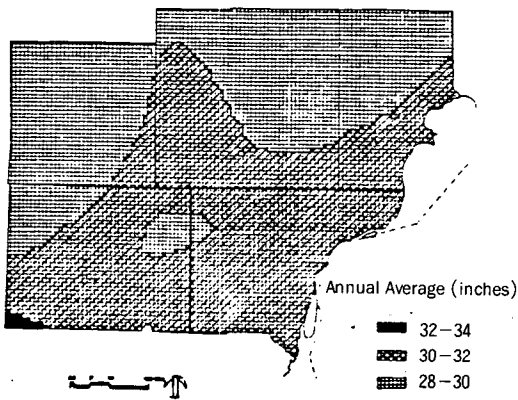


Figure 7. Precipitation

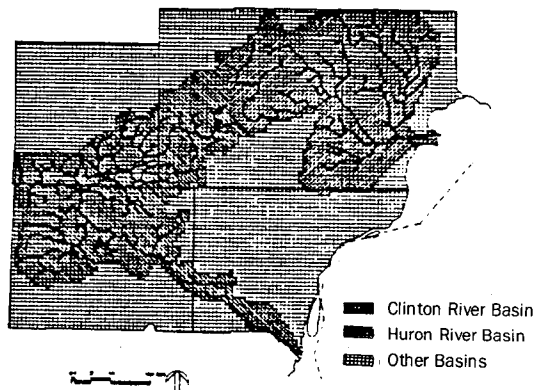


Figure 8. Huron & Clinton River Basins



planning (Dunne and Leopold, 1978). It is a basic resource not only for municipal, industrial, agricultural and recreational uses but for visual amenities. As such, preservation and conservation of water resource are emphasized in a region wide planning(SECOG, 1978). The existence of the metropark system within the Huron and Clinton watershed areas contributes to enhancement of the water quality of the region.

**Vegetation**

The vegetation of the region is further characterized as the oak-hickory subzone. Within this region original vegetative patterns follow the general northeast-southwest pattern of landforms and soils(Barnes, 1981).

The nature of a given vegetation is determined by the interaction of three factors ; the site available for plant growth, climate and soils. The plant communities shown in Figure 9 are climax communities, those that terminate a successional sequence on the regional climate, soils, physiography and other local site factors.

There are three distinct plant communities in the region : , Oak-Hickory, Beechs-Sugar Maple and Deciduous Swamp communities.

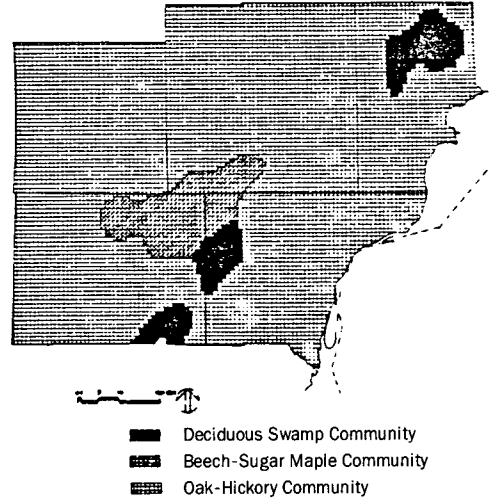


Figure 9. Potential Forest Communities

**Spatial Characteristics of Individual Metropark**

As stated previously, the Huron-Clinton Metropark system consists of 13 individual metroparks. At individual park level, spatial characteristics of each individual park is examined in terms of size, recreational activities and facilities and circulation pattern. Figure 10 to Figure 22 show the schematic plans of the 13 individual metroparks.

The size of each individual park is shown in Table 5

Table 5. Size of the Metroparks

Metropark	Area(ha)	Year Opened
1. Metro Beach Metropark	312	1950
2. Wolcott Mill Metropark	859	Open by Appointment
3. Stony Creek Metropark	1,805	1964
4. Indian Springs Metropark	893	1982
5. Kensington Metropark	1,755	1948
6. Huron Meadows Metropark	622	1984
7. Hudson Mills Metropark	657	1957
8. Dexter-Huron Metropark	49	1952
9. Delhi Metropark	20	1957
10. Lower Huron Metropark	501	1953
11. Willow metropark	620	1970
12. Oakwoods Metropark	711	1975
13. Lake Erie Metropark	643	1980
Total	9,447 ha	



of park area per 1,000 persons in the region.

All the metroparks are within an hour drive range for the most residents of the region. Access to each metropark is conveniently provided for by well planned free-ways and scenic parkways as shown in Figure 1.

Recreational activities and facilities accommodated in each metropark are shown in Table 6. Table 6 also represents diversity of spatial organization of each metropark. Assuming that each activity or facility in Table 6 has an equal weight, Kensington, Metro Beach and Stony Creek metroparks are the most diverse, Hudson Mills, Lower Huron, Willow and Lake Erie Metroparks are moderately diverse, and Indian Springs and Oakwoods Metroparks are the least diverse in terms of extent of providing recreational experience.

Although each metropark has its own unique spatial organization as shown in Figure 10 to Figure 22, it is possible to group spatial organization of the 13 metroparks into three major patterns. The first pattern is largely determined by the shape of river channel which is curvilinear. Circulation pattern is almost parallel to the line of river flow and recreational activities and facilities are linearly distributed along the circulation pattern. Hence the river channel forms the backbone of spatial organization. Oakwoods, Willow, Lower Huron, Hudson Mills, Dexter Huron, Delhi and Wolcott Mill Metropark belong to this category. Among them Wolcott Mill Metropark in Macomb County is still under development, and open for group tours of the historic mill site only by appointment.

The second pattern is organized around the edge of a large lake. The circulation pattern surrounds the lake and recreational facilities are located centrifugally toward the lake. Stony Creek and Kensington Metropark belong to this pattern.

The third spatial organization pattern is characterized by the shape of the interface between a park site and lake. Metro Beach, and Lake Erie

Metroparks interface with lake St. Clair and Lake Erie respectively. Recreational activities and facilities are distributed along the edge of the interface between the park site and the lake.

Huron Meadow Metropark has a mixed pattern of spatial organization between the first and the second pattern. The water bodies of the Metropark consists of a river and a lake. Circulation pattern is closely related to the water bodies to provide for access to recreational facilities along the edge of the water bodies.

Indian Springs Metropark has a different spatial organization pattern from the rest of the Metroparks in that the water body within the park site is not so dominant as other metroparks. It is due to that Huron River flows through just the southwest corner of the park site. Circulation pattern is parallel to the boundary of the park site and recreational activities and facilities are located linearly along the circulation pattern.

Another common feature in spatial organization of the metroparks is that development, conservation and preservation are spatially well-defined. Positive development to accommodate active recreational activities is functionally separated from passive recreational areas such as picnic area and trail but at the same time they are easily accessible from each other. And active recreational areas are located remotely from preservation areas. As such the circulation patterns of the metroparks not only provide for efficient connection among use areas but also facilitate effective preservation of ecologically vulnerable areas and scenic areas that should be preserved. (HCMA, 1979 ; 1981 ; 1983 ; 1985).

#### 4. Evaluation

The items for evaluation of the Huron-Clinton Metropark system as a whole are as follows :

1. accessibility from the population center of the region ;

2. distance between the metroparks and major transportation arteries ;
3. size of the metropark system ;
4. number of the metroparks in the metropark system ;
5. diversity of recreational activities accommodated in the metropark system ;
6. size of water bodies in the metropark system.
7. use of water bodies as recreation resources ;
8. compatibility of the metropark system with the adjacent land uses in the region ;
9. fitness of the metropark system to the ecological attributes of the region ; and
10. overall spatial organization of the metropark system in the regional context.

The items for evaluating spatial characteristics of each metropark are as follows ;

1. accessibility ;
2. size ;
3. diversity of recreational facilities ;
4. utilization of water bodies as recreation resources ;
5. size of water bodies
6. fitness of recreational development to given landscape ;
7. circulation pattern ;
8. relevancy of transition from recreational areas to conserved areas and to preserved areas ;

9. functional relationship among use areas ; and
10. ecological soundness of overall spatial organization.

These items were presented and explained to the panel of experts which consisted of 25 landscape architects along with the result of the analyses. For evaluation a 10-point scale was used (10=excellent, 5=neutral, 1=poor). The mean scores of the items for the Huron-Clinton Metropark system and for each metropark are shown in Table 7 and Table 8 respectively.

- where
- |                 |                   |
|-----------------|-------------------|
| 1. Metro Beach  | 2. Wolcott Mill   |
| 3. Stony Creek  | 4. Indian Springs |
| 5. Kensington   | 6. Huron Meadows  |
| 7. Hudson Mills | 8. Dexter-Huron   |
| 9. Delhi        | 10. Lower Huron   |
| 11. Willow      | 12. Oakwoods      |
| 13. Lake Erie   |                   |

Evaluation of the 10 items with regard to the metropark system as a whole indicates that it is an excellent park system in every aspect of spatial organization. Every evaluative item has moderately high to very high mean score in the 10-point scale except for accessibility factor, all have the mean scores above 9.0.

Evaluation of quality of spatial organization

Table 7. Mean scores of evaluation of the Metropark System as a whole.

Evaluative Items	Mean Score
1. accessibility from the population center	8.8
2. distance between the metroparks and major transportation arteries	9.2
3. size of the metropark system	9.8
4. number of the metroparks	9.6
5. diversity of recreational activities	9.4
6. size of water bodies	9.6
7. utilization of water bodies as recreation resources	9.2
8. compatibility of the metropark system with adjacent land uses	9.7
9. fitness of the metropark system to the ecology of the region	9.0
10. overall spatial organization of the context metropark system in the regional	9.4
Total	93.7

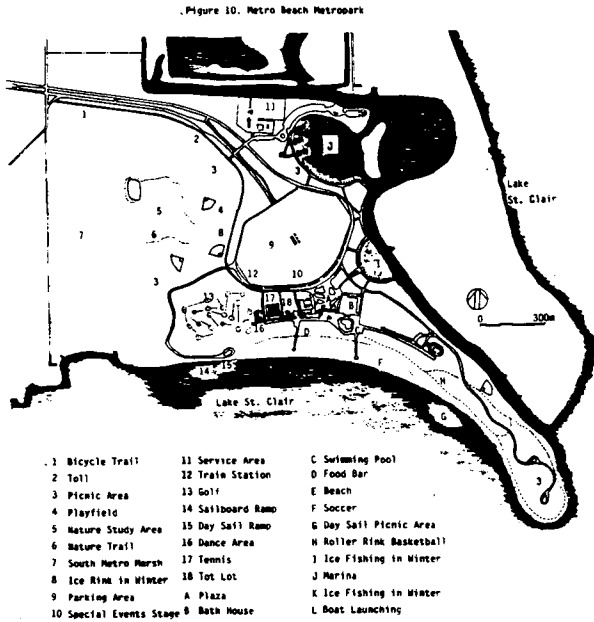


Figure 10. Metro Beach Metropark

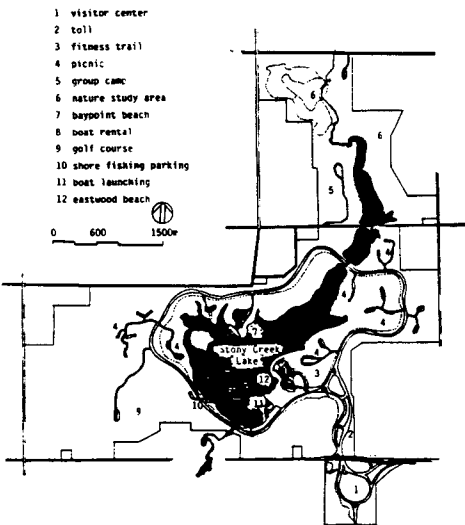


Figure 12. Stony Creek Metropark

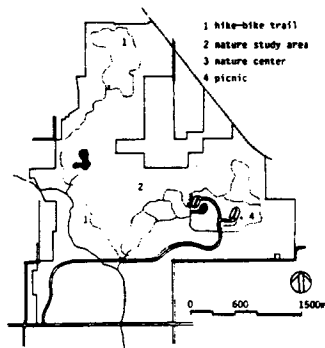


Figure 13. Indian Springs Metropark

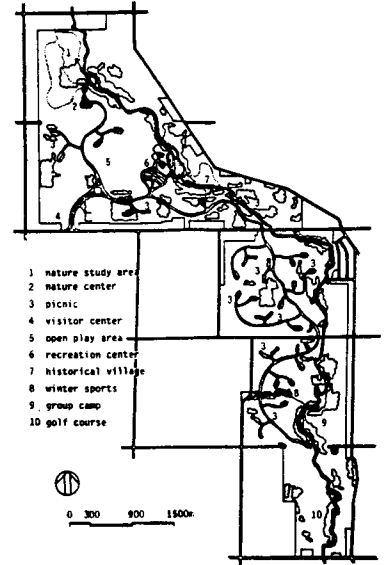


Figure 11. Wolcott Mill Metropark

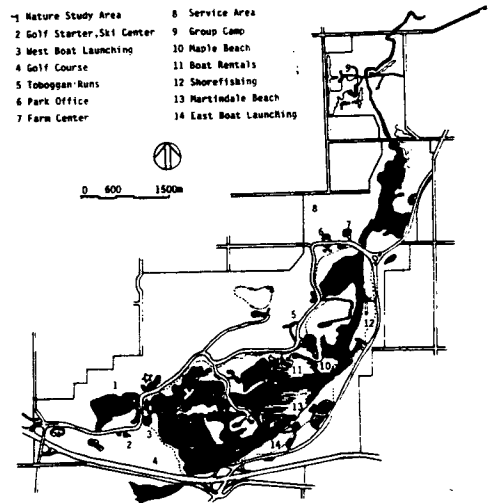


Figure 14. Kensington Metropark

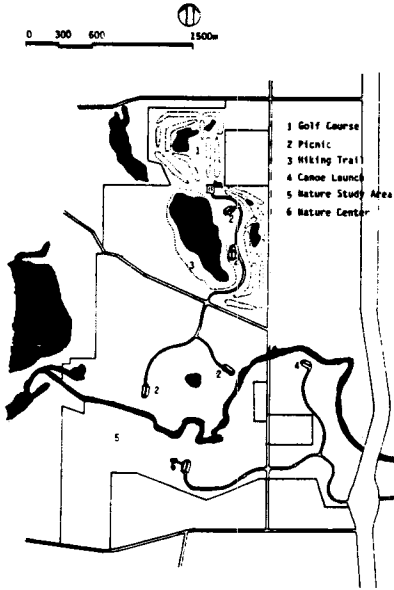


Figure 15. Hurson Meadows Metropark

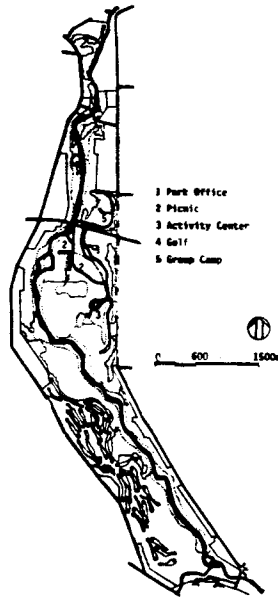


Figure 16. Hudson Mills Metropark

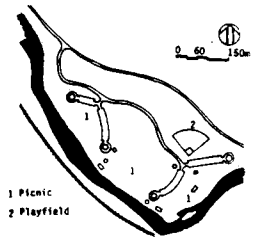


Figure 17. Dexter-Huron Metropark

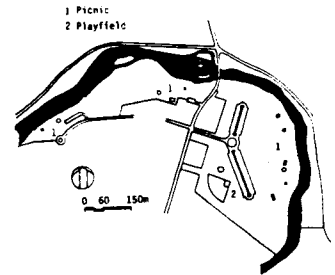


Figure 18. Delhi Metropark

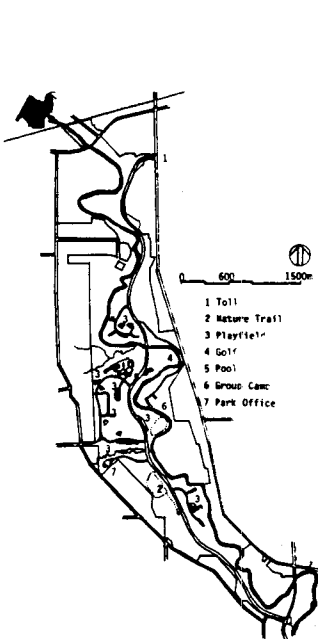


Figure 19. Lower Huron Metropark

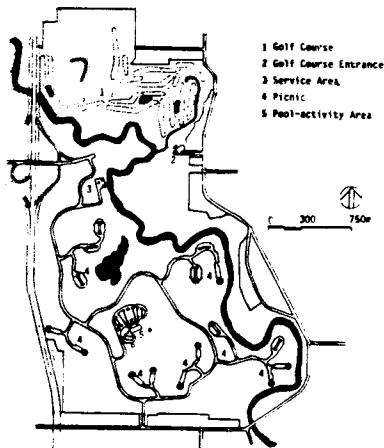


Figure 20. Willow Metropark

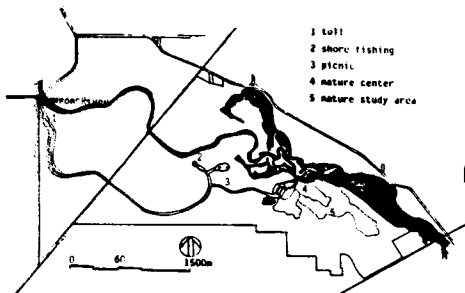


Figure 21. Oakwoods Metropark

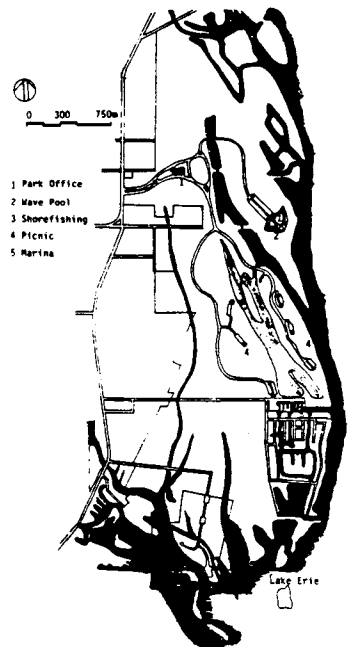


Figure 22. Lake Erie Metropark

characteristics of the 13 individual parks consists of 10 items. The mean scores for each individual metropark are shown in Table 8. The total score of each metropark which adds up the mean scores for the 10 items varies from modestly high to very

high. Except for Dexter-Huron and Delhi Metro-parks, each metropark has high quality in its spatial organization. Especially Metro Beach, Stony Creek, Kensington, Lower Huron, Willow and Lake Erie Metroparks have excellent quality.

Table 8. Mean scores of evaluation of each metropark

Evaluative Items	Metropark												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1. accessibility	7.5	6.8	7.8	8.0	8.7	7.8	6.8	7.0	7.8	9.6	9.4	9.0	8.1
2. size	5.2	9.0	9.8	9.1	9.7	8.1	8.4	3.5	2.0	7.6	8.1	8.6	8.2
3. diversity of recreational facilities	9.3	5.4	9.5	7.4	9.7	6.0	8.5	6.8	7.2	8.7	8.5	7.2	8.2
4. utilization of water bodies as recreation resources	9.4	3.4	9.6	3.4	9.6	3.4	4.2	4.2	4.2	7.2	7.2	5.0	8.0
5. size of water bodies	9.8	8.3	9.4	4.8	9.6	8.7	8.3	8.0	8.0	8.3	8.4	8.5	9.8
6. fitness of recreation development to given landscape	9.4	9.8	9.8	9.7	9.8	9.6	9.5	8.2	7.8	9.2	9.3	9.0	8.8
7. circulation pattern	9.4	9.7	9.6	9.4	9.7	9.2	9.0	8.6	8.4	9.2	9.3	8.6	9.1
8. relevancy of transition from recreation areas to conserved areas and to preserved areas	9.0	9.6	9.4	9.8	9.6	9.2	9.0	8.0	8.2	9.2	9.2	9.0	8.4
9. functional relationship among use areas	9.8	9.5	9.4	9.0	9.6	8.6	8.4	8.2	8.0	9.0	9.2	8.4	8.6
10. ecological soundness of overall spatial organization	8.8	9.7	9.6	9.6	9.6	9.4	9.0	8.8	8.8	9.2	9.2	9.2	9.0
Total	87.6	81.2	93.9	80.2	95.6	80.0	81.1	71.3	70.4	87.2	87.8	82.5	85.6

## Conclusion

By analyzing location, existing land use, population characteristics and ecology of the study region, it is possible to identify spatial character-

istics of the Huron-Clinton Metropark as follows ;

1. The metropark system surrounds the highly urbanized Detroit Metropolitan area ;
2. It serves approximately 4.4million people in the

- region in terms of providing recreation amenities;
3. For most of the residents in the region, it is easily accessible via well-planned freeway and scenic parkway systems, i.e., it is within one hour drive range for most of the residents in the region ;
  4. It provides for 9,447ha of recreational area, that is 2.15ha per 1000 persons ;
  5. It is within Huron and Clinton River basins ;
  6. It is organized around water bodies such as rivers, streams or lakes ;
  7. It is located at ecologically marginal land, that is, lands suitable for agriculture are avoided from selecting recreational lands for the metropark system ; and
  8. The existence of the metropark system contributes not only to enrichment of recreation experience of the residents in the region but also to enhancement of environmental quality of the region.

Analyses of spatial organization fo 13 individual metroparks reveal the commonal spatial characteristics as follows :

1. Water bodies are dominant element in spatial organization of each metropark ;
2. Development of recreational facilities, conservation and preservation of landscape resources within each metropark are well balanced, that is, the spatial organization of each metropark is ecologically sound, well-conceived and implemented ;
3. Spatial organization of each metropark is finely tuned not only to social demand for recreational activities of the residents but also to ecological requirements of each given site ;
4. Recreational facilities are designed effectively to meet the needs and demands for active outdoor recreation ;
5. Circulation patterns are fit to smoothy winding natural forms and lines of rivers, streams and lakes ; and

6. Spatial relations among active recreation areas (e. g., swimming, boating,) passive recreation areas (e. g., picnic ground, trail), and preservation areas(e. g., nature study area, scenic area) are well-established, i. e., active recreation facilities are grouped together closely and separated from passive recreation areas and from preservation area, while active recreation areas are conveniently interconnected to passive recreation areas and remotely located from preservation areas.

The evaluation of the metropark system by the experts supports that overall the Huron-Clinton Metropark System is and excellent park system in every aspect of the planning principles of a metropolitan park system and the general policies of the HCMA. The Huron-Clinton Metropark system and 13 individual metroparks have been planned, implemented and managed in accordance with the planning principles and it is an effective system to meet the goals of the general policies of HCMA. It is finely tuned to the needs and demand of the residents of the region for recreational activities and to the ecological requirement of the region.

Based on these research findings, implications for a future metropark system can be stated as follows.

1. The ideal spatial pattern of a metro park system is that it surrends a given metropolitan area ;
2. A metropark system should be able to encompass an entire watershed area for the planning of it to be ecologically sound ;
3. Each metropark should be with in a 70km radius ; and
4. A metropark system should be large enough to meet both standards of recreational and conservational needs, that is, more that 2.5 ha per 1000persons.



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