Monitoring and Management of Visitor Flows in Recreational and Protected Areas
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The Planning of User Flows in Istanbul Groves for Sustainability in Natural Structure

Adnan UZUN[1], Ahmet YESIL[2], Zerrin OZSULE[3]

[1]Associate Professor, Forestry Faculty, Landscape Architecture Department,
[2]Associate Professor, Forestry Faculty, Department of Forest Management Planning,
[3]Research Assistant, Forestry Faculty, Landscape Architecture Department
University of Istanbul , 80895 Bahcekoy, Istanbul
Email: aduzun@istanbul.edu.tr

Abstract: The greenness of Istanbul Bosphorus, except its natural vegetation, is gathered in its parks, gardens and groves. The greenness of the Bosphorus identifies itself with the groves that also have great monumental value. Today, in Istanbul, there is a great number of groves that belongs to either governmental or private institutions. Recently, these groves have experienced increasing pressure from the great number of visitors and their potential use. The latest inventories indicate that existing use patterns of the natural resources of groves affect the trees and plant diversity negatively. Overuse of specific sites causes damage to vegetation especially for exotic plant species that are rarely found in Istanbul. This paper is aimed to describe progress on a system that enables optimal dispersion of use patterns and sustainable use of the groves for future protection. The "User Inventory for Istanbul Groves" was developed to include periodic user observation and user survey in order to maintain groves effectively. For this reason, the computer technology is used as an evaluation tool for examining the user survey results and physical data of the groves that concentrate especially on Yildiz Grove. For the purpose of the study, Yildiz Grove is divided into different zones based on the physical conditions and potential use patterns of the grove and a system is developed that depends on sensitivity for usage.

INTRODUCTION

The metropolis of Istanbul is located in the northwestern part of Turkey. The Bosphorus that divides the city into two parts lets the European and Asian continents meet together.

Istanbul comprises the 9.7 % of the country's total land surface and it has significant importance on presence of the population. According to the year of 2000 population census, the total of the city's population reached to 10 041 477 and the annual increase is estimated to be 0.035 (Anonymous, 2000).

The amount of the active green space of Istanbul is 1.9 m²/per person including playgrounds, sport areas, public groves, forest and picnic areas. The amount of the passive green space is 3.1 m²/per person including afforested areas, nurseries and forests, green spaces with scenic values, public squares, refuges, cemeteries, etc. based on the 2000 census (Aksoy, Y. 2001).

According to this situation the total amount of the green space for per person is 5.2 m² in the city and there are certain efforts to raise this number of urban open spaces. But because Istanbul has always led in urbanization in the region, high immigration and the density of construction in the city center have limited these efforts.

The vegetation formation of Istanbul summarized maquis that represents the Mediterranean along the slopes and ridge of the Bosphorus and islands of Istanbul, and this vegetation type forms very dense and high vegetation cover in non-damaged areas. The other vegetation covers of Istanbul that form the green space of the city are comprised of groves, parks and residential gardens. Especially the Istanbul groves represent the greenness of the Bosphorus with natural appearance and monumental value.

In this study, the Yildiz Grove is selected as a sample area in the Besiktas District that has dense population and movement. The amount of the green space is 5.5m²/per person for the Besiktas district. In spite of the fact that the number is higher than the city average, the amount is accepted as "lower" because of the size of the population during day times.

The reasons for the selection of Yildiz Grove as a sample area for this research are its charming potential for the people with the magnificent Bosphorus view, its historical importance and the monumental trees that the grove has.

After examining the physical data of the Grove, questionnaire surveys named "User Inventory for Istanbul Groves" have been distributed to the user groups of the area.

In the light of this inventory, the Yildiz grove was evaluated depending on its sensitive structure, using style and density, and certain decisions were

made for keeping its sustainability in a natural structure.

ISTANBUL GROVES

The word "grove" is described as a small wood, a big group of trees or forested area located in or near the city.

Today, in Istanbul, there are a great number of groves that belong to either governmental or private institutions. And they have a very important role in the city because of their recreational capacities and potential of green spaces. (Table 1).

Grove Name	Area (ha)	Main characteristics
Cubuklu	23	Old garden of Ottoman Pavillion
Buyukcamlica	12.4	"
kucukcamlica	24.8	"
Abrahampasa	27.9	"
Fethipasa	16	"
Harem	3.2	Natural grown urban forest
Yildiz	46.7	Old Garden of Ottoman Pavillion
Emirgan	47.3	"

Table 1. The important Groves belong to governmental Institutions

Recently, these groves have experienced increasing pressure because of overuse of these areas. In the last few decades, there have been certain damages, especially on vegetation, depending on the overuse. Parallel to this dense usage, compaction occurred on the soil coverage of these areas and knocking down of trees, drying or dying of trees or growing problems were determined. There is no chance for natural succession like in the forest in these areas and it necessitates usage sensitivity and protection.

THE CHARACTERISTICS OF THE RESEARCH AREA

The most important one of all these groves is Yildiz grove in the Bosphorus area because of the natural structure and historical value. The ownership of the grove is the Istanbul municipality and it covers an area of 46.7 hectares. Opened to the public in 1950, the grove was restored and the historical Malta and Cadır Kiosks were opened for public use in 1979. The historical ceramic factory has also been run in the area (Yaltirik, Efe, Uzun, 1997).

The grove has very important potential for attracting people with its magnificent view open to the Bosphorus and Marmara Sea, cafés, sitting places, ornamental ponds, small lakes and monumental trees.

According to our study of the natural structure, 120 natural and exotic woody plant species were determined to be in the area. With natural vegetation structure in non-damaged areas, the grove has an important value for the protection of biological diversity in the city.

The user density of the area is very high because of district of Besiktas where the grove is located is very populated. Especially on spring and autumn days, the weekend use of the area has reached as high as 10,000 people. The area has two entrances and the one at the south is the most popular one. The daily average of cars that prefer the main entrance on summer season weekdays is 150 and this number can reach 1200 on weekends. During the winter season, the daily average of cars at the main entrance is around 100, but this number exceeds 400 during weekends. The number of the cars at the east entrance is more than 1/3 times bigger than the one at the south entrance. According to official recording and counting of the cars between January 1st and October 31st the total number of the cars is 53 000 in the year of 2001. There is no entrance fee for pedestrians but cars must pay a fee.

Figure 1. The location of the research area

THE CASE STUDY OF THE RESEARCH AREA

The fieldworks of the area have been subjected to a detailed study. All the physical data related to the area have been transferred to the computer in order to reach efficient and easy results for further studies.

Classification of various forest covers defined as individual inventory units were realised by using analogue topographic maps, the orthophotos having 1/5000 scale. First of all, the analogue data were transformed to the digital form by means of a wide-

Figure 2. The vegetation map of the Yildiz Grove

format scanner and a large-format digitiser. The cadastral boundaries of each planning unit were transferred onto the digital orthophotos, which were overlapped onto the topographic maps by using GIS software package NETCAD. Compartment boundaries were drawn first based on the roads, streams and mean ridges of the hills as a first step, and then the inventory units were placed into compartments (Yesil, et.al.,2001) (Figure 2).

After examining the physical data of the Grove via prepared maps, the area was evaluated based on the interferences and changes caused by land-use differences until today. According to natural data and land use relationships of the Yildiz Grove, the area is divided into four sections showing different characteristics.

- Maximum Interferenced Areas (Management Building and surroundings, nursery-garden and greenhouses, historical ceramic factory, Fire Department Building)
- Interferenced Areas (Malta and Cadır kiosks and surroundings, the pond and the surroundings)
- Minimum interferenced areas (the trees are protected but natural ground cover removed for the intensively cultivated areas with lawn)
- Protected Areas (the trees are healthy and protected, the natural ground cover is somewhat damaged but easily renewable)

THE PREPARATION AND APPLICATION OF THE DATA GATHERING

The methods of data gathering for the Yildiz grove were formed with long-term visitor observation, selective questionnaire conduction and official car registration and counting. After long-term observation of the area between May 2000 and September 2001, the important sub-groups and the relevant ratios between them were determined as following in order to determine the sample size for the questionnaire.

i. Main Entrance at South: East Entrance. 2:1
ii. Male: Female 1:1
iii. Pedestrians: Car Drivers
Main Entrance 2:1 East Entrance 1:1

TOTAL SAMPLE (240)

MAIN ENTRANCE AT SOUTH(160)	EAST ENTRANCE (80)
MALE (80) FEMALE (80)	MALE (40) FEMALE (40)
FOOT (60) CAR(20)	FOOT(20) CAR(20)
FOOT(60) CAR(20)	FOOT(20) CAR(20)

Figure 3. Determining sampling size

The primary purpose of the questionnaire was to explore the relationship between the area resources and usage of people. For the planning of user flows in Yildiz Grove to sustain its natural structure, visitors to the area were chosen by a systematic sampling method to complete an on-site questionnaire. These surveys included questions meant to determinate reasons in choosing to come to the area, including what they prefer to do in the area and which part of the area they prefer to be in. Additional items included on the surface related to the area quality and the problems that need to be solved.

The questionnaire was given to 240 people with 16 questions. And for the data analysis of the questionnaire, the SPSS Statistical package and excel programs were used.

THE OBJECTIVES OF THE QUESTIONNAIRE

The objectives of the questionnaire can be summarized in five subjects as following:

- The characteristics of the grove and the user groups

Asking the gender, age groups and occupation groups of the users, the social structure of the users

- The relationships of the grove and the user groups

The density of the crowd according to seasonal change, the main form of transport that the visitors prefer to use to get to the area, the time they spent at the area, which region they live in Istanbul and the well-known characteristics and their view of the grove.

- The using type and the facilities of the grove

The entrance points of the grove, the reason for preference of the grove, the areas preferred the most, and the activities that take place in the area

- Expectations of the users

The improvements or new developments that the users would like to see in the grove or the suggestions that they would like to see made to the appearance of the grove

- Expectations of the nature scientists

The improvements that the nature scientists would like to see in the grove or their suggestions to protect the area that have very important and sensitive issues that relate to the area

QUESTIONARIE RESULTS

After evaluation of the data received from the questionnaire, the findings could be summarized as follows:

Between the people visiting the area, 82.5 % of the respondents' have been the area before and 67.5% of the total think that the area needs some improvements and new developments especially on outdoor and parking facilities and educational provisions.

Respondents'experience about the reason for choosing to visit the grove and the activities that they prefer to perform at the area are summarized at the following tables.

Opinion	Number of person	Percentage %
For walking	156	65.5
Meeting place	46	19.2
On my way	8	3.4
Use a special facility	18	4.5
Getting fresh air	130	54.2
other	20	8.3

Table 2. Respondents' Reasons for Preference of the Area

Activities	Number of people	Percentage %
walking	226	94.2
eating at the kiosks	40	16.7
jogging	16	6.7
picnic	42	17.5
Dog walking	8	3.3
Child walking	18	7.5
Accompanying others	42	17.5

Table 3. The activities Respondents' have participated during the day

THE PLANNING OF USER FLOWS IN ISTANBUL GROVES FOR SUSTAINABILITY IN NATURAL STRUCTURE

Because there is a need to change existing use patterns for sustainability in natural structure, we suggest the voluntary dispersal through either information programs or changes in physical design of the setting. Compared to permit or regulation enforcement, make some changes in the physical design of setting and educational programs are non-confrontational. Limiting parking space, make some changes in road access, close to some areas to the vehicle traffic and direct people concentrate at particular attention within the landscape especially around Malta and Cadir kiosks.

Information programs at the grove level can be aimed at direct visitor contact through signing, information centers, on-site contact, and brochures. By making specific information available to users, the distribution of people over the area could be influenced and by making information available on existing patterns and points of overuse, the redistribution of visitor use could be effected.

The decisions related to urban planning

In order to control the visitor crowd, the planning needs to be considered in an urban planning scale. The renovation and improvements of the district parks adjacent to the grove will decrease the demand for the grove especially with children and teenagers.

The decisions related to planning of the grove

The operation and further development of the facilities and their functions and objectives will be determined one by one. The carrying capacity of each grove will be determined and concentrated on nature friendly usage. The parking problems adjacent to entrance points will be solved and the entire grove will be closed to vehicle traffic and pedestrilized. The road access passing through the protected areas will be controlled and redirected in the interferenced areas of the grove. The sitting and gathering places will be designed in short-time service.

The decisions related to visitor management

The management system needs to be developed considering user demands and it also will be supported by public relations efforts. Especially at the entrance points, the users need to be informed about some restrictions of using the area.

- An efficient signage system and directions at certain points will enable people to get oriented to the area.
- There must be some restrictions about the time that the people spend at certain points and some places need to be protected from overuse.
- People who prefer to have a traditional picnic in the area need to be directed away from the groves.
- The number of the personnel who work in the groves ought to be increased dependent on the area of the grove, usage density and land-use behaviours.
- Education programs for users ought to be held in order to make users conscious of the natural structure of groves and such topics as how to act in the area and how to benefit from the area.
- The user groups need to be informed via communication devices about the groves before visiting the areas.

In order to plan the user flows in Yildiz grove for sustainability in its natural structure, the grove was grouped as subsections based on the evaluation of land-use behaviours and recent use of the sections before conducting the questionnaire.

After examining the questionnaire results, the grove was divided into different zones based on recent use of the grove, characteristics of the user groups, the relationship between the land and the users, and the expectations of the users and nature scientists. Dependent on the selected zones, some very important decisions were made for each zone for the sustainability of the natural structure.

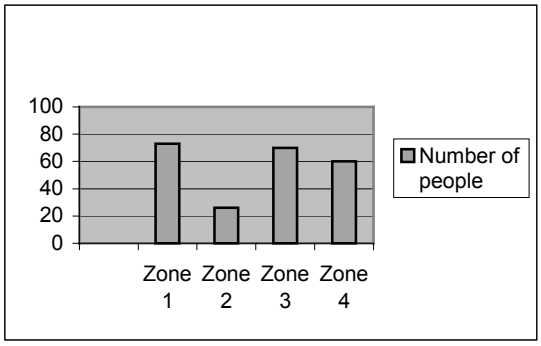

Table 4. The use percentage of zones that respondents' have visited during the day

ZONE 1. Having an average of 60-70 % slope, this area is maintaining a collection of mature trees and intensely cultivated areas with lawns. Building a natural history and information centre provides information and includes educational exhibits in this area. This will be a helpful decision in order to publicize the biological diversity and richness of the area. Additionally, the usage of this zone must be under control and the information about every plant and natural object will be presented. The existing pond in the zone has an advantage of increasing the biological diversity.

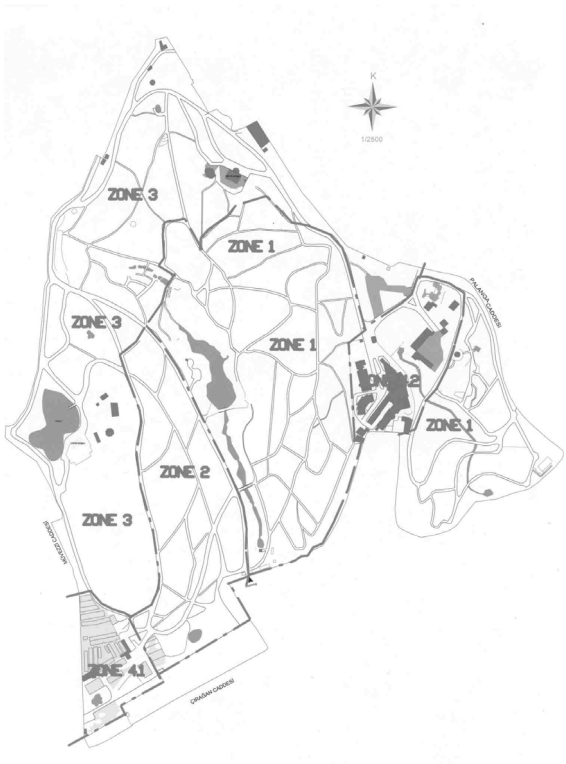

Figure 3. The Yildiz Grove land-use plan

ZONE 2. In this zone, the needle-shaped trees form the dominating vegetation and the ground cover is intensely cultivated with lawns. The usage of this zone needs to be considered as follow up of zone 1. The area has a potential for plant shows.

ZONE 3. This area, including the historical Malta and Cadır kiosks serving as a restaurant today, reaches the highest visitor potential with its unique scene. Especially on upper slopes, the undergrowths were damaged and somewhere natural ground cover replaced with lawns. This zone is mostly preferred by picnic users and it needs to be controlled and planning for short time usage will be promoted.

ZONE 4.1.The Istanbul Municipality, Chapter of Parks and Gardens Management Building and greenhouses that serve the plant requirements for the grove are located in this zone. The greenhouses need to be improved with modern technologies and should serve as demonstration houses. The greenhouses could be transferred into educational centres that provide information about plant growing techniques and nature.

ZONE 4.2. The historical ceramic factory is located in this zone and it ought to be protected and renovated. The existing sale pavilions should also be supported and improved for continuity.

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