

Christiane Brandenburg<sup>1</sup>, Alexander Ploner<sup>2</sup>, Arne Arnberger<sup>1</sup>, Andreas Muhar<sup>1</sup><sup>1</sup>Institute for Landscape Architecture and Landscape Management, University of Agricultural Sciences, Vienna<sup>2</sup>Institute for Mathematics and Applied Statistics, University of Agricultural Sciences, Vienna

## 1. INTRODUCTION

Recreational and protected areas experience everincreasing pressures from recreation and tourism, in particular in densely populated regions. This leads to extensive ecological impacts, and to increasing conflicts between user groups. In order to manage recreational and protected areas within acceptable ecological and social carrying capacities, one needs a profound knowledge of the uses visitors make of this area and a reliable prediction of potential visitor loads and activities (Heywood, 1993, Eagles et al., 1999).

## 2. MATERIALS AND METHODS

The results of two monitoring projects of the Institute for Landscape Architecture and Landscape Management allowed the investigation of prognostic models to predict visitor activities. The study area, the Danube Floodplains National Park, lies in close proximity to the large conurbation of Vienna, the capital city of Austria. This circumstance presents the managers and researchers of the conservation area with a variety of challenging problems, due to the high number of recreationists and the multifaceted visitor structure (Arnberger et al., 2001).

The statistical models are based on the dependence of the number of visitors and their activities on external factors such as weather and day of the week. The dependence of human well-being on the weather is a well-known phenomenon, and there has been widespread research into the relationship between recreational activities and the weather (De Freitas, 1999; McCalla et al., 1987; McColl et al., 1990). Biometeorological research in these fields and in the field of thermic comfort has resulted in a considerable increase in knowledge for applied research and the implementation in planning and management demands.

Using linear regression and regression trees these relationships were investigated and used to predict visitor loads and activities. Regression trees seem to be a flexible and intuitive tool for modelling the relationship between the day to day changes of the visitor loads and i.e. the weather.

For the model, a distinction was made between workdays and weekends and/or holidays. The weather was considered in a very differentiated way: Meteorological elements, i.e. temperature, clouds,

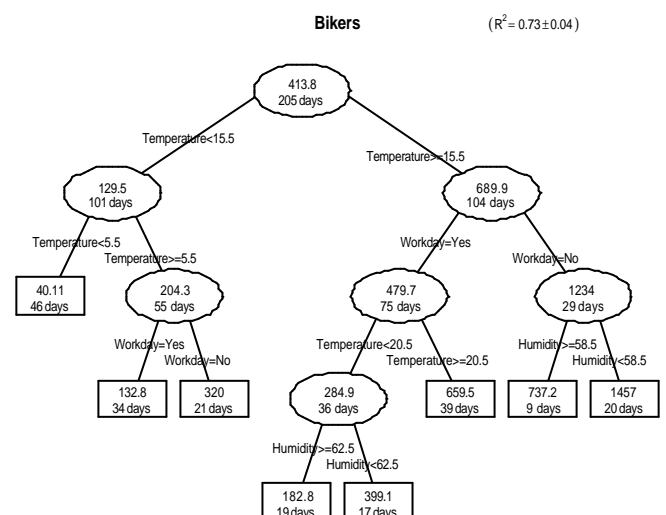
rain, appear directly as parameters in the models and indirectly as comfort indices, e.g. the Physiological Equivalent Temperature (PET) (Höppe, 1999, Matzarakis, 1999).

## 3. RESULTS

Using the linear regression reliable figures can be obtained for the daily totals of visitors as well as for specific user groups with high visitor loads, i.e. hikers and cyclists. The day of the week has the greatest influence on the total number of visitors as well as on individual user groups. The number of cyclists and hikers depend heavily on the comfort index PET. The effects of rain and clouds during the preceding seven days are small. The usage patterns of joggers and dog owners were more difficult to model as they are less influenced by the day of the week and weather related factors.

The regression trees confirm these results and additionally show the interaction between the meteorological variables that were absent from the linear models. Regression trees allow to identify typical weather and thus recreation scenarios.

Figure 1. Regression tree for the number of bikers per day using seasonal information and meteorological data.



Furthermore, the regression trees can be interpreted as a model describing in which way potential visitors make their decision to visit a recreation area based on the current weather situation, the recent weather of the preceding days, and the respective daily progression of the weather conditions (Ploner et al., 2002).

#### **4. DISCUSSION**

The availability of the discussed data on visitor monitoring permits a statistical evaluation of the correlation between the total daily number of visitors, as well for specific user categories, and the day of the week, meteorological parameters and comfort indices. The fact that it is so difficult to calculate the daily number of visitors of a specific category, such as joggers, is partially due to the fact that different decision-making patterns are decisive in the considerations of whether to jog or not.

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