

## A Survey of Recreation Interests in Urban Forests, the Influence of Travel Distance

Pieter Roovers<sup>1</sup>, Martin Hermy<sup>2</sup>, Hubert Gulinck<sup>2</sup>

<sup>1</sup> PhD Student, <sup>2</sup> Professor, Laboratory for Forest, Nature and Landscape Research,  
Catholic University of Leuven, Vital Decosterstraat 102, B-3000 Leuven, Belgium  
E-mail: [pieter.roovers@agr.kuleuven.ac.be](mailto:pieter.roovers@agr.kuleuven.ac.be)

**Abstract:** The forest complex of Heverlee-Meerdaal, which consists of two forest parts, is located on a gradient from a rural region to an expanding urban area. By means of counts an interpretation on congestion and on spreading of visitors in time and space in the area was made. On the basis of these counts questionnaires were carried out in the forest throughout the whole year and among all activity groups. The questionnaires dealt with socio-demographical characteristics of the visitors, preferences and perceptions of the respective activity groups and their interpretation of the forest area concerning structure and infrastructure. According to this study, the geographical distribution of the visitors in the forest is highly determined by the position of the forest along a gradient relative to the conurbation.

### INTRODUCTION

The region of Flanders (northern part of Belgium) has a long history of intense agricultural exploitation and high population densities, which resulted in a complex cultural landscape with a dense urban and infrastructural network. Forest cover is limited to 10%. The last decades there has been an increasing demand for outdoor recreation areas and particularly for afforestation in an urban environment. To ensure proper design of urban forests, more research needs to be done on visitors' perceptions, preferences and expectations (Rydberg & Falck, 2000). Little is known in depth about the interaction between the structural characteristics of the recreation site and recreation patterns in particular. However, much information has accumulated empirically by landscape architects in order to offer optimal planning, design and management solutions at particular sites for specific types of outdoor recreation (Bell, 1997). In sociological research a lot of attention is paid to the link between visitor characteristics and their behaviour in a broad spectrum of recreation activities (Tarrant & Green, 1999). An appreciation of visitor demands on natural resources and man-made facilities is required to identify the key issues that can be useful in decision-making and management. The recreation function of forests has been highlighted (Anon., 1993), but it is a task for the manager to integrate this function with all others, including nature conservation and silvicultural goals. As with most aspects of outdoor leisure, an attractive physical environment is demanded. The choice of a recreation site in a particular geographical area is influenced by site attributes (Clark & Downing, 1984) e.g. size, desolation, infrastructure, ...

An important factor for extensive recreational activity is the travel distance to the area (Lindhagen, 1996). This is of crucial interest for the design and establishment of new urban forests. The position of the two studied sites, situated at unlike distances to the city of Leuven, is an unique opportunity to study how recreation varies with the gradient from a more rural to a highly urbanized landscape. Next to socio-demographical characteristics of the visitors also their recreation preferences and forest perceptions are examined. We further analysed the demographical patterns of transport towards the forest complex and the interactions with visit typology.

### METHODS

#### *Study area*

The forest complex of Heverlee-Meerdaal consists of two forest parts and is located in a gradient from 5 to 10 km south of the city of Leuven (Figure 1). It covers a total area of approximately 1890 ha and is the second largest forest complex in Flanders. The complex is a remnant of a vast forest that once covered central Belgium (Tack et al., 1993).

Because of the relative position of the forest complex to the agglomeration of Leuven (88.500 inhabitants), the adjacent parishes (50.000 inhabitants in total) and the public access an intensely practised recreation occurs throughout the whole year at fairly high densities. Therefore it can be considered to be an urban forest. A main road from Leuven to Namur forms a direct connection between the city center and the two forest parts. The forest is state property (Flemish region) and managed by the division of Forest & Green

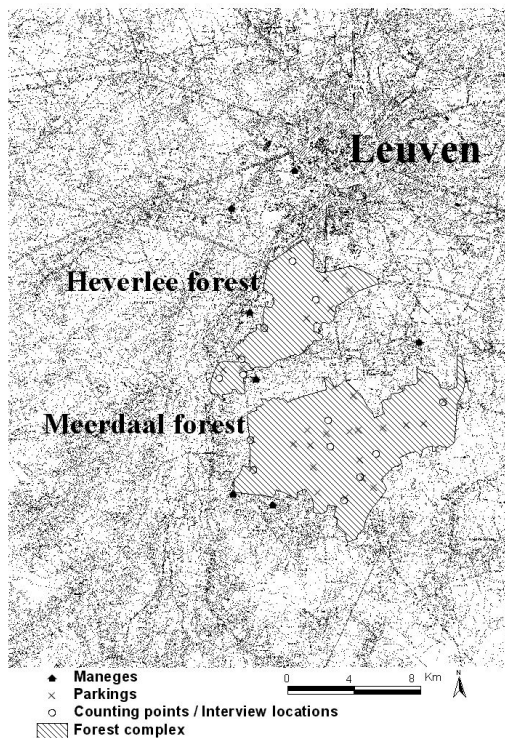


Figure 1: The study area, City of Leuven and the adjacent forest complex of Heverlee-Meerdaal

focussing on three main functions: leisure, wood production and ecological conservation. The latter are detailed and integrated in a forest zonation plan. Management gives priority to a sustainable wood production and an application for FSC (Forest Stewardship Council)-labelling is accepted. Access is restricted to forest roads and paths, with a clear regulation in function of the type of recreation (walking, biking, horse riding, driving,...). In contrast with many other Belgian forests plant biodiversity is exceptionally high, because of the limited fragmentation and the large habitat diversity on a variety of soil and topographic conditions. The forest stands consist mainly (65%) of deciduous tree species like oak (*Quercus spp.* L.; 25%), Beech (*Fagus sylvatica* L.; 30%), Hornbeam (*Carpinus betulus* L.) and Birch (*Betula pendula* Roth). About 35% is covered with coniferous species like Pine (*Pinus sylvestris* L., *Pinus nigra subsp. laricio* Maire; 30%).

#### Counts and data sampling

The counts ( $n = 5972$ ) had the purpose of giving a solid impression of the distribution of visitors throughout the total forest area. They were executed at nine predetermined locations (four in Heverlee (HF) and five in Meerdaal forest (MF), distributed over the total area but preferentially at paths used by all recreation types (Figure 1). This was done every season during the weekend as well as during the week between 7.00h and 21.00h. These data are not proper for simulating the total visitor in- and outflux but for each recreation type a reliable minimum of respondents per recreation type could

be determined. The counts were used further for controlling the proportional representativity of interviewees compared to visually observed visitors, in respect of preventing over- or underestimation of certain groups (cf. Jansen et al., 1994; Kroon, 1994).

Visitor information was collected by means of a questionnaire, administered through personal interviews in the period between the summer of 1998 and spring 1999, at the same positions where counts took place. The questionnaire was tested preliminary and then amended and made more complete. Visitors were interviewed by the 'next-to-pass' technique (cf. Segeren & Visschedijk, 1997), the sequential interview of a person or groups passing by. The first person taking the floor was considered being the respondent for the complete questionnaire. Initially a quatum of 450 questionnaires was taken because of statistical integrity. By planning and observation these were distributed proportionally over all seasons and recreation types. Finally 526 detailed questionnaires were completed and 606 of an earlier and more incomplete test version.

The questionnaire focussed on visitor profile and origin, complaints and preferences in activity, forest structure and infrastructure. Response formats were either closed (dichotomous, multiple choice) or in ranking scale (cf. Jensen & Koch, 1998). Where needed, questions were clarified by photos. The oral questionnaire gave the possibility of clarifying the questions by direct interaction between interviewer and interviewee, enhancing the reliability of the answers. The interviews were conducted by a professional polling firm.

#### Data analysis

The data were analysed using categorical data processing methods (Agresti, 1990) such as Pearson  $\chi^2$ -testing (cross tabulation) and nonparametric statistical tests (Siegel & Castellan, 1988). For all statistical analyses SPSS was used (SPSS 10.0, 1999). Analysis of the data concentrated on the differences between the two forest parts in relation to a distance gradient towards the city of Leuven and a possible influence of this on visiting patterns. Key issues are the distance covered reaching the forest and the transport means used. Another important item is visitor behaviour including the type of activity, group size, visit duration and frequency. The calculation of georeferential data (covered distances and time during journey) was executed using Geographic Information Systems (GIS), more specific with databases like Streetnet Flanders (TeleAtlas) and Route 66 (Copyright Route 66 GIS B.V.) (Moons et al., 2000). Items of interest are also the preferences for forest type and structure, topography and path structure.

## SOME RESULTS

### Visiting patterns in time and space

The counts give evidence to the fact that recreation appears to be most intense in autumn (28%), immediately followed by summer (26%). 45% of all visits happens in the weekend. There seems to be a preference of some activity groups for certain seasons. Walkers prefer autumn (57%), while joggers (52%) and bikers (41%) mostly come by in spring.

### Social characteristics of the visitors

Most respondents ( $n = 1132$ ) are male (71%), which can be considered to be an undistorted measurement because in the independent visitor counts male were 67% part of the visitors' party. The largest group of respondents is the 31-45 age group (37.8%), with second in line that under 30 years (27.9%). The mean and median age are respectively 42 ( $sd = 16$ ) and 40 years. The visitors in HF mostly belong to the youngest or oldest age group, while visitors of MF are rather middle aged. It can be observed that walkers appear more than expected in the oldest age groups, while joggers mainly are between the age of 36 and 45. Biking as well as horse riding are dominated by the youngest age groups.

As far as the educational status is concerned, 50% of the respondents ( $n = 526$ ) has a high level of formal education (higher level -3 years- or university education). Minimum 30% of the others has finished secondary school. 60% works as employee or skilled worker. Retired people and students count respectively 13% and 11% of the respondents.

Most of the visitors are married or live together (63%) and have a family of maximum three persons (60%). About 23% has children older than 15 years. Singles represent 30% of the total group. A minor group (7%) consists of divorcé(e)s and widow(er)s. Each of these groups consists of approximately 2/3 men and 1/3 women, as was also earlier observed in the counts.

### Recreation activities

Interviewees were asked for the main reason of their visit and were asked also to ordeny several pre-listed reasons, based on the preliminary questionnaire. Most visitors (48%) came for a walk. There is a pronounced difference ( $\chi^2 = 27.159$ ;  $P < 0.001$ ) between the two forest parts concerning the main activity. Joggers clearly prefer HF and bikers do the same with MF (Figure 2).

In general, biking (29%) is the second most practiced activity, followed successively by jogging (16%) and horse riding (7%). Mostly confirmed additional reasons for visiting the forest complex are health reasons (64%), relaxation (47%) and enjoyment of nature (36%).

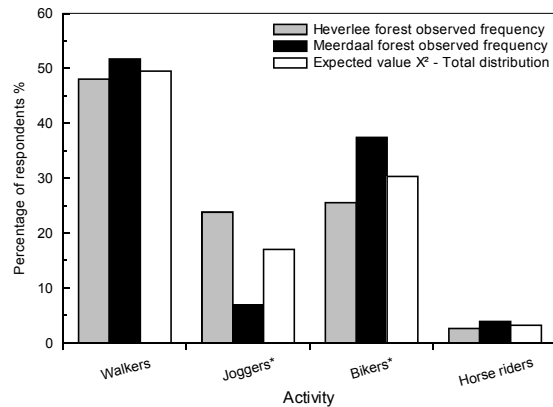


Figure 2: Distribution of the activities per forest part ( $n = 526$ ); \* significance of difference ( $P < 0,05$ ) between forest parts

For all activities, except for walking, a group size of one person is the most given answer ( $\chi^2 = 66.570$ ;  $P < 0.001$ ). Almost 50% of the interviewees visit the forest on their own. This is even much more for joggers (68%) and horse riders (63%). Walkers have a maximum score by a group size of two persons (48%). Relative frequency declines when group size increases. In MF visitors appear more in group than in HF ( $\chi^2 = 19.214$ ;  $P = 0.023$ ), matching a different spectrum of visitor activities.

Visitor arrival is maximal in two periods. One peak occurs from 9.00h till 11.00h and the other from 14.00h till 15.00h. The time of peak departure is postponed for about two hours in comparison with arrival (Figure 3). Arrival, as well as departure intensity, drops during noon. The maximum visitor congestion is reached around 11.00h, but there is a nearly stable congestion period between 10.00h and 19.00h. The mean length of a visit to the forest complex is 103 minutes ( $sd = 73$ ).

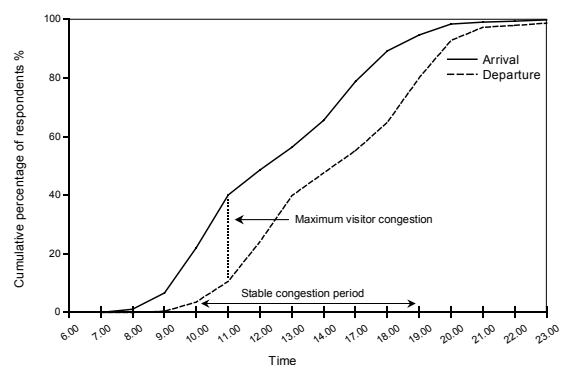


Figure 3: Cumulative percentage of visitors' arrival and departure time ( $n = 526$ )

Almost 80% of all interviewees stays between half an hour and three hours. There are some unexpected differences in visit duration between activities ( $\chi^2 = 55.810$ ;  $P < 0.001$ ) as well as between forest parts ( $\chi^2 = 42.298$ ;  $P < 0.001$ ). Explicit maxima in duration are observed for joggers, horse riders and bikers, varying respectively in length between

half an hour and three hours. In HF most visitors stay between half an hour and two hours (median= 75 min), while there is a peak duration in MF between two and three hours (median= 120 min).

Most of the total number (HF and MF together) of respondents (58.6%) visit the forest at least once a week. 16.7 % does so at least once a month and 24.1 % less. In MF the peak visit frequency is one time a week. In both forest parts a small peak (10.1%) is noticed at a frequency of two or three times a year. The most intensely visited forest is HF ( $\chi^2= 42.014$ ;  $P<0.001$ ). This is clearly reflected in the counts ( $n= 5972$ ) indicating that 68% of all visitors go to HF and also that forest recreation is most intense in weekends (45%), spring (36%) and autumn (43%).

Visit duration is significantly correlated with visit frequency ( $r_s= -0.261$ ;  $P<0.001$ ). So visitors that come more often, stay less long. People coming only a few times a year and making longer distances stay relatively longer.

#### Travel distance

Mean distances covered to both forest parts differ significantly from each other (Mann-Whitney:  $Z= -6.963$ ;  $P<0.001$ ). People visiting HF cover a mean distance of 6.6 km ( $sd= 8.9$ ), while visitors of MF do so in 8.8 km ( $sd= 8.8$ ). Travel distance and time (minutes) to reach the forest proved to be strongly correlated ( $r_s= 0.964$ ;  $P<0.001$ ). There is also a significant difference between the distances covered by different activity groups ( $\chi^2= 17.967$ ;  $P=0.036$ ). Joggers mainly cover short distances, while horse riders make no complaint travelling longer distances. This also explains the strong difference ( $\chi^2= 35.288$ ;  $P<0.001$ ) in covered distance between the two forest parts (Figure 4). As expected, similar patterns can be observed for the travel time to the forest. Both differences between forest parts ( $\chi^2= 19.863$ ;  $P=0.001$ ) and activity groups ( $\chi^2= 32.386$ ;  $P=0.006$ ) are significant.

Most visitors ( $n= 1132$ ) use the car for transport to the forest complex (55%). 27 % comes by bike and 15 % on foot. Differences between activity groups are significant ( $\chi^2= 219.212$ ;  $P<0.001$ ). The car is most popular, except for bikers, of which 60% arrives by bike. Approximately 30% of all walkers comes on foot. There also is a significant difference between the transport used for both forest parts ( $\chi^2= 33.459$ ;  $P<0.001$ ). Both are reached mostly by car, but the difference in frequency measures 25%. Accessibility (45%) is the most given argument if asked ( $n= 526$ ) why people enter the forest at a specific location, followed by the presence of a well indicated parking area (13%).

There is an interaction between the distance visitors have to cover reaching the forest complex and the way the visit occurs. Visit duration is positively correlated with covered distance ( $r_s=$

0.111;  $P=0.015$ ), whereas visit frequency and covered distance are less clearly related.

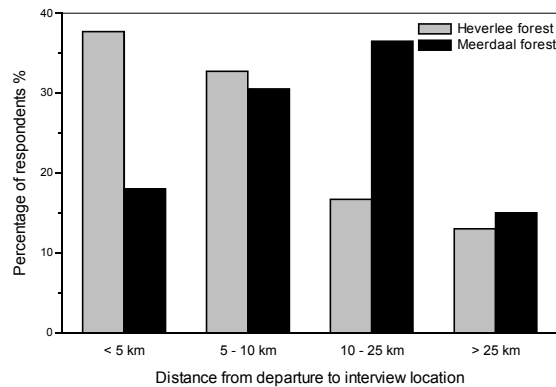


Figure 4: Covered distance per forest part (n= 500)

#### Visitors' expectations in forest structure and infrastructure

All activity groups were asked to answer multiple choice questions about preferred forest composition and structure. First they had to answer which forest type is preferential, either deciduous, mixed or coniferous ( $n= 246$ ). Most respondents (59%) explicitly prefer mixed forest ( $\chi^2= 109.780$ ;  $P<0.001$ ). Walkers react negatively against coniferous tree species and horse riders explicitly prefer mixed forest. Concerning forest structure, 78.9% of the respondents ( $n= 199$ ) prefer (little or strong) variation in forest layers ( $\chi^2= 14.0$ ;  $P=0.001$ ). Sloping grounds are preferred over flat terrain ( $\chi^2= 112.154$ ;  $P<0.001$ ). 84.6% of the respondents ( $n= 234$ ), distributed over all activity groups, has a strong preference for topographical variation. All activity groups together ( $n= 223$ ) have a weak but significant preference for wide forest paths ( $\chi^2= 3.771$ ;  $P=0.05$ ). But only the group of joggers ( $n= 37$ ) shows a clear ( $\chi^2= 7.811$ ;  $P=0.005$ ) preference for wide forest paths.

Visitors ( $n= 526$ ) were also asked to confirm whether certain infrastructure should be present in the forest. Litter bins (88%) are confirmed most, catering facilities least (18%). As expected the group of walkers, joggers and bikers give priority to organised routes for their activity, while non-hardened paths are important for horse-riders.

## DISCUSSION

Visitor characteristics are important variables explaining recreation activity. Personal characteristics, combined with those of family status and the specific work and living situation determine recreation activity responses (Katteler et al., 1975). Knowledge about these characteristics is essential to focus on the totality of the visitor population and their inherent demands and needs. We have found that forest visit is related to higher educational levels, which was also suggested by

Loesch (1980) and Jansen et al. (1994). Perhaps it may be explained by the fact that these people need more active relaxation in quiet surroundings. The 31-45 age group is strongly represented, as was earlier detected by Baillon (1975); this group includes mostly working people actively expanding their career and also having created a family or a cohabitation situation (AMINAL, 1993). These groups form about 24% of the total population of Leuven. Unlike other studies that demarcate the underrepresentation of singles (Meeles, 1982), in our results singles form 30% of all visitors. Recreational activities have mainly followed the increasing individualisation of society.

Walking is internationally the most important activity in forest recreation (Germany: Roznay, 1972; Flanders: Gillis & Lust, 1976; Vanderlinden & Lust, 1998; Sweden: Lindhagen, 1996; Switzerland: Gasser, 1997; Ireland: Guyer & Pollard, 1997). The other main pastimes like biking and jogging are a more energetic activity in comparison with the main reason in England, which is walking the dog (Hanley & Ruffell, 1992). In modern society there is a tendency to more active recreation. Horse riding is encouraged by the establishment of several maneges at the outskirts of the forest complex. It is remarkable that 64% of all respondents consider their outdoor activity as being important for their health (cf. Kaplan & Kaplan, 1989).

Compared to earlier European studies (Schmithüsen & Wild-Eck, 2000) the visit frequency is relatively high. It is presumed that distance is a crucial factor influencing the visit frequency of urban forests (Lindhagen, 1996). Small forests at a short distance from conurbation are more intensely frequented than large remote forests (Visschedijk, 1987; Hekhuis & Peltzer, 1995). This pattern is clearly confirmed by the location of Heverlee and Meerdaal forest. People living at a short distance from the forest travel limited time and thereby a visit happens more frequently, but the length is also much shorter. Critical distances, if shown consideration for travel time, are between 0 and 3 km for pedestrians, between 0 and 10 km for bikers and less than 25 km for car transportation (De Nil, 1973; Roggeman, 1982). A journey time of five minutes is already stated to be critical (Coles & Bussey, 2000), which is even more extreme, but relevant in interpreting the visitor proportion of Oud-Heverlee in the study. A total of 60 % of the forest visitors travels a maximum time of 15 minutes, comparable to the results of Elsasser (1996), who computed a total of 75 % travelling less than 20 minutes. The mean visit duration in the forest complex is restricted to approximately 100 minutes, explaining the peak arrival in late morning and afternoon, while there is a decline of activity during noon. This matches well former results observed in Flanders and the Netherlands (Gillis & Lust, 1976; Peltzer, 1993; Hoogstra & Van Kerkhoove, 1995; Vanderlinden &

Lust, 1998; Visschedijk, 1999). However there also is an difference between the two parts of the forest complex. Visitors having the intention of staying a longer time take more effort covering the distance to the larger and more distant forest of Meerdaal. The percentage of visitors in this forest part travelling by car is likely much higher, even so being everywhere the most popular transport (AMINAL, 1993; Peltzer, 1993; Schmithüsen & Wild-Eck, 2000), and these visitors stay significantly longer. For the same reason joggers, a lot of them also running toward the forest, are significantly more represented in Heverlee forest. In comparison, bikers have a smaller functional area in HF and benefit a longer travel time being compensated by a larger forest area. The benefit of transportation time is determined by a combination of both the type of recreation and the desired duration of the recreation activity. It is remarkable that more than 50% of all visitors comes minimum ones a week to the forest complex. However comparable high rates were observed in Finland (van de Ven & Konijnenburg, 1994) and Germany (Volk, 1992). Walkers come most frequently, followed by joggers and horse riders. Bikers stay behind in mean visit frequency. The same tendency has been observed in the Netherlands (Segeren & Visschedijk, 1997).

Concerning visitor preferences for forest structure, there is an explicit preference for mixed forest types and strong variation in forest structure and topography. This is in agreement with the hypothesis that diversity and variation makes a forest acceptable for recreation (Coeterier, 1992). Coniferous forests are not popular because of the association with uniform forest stands without variation in tree and brushwood, as they appear in many plantations of northern Belgium. But coniferous trees are quite appreciated in mixed forest because they create variation in winter time (Veer & Boerwinkel, 1998). A preference for wide forest paths is probably the consequence of the fact that one can choose his own way avoiding muddy tracks and a higher safety feeling is sensed.

Visitors give priority to infrastructure minimizing the impact effects of recreation. In particular the occurrence of litter is considered to be disturbing. Organised routes are appreciated by the respective target groups. In contrast with its visit frequency, Heverlee forest is appreciated less than Meerdaal forest. This could be due to the increased visitor congestion (Jensen & Koch, 1998) - even though this is not expressed in the responses -, the noise nuisance caused by the highway crossing the northern part of Heverlee forest or the less expressed variation in forest structure and topography.

## CONCLUSION

In this study the recreative use of the forest complex of Heverlee-Meerdaal by the population

was investigated. The visit typology can be approached throughout preferences and demands of the visitors themselves, as well by the location and the characteristics of the forest. Counts delivered quantitative data about forest congestion and subsequent questionnaires gave qualitative data concerning motives, perceptions and preferences of the visitors. The average visitor is a middle-aged person with higher formal education and living in a family or cohabitation situation, mostly male.

The preferred activity is walking, followed by biking and jogging. Most of the people visit the area on their own. Visit frequency and are negatively correlated and strongly determined by the covered distance from the residence to the forest.

This distance effect is described by a transport pattern of a gradient from an urbanised to an rural landscape. The dominant visitor group consists of locals and inhabitants of the city. Heverlee and Meerdaal forest attract a different type of visitor, influenced by the size of the forest area, the desired recreation activity and the distance to the forest part. Approximately 70% of the visitors are inhabitants of the city of Leuven and the adjacent conurbation, confirming the urban character of the forest complex.

A preference is given to mixed forest types with variation in structure and topography. Most respondents give a positive response to additional infrastructure, giving absolute priority to the appearance of litter bins. The overall forest area is evaluated very positively.

These data indicate the importance of visitor demands in respect of their interests for outdoor recreation activity. They provide essential information for decision-making concerning forest management in terms of silvicultural practices, infrastructure and the establishment of new urban forests.

## REFERENCES

- Agresti, A., 1990. *Categorical data analysis*. John Wiley & Sons Inc., USA.
- AMINAL, 1993. *Lange Termijn Planning Bosbouw, Eindrapport*.
- Anonymous, 1993. *Bosdecreet*. Ministerie van de Vlaamse Gemeenschap.
- Baillon, R., 1975. *La fréquentation des forêts*. *Revue Forestière Française*, 27: 155-170.
- Bell, S., 1997. *Design for outdoor recreation*. Spon Press, London.
- Clark, R.N. and Downing, K.B., 1984. *Why here and not there: The conditional nature of recreation choice*. In Stankey, G.H. and McCool, S.F. (Eds.), *Proceedings-Symposium on recreation choice behavior* (Gen.Tech.Report INT-184, 31-37). Intermountain Research Station, Ogden, UT: Forest Service.
- Coeterier, J.F., 1992. *De beleving van bos: resultaten van omgevingspsychologisch onderzoek*. *Nederlands Bosbouw Tijdschrift*, 64: 163-171.
- Coles, R.W., Bussey, S.C., 2000. *Urban forest landscapes in the UK – processing the social agenda*. *Landscape and Urban Planning*, 52: 181-188.
- COST E12, 1997. *Memorandum of understanding for the implementation of a European concerted research action designated as COST Action E12 'Urban forests and trees'*. European Commission, Brussels.
- De Nil, A., 1973. *Factoren tot het bepalen van de recreatieve waarden van bosgebieden*. Thesis RUGent.
- Elsasser, P., 1996. *Der Erholungswert des Waldes. Monetäre Bewertung der Erholungsleistung ausgewählter Wälder in Deutschland*. Frankfurt/M: Sauerländer Verlag.
- Gasser, G., 1997. *Aktivitäten der städtischen Forstverwaltung Liestal (BL) in der Wahrnehmung von Waldbesucherinnen und Waldbesuchern (Arbeitsbericht, Allgemeine Reihe 97/1)*. Zürich: Professor Forstpolitik und Forstökonomie ETH Zürich.
- Gillis, M. and Lust, N., 1976. *Bosbouwkundige en recreatieve aspecten van het Peerdsbos*. Groene Band, 23.
- Guyer, G. and Pollard, J., 1997. *Cruise visitor impressions of the environment of the Shannon-Erne Waterways system*. *Journal of Environmental Management*, 51: 199-215.
- Hanley, N.D. and Ruffell, R.J., 1993. *The contingent valuation of forest characteristics: two experiments*. *Journal of Agriculture Economics*, 44 (2): 218-229.
- Hekhuis, H.J. and Peltzer, R.H.M., 1995. *Intensiteit van het recreatief bosgebruik in Overijssel – indelingscriteria en kosten*, IBN-rapport n° 209. IBN-DLO, Wageningen.
- Hoogstra, M. and Van Kerkvoorde, M., 1995. *De maatschappelijke waarde van een natuurgericht bosbeheer*. Agricultural University of Wageningen.
- Jansen, M., Bakker, J.G. and Boerwinkel, H.W.J., 1994. *Recreatie in het Nationaal Park i.o. Zuid-Kennemerland – een onderzoek naar omvang van het bezoek en het activiteitenpatroon van de bezoekers in 1993*. *Werkgroep recreatie, rapport n° 31*, Landbouwwuniversiteit Wageningen.
- Jensen, F.S. and Koch, N.E., 1998. *Measuring forest preferences of the population, a Danish approach*. In Terrason, D. (1994-1998). *Public perception and attitudes of forest owners towards forest in Europe*. Cenagraf editions, France.
- Kaplan, R. and Kaplan, S., 1989. *The experience of nature. A psychological perspective*. Cambridge University Press, Cambridge.
- Katteler, H.A. and Kropman, J.A., 1975. *Gebruik en beleving van bos door de recreant*. Instituut voor toegepaste Sociologie, Nijmegen.
- Konijnendijk, C.C., Randrup, T.B., Nilsson, K., 2000. *Urban forestry research in Europe: an overview*. *Journal of Arboriculture*, 26 (3): 152-161.
- Kroon, H.J.J., 1994. *Het recreatief gebruik van bossen en natuurgebieden in Brabant en Limburg – een regionale enquête in oostelijk Noord-Brabant en noordelijk Limburg*, IBN-rapport n° 057. IBN-DLO, Wageningen.
- Lindhagen, A., 1996. *Forest recreation in Sweden. Four case studies using quantitative and qualitative methods*. Dissertation, Swedish University of Agricultural Sciences, Uppsala.
- Loesch, G., 1980. *Typologie der Waldbesucher – Betrachtung eines Bevölkerungsquerschnitts nach dem Besuchsverhalten, der Besuchsmotivation und der Einstellung gegenüber Wald*. Unpublished Dissertation, Universität Göttingen.
- Meeles, M., 1982. *Bezoek aan bos- en natuurgebieden – een landelijk recreatie-onderzoek*. *Bos en Recreatie*, 12. Staatsbosbeheer, Utrecht.
- Moons, E., Eggermont, K., Hermy, M. and Proost, S., 2000. *Economische waardering van bossen. Een case-study van Heverleebos-Meerdaalwoud*. Garant, Leuven.
- Peltzer, R.H.M., 1993. *Het recreatief gebruik van het stroomdallandschap Drentsche A-gebied*, IBN-rapport n° 54. IBN-DLO, Wageningen.
- Roggeman, G., 1982. *Bepalingen van de recreatieve van het bos te Lembeke-Waarschoot*. Thesis RUGent.
- Roznay, 1972. *Forstliche Meinungsumfragen in Bremen und im Forstamt Kattenbühl in Hann, Münden*.
- Rydberg, D. and Falck, J., 2000. *Urban forestry in Sweden from a silvicultural perspective: a review*. *Landscape and Urban Planning*, 47: 1-18.
- Schmithüsen, F. and Wild-Eck, S., 2000. *Uses and perceptions of forests by people living in urban areas: findings from selected empirical studies*. *Forstwissenschaftliches Centralblatt: Cbl*. 119: 395-408.

- Segeren, A.J.H and Visschedijk, P.A.M., 1997. Het recreatief gebruik van SBB-terreinen in de regio Brabant-West, IBN-rapport n° 264. IBN-DLO, Wageningen.
- Siegel, S. and Castellan, N.J.Jr., 1988. Nonparametric statistics for the behavioral sciences. Second Edition. McGraw-Hill Inc., Singapore.
- SPSS.1999. SPSS 10.0. SPSS Inc., Chicago.
- Tack, G., Van Den Breemt, P. and Hermy, M., 1993. Bossen van Vlaanderen. Davidsfonds, Leuven.
- Tarrant, M.A. and Green, G.T., 1999. Outdoor recreation and the predictive validity of environmental attitudes. *Leisure Sciences*, 21 (1): 17-30.
- Vanderlinden, I. and Lust, N., 1998. Kenntnis und Einstellung der Bevölkerung in Bezug auf der Wald in relativ walddreiche und walddarme Regionen in Flandern. *Silva Gandavensis*, 63: 16-35.
- van de Ven, M.D. and van Konijnenburg, 1994. Valuation and use of urban forest in Finland (recreative valuation and use of the urban forest of Joensuu, Finland). Agricultural University of Wageningen /University of Joensuu.
- Veer, M. and Boerwinkel, H.W.J., 1998. Exoten: beleefd en gewogen. Een onderzoek onder recreanten naar de waardering van uitheemse naaldboomsoorten en de houding tegenover het verwijderen. *Nederlands Bosbouw Tijdschrift*, 69(4): 157-164.
- Visschedijk, P.A.M., 1987. Het recreatief gebruik van grote en kleine bossen. *Bos en recreatie*, 14. Staatsbosbeheer Utrecht.
- Visschedijk, P.A.M., 1999. Gegevensverzameling recreatief gebruik SBB-terreinen 1998, IBN-rapport n° 404. IBN-DLO, Wageningen.
- Volk, H., 1992. Neue entwicklung bei der Walderholung in Südwest-Deutschland. *Forstw. Centralblatt*, 111: 282-292.
- White, P.C.L. and Lovett, J.C., 1999. Public preferences and willingness-to-pay for nature conservation in the North York Moors National Park, UK. *Journal of Environmental Management*, 55: 1-13.