Monitoring and Management of Visitor Flows in Recreational and Protected Areas
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Visitor Structure of a Heavily Used Conservation Area: The Danube Floodplains National Park, Lower Austria

Arne Arnberger, Christiane Brandenburg

Institute for Landscape Architecture and Landscape Management, Bodenkultur University,
1190 Vienna, Austria
Email: arnberg@edv1.boku.ac.at

Abstract: National parks in close proximity to large conurbations are not subject to the normal conflicts between conservation and ecological tourism but to those between conservation and urban recreational requirements. The Danube Floodplains National Park, Lower Austria is situated to the east of Vienna, the capital city of Austria, with a population of 1.6 million. Between June 2000 and May 2001, visitors were monitored in the Lower Austrian part of the National Park. An analysis of the results of the interviews, as well as their integration with the results obtained using long-term video monitoring, counts by human observers and route analysis, led to the identification of specific visitor categories with individual behavioral patterns and spatio-temporal distribution. In particular, regular recreational visitors from adjacent residential areas were very concerned about overcrowding and would react to the high visitor frequency through a change in their habits. This alteration of visiting habits would lead to grave problems for the environmental management of the National Park.

INTRODUCTION

Conservation areas, such as national parks, in close proximity to large conurbations present managers and researchers with a variety of challenging problems, due to the high number of visitors and the multifaceted visitor structure (Heywood, 1993). The visitor structure is characterized by a high percentage of visitors who come from the adjacent suburbs and villages using the park for everyday spare-time activities, such as walking the dog, jogging, and picking flowers. Only a low number of tourists explicitly wants to visit conservation areas to experience nature (Arnberger, Brandenburg 2001). The temporal stress on such areas is not limited to the weekends or particular seasons; due to the varying motives visitors have for visiting the protected areas, there is a continual high daily visitor stress throughout the year. The management of protected areas is made even more difficult if a recreational area, which has existed for decades and been used intensively, is converted into a national park. Traditional behavior patterns, long-established claims regarding its use and excellent local knowledge make management measures, limiting its use for leisure time activities, even though inevitable from the conservation standpoint, more difficult. These national parks, therefore, are not subject to the normal conflicts between conservation and ecological tourism but to those between conservation and urban recreational requirements.

If there are particular attractions at one location within an already highly-frequented conservation area, such as a well-developed recreational infrastructure (parking sites, easy accessibility) or natural features, visitors will be attracted for a variety of reasons and needs. If visits by these individual groups coincide also temporally this can lead to conflicts between the groups, due to their specific individual requirements and high numbers, as well as to negative influences on the nature of the area. In order to develop strategies to mitigate negative consequences associated with use, managers must be able to quantify the types and amount of use that occur. Some sound knowledge of the visitor structure is, therefore, one of the most important challenges and tasks in the development of national parks.

The Danube Floodplains National Park stands between these two fields of interest - conservation and the requirements of an urban population for nearby recreational possibilities. Taking the most frequented access point of the National Park as a model example, a discussion follows on the visitor structure and the resulting problems for the management of the area. This visitor monitoring study (Arnberger, Brandenburg, in press), which combines long-term monitoring and survey data, was commissioned by the Danube Floodplains National Park Administration, Lower Austria.

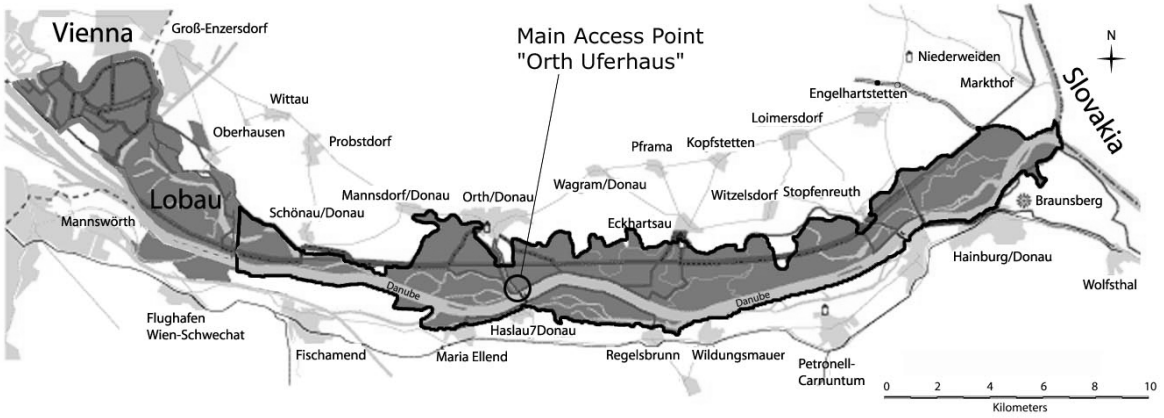

Fig. 1: The Danube Floodplains National Park, (the Lower-Austrian section is outlined in black)

STUDY AREA

The Danube Floodplains National Park is situated to the east of Vienna, the capital city of Austria, with a population of 1.6 million. The Lower-Austrian section of the National Park, with an area of 6.900 hectares, extends about 38 kilometers along the Danube river from Vienna to the border of Slovakia. In 1997, the Danube Floodplains, Lower Austria, were declared a National Park, and received international recognition, IUCN category II.

The location "Orth Uferhaus" is the most frequently used entrance. This entry point lies on the north bank of the Danube, south of the village of Orth, with a population of approximately 1,800. Orth is only 15 kilometers distant from the Vienna city limits. It is easy to reach this location by car - public transportation, on the other hand, is not optimal. The entrance "Orth Uferhaus" offers the visitors an abundance of attractions and manifold possibilities for recreation in the attractive environment of the Danube with its old arms. The "Orth Uferhaus" is well known for the following reasons:

- a traditional excursion restaurant with excellent cooking,
- a large parking area only a short distance from Vienna and the National Park,
- close to highly frequented transnational biking routes,
- close to the village of Orth,
- starting or meeting point for excursions into the National Park,
- hiking trails, possibilities for swimming, children's playgrounds, renovated mills,
- the only ferry across the Danube east of Vienna,
- boat rentals and a small yacht harbor.

METHODS

Between June 2000 and May 2001, visitors were monitored in the Lower Austrian part of the National Park. As the quality of data collected in short-term monitoring campaigns is heavily affected by statistical variations, the use of long-term monitoring is a very important complement to short-term, in-depth visitor observation and interviews. Therefore, the combination of long-term monitoring and survey data, obtained using various methods, permitted a thorough analysis of visitor activities.

Permanent time-lapse video recording: Video-cameras were installed at two access points to monitor recreational activities (see Leatherberry & Lime 1981) year round, from dawn to dusk. For the analysis, only 15-30 minutes of observations per hour were taken into account, but this had no negative impact upon the significance of the results (Brandenburg 2001, Muhar, Zemann & Lengauer 1995). Given the type of video system installed, it was not possible to identify individual persons, so anonymity can be guaranteed.

Interviews: At 11 main entrance points into the Park, visitors were interviewed on eight days; the interviews took place on a Thursday and the immediately following Sunday, in March, June, August and September. The survey was conducted on days with fine weather, to permit the collection of as much data as possible. The total sample size for this study was 394.

Personal observations: Additionally, at 11 main entrance points to the Park and on the days of the survey, visitors were counted; the results of counting were combined with video data for extrapolating the total number of visitors per year.

Analysis of the visitor routes (frequency maps): As part of the survey, visitors were asked to mark the route through the National Park which they took, or planned to take, on a simple map. By linking the data from the interviews, with the help of an Access database, an analysis by topic was possible and the respective routes could be made visible via GIS (Arnberger, Hinterberger et al. 2000).

Infrared Sensors: Infrared sensors were installed at six (entrance) points to monitor recreational activities, year round. The sensors were properly calibrated by test series and by counting persons.

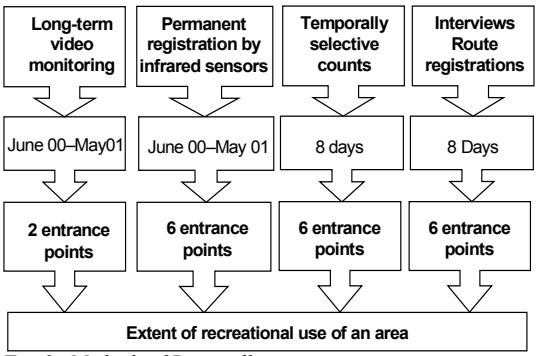

Fig. 2. Methods of Data-collection

OVERVIEW OF RECREATIONAL USAGE IN THE LOWER-AUSTRIAN SECTION OF THE NATIONAL PARK

From the video monitoring and counting data it could be calculated that there were close to 400,000 visits to the Lower-Austrian section of the National Park in the year of the study. The visitor density was calculated as 55 visits per year/per hectare. May was the month with the most visits, the fewest were registered in December. Sunday afternoons were the most highly frequented periods. One third of recreationists visited the national park at least once a week. The main users of the national park enjoyed biking and hiking, and a minority went jogging and canoeing. Only 4% of recreationists interviewed came due to motives focusing on the National Park (see fig. 3). More than 50% of the visitors to the National Park arrived in private cars.

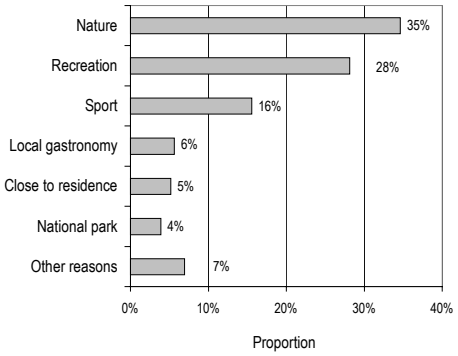

Fig. 3: Main reason for visit (n = 231)

QUANTIFICATION AND TEMPORAL DISTRIBUTION OF LEISURE-TIME ACTIVITIES AT THE MAIN ACCESS POINT "ORTH UFERHAUS"

The video observation of the access road to the location "Orth Uferhaus" showed 224,000 visitors entering the National Park, either on foot or using a vehicle, during the year of our research. The high season for visiting this location was the period between April and August. In May, 30,000 visits were registered. Itemized, according to the time of the year, we see that visitors using bicycles or motorbikes only arrive during the warm season.

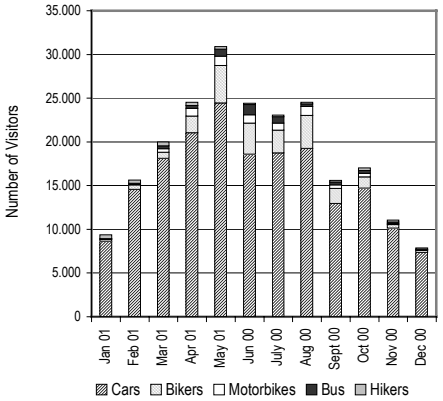

Fig. 4:Yearly progression of visitors according to means of transportation (Video-recording)

The highest visitor frequency was recorded on Sundays and public holidays. All user groups were concentrated on the weekends.

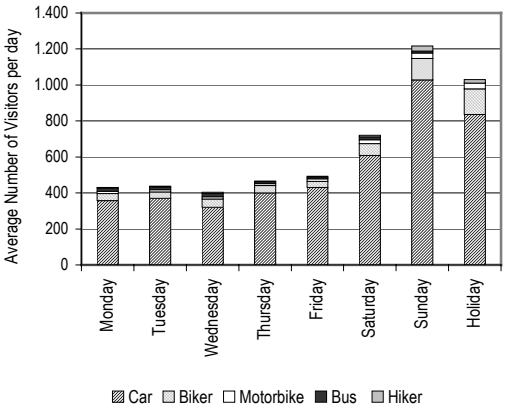

Fig. 5: Weekly progression of visitors according to means of transportation (Video-recording)

As can be seen, the highest frequency of visitors occurred on the weekends of the spring and summer. The daily results showed a peaking at noon and in the afternoon.

CATEGORY OF VISITORS AT THE LOCATION " ORTH UFFERHAUS"

An analysis of the results of the interviews, as well as their integration with the results obtained using video, counts and route analysis, led to the identification of five specific visitor categories with individual behavioral patterns and spatio-temporal distribution at this area. The linkage of video data with the data from our questionnaires concerned, principally, the choice of the means of transport (see fig. 6). Based on the results of a year-long video-observation the number of visits, were quantified according to the category of visitor.

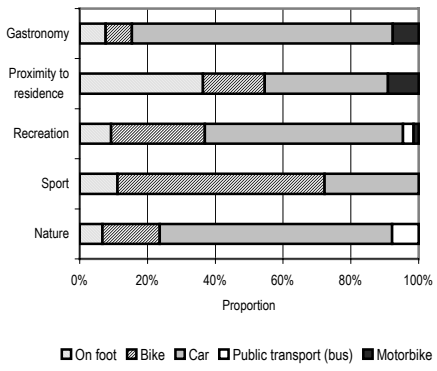

Fig. 6: Principal reason for visiting / according to means of transportation (n = 231)

The person interested in nature as visitor to the National Park

This person usually arrives by car or, sometimes, by bicycle to visit this natural region and/or the National Park. The main visiting periods are the weekends and spring.

The gastronomic- visitor

The gastronomic-visitor chooses this entrance solely because of the specialties offered in the "Ufergasthaus" restaurant. The National Park does not play a role in his decision-making process.

This category of visitor predominantly arrives by car, concentrated at noon (see fig.7). A hike through the national park is unusual.

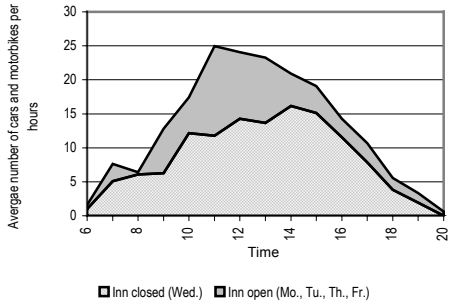

Fig. 7: Average daily progression, on workdays, of the number of cars and motorbikes travelling towards Orth, for the period October 2000 until Mai 2001. Video-observation.

The sporty, active type

This category of visitor usually arrives in the Danube Floodplains by bicycle or are joggers. The peak season is between April and August.

The person seeking recreation

The person seeking recreation predominantly arrives in the Danube Floodplains by car or bicycle. Weekend afternoons in spring and summer are the principal periods.

Characteristics	**Interested in nature and National Park visitor**	**Recreation seeker**	**Gastronomic visitor**	**Sporty, active**	**Visitors for whom the National Park is a part of the immediate environment**
Access	Car, bicycle (public transport)	Car, bicycle	Car (Motorbike, on foot, bicycle)	Bicycle, car, on foot	On foot, bicycle, car
Relative percentage at the location "Orth Uferhaus"	33 %	23 %	19 %	15 %	10 %
Main reason for visiting	To experience nature and the landscape, National Park	Recreation	Gastronomy	Sport	Proximity to home Recreation
Origin	Vienna, provinces	East Austria	Vienna	Proximity to the National Park, abroad	Settlements bordering on the National Park
Duration	More than 2 hours	Approx. 2 hours	Less than 2 hours	More than 2 hours	Less than 2 hours
Regularity of visiting	At least once a month	At least once a month	Less than once a month	Less than once a month	At least once weekly
Main day of visit	Weekend	Weekend	During the week and also at the weekend	During the week and also at the weekend	During the week and also at the weekend
Time of the National Park visit	All day	At noon and in the afternoon	At noon	All day	Early and late in the day
Average distance covered	7,6 km	10,6 km	3,4 km	16,5 km	8,2 km
Main season	Year-round, with peak in spring	Year-round, with peak in spring	Year-round, with peak in spring	Bicyclist between May and August, Joggers year-round	Year-round, with peaks in spring and early summer.

Table 1: Categories of visitors at the location Orth Uferhaus. Source: Surveys (n = 394(76)), Surveys of the route, counting, video-observation

Persons for whom the National Park is a part of their immediate environment

This group, from the nearby settlements (up to 1,5 km from the National Park), arrives in the National Park on foot, by bicycle or by car. The duration of their stay is the shortest of all visitor categories. They visit the National Park at the weekend and also during the week.

Due to the many possibilities offered, the location "Orth Uferhaus" is a center of attraction for visitors of the most varied categories. Approximately only one-third is really interested in the environment or the National Park. One hundred and fifty thousand visitors have other motives for their visit.

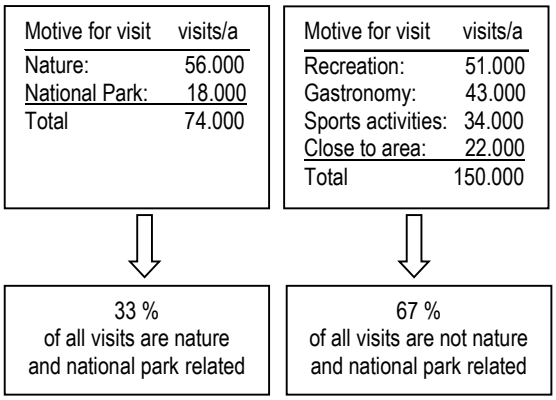

Fig. 8: Categories of visitors and frequencies at the main access point to the National Park

EFFECTS OF THE HIGH NUMBER OF VISITORS

Within the scope of our survey, visitors were also asked to give their views on the number of visitors. One-third was of the opinion of all visitors that the frequency was very high, particularly in the vicinity of the "Orth Uferhaus" and here, particularly at weekends in spring and in summer. Every second person interviewed at the access point "Orth Uferhaus" thought that there were a great number of or too many visitors. In particular, regular recreational visitors from adjacent residential areas were very concerned about overcrowding (see table 2).

	Residence adjacent to National Park	Residence in Eastern Austria	Residence in Western Austria or abroad
Appropriate number of visitors in the NP	49 %	71 %	83 %
Very many or too many visitors in the NP	51 %	29 %	17 %

Table 2: Occurrence of visitors with residence (n = 385;Pearson Chi-Square: Value: 25,347, df: 2, Sig. 0,000)

Those seeking recreation were asked to explain their reactions to the large number of visitors. This question is of particular importance for the management of the area because a spatial or temporal modification of the visitors to the byroads or to the evening or morning hours would lead to additional stress being placed on the animal world through leisure time activities. More than half of the interviewed groups, who stated that there were too many visitors in the National Park, alter their behavior. A change of their itinerary or other visiting times are the most common reactions to the high number of visitors (see fig. 8).

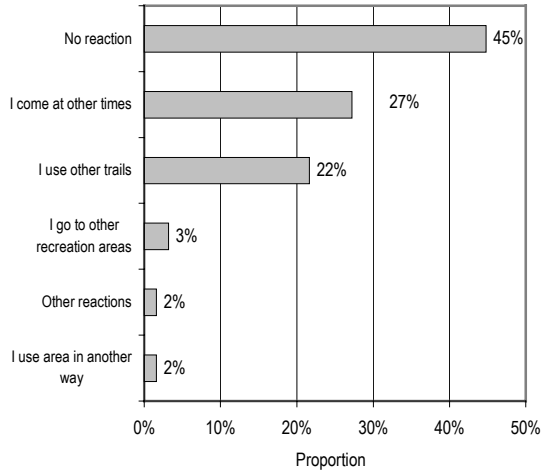

Fig. 9: Reactions to the large number of visitors (n = 125)

Above all, recreationists living in the vicinity or coming regularly, would react to the high visitor frequency through a change in their habits. Of those members of this group, 60% change the habits of their visits (see fig. 9).

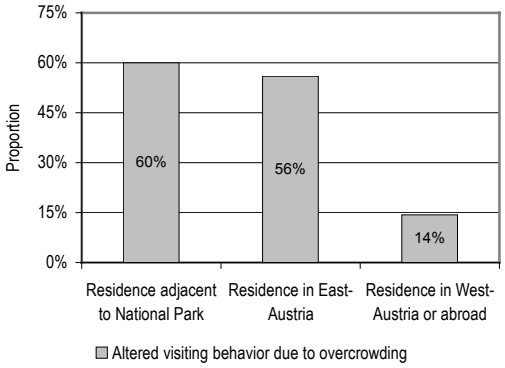

Fig. 10: Visitor reactions according to place of residence (n = 125)

This shows that visitors from Vienna and the other Austrian provinces partially oust the local population from their traditional surroundings. This alteration of visiting habits would lead to grave problems for the environmental management of the National Park. Due to the existing pressure, resulting from the large number of visitors, there are hardly any rest areas or rest periods for the

endangered species. If there was an alteration in the habits of those seeking recreation, these animals would be concentrated into even smaller areas and their rest periods would be even more reduced. This pressure would lead to the environmental potential of the National Park not being optimally utilized, in respect to the number of species and individual animals (see also Sterl et al., in print). The extreme, permanent recreation pressure seems particularly critical from the point of view of wildlife ecologists as the National Park represents the only remaining migratory corridor between the Alps and Carpathians (Völk 2001). Therefore, overcrowding is one of the main, principal challenges for the park management.

CONCLUSIONS

The high visitor frequency at the location "Orth Uferhaus" and in the entire National Park is only caused, to a minor extent, by visitors to the National Park and other nature areas. The necessity for recreation, along with the traditional recreational habits of the Viennese, leads to high stress being placed on this conservation area. Seeing that suitable areas for this group of visitors to the National Park do not exist within the urban area of Vienna, or that these have already reached their social carrying capacities (e.g., the upper section of the Lobau in the Viennese section of the National Park), other nearby recreational areas are frequented. Urban inhabitants are now highly mobile and can, therefore, take advantage of more distant recreational offers. This is accompanied by traffic problems, particularly during the weekends, and an exceeding of the social and ecological carrying capacity of some sections of the National Park, such as near the entrance "Orth Uferhaus". Measures to regulate visitors in the area are necessary and can only be precisely targeted using the information on the types of visitor available from the visitor monitoring of the National Park.

In the neighboring residential areas, building is proceeding rapidly, an increasing number of city dwellers is looking for recreation in natural areas and motorization is increasing. It can, therefore, be assumed that there will be an intensification of recreational activities in the National Park. In addition, advertising and improvements to the recreational infrastructure (visitor centers) will also increase the reputation of the National Park. This will lead to visitors to the National Park being increasingly, explicitly addressed. These additional visitors will affect the quality of the outdoor experience of others and their own needs were not satisfied.

The National Park is not able to solve these described problems and tendencies by itself, a form of co-operation with the City of Vienna and the Government of Lower Austria is essential in order to establish sustainable measures in the areas of urban, regional and traffic planning which can be kept within, more or less, acceptable ecological and social limits. Measures taken at the source itself, such as improvements to the housing environment through the establishment of convenient green areas, in addition to a buffer zone around the National Park - particularly around the Viennese area - would be some possible approaches to a reduction of visitor pressure (Arnberger, Brandenburg 2001).

PERSPECTIVES

Through the linkage of data on year-long visitor frequency with the survey results and weather data (Brandenburg 2001) it is possible to develop a spatio-temporal model for the prediction of the flow of visitors to the National Park combined with their categories. This would be a proactive approach to managing carrying capacity. The realization that visitor behavior changes due to higher visitor density makes research into the social carrying capacity, as well as on crowding issues (Shelby & Heberlein 1986, Manning 1999), based on the types of visitors and in combination with long-term video data seem absolutely imperative. Additionally, data on visitor flow forms the basis for studies on the effects of recreational usage on the fauna (see Sterl et al. in press), particularly in respect to wildlife ecology and the flora.

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