These routes are made for walking

Understanding the transactions between nature, recreational behaviour and environmental meanings in Dwingelderveld National Park, the Netherlands

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Understanding the transactions between nature, recreational behaviour and environmental meanings in Dwingelderveld National Park, the Netherlands

Ramona van Marwijk

Thesis

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1 Introduction

1.1 Protected nature areas: balancing recreation and nature

The Netherlands is one of the most densely populated countries in the world, and therefore needs a lot of recreational amenities. This is reflected in the many popular nature areas where people spend their free time, for example walking and cycling. Over the past decade 'new' activities such as mountain biking and Nordic walking have also gained in popularity. The Dutch government stimulates outdoor recreation, because visiting nature areas and getting exercise is believed to reduce stress and prevent obesity. The Day Trips Survey conducted by Statistics Netherlands (CBS) investigates the number of day trips taken by Dutch people in one year. In 2001/2002, Dutch people made at least 76.5 million open air day trips[1] to nature areas (Elands & Koppen, 2007). The 20 Dutch National Parks attract an estimated 20 million visitors per year (SNP, 2007).

The growth in active outdoor recreation has fuelled concern about the consequent pressures on the environment, and about the vulnerability of National Parks and other protected areas in particular. Consequently, possible ways of achieving an acceptable balance between nature conservation and outdoor recreation continues to be a recurring theme in the academic literature and the field of practice (Swinnerton, 1999). Broadly speaking, two visions on the combination of recreation and nature can be distinguished (Cole, 1993; Gijsbertse & Bruls, 2005; Knight & Gutzwiller, 1996):

Nature and recreation as rivals
Advocates of the 'competing view' ask for spatial and temporal separation of nature and recreation. For example, Birdlife International in the Netherlands recently mentioned examples of areas where 'recreation beats nature' (Omroep Flevoland, 2008). This phrasing implies a competition between recreation and nature. Recreation negatively impacts nature, for example by disturbing birds or destroying vegetation. The independent magazine for nature and landscape management Boomblad wrote:

> 'Too many people are visiting nature areas. Birds are disturbed by the explosive expansion of recreation, forests get polluted, and hikers complain about the lack of peace. (…) Is nature a recreation area?' (Dijksterhuis, 2007, p. 13)

[1] A day trip is defined as 'each recreational activity outside one's house that takes at least 2 hours' (Elands & Koppen, 2007).

Bird of prey expert Rob Bijlsma is another advocate of the 'rivalry view':

> 'The installation of a National Park is the beginning of the end. National Parks are not established for the benefit of nature, but for the exploitation of nature in favour of recreation. Just look at the budget of such a park. Most of it is poured into recreation. Enormous amounts of money. The protection of nature has not been the main goal for a long time.' (Moons, 2006, p. 16)

Both these statements reflect the 'biocentric' approach to resource management, which acknowledges the legitimacy of adopting a non-use perspective (Swinnerton, 1999).

Nature and recreation as partners

An alternative view on the relation between nature and recreation is that they need each other. This view is based on psychological, ecological and economical arguments. Firstly, spending time in nature has positive effects on health and well-being (Bell et al., 2007). Secondly, people who spend time in nature come to relate to it emotionally, and are therefore likely to provide the public support that is essential for nature conservation. Thirdly, nature is a source of income for recreational businesses such as restaurants, campsites and bungalow parks. But municipalities benefit from nature too: property taxes are up to 15% higher in municipalities surrounded by natural areas than they are in more built-up municipalities (Bade & Smid, 2007). The twenty Dutch National Parks are aware of the economic value of nature and recently asked an expertise centre on leisure and recreation to draw up a list of income generating initiatives that would be interesting for National Parks (Berkers & Jong, 2008). The idea is that commercial activities strengthen a park's position for three reasons. Extra income from commercial activities could contribute to the management, design and maintenance of the park. Secondly, commercial activities (such as catering, excursions and bicycle rental) meet visitors' needs and ensure high quality service. Lastly, these activities also increase public support and commitment among visitors and local inhabitants. Staatsbosbeheer (the Dutch State Forest Service[2]) is an explicit advocate of the 'partnership view':

> 'Staatsbosbeheer views recreation and nature as partners and therefore offers opportunities for recreation in nature areas. The forms of recreation are focused on the experience of nature and landscape, of tranquillity and space. Active and sporty forms of recreation are also possible, such as canoeing, horse riding or mountain biking.' (Staatsbosbeheer, 2006)

[2] See also http://www.staatsbosbeheer.nl/English.aspx

Nowadays, the view of nature and recreation as partners is gaining support – at least in the rhetoric – in Dutch nature policy, as illustrated by the title of the latest national nature policy document: 'Nature for people, people for nature' (LNV, 2002). Because recreation is seen as a basic condition for people's wellbeing, 'more knowledge about the people for whom nature policy is created should be available' (Berends & Veeneklaas, 2003, p. 3). This knowledge should include data on at least three aspects of these people: their behaviour in nature, the way they experience nature, including environmental meanings, and their preferences related to nature (ibid.). However, researchers have concluded recently that the available data are either insufficient– especially with regard to behaviour – or lacking in sound theoretical underpinning. A possible reason for the dearth of data on recreation and nature might be the fact that there is no clear demand nowadays for this type of knowledge (Berends & Veeneklaas, 2003; RLG, 2004) – unlike the 1970s, when the Ministry of Culture, Recreation and Social Work (CRM) was eager for such data.

The aim of this thesis is to further explore the partnership view. In order to effectively combine nature and recreation, knowledge of both ecological and recreational goals and qualities is indispensable (Berends & Veeneklaas, 2003; Opdam et al., 2006). In this thesis I concentrate on recreational issues, and not specifically on ecological goals and qualities. The setting for this study is a Dutch National Park, a choice which I explain in section 1.4.

In the next section I discuss the approach of combining recreation and nature within policy practices, and explain how the decentralization of national policy has put relatively extensive decision-making and executive powers in the hands of nature area managers.

1.2 From national recreation policy to on-site planning

When the need for outdoor recreation increased in the 1950s – because of increased leisure time and the introduction of cars – the government decided to develop relatively large recreational areas (LNV Consumentenplatform, 2005). In response to the mono-functional character of these areas, the Ministry of CRM wanted to encourage 'recreational co-use' of existing nature areas[3], and was able to organize and finance research to inform their policies related to this aim (Lengkeek, 2001). In 1979, for example, CRM asked a group of social scientists to advise it on how to develop an outdoor recreation policy (Kruis & Kropman, 1982). However, in 1982 the Ministry of CRM was dismantled and nature conservation and outdoor recreation became responsibilities of

[3] The expectation that a policy aimed at co-use of nature and rural areas would be financially more favourable than large monofunctional recreation areas was also important during the recession of the 1980s (Lengkeek, 1996).

the Ministry of Agriculture and Fisheries[4]. And with this development, the 'R' of recreation disappeared completely, which can be seen as 'symptomatic of national policy' (Hooiring, 1982, p. 81) – in other words, of the sector's subordinate position (Caalders, 2002).

Over the following decade, according to Lengkeek (1996), the recreation sector was threatened not only by this decentralization and economization of national policy, but also by the spectacular increase in the importance given to nature in the early 1990s. 'Recreational behaviour is simply reduced to consumer behaviour' (ibid., p. 80).

The Council for the Rural Area (RLG), an independent policy advisory body for agriculture, nature, forest, outdoor recreation and fisheries, concluded recently that the Ministry of Agriculture, Nature and Food Quality (LNV) has developed hardly any new policy for outdoor recreation since 1982 (RLG, 2004, p. 5): 'The implementation of policy has continued, but the preparation time is often so long that the plans do not connect to the changing recreational needs of citizens.' However, in its response to the RLG's comment, the Ministry denies that recreation has been absent from the political agenda. It claims to acknowledge the importance of outdoor recreation, but points to the changed political-administrative relations, with their new focus on decentralization, deregulation and the integration of policy and implementation instruments. The role of the state is now to formulate national goals and steer policy implementation on key principles, as well to play a facilitating role by passing on knowledge and instruments so that others can implement policy: a change from 'taking care of it' to 'making sure it happens'. In practice this means that lower governmental bodies get more responsibilities. The provinces have become responsible for area policy, including recreation. Citizens, social organizations and the business community also have more responsibilities. With regard to the recreational needs of citizens, the state's role is not to conduct extensive analyses of different forms of outdoor recreation. The state only formulates the framework that gives other parties the space to develop regional tailor-made plans and activities (LNV, 2004b). Interestingly, while the state wants to steer from a distance, RLG advises LNV not to leave it to the market to link recreational demand with supply. RLG concludes that the current supply does not entirely meet the demand, in terms of either location or content, and advises developing new forms of recreation, such as GPS-hiking, *laarzenpaden (*boot trails), *speelbossen* (play forests), and *struingebieden (*rambling areas)[5], to attract more

[4] The Ministry of Agriculture and Fisheries changed its name twice: in 1989 into Ministry of Agriculture, Nature and Fisheries (LNV) and in 2003 into Ministry of Agriculture, Nature and Food Quality (still LNV).

[5] In most Dutch nature areas, visitors are obliged to stay on the paths. In selected areas, browsing or roaming is permitted. The goal of browsing is to 'experience the illusion of wilderness without the accompanying dangers' (Boer & Raffe, 2003, p. 19)

visitors (RLG, 2004).
The latest version of recreation policy is called 'Vital Rural Area' (LNV, 2004a), and it follows the above-mentioned principle that the state only steers on key goals and principles. For the National Parks, the showpieces of the National Ecological Network[6], these are:

- To open the National Parks completely to the public for recreational use, subject to measures related to specific nature protection goals; and
- To offer a common future for both nature and recreational/tourism entrepreneurship.

The overall national goals with regard to nature and recreation in National Parks, as described above, lead provinces and National Park authorities to focus on both these functions, but leave open *how* to develop *what type* of recreation. The provinces are responsible for translating national policy to the provincial level, and integrating it into procedures for spatial development (LNV, 2004a). The provinces outline their views on outdoor recreation in *Provinciale Omgevingsplannen (*Provincial Environmental Plans). In turn, these plans form the basis for the *Beheers- en Inrichtingsplannen* (Management and Design Plans) for National Parks, developed every 10 years by the *Overlegorgaan* (Consultative Body) of the National Park. The Management and Design Plan gives an inventory of the park's characteristics, describes visions and goals, changes and problems, and explains how to reach the goals and mitigate the problems.

Although the recreation policy process described above is based on solid reasoning, it has been criticized for a discrepancy between 'wishes and realities' and for its vagueness (Alma, 2007). The Provincial Environmental Plan for the province of Drenthe for example, mentions as (the only!) recreation goal for National Parks for the time span of the policy plan 'prevention of extension or intensification of the recreation sector in the National Parks' (Provincie Drenthe, 2004, p. 222). Other plans mention the importance of tuning recreation to the environment (Provincie Gelderland, 2005; Provincie Groningen, 2007): 'extension of current recreation is only possible when it is part of a integral plan that proves its merits for the spatial quality' (Provincie Utrecht, 2004, p. 84).

As a result of the policy of only steering on 'key principles', local-level parties such as the Consultative Body of the National Parks have to formulate appropriate recreation policy

[6] The National Ecological Network (NEN) is the backbone of Dutch nature policy, the main thrust of which has been consistent since 1990 (Milieu en Natuur Planbureau, 2006).

themselves. In general, nature policy for National Parks distinguishes four goals[7]: nature conservation and development, education, outdoor recreation and research[8] (SNP, 2007). At the national level, these goals are not further elaborated and it is therefore left undefined, for example, whether the goals have equal importance or whether the nature conservation and development goal takes precedence. However, some parks explicitly state that the nature goal is most important (e.g. Overlegorgaan Dwingelderveld, 2004). The usual practice is for park management to draw up recreational zoning plans[9] to prevent and mitigate conflicts between recreation and nature. However, in doing so they mention a lack of expertise on issues related to recreation. The uncertainties they mention include the exact demand for different forms of recreation, actual use levels, and the relationships between (different forms of) recreation and the area's ecological carrying capacity (Overlegorgaan NP Oosterschelde, 2001; Pleijte et al., 2008).

Interestingly, the Dutch National Park zoning plans focus exclusively on activities, while at the same time nature management organizations do acknowledge the importance of recreational experiences: the recreation policy documents of both *Natuurmonumenten* (Natural Monuments) and *Staatsbosbeheer* (State Forest Service) [10] explicitly mention the importance of the 'experience of nature' (Staatsbosbeheer, 2004a; Vereniging

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[7] Originally, the Dutch National Parks – with the exception of Schiermonnikoog, which is a 'National Park' (IUCN category II) – are so called 'habitat/species management areas' (IUCN category IV): protected areas managed mainly for conservation through management intervention. This definition interestingly does not mention recreation. The National Park Commission, which advised the Dutch House of Representatives in 1975 on the installation of National Parks, stated that the conservation and development of natural values in National Parks takes precedence over all other values. The parks may offer possibilities for the experience of environmental beauty and education. This characterization of National Parks was adapted in 1993. Since then, nature policy for National Parks has distinguished four goals: nature conservation and development, education, outdoor recreation and research (SNP, 2007).

[8] In this thesis I focus on the nature conservation and recreation goals.

[9] Recreational zoning plans are a common tool for preventing and mitigating problems between recreation and nature. In the so called 'core zones', areas that accommodate vulnerable nature, nature goals prevail over recreational goals. Areas where nature and recreation goals are of similar importance are so called 'extensive zones'.

[10] Natuurmonumenten (in English: Society for the Preservation of Natural Monuments) is a society with 882,000 members (in 2008). It manages 100,000 ha of nature. Staatsbosbeheer (in English: State Forest Service) is an independent governmental organization and manages 250,000 ha of nature.

Natuurmonumenten, 1999). Their nature discovery games, 'gnome routes', GPS routes[11], and 'barefoot trails' are recent examples of their interest in and eye for nature experiences. However, these experiences are not (yet) part of strategic plans, and are still implemented on an ad hoc basis. The application of zoning plans assumes knowledge of the relationships between environmental characteristics, recreational behaviour and associated experiences: facilities are located and designed in such a way that they take into account (1) the sensitivity of ecosystems[12], (2) the recreational experiences that are to be enhanced, and (3) the type and amount of recreational use (Cole, 1993). Most probably, it is the lack of knowledge on the relationships between environment and experiences that has led to activity-based zoning plans. With regard to type and amount of recreational use, National Park managers design the area with the aim of minimizing the harm done to the natural environment while benefiting their visitors. This is illustrated by several studies which give clear examples of how design and management practices influence recreational use (Kaplan et al., 1998; Proudman & Rajala, 1981). For instance, a general principle often applied in Dutch National Parks is to concentrate facilities as much as possible and to locate car parks at the edge of the area. However, not all recreational facilities are part of a bigger plan. The Management and Design Plan for Dwingelderveld, for example, states that the increase in recreational facilities such as marked trails has not been based on former Management and Design plans, but has 'just been done' (Overlegorgaan Dwingelderveld, 2004). Another example is the creation of a lookout hill in the same National Park. This recreation attraction was not realized because it was planned, but because the managers had to get rid of several cubic meters of soil (personal communication, A. Henckel). These examples demonstrate the often ad hoc and unscientific character of recreation management (Cole, 2006). Can we, as social scientists, contribute to changing this by providing functional knowledge for nature managers on visitor experiences and spatial behaviour in relation to the environment they visit? Such knowledge would be highly relevant to managers of much-visited National Parks, which have often reached the limits of the potential of zoning plans (Pleijte et al., 2008). Recently, Cole (2006, p. 11) concluded that we need:

> '[a type of] park management that relies less on personal observation and instinct, is more responsive to the views of stakeholders, is guided more by explicit management objectives, and is more science-informed.'

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[11] The GPS routes I refer to were developed by Staatsbosbeheer superintendent Coert Donker in 2001. He decided in 2005 to disable them because by that time it was possible to download maps on GPS. The goal of the GPS routes was to see nature with different eyes, to get an intense experience of nature. According to Donker this is no longer possible when you have a map on your screen (instead of only an arrow pointing into the direction you have to go). (Source: personal communication, C. Donker, 29 June 2008)

[12] This thesis does not focus upon the sensitivity of ecosystems or recreational impacts on nature.

In addition to scientific knowledge on how to effectively design National Parks for recreational co-use, managers also need knowledge on how effective their design and management is in relation to actual recreational use and experiences. Both researchers and managers lack knowledge about the relationships between recreation experiences, activities and settings (Pierskalla et al., 2004). One way to deepen the understanding of visitor expectations and motivations, visitor numbers, activities and behaviour, is by visitor monitoring (Arnberger et al., 2002). The next section elaborates on monitoring methods and introduces a relatively new method: recreational simulation modelling.

1.3 Visitor monitoring and management: simulation modelling as a tool

While there is a longstanding tradition of monitoring vegetation and wildlife in protected areas, there is very little systematic monitoring of recreational uses. The goals of monitoring programs range from identifying problems of overuse of sensitive areas to minimizing conflicts between user groups, checking adherence to use limitations, or simply justifying funding requests (Muhar et al., 2002). The practice of visitor monitoring was first established about forty years ago in the USA , where there is now a sophisticated on-site visitor monitoring system called the National Visitor Use Monitoring System (NVUM) (Bell et al., 2007). The system gathers information about the type, quantity, quality and location of recreation use on public lands (USDA Forest Service, 2008). Each national forest is monitored every five years. Information on visitor use, visitor characteristics, their satisfaction with the resource and their expenditures is useful for forest planning and decision making (Zarnoch et al., 2005). In Europe, many countries (85%) have conducted studies of recreational visits to specific nature areas, but systematic and standardized visitor information collection systems are still at the development stage (Skov-Petersen & Jensen, 2005). This is also true of the Netherlands, where there is no systematic recreation monitoring system (Vries & Veer, 2005). However, the first initiatives to develop such a program at National Park level are emerging (Hooff & Bruin, 2008).

Several techniques are available for recreation monitoring in nature areas. Which method or mix of methods is best depends on the goal of the monitoring. Muhar et al. (2002) describe various direct methods (e.g. interviews, observation), indirect methods (e.g. mapping of traces of use), and useful combinations for avoiding the disadvantages of relying on a single technique. These disadvantages may relate to ethics (e.g. video recordings), vandalism (e.g. manipulation or destruction of devices), or costs (especially labour costs).

Recent research presents computer-based modelling as an effective tool for managing visitor behaviour in natural settings (Gimblett et al., 2001; Lawson et al., 2003). Of the different types of simulation models available, the agent-based simulation models seem

most appropriate (Itami et al., 2004). These models use autonomous agents that are programmed to move around the virtual landscape like software robots. The landscape is represented by a travel network that is assigned properties (e.g. facilities, views) to which the agents respond (Manning et al., 2005). Simulation modelling has several advantages over the more conventional methods described above (Lawson, 2006, pp. 601-602):

- Simulation modelling can be used to describe existing visitor use conditions that are inherently difficult to observe (e.g. in larger areas that receive more dispersed use);
- It can be applied to monitor the condition of indicator variables that are hard to measure (e.g. encounters during the day, changing number of people at a popular attraction during the day).

In addition to monitoring, simulation models may also be used as planning and communication tools:

- Simulation modelling can test the effectiveness of alternative management practices in a more comprehensive, less costly, and les politically risky way than on-the-ground trial and error (Lawson, 2006, pp. 601-602);
- It may provide a communication channel in participatory processes (Skov-Petersen & Gimblett, 2008).

While there are many advantages of simulation for the management of nature areas for recreation, the application of recreation simulation modelling is still in its infancy and there are many obstacles to overcome. These obstacles relate to the collection of data, the translation of these data into behavioural rules, the reliability and validity of the model, analysis of the simulation outcomes, and integration of simulation modelling into decision-making processes (Gimblett, 2005; Gimblett & Skov-Petersen, 2008; Lawson, 2006). Whereas researchers argue for a structured and systematic assessment of the benefits of modelling for planning processes in research (Skov-Petersen, 2008b), it is important to keep focusing on further improvements in data collection and model development. After all, models are powerful tools when used as 'truth machines', not just as tools that enable users and experts to develop shared understandings through continuous dialogue (Evans, 2000). When models were used by Alterra to analyse the New Forest Visitor Survey, the managers expected a 'user friendly' system which did not require a high degree of systems knowledge (Gallagher et al., 2007). In reality, however, the complexity of the applied simulation model meant that it could only be used by specialists from Alterra. Interestingly, it emerged from the evaluation of the process that the visual products of the simulation model were perceived as having 'great impact' during stakeholder meetings in the PROGRESS[13] project. In addition, the MASOOR model was recognized as 'a powerful decision-making tool' (Colas et al., 2008, p. 166). Indeed,

[13] PROGRESS http://www.progress-eu.info/uk.htm

the managers of the New Forest used the simulation outcomes to decide to close one particular car park.

This example highlights a key challenge for the future, namely to develop a modelling system that functions on a minimal amount of input data, and that is both statistically valid and representative, and an accurate representation of the situation being modelled (Elands & Marwijk, 2008; Gimblett, 2005). It is also interesting, in relation to the validation of model outcomes, to analyse recorded patterns of movement (e.g. from GPS) as a result of a number of explanatory variables related to infrastructure, environment and other agents (Skov-Petersen, 2005). This study aims to contribute to addressing these challenges and will explore some of the complexities involved in applying simulation models. In the next section, I will state the aims of this thesis that follow from the ideas outlined so far.

1.4 Goals and research questions

In the foregoing sections I explained how the decentralization of national policy placed relatively extensive decision-making powers and executive control in the hands of nature area managers, many of whom lack scientific knowledge on how to effectively design nature areas so as to influence visitor behaviour and enhance recreational experiences. I suggested that visitor monitoring can provide nature managers with useful information about recreational behaviour and experiences. This thesis looks at nature as both an outcome of human decision making, and as the context of recreational behaviour and experiences. Thus, it focuses on the recreational knowledge that is necessary to successfully combine nature and recreation, in line with the 'partnership' view described above. More specifically, this thesis focuses on knowledge about people's behaviour in nature and their recreational experiences. Behaviour in this thesis refers to the recreational activity of walking[14]. With regard to recreational experiences, I decided to focus on environmental meanings. Environmental meaning is one of the themes studied within the field of landscape experience research (Jacobs, 2006). These meanings are based upon actual experiences of places (Williams & Patterson, 1996): people perceive a physical environment and give meaning to a place on the basis of their experience.

With this in mind, the current study aims to understand the relationship between the environment, recreational experiences, and behaviour in a natural setting. Furthermore, in order to contribute to the development of simulation models as a relatively new method of visitor monitoring and management, I would like to use these understandings

[14] I have chosen to focus the study on the act of walking since walking is one of the most important recreational activities among Dutch people (CBS, 2008).

in the application of a recreation simulation model. I have posed two preliminary research questions on recreational experiences and behaviour in a natural setting:

- How can nature visitors' environmental meanings and actual behaviour be understood in response to the environment they visit?
- To what extent can information on environmental meanings and visitor behaviour inform nature management so that it can successfully combine nature and recreation?

I decided to focus the study on Dwingelderveld National Park, which was also the setting for a modelling study I participated in at the start of my PhD-research[15]. I elaborate further on this National Park in chapter 3.

1.5 Outline

Chapter 2 discusses the theoretical framework for this study, starting by describing four perspectives in person-environment research before positioning my study. I introduce four environmental values and give a review of relevant literature about person-environment relationships. I am then able to state the research questions.
Chapter 3 describes the organization and environmental management practice in Dwingelderveld National Park. I go back to 1904, when the first hectares of the current National Park were bought for nature conservation. I explain changes in nature management and the introduction and rise of recreation in terms of the four environmental values. This sets the stage for chapters 4 to 6 on the empirical research findings. Chapter 4 describes the visitors of Dwingelderveld and their interpretations of the environment. A visitor typology is outlined, which is based on these ascribed environmental meanings. Chapter 5 deals with the behaviour of the visitors: where they go, and how they behave in relation to both the physical and the interpreted environment. Chapter 6 delves deeper into the experience value of Dwingelderveld and describes visitor perceptions of the attractiveness of different landscape types, which are the result of so called restoration strategies. Chapter 7 concludes the survey of empirical findings and describes how the results can be used to refine and improve a recreation simulation model. Finally, Chapter 8 draws conclusions and discusses the implications of the research.

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[15] This study aimed to develop a spatial design for Dwingelderveld National Park that combines both recreational and ecological qualities. The study was financed by the Ministry of Agriculture, Nature and Food Quality, while representatives of Staatsbosbeheer, Natuurmonumenten and Unie van Bosgroepen (in English: Union of Forest Associations) were on the supervision committee of the project. We explicitly looked into the relationship between recreational behaviour and experiences, and used a simulation model to test different design options.

2 Theoretical framework

2.1 Introduction

The knowledge generated by this study is intended to contribute to the successful combination of ecological and recreational functions in general, and to the improvement of recreation simulation modelling in particular. In the previous chapter I explained that this study focuses on nature visitors' environmental meanings and their actual behaviour in response to the environment they visit. These topics have been the subject of research within the fields of environmental psychology and behavioural geography (Bonnes & Secchiaroli, 1995). Both these disciplines view people as an integral part of every problem, and the environment as defined and ordered through human actions (Kitchin, 2000). The two fields also share an interest in a whole range of topics such as place and environmental perception (Spencer & Blades, 1986). However, environmental psychology's conceptualization of the environment is generally narrower than the conceptualization used in geography. Psychologists often take only the mental representation of the environment into account, while geographers place more emphasis on the environment, and define it more broadly, including both physical and non-physical (cultural, political, legal) aspects (Gärling & Golledge, 1993).

My study focuses on both the environment that is managed by nature organizations – who create meaning through interventions in the physical environment – and visitors, who give meaning to the environment during their interaction. It therefore takes both the physical and the interpreted environment into account. Amadeo (1993, p. 83) expresses this as follows:

> '(…) Environments constitute an external source of information necessary for the execution of human action and for undergoing experience. (…) People necessarily transact and interact with this information and, in the process, assess it for meaning.'

Before I elaborate on the distinction between the physical and the interpreted environment, I explain perspectives that can be applied in people-in-environment studies and I position myself (2.2). After a theoretical review of conceptualizations of the environment (2.3), I introduce four environmental values that can be used to describe both the physical and the interpreted environment (2.4). Next, I say more about human factors that influence environmental meanings and recreational behaviour (2.5). Finally, in section 2.6 I reformulate and elaborate upon the two preliminary research questions which I formulated in chapter 1.

2.2 Perspectives in person-environment research

During the 1960s and 1970s, the study of human behaviour in relation to the physical and social environment emerged as a fast-growing area of psychological research (Stokols, 1977). Issues such as the worldwide concern with the environment, increasing criticism of laboratory methods, interest from architectural, geographical, and ecological fields, and a call for psychology and other social sciences to contribute to the solving of social problems resulted in the development of the interdisciplinary field of environmental psychology (Altman & Rogoff, 1987; Bonnes & Secchiaroli, 1995). Altman and Rogoff (1987) described four perspectives (or world views, as they called them) that currently and historically underlie research and theory in environmental psychology. Their terms for these perspectives are *trait, interactional, organismic,* and *transactional* (Altman, 1992; Werner & Altman, 2000; Werner et al., 2002)*:*

- Trait: there is an emphasis on people and personality as the reasons for action (and thus not the environment).
- Interactional: people and context are seen as separate elements, and change comes about by the 'interaction' of the independent elements.
- Organismic: sets of independent elements interact in complex and often reciprocal ways, with the system, evolving towards an ideal and homeostatic end state.
- Transactional: people and psychological processes are embedded in and inseparable from their physical and social contexts.

These perspectives are based on the philosophical frameworks of Dewey and Bentley (1949) and Pepper (1942), and are associated with different definitions of the unit of analysis, time and temporal qualities, and philosophy of science (role of researcher, causation and focus) (see table 2-1). Before elaborating on these perspectives and positioning my study, I show, with reference to Werner and Altman (2000), that many research projects are based on a combination of perspectives and assumptions. As Altman and Rogoff (1987, p. 11) say: 'no research example, theory, or theorist can be exclusively pigeonholed into one or another world view'. Each perspective has strengths and weaknesses, and all are necessary to fully understand an event (Werner et al., 2002).

The following sections elaborate on the four perspectives, looking at each of the topics of the columns in table 2-1 in turn.

2.2.1 Unit of analysis

A researcher needs to be aware of the philosophical underpinnings of a research. One related question is whether a phenomenon is assumed to be a collection of separate entities or a holistic unity in which discrete elements are mutually defining and

inseparable. Trait, interactional and organismic perspectives focus on separate and independently defined psychological processes, environmental and social contexts. The trait perspective focuses on individuals or psychological processes, using personality theories, for example. However, pure trait perspectives are a rarity[16] because they usually consider situational factors in interaction with personal qualities, a characteristic of the interactional perspective (Altman & Rogoff, 1987; Werner & Altman, 2000).

The interactional perspective focuses on the prediction and control of behaviour and psychological processes. It defines psychological processes, environmental settings, and contextual factors as independent and operative entities. The emphasis on prediction and control implies that antecedent factors affect variations in psychological processes, typically in a unidirectional fashion. In general, behaviour and psychological processes are treated as dependent variables, whereas environmental factors and sometimes personal qualities or other psychological processes are treated as independent variables. Examples are studies on the influence of environmental factors (such as noise, climate) on psychological functioning (Altman, 1997; Altman & Rogoff, 1987).

Unlike the interactional perspective, the organismic perspective takes the integrated system as the unit of analysis. However, although the whole cannot be understood strictly on the basis of knowledge about the parts, an eventual understanding of the whole does permit a better understanding of its parts and of the relation of the parts to the whole (just like interactional perspectives). In addition to an analysis of the parts, the organismic perspective also examines how the parts fit together in terms of system-wide principles of organization. Also, the focus is on reciprocal and complex patterns of relationships. Examples of the organismic perspective are crowding studies that include personal, interpersonal, and physical factors that affect appraisals of the situation and, in turn, result in coping responses and the psychological and physical effects of crowding (Altman & Rogoff, 1987).

[16] In fact, pure trait perspectives, in which the individual, the mind, or mental and psychological processes are studied, and in which environments and context playing a secondary role, are hardly ever applied in the field of human-environment research (Altman & Rogoff, 1987). However, trait theory is a major approach in personality psychology (Matthews et al., 2003).

Table 2-1: Comparison of perspectives in person-environment research

	Unit of analysis	Stability and change	Philosophy of science		
			Researcher	Causation	Focus
Trait	Person, psychological qualities of people	Usually assumes stability; change often occurs according to pre-established teleological mechanisms and developmental stages	Researchers are separate, objective, and detached from events; equivalent observations by different observers	Material causes: cause internal to events	Focus on trait and seek universal laws of psychological functioning according to few principles associated with person qualities
Interactional	Psychological qualities of person and social or physical environment treated as separate entities with interaction between parts	Change results from interaction of separate person and environment entities; time and change not intrinsic to events	Researchers are separate, objective, and detached from phenomena; equivalent observations by different observers	Efficient causes: antecedent-consequent relations	Focus on elements and relations between them; seek laws of relations between variables and parts of system; understand system by prediction and control and by accumulating added information about relations between elements

Organismic	Holistic entities composed of separate person and environment components whose relations yield qualities of the whole that are more than the sum of the parts	Change results from interaction between person and environment entities. Change usually occurs in accord with underlying regulatory mechanisms, e.g. homeostasis, and teleological mechanisms. Assumes that system stability is goal	Researchers are separate, objective, and detached from events; equivalent observations by different observers	Final causes: teleology, pull toward ideal state	Focus on principles that govern the whole; emphasis on unity of knowledge; principles of holistic systems and hierarchy of subsystems; identify principles and laws of whole system
Transactional	Holistic entities composed of 'aspects', not separate parts or elements; aspects are mutually defining; temporal qualities are intrinsic features of wholes	Stability/change are intrinsic and defining features of psychological events; change occurs continuously; directions of change emergent and not pre-established	Relative: researchers are aspects of events; observers in different locations (physical and psychological) yield different information about events	Formal causes: description and understand-ding of patterns, shapes, and form of events	Focus on event, i.e. confluence of people, space and time; description and understanding of patterning and form of events; openness to seeking general principles, but primary interest in accounting for event; pragmatic application of principles and laws as appropriate to situation; openness to emergent explanatory principles; prediction acceptable but not necessary

Source: Adapted from Altman and Rogoff (1987) and Werner and Altman (2002)

Like the organismic perspective, the transactional perspective emphasizes the study of holistic person-environment units of analysis. However, the two perspectives differ in their conceptions of how the system is composed and operate. The transactional perspective assumes that psychological, physical environmental and social 'aspects' (in stead of 'parts') of events are inseparable (Altman, 1997). It rejects the use of separate parts. Instead, all the aspects of a phenomenon are defined in terms of one another; they coexist as intrinsic and inseparable qualities of the whole[17] (Altman & Rogoff, 1987). Werner and Altman (2000, p. 23) explain the difference between interactional and transactional perspectives by giving an example related to landscaping around the home. From an interactional perspective, a researcher would focus on specific qualities of yards such as size, layout, and kind of plants. These qualities are separate from individuals. Individuals, the residents in this case, would be described in terms of health status and family type. Then the researcher tries to understand how yard qualities relate to individuals. Research questions might include: What qualities of yards are related to housing satisfaction? Is access to green areas related to health? The transactional perspective, on the other hand, emphasizes the dynamic unity between people and environment. In the yard example, the researcher may look at how people describe their yard to express their identity as both individuals and members of groups and the broader society. Research questions could be: How does the yard reflect the family's self-expression processes? How do individual and collective styles change across the lifespan, and how do yards mirror these changing styles? The key difference between interactional and transactional perspectives is therefore how you define the unit of analysis: as holistic, or as composed of independent elements. I come back to this assumed difference in section 2.2.4.

2.2.2 Stability and change

Perspectives also differ in their assumptions about the temporal aspects of events. Is time viewed as internal or external to events?

The trait perspective essentially assumes that psychological phenomena are stable, or that change results from pre-established teleological mechanisms, independent of environmental influence and moving towards an ultimate and newly stable state of being. Freudian theories of social development, for example, postulate fixed and predetermined

[17] Transactional and phenomenological approaches both consider person and environment as mutually defining. However, they may differ in that (1) transactional approaches are not limited to qualitative description of events, (2) transactional approaches can apply existing explanatory principles in trying to account for a holistic event, and (3), transactional approaches can permit generalization in terms other than of an observer's direct experience of the phenomenon (Hartig, 1993).

stages in which development is not emergent and does not result from the interaction of people and environments (Altman & Rogoff, 1987).

The interactional perspective treats time as an independent dimension, not as an intrinsic aspect of phenomena. It describes change as a result of the interaction and influence of separate environmental and person/social entities, and/or the underlying regulatory mechanisms such as homeostasis (Altman, 1997). In other words, change is determined by the pre-established properties of the interacting entities. Unlike the trait and organismic perspectives, this perspective does not assume that change is teleological. In line with the idea that time is an independent dimension, change is marked by arbitrary chronological units, not by physiological units. Change is treated as the difference between the state and structure of the event at time 1 and its state and structure at time 2. Actual processes of change are examined directly as the phenomenon unfolds; they are deduced from changes in status from one time to the next (Altman & Rogoff, 1987). An example of an interactional study is a comparison of consumer recycling behaviour before and after community interventions (De Leon & Fuqua, 1995). Overall, the interactional perspective applies a rather static approach to change.

According to the organismic perspective, stability and change occur because of directional and predetermined underlying teleological mechanisms. In other words, progression occurs through pre-established stages of development toward some ideal end state. This ideal end state is totally stable and functions harmoniously. Unlike the interactional perspective, which focuses on changes within parts, the organismic perspective is concerned with changes at the level of the whole system (Altman & Rogoff, 1987). An example of an organismic study is one that focuses on coping processes such as social withdrawal associated with crowding stress (Greenberg & Baum, 1979). Crowding is perceived as disrupting the system balance, and the ultimate goal within organismic perspectives is an ideal end state.

In contrast to trait, interactional and organismic perspectives, the transactional perspective assumes that stability and change are intrinsic aspects of psychological and social phenomena, and that change does not necessarily proceed in a predetermined direction. Thus, change is intrinsic to the event rather than an outcome of the interaction. This is different from the interactional perspective, which treats psychological and social systems as changing largely by virtue of external factors. In the transactional perspective, efforts are directed toward understanding the changing phenomenon. The focus is on the sequences of events that describe phenomena (Altman, 1997; Hartig, 1993). An example is a description of the ways in which temporal features of homes are intrinsically linked with the psychological, social, cultural, and physical qualities of homes (Werner et al., 1985).

2.2.3 Philosophy of science

The latter set of assumptions emphasizes the criteria for collecting and evaluating data. These criteria depend upon three distinctions (Werner & Altman, 2000, p. 26):

- Whether the researcher is objective or subjective;
- Whether the goal of the research is to identify unique or general principles of behaviour (or both);
- What form of determinism is at work (cf. Aristotle's causes[18]).

The trait perspective, just like the interactional and organismic perspective, values objectivity, replicability, and generalization of findings and theories. These three perspectives also have in common that they see the researcher as separate from events. However, the trait perspective differs from the other perspectives in its notion of causation: material causation is central to trait perspective. This involves the idea that psychological causes are self-contained in the phenomenon itself. For example: a person's genes set limits on behaviour (Altman & Rogoff, 1987).

The interactional perspective emphasizes Aristotle's concept of efficient causation, with a search for antecedent-consequent relationships between variables[19]. In practice, the interactional perspective dominates much of the research in environmental psychology. Its usual method of analysis is (1) to separate the whole into its basic parts, (2) to specify the properties of these parts and their interaction, and (3) to formulate laws that describe principles according to which the elements interact. It is assumed that these principles are generalizable and universal, and that the goal of research is to search for broad underlying principles for phenomena. The search for knowledge – by an independent researcher – can be objective and replicable. Environments are usually treated as independent predictor variables (Altman & Rogoff, 1987). An example is a study into the preferences for wild versus managed nature, which reported differences between landscape types and respondent groups (Berg & Koole, 2006).

The organismic perspective relies not only on the concept of efficient causation, like the interactional perspective, but even more on the concept of final causation. It is less of a search for specific antecedent-consequent relations between variables that can explain phenomena, because any part of the system can be an antecedent or a consequent. The emphasis is on teleological changes in the system as a whole, and on the ideal state of functioning. As with the interactional perspective, the goal is to discover general and

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[18] Altman and Rogoff (1987) related the four perspectives to Aristotle's classification of causation in natural phenomena.

[19] According to the psychologist Rychlak (1977), most people immediately think of the efficient meaning (=interactional) of cause when we use the term, thanks to natural science.

universal principles of human behaviour (Aitken & Bjorklund, 1988; Altman & Rogoff, 1987). An example is an ecological analysis of the relation between transportation and human wellbeing (Stokols & Novaco, 1981). This analysis includes psychological aspects of transportation and wellbeing that are assumed to have reciprocal relationships, and are linked together in terms of congruence (Altman & Rogoff, 1987); an organismic notion of balance is at work here.

The transactional perspective relies heavily on formal causation, which implies a focus on describing patterns, forms and flows of events and relationships. From a transactional perspective a researcher attempts to discern the nature of the whole without an emphasis on antecedent-consequent relationships, an analysis of the whole into its elements, or an identification of the teleological mechanisms governing the phenomenon. The goal is to understand a specific event in all its complexity. General principles are applied, but with an acceptance of the possibility that different configurations of principles may be necessary to understand different events. This perspective therefore adopts a pragmatic and relativist approach to researching phenomena (Altman & Rogoff, 1987). An example is a study into the structure of and changes in the personal projects, time perspective, and personal networks of Japanese university graduates prior to and after the transition from graduation to employment (Yamamoto et al., 1992). Their study illustrated how psychological processes are linked to and directly reflected in everyday actions with respect to features of the physical environment within which people function (Altman, 1992).

2.2.4 Combining perspectives

In the foregoing sections I described the differences between the four perspectives in terms of units of analysis, treatments of the temporal dimensions of person-environment systems, and philosophies of science. It became clear that pure trait-based research in the field of human-environment studies hardly exists. The interactional perspective dominates in current research on person-environment relations, whereas organismic and transactional perspectives are less often applied (Altman, 1993). While both the organismic and transactional perspectives focus on holistic entities, they differ in their approach to causation, which is teleological (positing an ideal state) in organismic perspectives, and formal (seeking understanding) in transactional perspectives.

Although the founding fathers of the transactional perspective (Altman and Rogoff) and other advocates (Werner, Brown) stress they do not overtly suggest that any one perspective is better than the others, they do imply that ‘research of a more holistic character should supplement interactional research’ (Hartig, 1993, pp. 18-19). I have already indicated that studies often combine elements from different perspectives. Hartig (ibid.) does not discuss the organismic perspective, probably because of its focus on

teleology, which is applied by natural scientists rather than by social scientists (Bekoff & Allen, 1995). A combination of interactional and transactional perspectives, as envisaged by Hartig (1993), is interesting for this study because I aim both to understand the relationship between visitors, their experiences and behaviour in a natural environment, and to develop a simulation model, which requires an insight into antecedent-consequent relations (e.g. what environmental characteristics influence the spatial behaviour of hikers).

Hartig (1993, p. 18) illustrates the difference between the interactional and transactional perspectives by describing the kind of nature experience research that follows from each perspective:

> 'Interactional research concerns itself with impacts of discrete natural features and environments on psychological variables such as emotion or stress. It also tests hypotheses about the modification of impacts by distinct personal (e.g. sex, ethnicity), situational (e.g. the social density in the setting, presence of a threat), and temporal factors (e.g. amount of time spent in the setting on the given occasion).'
>
> 'A goal of transactional research, on the other hand, is to embed nature experience in the pattern of relationships that holds and unfolds among people, places, and psychological processes. The fact of a person's movement into a natural place, or of their engagement with a natural feature in a built environment, is assumed to represent the converging influence of evolutionary, sociocultural, and motivational forces. Meanings and qualities of nature experience that are salient for individuals or groups are then understood through reference to other forms of environmental experience, individual and collective, past, present, and future.'

This example illustrates that the difference between interactional and transactional research lies mainly in the unit of analysis. For the transactional perspective, this is holistic, while for the interactional perspective, it consists of elements and their relations. However, when I analyse studies that explicitly profess to apply a transactional perspective (e.g. Bonaiuto et al., 2004; Brown et al., 2007), I get the impression that interactional and transactional perspectives are intermingled. There are two reasons for this. Firstly, these studies mention the holistic character of a phenomenon, but do divide person-environment systems into discrete elements. It may be no surprise that the transactional perspective has received criticism based on the argument that transactions between people and environments are extremely difficult to investigate (Aitken & Bjorklund, 1988). Secondly, although it is not explicitly stated, the researcher who professes to apply a transactional perspective is often detached from the phenomena under study, which is a characteristic of an interactional approach. This is probably

related to what is traditionally recognized as good research (Hart & Conn, 1991). For example, Brown et al. (2007) applied an audit of environmental features that three trained observers applied at the same time. They agreed on their ratings 98% of the time. This is more in line with the interactional perspective, which aims for equivalent observations by different observers, than with the transactional perspective, in which different observers yield different information about events.

In practice, the division between interactional and transactional perspectives is not very strict because no study illustrates all the components of a transactional perspective (Kamp et al., 2003); 'one cannot do everything in every transactional study' (Werner et al., 2002). In fact, as Amadeo (1993) puts is, the two perspectives are quite similar in their reasoning. Human behaviour and experiences can only be understood when viewed in terms of the environmental circumstances in which they occur. In the next section I explain how this study combines elements from both interactional and transactional perspectives.

2.2.5 Positioning my study

The real challenge for holistic research lies in finding a methodology for fulfilling this ambition to combine the interactional and transactional perspectives (Pettigrew, 1997). The key here is that although various aspects of the whole, such as individuals and contexts, are not separate entities (Altman, 1992), they may be studied separately (Hartig, 1993).

The current study aims to understand the event of recreational behaviour and meanings visitors attach to the environment in which they spend their leisure time. However, in order to be able to research how the environment is interpreted, or how environmental features relate to visitor behaviour, I assume I can define people in terms of characteristics such as age and place of residence. Also, I can define the environment both in objective terms (e.g. type of paths, situation of recreational facilities) and in subjective terms (e.g. busy, touristy, and natural). Furthermore, I assume that issues such as group composition, familiarity, and access to area information play a role in recreational behaviour and experiences. In short, I think holistically (in transactional terms) but am not eschewing a description of the parts (taking an interactional approach). The relationships between environment, experiences and behaviour are not unidirectional but multidirectional (transactional). The transactional perspective makes a researcher sensitive to the physical and social contexts of phenomena (Altman, 1992), which play an undeniably important role in this study. The person-in-environment is the unit of analysis, rather than only the person (Wapner & Craig-Bray, 1992).

Secondly, I see change as inherent to a phenomenon (in line with the transactional perspective), but I acknowledge that time can be used to mark phenomena as well (in line with the interactional perspective). Change is not addressed as static, although arbitrary periods can be assigned to phenomena in order to 'mark' or characterize changes. An example might clarify this. It is possible to define nature in the Netherlands by describing the proportion of the national surface area that it occupies: Since the 1950s the total surface area of nature has slightly decreased, from 500,000 (or 16% of the Dutch land surface) to 483,000 hectares. The major decline took place in the 1950s and 1960s, mainly as result of spatial claims by agriculture in the 1950s and continuing urbanization thereafter. In the 1980s the downward trend ended. This was partly the result of policy measures taken due to increased global interest in nature and the environment in the late 1960s and early 1970s (Groote et al., 2006).

Thirdly, my role as a researcher is detached (interactional): I operate separately from the phenomenon, which I want to observe and understand. I am aware that I change the phenomenon when I observe it, e.g. when I ask questions to visitors to a nature area, but I assume that I do not influence their behaviour and experiences very profoundly. Nevertheless, I do not claim that my observations are completely 'neutral'. Another researcher might have come to different conclusions based on similar results.

Fourthly, in relation to causation, this study aims to understand relations between (interpreted) environments and recreationists. This implies formal causation (transactional), but my interest in gaining insight into the influence of environmental elements on experiences and behaviour inclines towards efficient causation (interactional).

Finally, the goal of the study is to *understand* the relationships between people and space in time, as well as principles underlying those relationships (transactional). I am open to finding generalizable laws and broad principles (interactional), but the main aim is to understand relationships in a specific situation. The focus is on an event, namely: recreational experiences and behaviour in Dwingelderveld National Park.

The grey cells in table 2-2 mark the emphasis of the current study on the five demarcating issues of the transactional perspective, as described in sections 2.2.1-2.2.3.

Table 2-2: Emphasis in the current study

	Unit of Analysis	Time and change	Observers	Causation	Focus
Interactional	Psychological qualities of person and social or physical environment treated as separate entities with interaction between parts	Change results from interaction of separate person and environment entities; time and change not intrinsic to events	Observers are separate, objective, and detached from phenomena; equivalent observations by different observers	Efficient causes: antecedent-consequent relations	Focus on elements and relations between them; seek laws of relations between variables and parts of system; understand system by prediction and control and by accumulating additive information about relations between elements
Transactional	Holistic entities composed of 'aspects', not separate parts or elements; aspects are mutually defining; temporal qualities are intrinsic features of wholes	Stability/change are intrinsic and defining features of psychological events; change occurs continuously; directions of change emergent and not pre-established	Relative: observers are aspects of events; observers in different locations (physical and psychological) yield different information about events	Formal causes: description and understand-ding of patterns, shapes, and form of events	Focus on event, i.e. confluence of people, space and time; description and understanding of patterning and form of events; openness to seeking general principles, but primary interest in accounting for event; pragmatic application of principles and laws as appropriate to situation; openness to emergent explanatory principles; prediction acceptable but not necessary

Grey colour refers to the underpinnings of the current study

In line with a transactional perspective[20], I assume that recreational behaviour is multiply determined, with physical, psychological, social, cultural, and personal aspects all playing a role (Brown et al., 2007). Physical aspects are attributes of the environment such as trees and roads; psychological aspects include motivation (for recreational activity) and familiarity with the setting; social aspects include group composition and encounters; cultural aspects include cultural and ethnic values. Lastly, personal aspects include socio-demographics and childhood experiences. Moreover, I assume that visitors actively give meaning to their environment, which is a result of a transaction between the physical environment and the person. It is the physical environment than alters due to nature managers' interventions, such as restoration practices (Junker & Buchecker, 2008). Thus, both the physical environment and the environment as perceived by visitors are objects of research. The next section describes a conceptualization of environment that is useful for this study.

2.3 The environment: physical and interpreted

The environment is where behaviour – such as recreational activities – occurs. An environment may be measured both objectively and subjectively (Gärling, 1998). Objective measurements focus on properties of the physical environment which are relevant predictors of the behaviour of the users of the environment being assessed. Subjective measurements refer to how individuals subjectively assess their environments (ibid.). Indeed, environments may be conceptualized by their physical features such as landmarks, nodes, routes (Golledge, 1993; Lynch, 1960), as well as by their meanings (Gustafson, 2001; Williams & Patterson, 1999). The importance for managers of combining both types of measurement lies in the recognition that resources exist in a meaning-filled spatial (and temporal) context (Williams & Patterson, 1996).

An overview[21] of the main theoretical traditions in environmental psychology illustrates that different researchers not only have different conceptualizations of environments, but also different focus points (table 2-3).

Kurt Koffka, a psychologist from the Gestalt school, may have been the first to make the distinction between 'geographical environment' (absolute space) and 'behavioural environments' (relative space) (Downs & Stea, 1973; Koffka, 1935). The geographical

[20] For the rest of this thesis, the phrase 'transactional perspective' refers to the combination of inter- and transactional perspectives as reflected in table 2-2.

[21] This overview of conceptualizations of environment is by no means complete, and does not aim to be so. It serves as an illustration of how different scholars have dealt with the distinction between and conceptualizations of physical and interpretative environments.

environment is the environment existing in reality, while the behavioural environments are the environment as experienced by people. However, the geographical environment tended to be ignored by Gestaltists, who considered only the behavioural environment to be relevant for behaviour. Gestaltist thinking was rooted in the theory of isomorphism, which implies the existence of innate neurological mechanisms in all individuals. As a result, the behavioural environment corresponds with the geographical environment (Bonnes & Secchiaroli, 1995).

Kurt Lewin was initially trained in the phenomenological orientation of the Gestalt school, but later came into more pragmatist circles (Bonnes & Secchiaroli, 1995). For Lewin, environment was usually understood as the perceived environment. Lewin introduced the concept of 'life space' that consists of both the person and the psychological environment that exists for him (Lewin, 1951). A major criticism of Lewin's theory, however, is that he did not fully elaborate how the objective world was related to the 'life-space' (Hart & Conn, 1991).

Egon Brunswik opposed the isomorphic view, which paid little attention to the physical structure of the environment, and developed the 'lens model' theory (Brunswik, 1957). He claimed that psychology should pay as much attention to the properties of the organism's environment as it does to the organism itself. The so called 'ecological environment' consists of physical/objective characteristics. Elements of the environment, 'distal cues', may be perceived by the observer, who tries to make sense of them. However, another difference from Gestalt thinking is that the active subject is faced with ambiguities and inconsistencies in the environmental cues that originate from environmental conditions. It is through actions in the environment that the individual tends to verify the accuracy of his judgement. Thus, both cognition and action are part of the 'symbolic' environment (Bell et al., 2001; Bonnes & Secchiaroli, 1995). Brunswik's ideas received widespread attention, but the complexity of his work discouraged researchers from applying his theory (The Brunswik Society, 2007).

Brunswik's emphasis on the importance of the environment is also found in the development of 'psychological ecology', best illustrated by the work of one of Lewin's students, Roger Barker (Bonnes et al., 2003). His conceptualization of environment is much more objectivist than Lewin's highly subjectivist view (Clitheroe et al., 1998). He was disappointed by the consolidated laboratory methodology that dominated in the 1930s and 1940s and developed a 'station' for observing behaviour in the field (Bonnes & Secchiaroli, 1995). Personality is not an issue for Barker: behaviour patterns in given settings would be internally consistent, and actors in the setting are interchangeable without affecting the observed behaviour. According to Barker, individual differences are often less influential than the behaviour settings (Hart & Conn, 1991; Scott, 2005).

Barker sees 'Behaviour settings' as:

> 'Bounded standing patterns of human and non-human activity with integrated systems of forces and controls that maintain their activities at semi-stable equilibria; the parts and processes of behaviour settings have high degrees of internal interdependence in consequence of which they are discrete units – they are entities within the ecological environment.' (1987, p. 1420)

In this sense, the ecological environment is much more specific than the natural environment; it is the organized environment of the setting in which observed behaviour is found and explained. The only reality to be investigated is the observable one, also defined by Barker as 'pre-perceptual environment' (Bonnes & Secchiaroli, 1995). This focus on the objective environment is seen as a main limitation of Barker's approach and one of his colleagues, Wicker, tried to revise the concept (Wicker, 1987). To date, Barker's theory has not moved into mainstream psychology, probably because of its complexity, its labour-intensive methods, and its incompatibility with the highly individualistic dominant paradigms in psychology (Scott, 2005).

Urie Bronfenbrenner was another student of Lewin. Bronfenbrenner criticizes not only psychologists who focus mainly on the properties of the person ('and only the most rudimentary conception and characterization of the environment in which the person is found' (Bronfenbrenner, 1979, p. 16)), but also researchers – such as Barker – who direct specific attention to the characteristics of the environment: 'that may be quite adequate for the study of behavior in animals but […] hardly sufficient for the human case' (Bronfenbrenner, 1977, p. 514).

Bronfenbrenner developed a theoretical framework[22] that encompasses the microsystem (the complex of relationships between the person and the environment of an immediate setting and represented by the individual's experience of that setting), the mesosytem (a system of microsystems), the exosystem (settings that do not involve the person as an active participant, but in which events occur that affect or are affected by what happens in the setting containing the person), and the macrosystem (which includes attitudes and ideologies of the culture in which individuals live) (Bonnes & Secchiaroli, 1995). The setting is an important concept for his theory, and is defined as:

[22] Although Bronfenbrenner's work is focused on human development issues, is psycho-social framework is also inspiring outside the field of developmental psychology. His 1979 book (Ecology of human development) had been cited 5545 times by September 2008 by scholars in a wide range of fields (e.g. health, communication, environmental management, and psychology).

> 'A place with particular physical features in which the participants engage in particular activities in particular roles for a particular period of time. The factors of place, time, physical features, activity, participant, and role constitute the elements of a setting.' (Bronfenbrenner, 1977, p. 514)

It is interesting to note that Bronfenbrenner specifically includes not only the physical characteristics of the setting, but also the way in which these properties are perceived by the people in the environment:

> 'A critical term in the definition of the microsystem is experienced. The term is also used to indicate that the scientifically relevant features of any environment include not only its objective properties but also the way in which these properties are perceived by the people in the environment.' (Bronfenbrenner, 1979, p. 22)

In other words, he stresses the importance of subjective experience along with the objective perspective. The people in the environment are viewed as active rather than passive. Furthermore, the interactions between the individual and his/her environment are viewed as both bidirectional and synergistic. These characteristics make Bronfenbrenner's ecological approach transactional. Although it aims at discovering how systems and processes work from a holistic perspective, it also applies elements from an interactional perspective because it recognizes separate properties or entities, such as physical features.

Table 2-3: Conceptualizations of objective and interpreted environment

Scholar and main reference(s)	Physical environment*	Interpreted environment
Koffka (1935)	Geographic environment	Behavioural environments
Lewin (1954)	Objective world	Life space
Brunswik (1957)	Ecological environment	Organismic portion of perception
Barker (1968, 1987)	Ecological environment	Behaviour setting
Bronfenbrenner (1979)	Naturalistic environment	Setting

*The physical environment was not usually the object of research for these scholars. However, I have included the related descriptions to show that the scholars distinguished the physical environment from the interpreted environment.

This overview of the main theoretical traditions in environmental psychology shows the different conceptualizations on environments, some mainly in physical-perceptual terms (Koffka and Brunswik), and others from a more molar point of view (Lewin, Barker and Bronfenbrenner). For the purposes of this thesis, Bronfenbrenner's ecological approach is particularly interesting, since it meets the criteria of transactional research. However, like most theorist in environmental psychology (Hart & Conn, 1991), Bronfenbrenner pays

little attention to the physical structure of the environment. He tends to consider the spatial-physical features of the environment only indirectly, as the implicit component of the setting under examination (Bonnes & Secchiaroli, 1995). In the next section I describe a different way of conceptualizing the environment, and introduce four environmental values that can be applied to describe both the physical and the interpreted environment. By applying these values, we emphasize the transactional character of person-environment relations: people value elements in their environment, and may influence and shape the landscape according to their interpretations (Antrop, 2005). These values also provide a framework for an analysis that can form the basis of a holistic research into nature recreation.

2.4 Environmental values [23]

Visitors' experience of nature and their time-spatial behaviour are influenced by the physical surroundings and how they interpret them. Stedman (2003) demonstrated that landscape attributes matter a great deal to constructed meaning; these constructions are not exclusively social. 'Empirical research has neglected the role of the physical environment, focusing on place meanings and attachment as products of shared behaviour and cultural processes' (ibid., p. 671). Palacio and McCool (1997) noted that developing the relationships between site characteristics and benefits expected from a recreational engagement represents a significant research challenge. Moos (in Pennartz, 1986) stated as long ago as 1975 that the physical and social environment are inextricably related and must be studied together. Lengkeek et al. (1997) developed a framework of four values that can be attributed to socio-physical surroundings:

- Use value: instrumental value that refers to opportunities offered by the surroundings for the pursuit of activities;
- Experience value: this value refers to qualitative schemata or mental filters which people use when evaluating an environment (e.g. open or closed, beautiful or ugly);
- Narrative value: the expression of a variety of interesting facts and specific information on an area, such as stories on the history of a place, references to people who have lived there, information about things that can be found locally or that once existed;
- Appropriation value: the intensity of being (mentally) attached to the environment.

In this thesis I apply the concept of 'value' in two ways: objectively and subjectively. Let me explain this distinction in more detail before I elaborate on the four values. The

[23] Parts of this section have been published in Forest, Snow, and Landscape Research (Marwijk et al., 2007).

concept of value implies that it is attributed to something by somebody. This somebody is the subject who recognizes that something indeed has a value for him or her. 'The elimination of all subjective valuation destroys ipso facto the very possibility of the concept and the existence of values' (Peperzak, 1986, p. 73). What, then, is an objective value? In this thesis the objective application of values relates to observable matters, implying a factual evaluation rather than a normative statement. This means that something does *in fact* have value for somebody, rather than that something *should* have value for somebody. An example may clarify this. The presence of other people in a nature area (which is an observable matter) may be interpreted by one visitor as 'very busy' (a subjective value for this individual), while another person might evaluate the situation differently, as 'very convivial'. Observable matters may serve as input or as the basis for evaluations and interpretations (Stedman, 2003). It is these observable matters that nature managers influence and adapt, such as the construction of trails (use value) and lookout towers (experience value), the placement of information panels (narrative value), or the closure of a vulnerable part of a nature area to visitors (appropriation value). However, the interpreted environment is not solely determined by the physical environment; in line with the transactional approach, biological, cultural and personal factors also influence the way people experience the environment (Bourassa, 1990; Jacobs, 2006).

2.4.1 Use value

The use value of an area is basically determined by the opportunities it offers for activities. A tourist product consists of core resources and supportive elements (Ritchie & Crouch, 2003). A National Park can be seen as a core element (attracting visitors because of its status), while the paths, car parks and signs are supportive elements. A second important concept with regard to the use value of nature areas is orientation (Lynch, 1960). The use value of an environment depends upon an individual's interpretative processes: a visitor's cognitive representation of the spatial environment influences his opinion on its possible or appropriate use. Recent research shows that landmarks are the most distinct anchor points for tourists in nature areas (Young, 1999). Paths, signage and marked trails can also serve as anchor points for orientation and wayfinding in protected nature areas.

2.4.2 Experience value

Within environmental psychology, the experience value can be explained by Berlyne's arousal theory (1974), Appleton's prospect-refuge theory (1975) and people's desire to understand and explore their environment (Kaplan & Kaplan, 1989). The environment has the potential to stimulate a person's level of arousal. Both over-stimulation and under-

stimulation create uneasy feelings. The 'right' level of arousal creates a 'hedonic value'. Berlyne gives an evolutionary explanation for this preferred level of stimulation from the environment. He argues that humans prefer environments which have moderate complexity, incongruity and surprisingness. Appleton (1975) suggests that evolution of homo sapiens in the savannah of East Africa created a 'hard wired' neurological preference for half-open landscapes in which people could simultaneously scan for and hide from dangers and threats to continued evolution. The Kaplans (1989) expand this theory by claiming that evolution required an ability to simultaneously understand and explore environment. Their concepts of coherence, legibility, complexity, and mystery connote dimensions in the environment that lead to the development of understanding and encourage further exploration in both the two-dimensional pictorial visual array and the three-dimensional spatial array presented by the environment. Brown et al. (1986) broke down the Kaplans' concepts into the elements of land form (slope, spatial diversity, relative relief, and relief contrast) and land cover (naturalism, height contrast, internal variety and compatibility). However, these labels are still quite vague, and from a meta-analysis of 28 researches on mystery, complexity, legibility and coherence, Stamps (2004) found no reproducible results. For instance, some studies found mystery to be negatively related to preference, while others found it to be strongly related. Similar findings emerged for all four variables (ibid.).

The psychological theories of Berlyne, Appleton, and the Kaplans claim the existence of universal mechanisms within all human beings. The underlying assumption of the evolutionary approach is that landscape perception relates directly to the physical attributes of the natural landscape. In Dutch research, this approach is theoretically and empirically elaborated by means of eight indicators, i.e. abundance of vegetation, degree of naturalness, degree of variation, abundance of water, abundance of relief, degree of landscape identity, degree of skyline disturbance, and degree of noise pollution (Buijs & Kralingen, 2003). Jacobs (2006) states that, although this theory ignores socio-cultural aspects of landscape appreciation, research suggests that these indicators are able to successfully predict the aesthetically appreciated qualities of landscape. Theories on the social and cultural backgrounds of appreciation and preferences underline the differences between individuals according to the groups to which they belong. Bourdieu (1979) pointed out that cultural preferences are passed on from generation to generation in the form of capital and embodied in 'habitus'. Preferences are linked to lifestyles, which are characteristics of groups or 'social fields'. These lifestyles are constructed and reproduced in social and economic processes.

2.4.3 Narrative value

Understanding beauty as the perception of aesthetics is not entirely unproblematic. Our appreciations are not only mobilized by physical appearances, but also by the cognitive

dimension of 'knowing' what the object is about. MacCannell (1989) introduces the concept of 'attraction', the notion that the narratives related to objects define whether any object (landscape, building, etc.) becomes articulated as an object that is attractive to tourists. The observer who does not know the narratives of an object is able to experience beauty, which is related to general mental schemes of appreciation. The same observer, nevertheless, is not able to discern the object's attractiveness to tourists. For this reason Lengkeek et al. (1997) have separated – at least analytically – the perception value from narrative value. The narrative value refers to the construction of specific stories about an environment.

Narrative value is in many ways embedded in the very concept of landscape itself (see Schama, 1995). The physical appearance of natural environments is linked to symbols, meanings and narratives which are stored in the human mind and form the basis for understanding or even 'reading' a landscape. This reading of our natural environment is dynamic, as over time natural settings accrue new layers of symbolic representations (Corner, 1999). These layers of symbolic representations of our natural environment become especially relevant for tourism and recreation purposes (Lengkeek et al., 1997; MacCannell, 1989). Interpretive facilities such as fact sheets and brochures, maps, roadside signs, walking trail signs and leaflets, information centres, and guided walks and talks (Ballentyne et al., 1998) are considered to be relevant in the construction and dissemination of collective stories. This implies that nature managers can actively influence the interpreted environment. They construct interpretative facilities for several functions, such as education (on history, management, nature) and information (what activities to do, where to find facilities). Narratives are sometimes value laden in the sense that they seek to influence thinking or behaviour. For example, nature management organizations purposely leave out certain roads on maps, in the hope that fewer people will walk on them. Another example is related to ecological restoration, which entails intentional activities to recover an ecosystem, such as the re-establishment of a historical flooding regime, the reintroduction of native species, or the elimination of exotic species (SER, 2004). Restoration activities have sometimes met with opposition from various societal groups, including local citizens or recreationists (Swart et al., 2001). Subsequently, several researchers have suggested that the perception of environments and their (changing) attributes can be influenced by information on e.g. nature management techniques (Ribe, 2002). Public education can help managers to influence public beliefs about ecosystem management (Brunson & Reiter, 1996).

The nature visitor also plays an active role in addressing the narrative value (Henning, 2008), perhaps by 'reading the landscape': this term refers to the relationships between environment and narratives formed by recognition (Jacks, 2007). People may, for example, discover a burial mound or a Celtic field in an area where they recreate. However, what people discover or interpret depends on both available information and

personal skills and knowledge. Besides those collective stories, people also have personal stories and memories for which places are valued (e.g. visiting the place where a person used to play when he[24] was young).

2.4.4 Appropriation value

Finally, the appropriation value refers to the fact that people can symbolically 'own' the environment (Brouwer, 1999). This mental ownership is not per definition intrinsic to the physical setting itself, but resides in human interpretations of the environment, which are constructed through experience with it. Appropriation shows, first of all, that an individual is attached to a place. Place attachment is often described as a positive emotional bond that develops between people and specific places. Through these bonds, people acquire a sense of belonging and purpose that gives meaning to their lives (Bricker & Kerstetter, 2000; Relph, 1976; Tuan, 1977).

The wide range of emotional bonds[25] that people form with places have been diversely framed and studied by different researchers[26]. In this research, I build upon conceptual work by Stedman (2003) who demonstrated that landscape characteristics underpin place attachment, which can be measured by asking people about the importance of a specific place to them. This emotional bond is developed over time, i.e. the better acquainted a person is with an area, the more attached he feels (Williams et al., 1992). People are more emotional in their experiences when they consider something their own. For example, proposed developments that will change the physical environment of a place can be perceived as a threat by people who feel attached to it, regardless of their potential value (Manzo & Perkins, 2006).

While the use, experience and narrative values can be characterized as content-oriented (e.g. doing something, liking something, knowing something), the appropriation value differs in that this value is more about the bond between people and places in its own right. Most people experience feelings of place attachment which go beyond the usefulness of a particular place or setting for pursuing a particular activity (Proshansky et al. 1983 in Williams & Roggenbuck, 1989). In addition, when place attachment grows,

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[24] Note that instead of 'he', you could also read 'she' in this thesis.

[25] Besides a 'mental' appropriation, people can also literally make an area their own. Consider the Francophiles who buy a second home in their favourite holiday destination.

[26] 'Geographers have commonly taken a phenomenological approach, examining how spaces become places through personal activities and experiences. […] Sociologists have applied a social constructionist perspective, exploring the shared values and symbols that when applied to a landscape create common meanings. […] Psychologists have taken a cognitive approach to sense of place.' (Davenport & Anderson, 2005: 627)

people start to identify with places (Knez, 2005). 'In this sense, settings offer individuals the opportunity to both express their identity as well as to affirm their identity' (Kyle, Graefe, Manning et al., 2004, p. 214). Proshansky coined the term place identity and stressed the importance of the physical environment for identity (Proshansky, 1978; Proshansky et al., 1983). In fact, human actors are able to appropriate physical contexts in order to create a space for attachment and rootedness (Dixon & Durrheim, 2000). Although the issue of identity is beyond the scope of this thesis, its relationship with appropriation value underscores the higher level of subjectivity incorporated in appropriation value compared to use, experience and narrative values. This implies that use, experience and narrative values are more easily found in the physical environment (e.g. paths, water bodies, and burial mounds) than the appropriation value is.

2.4.5 Environmental values and transactions

I have already mentioned that the physical environment serves as input for the interpretative environment. Natural resource managers are able to influence not only the physical environment (e.g. by adding elements) but also the interpretative environment. In fact, the distinction between the two is blurring. When a nature manager puts an information sign in the area explaining the international importance of species that can be found in the specific area, they influence both the physical and the interpretative environment. Thus, the link between physical and interpretative environment is unbreakable (Peperzak, 1986). Moreover, the division between the four values is not always very sharp. For example, a view tower invites us to climb it (use value) and look out over the surroundings. This tower is related to experience value as well: people generally like views. Other environmental elements that people generally value highly are the presence of water and trees (Buijs & Van der Molen, 2004; Kaplan & Kaplan, 1982). The narrative value is associated with descriptions and stories people tell about places, for example stories that explain the history of an area. Those stories are told by people (e.g. in the visitor centre) or explained by information sheets in the area, and they can influence the way people use the area (they might specifically look for a certain object) and perceive the environment (they might discover a burial mound). In essence, the position I take here is to posit an ongoing transaction between the person and the environment. Individuals seek to make sense of their surroundings. They actively acquire and organize information in the environment in the form of a behaviour-environment transaction (Aitken & Bjorklund, 1988). Stokols (1978, p. 259) summarizes the active role of the individual as follows:

> '(…) People orient to the environment in terms of existing information, goals, and expectations; they operate on the environment in an effort to achieve their goals and maintain desired levels of satisfaction; they are directly affected by

environmental forces (e.g. situational supports, constraints); and they evaluate the quality of the environment as a context for future activity and goal attainment'.

Consequently, a physical environment can acquire a number of totally different significances or meanings (interpreted environment) for different people (Lengkeek et al., 1997). Table 2-4 gives examples of elements in both the physical and the interpreted environment. The arrow in the table refers to the unbreakable link between the physical and the interpretative environment. The next section deals with important personal, psychological, socio-cultural and informative aspects of person-environment research.

Table 2-4: **Examples of elements in the physical and interpreted environment**

	Physical environment		Interpreted environment
Use value	Pattern of roads		Easy to get lost
	Hill		Very accessible
	Marked trail		Many landmarks
Experience value	Spyhole		Beautiful-unsightly
	Attractions	transactions	Exciting-boring
	Open spaces		Pleasant-unpleasant
Narrative value	Visitor centre		Recognizable history
	Information panel		Memories
	Fact sheets & brochures		
	Roadside signs		
Appropriation value	Ownership status		A home
	Accessibility		My place

2.5 The nature visitor

In this section I describe several human aspects that are often mentioned as possible correlates of individual differences in both experience and recreational use of nature.

A meta-analysis of 107 references to the *demographic* effects in nature aesthetics suggests a very high degree of consensus for many demographic distinctions (Stamps, 1999). However, several empirical studies proved that demographic characteristics can be a source of variation in environmental preference (Berg & Koole, 2006; Strumse, 1996). In general, people prefer natural environments to unnatural ones. However, not all nature scenes are highly preferred. For example, elderly people have relatively lower preferences for wild natural landscapes and relatively high preferences for managed nature (Berg & Koole, 2006). However, preferences change through the life cycle; variation in preference with age might be explained by chronological changes in

contextual factors (Lyons, 1983) such as socio-economic status, which I discuss below. Studies of the recreational use of Dutch nature areas report that young people, in particular, participate very little (SME Advies, 2007). A possible explanation, besides the fact that children spend more and more time watching television and at the computer, might be that Dutch nature is mainly designed to be 'looked at' rather than 'experienced' (LNV Consumentenplatform, 2006).

A second potential personal aspect is *socio-economic status*, measured by income and education level. Visual preference studies show a relation between socio-economic status and nature type preference (Berg & Koole, 2006). For example, Berg et al. (1998) found that highly educated people displayed preferences for wild nature landscapes. With regard to actual use of nature, the general trend is that people with high incomes and education levels are over-represented among nature users (Virden, 1990). A study among 9000 people from the Netherlands showed that 93% of people with a high socio-economic status visit nature areas, compared to only 56% of people with a low socio-economic status (SME Advies, 2007).

Thirdly, evidence for the importance of *familiarity* can be found in a number of studies. Place of residence has been reported to influence how people judge environmental aesthetics (Berg & Koole, 2006; Daniel & Boster, 1976; Lyons, 1983; Zube et al., 1974). However, is it not always clear what the effect of familiarity on landscape experience and preference will be (Kaplan & Kaplan, 1989). Overall, the relationship between place of residence and familiarity has been a positive one (Berg & Koole, 2006), but negative relationships have also been reported (Strumse, 1996). Another factor that is often mentioned in relation to familiarity is childhood experiences[27]: an issue that is currently receiving a lot of policy attention. However, of several empirical studies, none have found significant relationships between landscape exposure as a child and landscape preferences (Brush et al., 2000; Strumse, 1996). With a view to the transactional outcome of behaviour, Young (1999) collected cognitive maps drawn by nature-based tourists. Visitors who were familiar with the area of research drew more landmarks and paths than first-time visitors and were more advanced in their spatial learning. This might imply that familiar visitors display more diverse spatial behaviour patterns than visitors who do not have prior knowledge of an area: a study among visitors to four Spanish National Parks showed that the most rough and inaccessible landscapes were preferred by those visitors that knew the area best (DeLucio & Múgica, 1994). However, there is relatively little

[27] This trend is reflected by the enormous attention for Louv's 'Last child in the wood' (2005). In this book Louv links the lack of nature in the lives of children to social trends such as the rises in obesity, attention disorders, and depression.

empirical research on this relationship between familiarity and spatial visitor behaviour.

Fourthly, *motivation* is an extensively researched topic within tourism and recreation studies. Many of these studies are based on the work of Dann (1977), Crompton (1979) and Iso-Ahola (1980). Dann (1977) identified two basic motivations: anomie (the desire to have a break from everyday life) and ego-enhancement (the desire for recognition). Crompton (1979) identified nine factors: escape from everyday life, exploration and evaluation of self, relaxation, prestige, regression, enhancement of kinship relationships, facilitation of social interaction, novelty, and education. Iso-Ahola (1980) developed a social-psychological model for tourism motivation based on two motivational forces: seeking and escaping. Both dimensions have a personal and an interpersonal component. For example, a person may escape his personal world (i.e. personal troubles, problems) and/or the interpersonal world (i.e. co-workers, family members, friends) and he may seek personal rewards (e.g. learning about other cultures, rest and relaxation, being refreshed and recharged , ego-enhancement and prestige) and/ or interpersonal rewards (e.g. varied and increased social interaction, interacting with friendly natives or members of the travel group, interacting with old friends in a new place or with new friends in an old place) (Iso-Ahola, 1982). Unlike Crompton and Dann, Iso-Ahola does not differentiate between push and pull factors, because 'reasons (e.g. exploring new places) can be benefits and benefits (e.g. escape from routine) can be reasons' for leisure behaviour' (Iso-Ahola, 1982, p. 260).

Within the specific field of recreational outdoor behaviour, Driver et al. (1991) developed a Recreation Experience Preference (REP) scale, which measures 21 benefit domains[28] that an individual may experience when participating in outdoor recreation. The scale has been revised over the years, employed in numerous outdoor settings, and tested for validity across multiple studies. It has been proven to be a consistent instrument to measure recreation motivations and benefits (Manfredo et al., 1996).

Finally, *expertise* has been shown in a number of studies to influence landscape preferences. Members of environmental groups, for example, are more in favour of wilderness scenes (Berg & Koole, 2006; Dearden, 1984). Related to expertise is a participant's reported knowledge regarding land management. This knowledge was found to be significantly related to the enjoyability of different rural landscape types (Brush et al., 2000).

[28] These are: achievement, autonomy/leadership, risk taking, equipment, family togetherness, similar people, new people, learning, nature appreciation, introspection, creativity, nostalgia, physical fitness, physical rest, escaping personal-social pressures, escaping physical pressure, social security, escaping family, teaching/leading others, risk reduction, and temperature.

Besides the above-mentioned personal factors, there are also socio-cultural factors which are assumed to influence recreational behaviour and experiences. In line with the transactional approach, individuals ascribe meanings to specific environments based on interactive processes involving the individual, the setting, and the social world (Eisenhauer et al., 2000; Kyle, Graefe, Manning et al., 2004). Firstly, *group composition* may play a major role in recreation choice behaviour (Downing & Clark, 1984; Kellert, 1998). Members of the group have to negotiate where to go, what to do and how long to stay. Strangely though, most empirical studies on nature experiences and behaviour tend to omit group composition (e.g. Ballentyne et al., 1998; DeLucio & Múgica, 1994; Payne et al., 2004).

Secondly, *cultural characteristics* may influence experience and use of nature. Differences between cultures are beyond the scope of this thesis[29]. However, I would like to point out that recreational behaviour and nature preferences change within cultures over time as well. For example, while in the 1960s[30] many Dutch people spent their leisure time at the side of the road watching other people, today 'fun shopping' is the most popular leisure activity among the Dutch (Janssen, 2005). With regard to outdoor recreation in Dutch nature areas, new activities include GPS-hiking, geocaching, hiking on 'boot paths', and playing in 'play-forests' (Boer & Raffe, 2003). Nordic walking, horse riding and mountain biking have also become popular. Nevertheless, walking and hiking remain the most popular outdoor recreation activities among Dutch people in outdoor recreation areas (Sollart & Niet, 2006).

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[29] A comparison between Korean and Western tourists for example, showed that both groups preferred Japanese landscape style and elements over Korean and Western landscape types (Yang & Brown, 1992). In addition, Koreans preferred a Western landscape style to their own Korean landscape style, whereas a Korean landscape style was preferred by Western tourists. The authors referred to the strong influence of landscape style and elements on preference, regardless of cultural differences. However, a comparative study of Australian and American students' attitude to Australian natural landscapes had rather different results (Herzog et al., 2000). Herzog et al. found a greater liking for Australian landscapes among Australians than among Americans, a result that they call 'familiarity bias'. Within the Netherlands, immigrants rate Dutch landscapes lower than the Dutch themselves do (Buijs et al., 2009). In addition, they prefer traditional production landscapes over natural ones, in contrast to native Dutch people. With respect to recreation behaviour, Dwyer and Hutchison (1990) found cultural differences among black and white households in Chicago. Black residents were more likely to engage in activities closer to home than were whites, and blacks strongly preferred to recreate at highly developed facilities, whereas whites preferred more natural, less developed sites. Comparable patterns can be recognized in the Netherlands, where non-western immigrants mainly use urban areas to recreate and hardly visit nature areas (Gelderman, 2008).

[30] In 1961 Saturday became a day off in the Netherlands, which implied more leisure time. This was enhanced in 1966 when employees became entitled to paid holidays.

2.6 Research questions

In chapter 1 I indicated that this study focuses on Dwingelderveld National Park and I formulated two preliminary research questions. The first research question – how do nature visitors' environmental meanings relate to their behaviour in response to the environment they visit? – is related to transactional outcomes. The second question – to what extent can information on environmental meanings and visitor behaviour inform nature management so that it can successfully combine nature and recreation? – refers to the use of recreational knowledge. In order to be able to answer those questions in accordance with the holistic approach aimed at in this study, I have formulated two additional questions about the environment and the nature visitor (see Figure 2-1). The numbers on the right of the figure show which chapter addresses each question.

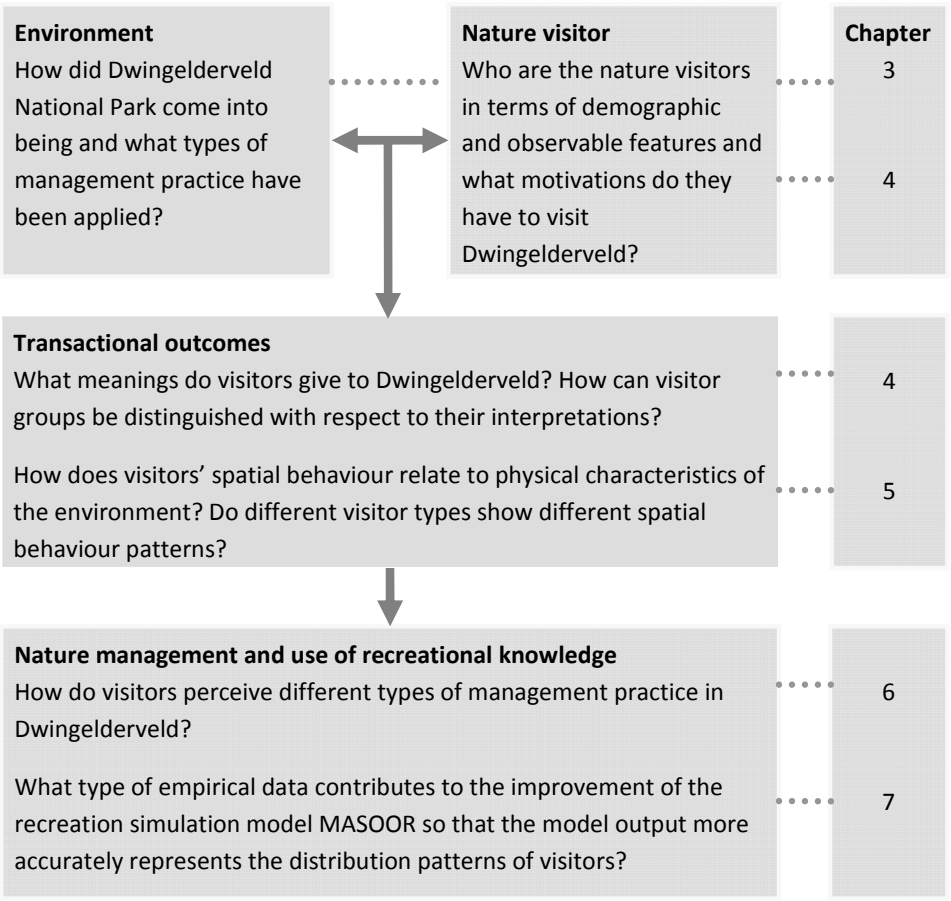

Figure 2-1: Research questions

A detailed account of how I conducted the research can be found in each of the empirical chapters (chapters 3-7). I have presented it like this to enable the reader to understand which method(s) I used to conduct the research described in each specific chapter. I used a range of methods: desk research, observation, qualitative interviews, quantitative survey, GPS-recording, GIS-analysis and modelling.

3 Dwingelderveld National Park

3.1 Introduction

This chapter deals with the characteristics of the study area, Dwingelderveld National Park, and with developments in the management of the area since 1904, when the first parcels of the current National Park were bought for both wood production and nature conservation. It explains which nature management organizations bought these parcels, and what nature management practices they put in place. The story of Dwingelderveld through the twentieth century is not so much about ecology, as about the dynamic and changing interaction between nature and people. Moreover, the story of the developments in Dwingelderveld is linked to the wider national post-war trend of (mass) recreation developments (Konijnendijk, 2008).

The chief purpose of this chapter is to offer an overview of the context of this study: the origins and directions of nature management in Dwingelderveld. This will help the reader to follow the remaining chapters. In addition, it presents the 'objective' environment by describing developments in the physical environment of Dwingelderveld in terms of the four environmental values (use, experience, narrative and appropriation).

The information in this chapter is a result of a combination of document analysis (policy documents, historical reviews, scientific reports, maps, management plans, and excursion reports), qualitative interviews, and observation. To select potential interviewees, I applied a mixture of snowball and expert sampling (Jennings, 2001). Since I aimed to describe the developments in Dwingelderveld from a holistic viewpoint, I wanted to talk not only to affiliated nature managers but also to more independent nature experts and people with other professions and interests. The first person I contacted was an employee of one of the nature management organizations in Dwingelderveld. Because of his job as a communication and education officer, he was in a position to suggest potentially interesting interviewees. These people in turn suggested other interesting people, and I also asked two people working in the area (a volunteer and a manager) during my field visits. In total, I interviewed 10 people:

- A Staatsbosbeheer nature manager responsible for two information centres in the area;
- A Staatsbosbeheer nature manager responsible for education and inventory of plants and butterflies, living in Dwingelderveld;
- A shepherd living in Dwingelderveld who has worked for Natuurmonumenten since 1987;
- An independent butterfly-expert;
- A Natuurmonumenten nature manager responsible for evaluation and quality of

management;
- A Natuurmonumenten communication and education officer;
- A former nature manager at Natuurmonumenten, district manager and land agent;
- An independent bird specialist living in Dwingelderveld since 1989;
- A local inhabitant whose grandfather had worked in the area;
- A local inhabitant, an artist who often paints in Dwingelderveld.

The interviews were semi-structured. Topics that I addressed were area development, nature management, personal attachment to the area, experiences and meanings of visits to the area, visitors to the area, and visitor management. During the interviews one other topic was addressed, namely nature restoration. The interviews were tape-recorded and analysed according to concepts on the topic list. All the interviews lasted between one and a half and two hours.

In addition to these interviews, I was allowed to use the transcripts of six interviews conducted by researchers from Alterra in 2006[31] with the following people:
- The head of the management unit of Natuurmonumenten for South Drenthe;
- The chairperson of the *Overlegorgaan* (Consultative Body, see section 3.2.2);
- The district Head of Staatsbosbeheer for South-west Drenthe district;
- The secretary of the Consultative Body;
- An alderman of the municipality of Westerveld, member of the Consultative Body;
- A farmer on the Consultative Body.

These interviews were used to complement the information from the interviews that I carried out personally.

Section 3.2 describes the characteristics of Dwingelderveld, such as geography, landownership, organizational structure, and important natural and recreational facts. Section 3.3 describes the history of Dwingelderveld since 1904, when the first parcels of land in the current National Park were purchased. The last subsection summarizes changes in management styles in terms of the four environmental values. Finally, section 3.4 deals with the current layout and possible future scenarios, including visitor distribution.

[31] Three of these interviews were carried out by Marcel Pleijte to describe the so-called 'situation zero' for Dwingelderveld National Park (Pleijte, 2006; Pleijte et al., 2008). Rosalie van Dam conducted the other three interviews to study the decision making processes within Dutch nature policy (Kuindersma et al., 2007). I am very grateful to both researchers for allowing me to use the transcripts.

3.2 Dwingelderveld National Park

3.2.1 General characteristics

Dwingelderveld is one of the 20 Dutch National Parks. The area is situated in the north-east of the Netherlands, in the south-west of the province of Drenthe and was officially established in 1991 (Figure 3-1). It forms part of the characteristic so-called es-village countryside of Drenthe, a type of landscape that originated from an agricultural system which developed during the middle-ages. For centuries, this type of landscape consisted of 'essen' (arable fields), grassland and meadows, and heathland.

The current National Park is an area of almost 3,700 ha and consists of wet heathland (ca 1,550 ha, the largest in Western Europe) and a mixture of natural deciduous and pine forests (ca 2,000 ha). There are more than 60 bog pools on the heaths and in the woods, with specific rare ecological values. There is also one of the largest complexes of juniper shrubs in Europe. The combination of dry and wet heathland with fens, bog pools and high peat is valuable and unique in Europe. The variation in the forests results from differences in microclimate, hydrological situation, soil type, age and tree density (Overlegorgaan Dwingelderveld, 2004). Its natural values are acknowledged through its National Park and Natura-2000 status.

Large sections of the forest consist of pine trees that were planted in the early 20th century to reclaim drift sand. However, from a natural-scientific point of view, mixed forests have greater ecological value. Since the 1990s, exotic species such as Larch (Larix), Douglas (Pseudotsuga) and Spruce (Picea) have been gradually removed. A second intervention to increase natural values was the raising of the groundwater level. Due to the presence of farmland within the borders of the National Park until 2007, the groundwater level was kept artificially low. According to a nature manager at Dwingelderveld, 'within ten years the heath land is as of old: high sand ridges interspersed with about 80 fens. Scotch heather[32] will be replaced by cross-leaved heath33, which is more unusual' (Bezemer, 2007). Raising the water table will influence the area's accessibility. However, this manager expects no problems: 'Wet heath is characteristic for this Drenthe landscape, so we are able to explain that to visitors. Even though they have to wear boots more often...' (ibid.)

[32] Calluna vulgaris

[33] Erica tetralix

Dwingelderveld is a popular National Park, with between 1.5 and 2 million estimated visitors a year. It is a typical Dutch nature area with an extensive recreational network for both short strolls (60 km of marked trails, of less than 7 km in length) and long walks, for cycling ('normal', racing, ATB) and for horse riding[34]. Visitors can acquire information in the visitor centre or in two unstaffed information centres. They can watch birds from two bird lookouts and have a drink at a teahouse, and eat a pancake at the Forest Pub or French fries at the snack bar. Besides these more common recreation attractions and facilities, Dwingelderveld has attractions related to its cultural history. For example, the two sheep flocks that contribute to the management of the heath land are very popular tourist attractions. The heathland is a result of old farming traditions going back to a time when it served as pasture for sheep. During the day, sheep grazed on the heath; at night they were kept in the barn so that the precious manure could be collected. The sheep barns were maintained by spreading thin layers of peat sods[35] – dug on the heath – over the manure. This mixture of manure and peat was used to fertilize the 'essen' (agricultural fields). The introduction of chemical fertilizer at the end of the 19th century ended this way of farming at one blow. In Drenthe, large tracts of the heath land were transformed into agricultural land, while other parts were planted with conifers (Haaland, 2004; LNV, 1991). Nature organizations started purchasing large areas of heathland in Dwingelderveld to prevent reclamation and cultivation (see also section 3.3.1). Currently, two flocks of sheep graze on Dwingelderveld, and provide an important recreational attraction[36]. Other attractions related to cultural history are the radio telescope (the oldest in the Netherlands, built in 1954, and a national monument) and the little house on the Benderse Berg (where the Drenthe writer Anne de Vries lived, author of 'Bartje').

Table 3-1 summarizes the recreational facilities and attractions in Dwingelderveld according to the value they relate to. While it is rather straightforward to allocate environmental characteristics to use, experience and narrative values, it is less easy to do so for the appropriation value (see also section 2.4.4). Appropriation value is much more subjective than the other three values. Some visitors might for example feel very attached to a certain fen in Dwingelderveld because they used to ice skate there when they were young, while for others this fen is just one in a million. For this reason, I decided not to include appropriation value in table 3-1.

[34] In the Netherlands, in most nature areas it is compulsory for visitors to keep to designated paths.

[35] Peat sods were also used as fuel.

[36] see also www.nationaalpark-dwingelderveld.nl

Furthermore, it is important to bear in mind that the distinction between the values is rather conceptual, since in reality they are interrelated. For example, some visitors (and even nature managers) perceive the radio telescope as a prototypical element of Dwingelderveld (narrative value), while disliking its appearance (experience value).

Table 3-1: Recreational facilities and attractions in Dwingelderveld

Use value	Experience value	Narrative value
Path network	Water	Radio telescope
Car Park	Forest (deciduous, coniferous, mixed)	Sheep farm
Benches/picnic tables	Heath	Visitor centres
Predefined routed (by coloured pole in field or described in a leaflet)	Expressway and highway (negative -> distraction)	Bird lookout Davidsplassen
Signs/ANWB mushroom		Bird lookout Holtveen
Tea house, snack bar, forest pub		Juniper
		House on Benderse Berg

The forest, heath, fens and recreational facilities are managed by two nature management organizations: Staatsbosbeheer[37] and Natuurmonumenten[38]. Dwingelderveld consists of exactly 3,692 hectares, of which Staatsbosbeheer manages around 1,900 and Natuurmonumenten around 1,485 hectares (see Figure 3-2) (Staatsbosbeheer, 2004b; Vereniging Natuurmonumenten, 2006). The other 300 hectares are managed by several private owners (Nationaal Park Dwingelderveld, 2004). Staatsbosbeheer is in charge of the forest of Dwingeloo and the Kraloërheide. Natuurmonumenten owns a large part of the heath area, the Dwingelose Heide, as well as the forest areas of Dwingelderzand and Anserdennen. Since the bestowal of National Park status in 1991, these two organizations have intensified cooperation. Box 3-1 describes the goals of both organizations. Interestingly, only Staatsbosbeheer explicitly mentions recreation in its goals. The description of the development of management practices in Dwingelderveld will also show that Staatsbosbeheer is more tolerant towards recreation than Natuurmonumenten is.

[37] See www.staatsbosbeheer.nl

[38] See www. Natuurmonumenten.nl

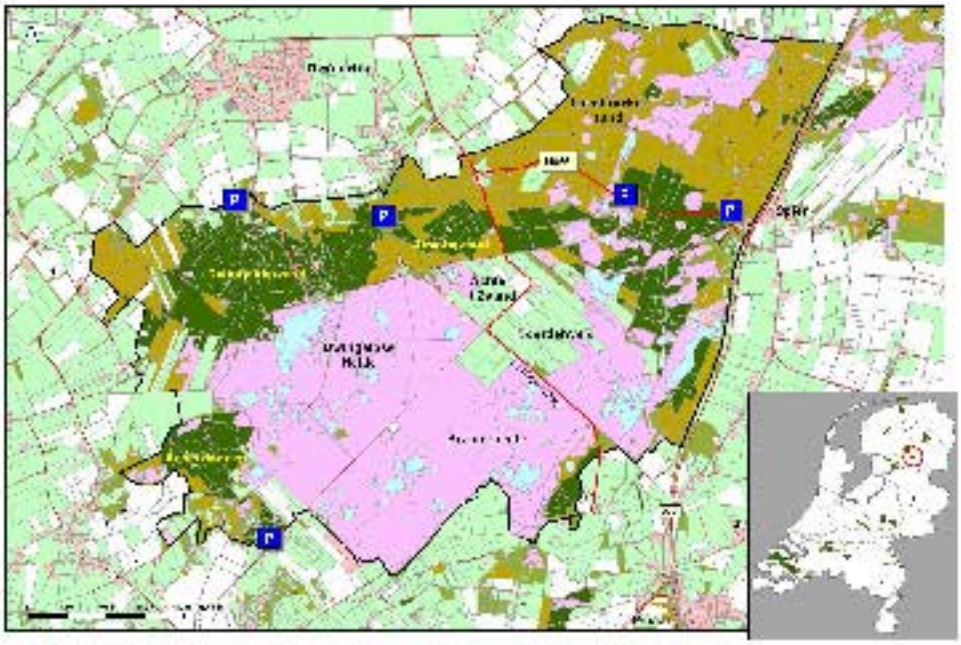

Figure 3-1: Location Dwingelderveld National Park

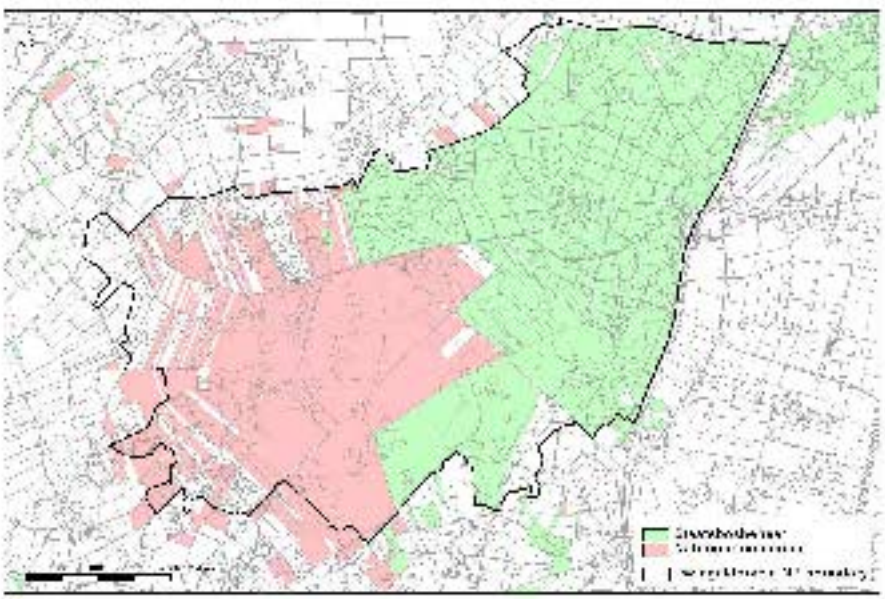

Figure 3-2: Distribution of land among the major land owners

Box 3-1 Goals of Staatsbosbeheer and Natuurmonumenten

Goals Staatsbosbeheer:

- To manage, i.e. to preserve, restore and develop values of forest, nature, landscape and cultural history in our areas.
- To promote recreation in as many of our areas as possible.
- To contribute to the production of environmentally friendly and renewable resources.

Goals Natuurmonumenten:

- To promote the preservation and restoration of nature and landscape.
- To promote purity of water, soil and air and to protect silence.
- To promote the awareness that mankind is responsible for this.

3.2.2 Organizational structure

In each Dutch National Park, a Consultative Body (*Overlegorgaan*) has been established, in which all the bodies, owners and managers take part. The Ministry of Agriculture, Nature and Food Quality explains the Consultative Body (LNV, 2005, p. 13) as follows:

> 'All the stakeholders in a National Park are on a Consultative Body. The provincial authorities are responsible for running the secretariat of the Consultative Body. In the Consultative body, the stakeholders develop a common vision for the area, which is laid down in a Management and Design Plan, usually covering a ten- year period. They meet at regular intervals to work out the practical details of the plan and to monitor implementation.'

The Consultative Body in Dwingelderveld was installed by the Ministry of LNV at the behest of the National Park in development in 1986[39], and is made up of the following members:

- An independent chairman;
- A secretary (from the Province of Drenthe);
- Representatives of:
    - Management organizations (Staatsbosbeheer and NM);
    - Private land owners;
    - The agricultural sector;

[39] The park officially became a National Park on 22 August 1991.

- The Province of Drenthe;
- The municipality of Westerveld;
- The regional *recreatieschap* (recreation board) of Drenthe;
- The water board of Reest and Wieden;
- Recreation entrepreneurs in Dwingelderveld.

Copies of the agenda and minutes are also sent to:

- A representative of the municipality of De Wolden;
- The Information and Education coordinator of the *IVN* (Association for Environmental Education).

Together, these parties pursue a common mission: 'to manage, protect and develop the park in a sustainable manner, to enable research and ensure public access'. The Consultative Body has a yearly budget of 250.000 Euros, of which 20-25% is available for information and education (Overlegorgaan Dwingelderveld, 2004). Three Working Groups have been established to assist and advise the Consultative Body: the Information and Education Working Group, the Recreation Working Group, and the Management and Research Working Group (see Box 3-2 for an overview of their members).

The Consultative Body meets three or four times a year to discuss plans, projects and finances. The meetings are open to the public. Essentially, the Consultative Body functions as a 'meeting platform' that makes decisions based on consensus. However, not all the respondents saw it this way; one of them stated:

> 'Yes, the Consultative Body is the decision-making authority, but managers are pretty autonomous. I think that not everything…. Well, in principal the Consultative Body takes the decisions, especially with regard to radical changes. But I wonder if this always works like that…whether it is not more consultation than government. I really wonder…'

In short, the members of the Consultative Body, which represents the stakeholders of Dwingelderveld, are responsible for the creation of the Management and Design Plan and for controlling its implementation, as well as for allocating funding. However, the Consultative Body's actual power with regard to decision making is debatable: nature managers – in this case Staatsbosbeheer and Natuurmonumenten – may in reality have more decision-making powers.

Box 3-2 Members of Working Groups

Members of the Information and Education Working Group (representatives of):

- Province of Drenthe
- Regional Recreational board of Drenthe
- Staatsbosbeheer
- Natuurmonumenten
- Water board of Reest and Wieden
- VVV Dwingeloo
- Organization for Nature and Environmental Education
- Visitor centre Dwingelderveld (Natuurmonumenten)

Recreation Working Group (representatives of):

- recreation entrepreneurs (four)
- Province of Drenthe
- Visitor centre Dwingelderveld (Natuurmonumenten)
- Recron

Management and Research Working Group (representatives of):

- Recron
- Municipality of Westerveld
- Province of Drenthe
- Regional Recreational board of Drenthe
- Staatsbosbeheer
- Natuurmonumenten
- Water board of Reest and Wieden
- Private land owners
- Landscape Management Drenthe

3.3 The development of management practices[40]

This section describes the purchase and management history of Dwingelderveld, from the year 1904, when Staatsbosbeheer acquired the first parcels of land. The historical description is divided into four phases, based on changes in management perspectives[41].

[40] Parts of this section are derived from an MSc thesis (Terlouw, 2008). I would like to acknowledge the contributions of Sander Terlouw in gathering the data.

[41] The division into phases may imply that the changes in perspectives were rather abrupt. In reality, such changes occur gradually, as the descriptions of the periods will show.

In order to compare the management practices in the four periods, a table at the end of the section summarizes the developments according to their relation to the four categories of use, experience, narrative and appropriation values.

3.3.1 Purchase and cultivation (1904-1950)

At the end of the 19th century, the area of the current National Park was mostly used by farmers and consisted of heath, peat bogs, forest and – as a result of excessive grazing – sand drifts. With the invention and introduction of artificial manure around 1900, the traditional agricultural system became redundant and the area became so called 'waste land' ('woeste gronden') with little economic value (Bakker et al., 1986). Staatsbosbeheer was the first of the two major management parties to acquire land in the area. Its main task was to cultivate the waste land and to ensure wood production. Staatsbosbeheer was founded in 1899 as a governmental organization with the task of reafforesting waste land, which was necessary since a number of villages were threatened by drifting sand[42]. The first part of the present-day Dwingelderveld to be planted was Lheederzand, in 1904. This area is part of the Dwingeloo forest, which was one of the first of its kind to be established in the Netherlands (Abrahamse, 1995). On the sand drifts of Lheederzand, Scots pine (Pinus sylvestris) was already advancing naturally. Because Scots pine was very well-suited to these dry and sandy places, Staatsbosbeheer decided to plant more. Other less dry areas were mostly planted with exotic tree species such as Japanese larch (Larix kaempferi), Douglas fir (Pseudotsuga menziesii), Sitka spruce (Picea sitchensis) and Norway spruce (Picea abies), all of which have been found to grow well with high yields (Jonášováa et al., 2006). From the First World War onwards American oak (Quercus rubra) was also planted between the coniferous trees (Nationaal Park Dwingelderveld, 2004; Vereniging Natuurmonumenten, 2006). The purchase of land continued steadily and forestry in Dwingeloo expanded: from 500 hectares in 1910 to 1,100 in 1924 (Beijerinck, 1924; Schukkink, 1976).

However, Staatsbosbeheer did not cultivate all the purchased land. As soon as the Dwingeloo Forest was established in 1904, an area of 30 hectares – the Lheebroeker Zand – was left uncultivated. Besides, some small bogs were 'saved', for example the Schurenberg bog, which was designated as a nature reserve in 1908. In 1924 Staatsbosbeheer invited an ecologist to assess the area's ecological value, and they decided to designate Lheebroeker Zand as a nature reserve as well (Beijerinck, 1924). In the following years, several other bogs were officially designated as nature reserves: the Westerveen in 1931 and another eight bogs in 1935 (Langeveen, Grote Veen, Diepeveen, Blanke Veen, Zandveen, Karreveen, Witteveen and Turfveen). Besides these areas, some

[42] Around 1899, only 3% of the Dutch landscape was afforested; nowadays the proportion is over 10% (Kuiper, 2000).

other bogs were left untouched during the afforestation, without being specifically designated as nature reserves (Staatsbosbeheer, 1954). The rise of the nature movement that sought the protection of 'natural beauty' in the early 20th century led Staatsbosbeheer to officially add a second task: from 1928 (the year of the *Voorlopige Natuurbeschermings Wet*: Provisional Nature Protection Act) Staatsbosbeheer focused not only on wood production, but also on nature protection (Buis & Verkaik, 1999).

The recognition of the area's ecological values gained in public prominence in 1929, when a group of fifty scientists, among whom Jacques P. Thijsse[43], published an article in a national newspaper stating that it is sometimes better not to cultivate land. In their opinion, each provisional cultivation project should consider what would be more beneficial: conserving the area for recreation[44] and science, or cultivating it. Responding to the rapid disappearance of typical heath landscapes, Thijsse stated that at least one large heathland in Drenthe should be 'saved' from cultivation. He visited three heaths in Drenthe and concluded that the heath in Dwingelderveld was the one to preserve. Natuurmonumenten started fund raising in December 1929 to collect the necessary 45,000 Euro[45]. The rise of mass media like radio and television made this campaign successful and membership of Natuurmonumenten rose significantly. However, the provincial board of Drenthe did not support the campaign and Natuurmonumenten collected only enough money (32,200 Euro) to buy the western part of the heathland in 1930 (Encyclopedie Drenthe Online, 2003). In 1933 they obtained another piece of the Dwingelose Heide: a large bog called the Davidsplassen (Maas, 2005). The eastern part of the heath, the Kraloërheide (325 hectares) was threatened with agricultural exploitation during the Second World War, even though it was listed on the Nature Conservation

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[43] Jacques P. Thijsse, a primary school teacher and ecologist *avant la lettre*, was one of the founding fathers of Natuurmonumenten (founded in 1905). He pled for the conservation and rehabilitation of nature areas, at the expense of both urban expansion and rural cultivation. The first official Nature Monument was established in 1906: the Naardermeer (Lake Naarden). This area had been impoldered three centuries earlier, but was deliberately inundated again shortly after that (in 1629) as a defensive measure to halt the advancing Spanish forces. Amsterdam city council had plans to turn the Naardermeer into a refuse dump. Natuurmonumenten bought the area for approximately 330.000 Euro (Zwart, 2003).

[44] The Dutch term for recreation is 'recreatie'. The Dutch conservationist and board member of Natuurmonumenten H. Cleyndert introduced the term in the Netherlands in 1922, after a visit to National Parks in the USA. He wrote: 'The English speaking people are to be envied for their beautiful word 'recreation': re-creation of the soul and life-energy' (LNV, 1999). However, it took until 1939 before he spoke in terms of recreation to representatives of Natuurmonumenten in a lecture on the protection of Dutch nature (Roenhorst, 2007). The first time Natuurmonumenten took up an official position on recreation was in the 1980s. Since then, management plans have included recreational aspects of management (Maas, 2005).

[45] Until 2002 the Dutch currency was the Guilder. One Euro is approximately equivalent to 2.2 Guilders.

Ordinance, a list of valuable nature areas. The area was privately owned and the owner resisted selling it until he was persuaded by a large sum of government money (61.000 Euro) and the threat of expropriation in 1942. The area was designated as a heath reserve under the management of Staatsbosbeheer. After this relatively large purchase, only small areas were acquired. By 1952, Staatsbosbeheer owned almost 1,600 hectares of land in Dwingelderveld (Staatsbosbeheer, 1954).

Although, as we have seen, the recreation function was gaining some recognition, the three main functions of the area in this period were wood production (by Staatsbosbeheer and to a lesser extent Natuurmonumenten[46]), nature conservation (by both Staatsbosbeheer and Natuurmonumenten), and agriculture (by private owners). These three functions require different management practices, which can conflict. For example, wood production and agriculture involve significantly lower water tables than wet heath. Staatsbosbeheer dug ditches in the Dwingeloo Forest to promote wood production (personal communication, J. Bouw; Staatsbosbeheer, 1954). And the Water Board of the Woldse Aa created a drainage ditch through the middle of the heath to make the Noordenveld (the last cultivation project in Dwingelderveld from 1936-1960) cultivable (Overlegorgaan Dwingelderveld, 2004). Moreover, in the late 1940s and the 1950s the larger streams in the vicinity of Dwingelderveld were canalized. This helped the Water Board to gain more control over the water levels. As a result, the water levels in Dwingelderveld were lowered significantly, a trend visible throughout the Netherlands (Maas, 2005; Staatsbosbeheer, 1954). As expected, this negatively influenced the ecological value of the area.

The first signs of the fourth function of Dwingelderveld, recreation, became visible with the creation of the first campsite in 1948 (Bakker et al., 1986; Overlegorgaan Dwingelderveld, 2004). The establishment of a sheep flock in the area in 1946 may have served as an attraction. However, the flock was primarily established to save the typical Drenthe Heath Sheep from extinction. Moreover, the sheep contributed to both the ecological and the cultural value of the area (Elbersen et al., 2003), halting the spread of Birch (Betula) and Scots pine (Pinus sylvestris), which had started to grow on the heath (Maas, 2005).

To sum up, in the period 1904-1950 large parts of Dwingelderveld were bought mainly for wood production, but to a lesser extent also for nature conservation. In the next period, both nature conservation and recreation gained more priority in the area management, at the expense of wood production and agriculture.

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[46] Until the 1970s Natuurmonumenten also had to generate income from its areas by means of wood production (Maas, 2005). However, this did not apply so much to Dwingelderveld, since Natuurmonumenten owned mainly non-forest areas here. One exception was Anserdennen, bought in 1957.

3.3.2 Introduction of nature conservation and recreation (1951-1969)

In the 1950s the level of prosperity rose and the recreation and tourism industry began to flourish. Nature areas in general became attractive as places to recreate (Godbey, 1999; Holden, 2000). This applied to Dwingelderveld too, and the number of campsites and holiday cottages in the area grew rapidly after the establishment of the first campsites in 1948 (Zonnetij) and 1953 (Noordster[47]) (Bakker et al., 1986; Overlegorgaan Dwingelderveld, 2004). In the 1950s a swimming pool was built near Dwingeloo, and a catering facility near Ansen (Bakker et al., 1986). Yet recreation in Dwingelderveld was explicitly of a quiet kind (Staatsbosbeheer, 1965) and was not assumed to be very important for Staatsbosbeheer and Natuurmonumenten. Staatsbosbeheer, for example, acknowledged that recreation and tourism around Dwingeloo were becoming more important every year, but stated that 'this does not justify an increase in the rotation period of the forest[48] to enhance its visual attractiveness with larger trees' (Staatsbosbeheer, 1954, p. 40). The economic function of wood production was more important than the visual attractiveness or experience value. Moreover, the scientific value of the bogs and heath was seen as more important than the recreational value. For instance, the Lheebroekerzand nature reserve was closed to the public because of possible negative trampling impacts on flora (Schukkink, 1976), and as a consequence the Kiploo bog could no longer be used for swimming (Kerssies, 1984). The Kraloërheide was an important nature reserve too. 'Because it joins the heath reserve of Natuurmonumenten in the north and the west, the reserve encompasses 1150 ha, which will conserve a part of the former Drenthe heath lands for the future. The object is therefore of high scientific value, and to a limited extent also of recreational value' (Staatsbosbeheer, 1954, p. 45).

The scientific value of the waste lands was officially recognized when their cultivation was prohibited in 1962. In the Queen's speech of 1961, Queen Juliana mentioned the end of the cultivation of the country's last remaining waste lands in the interests of nature conservation and outdoor recreation (Oranje Nassau, 1961). Interestingly, she specifically mentioned the importance of outdoor recreation. At the end of the 1950s people gained more free time, for reasons including the introduction of the five-day week in 1960. Subsequently, in the 1960s, Staatsbosbeheer changed its attitude to the importance of recreation; it even became one of their goals in 1965 (Staatsbosbeheer, 1965). Due to the

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[47] Campsite Noordster (North Star) is named after the radio telescope, which has been in operation in Dwingeloo since 1956. At that time it was the world's largest telescope. The telescope is still present in the area, but has not been in operation since 1997. Since 2007, the CAMRAS foundation has made the telescope available to amateurs http://www.camras.nl/.

[48] 50 years for larch and pine trees, 70 years for spruce.

deteriorating status of forestry (management costs rose, wood prices did not, and there was increased international competition) and the increasing numbers of visitors to Dwingelderveld, Staatsbosbeheer decided to adjust its management strategy. The rotation period was increased from 50 to 70 years, and thinning became less common or was postponed. Moreover, the importance of recreation was formalized by assigning 60 hectares[49] of (unproductive) forest for recreational purposes. Besides this, Staatsbosbeheer developed five marked walking trails in the forest to increase its accessibility. The forest was accessible from three car parks, and seven picnic places provided visitors with a chance to relax. The first recreational map was published (Figure 3-3) and the leaflet 'Voetspoor' (Footprint) communicated recreational activities to the public[50] . A natural campsite (for which a special membership card is needed) was constructed close to the manager's house. A zoning plan dictated where motorized vehicles were allowed (Staatsbosbeheer, 1965). In 1964 the first part of a regional cycle path was realized and named after the Queen's Commissioner in Drenthe (1951-1964), Mr. Cramer. By the end of the 1960s, the forest's function had gradually changed from a production site to 'part of a very important recreation area in the south-west of the province of Drenthe' (Staatsbosbeheer, 1965, p. 4). As part of the 60 ha recreational area, 10 ha were selected for development as a recreational pool[51]. Another 10 ha were designated to become 'open recreational spaces'.

However, although the management of the forest was focused on recreation, Staatsbosbeheer did not allow this to happen at the expense of nature, landscape and wood production. In Staatsbosbeheer's terminology: it managed forestry, recreational forest, nature reserves (fens within the forest, and the Kraloërheide) and 'other nature areas' which were still referred to as 'waste lands'. These waste lands were considered neither suitable for forestry, nor 'of enough importance (or, due to insufficient research, recognized as such) to justify their official designation as nature reserves' (Staatsbosbeheer, 1965, p. 70). However, these waste lands deserved to be managed as nature areas because of their value for recreation: 'The only value of these waste lands is the discontinuation of the forest image' (ibid., p. 70). In other words, although the waste lands were not officially protected, the management of those areas focused on protection for the sake of recreation.

While Staatsbosbeheer started to focus explicitly on recreation, Natuurmonumenten still

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[49] The total area of the forest was 1,255 ha in 1963, of which 980 ha were assigned to the 'productivity regulation'.

[50] Interestingly, the map indicates that the walking routes were developed to 'prevent people from getting lost in this extensive area'.

[51] In the end this plan was not realized because of problems: Staatsbosbeheer could not find a buyer for the removed soil.

aimed mainly at nature conservation by means of purchasing areas. In 1957 Natuurmonumenten expanded its area westwards with the acquisition of the Anserdennen, a forest on sand dunes. Within the Anserdennen, a catering facility was present. A respondent described it as follows: 'Picture a place with a pony ride for a guilder, rugs on the tables, antlers at the walls, where a lot of people would gather, also for parties'. Natuurmonumenten experienced this facility as disturbing and tried to remove it in 1968. They met with strong resistance from the local population. However, in 1989 Natuurmonumenten finally succeeded in purchasing the facility with a subsidy from the Ministry of Agriculture (Overlegorgaan Dwingelderveld, 1993).

To sum up, in the period from 1951 and 1969 recreation was formalized by the designation of special recreation areas and the development of recreational facilities. It was obvious that Staatsbosbeheer and Natuurmonumenten had very different attitudes to recreation: while Staatsbosbeheer adjusted its management strategy in favour of recreational values, Natuurmonumenten tried to remove a recreational facility for the sake of nature conservation.

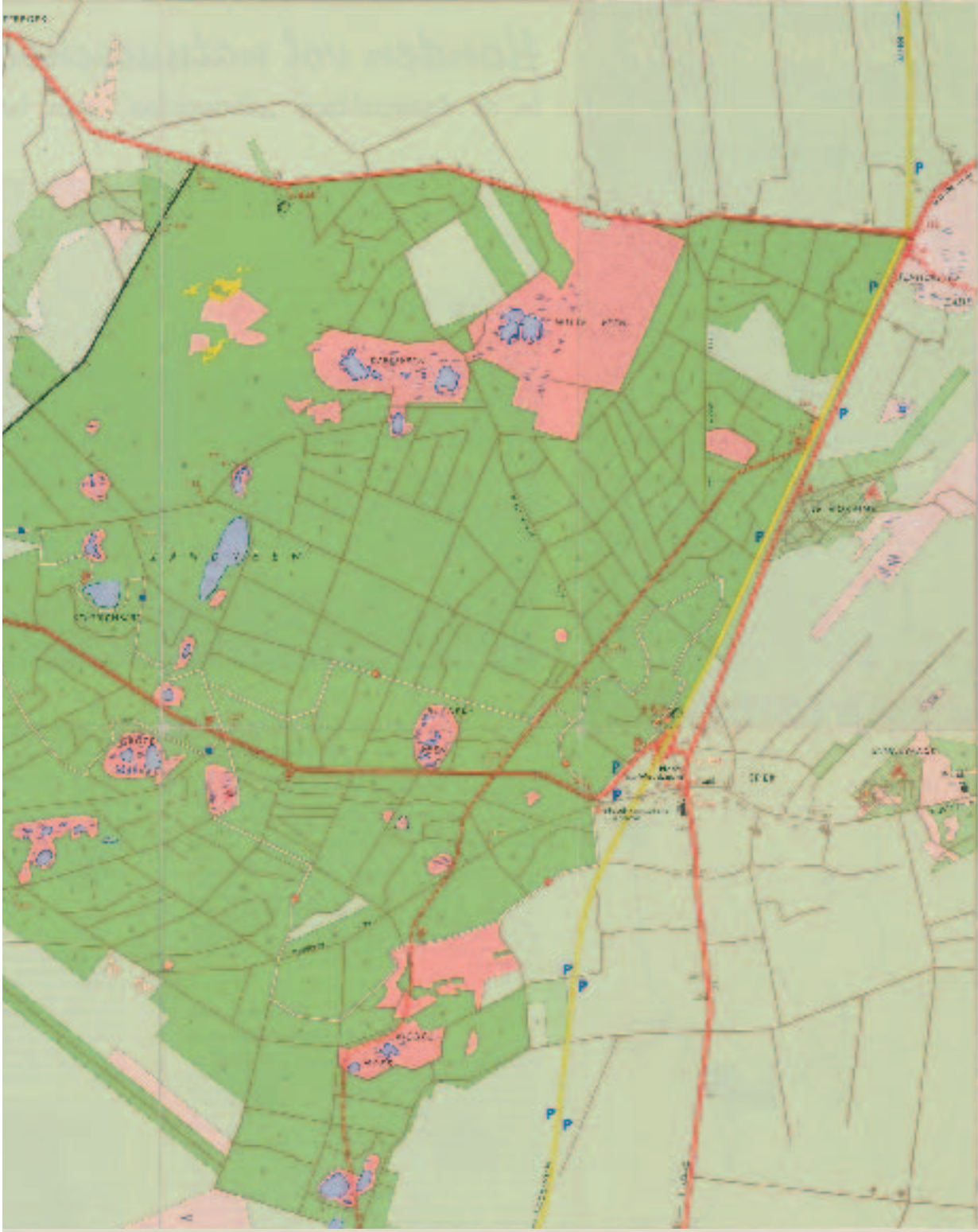
3.3.3 Focus on nature development and recreation (1970-1989)

In this period, several national and international natural and societal developments influenced forest management in general, and in Dwingelderveld in particular. Firstly, the year 1970 was the first European Nature Conservation Year (referred to as 'N70'). The Dutch theme was 'Nature conservation in a densely populated country' (Bemmel et al., 1970). The declaration is seen as one of the first important international binding agreements on nature and environmental policy and public awareness of nature and environment (Verheyen, 2006), and marked the start of the Dutch environmental movement (Hoeven, 1984). The main goals were nature conservation and more attention for a clean environment. The Dutch Committee emphasized the importance of public support for national and international nature conservation organizations such as World Wildlife Fund[52] and Natuurmonumenten. Research and nature education were also important goals (Bemmel et al., 1970). In Dwingelderveld, the declaration was an eye opener and had a big influence on the thinking of the people working there, according to the Staatsbosbeheer manager at that time.

Figure 3-3: Recreational map Staatsbosbeheer 1963

See next page. Characteristics 1963-recreational map: five marked trails 'to prevent getting lost'; four car parks; three camp sites; cars allowed on all roads; picnic places; cycle path.

[52] The Dutch branch of WWF was founded in 1962.



Secondly, natural disasters showed the need for a change in nature management strategies. Heavy storms in 1972 and 1973 destroyed thousands of hectares of forest in the Netherlands, including 150 ha in the Dwingeloo Forest. In the 1970s there were also insect plagues in the forest. Mixed forest suffered less damage from these natural disasters than monoculture forests (Staatsbosbeheer, 1977, 1985).

Thirdly, societal pressures influenced Dutch forest management as well. In the 1970s several people, among them biologists, expressed criticisms of Dutch forests. In 1973 a national action group was created: the *SKB* or *Stichting Kritisch Bosbeheer* (Critical Forest Management Foundation). What this group wanted was to 'get rid of the unnaturalness in many Dutch forests and to make them more local and natural, and less man-made' (Stichting Kritisch Bosbeheer, 2007). SKB was responding to the fact that in the 1970s 75% of the Dutch forests consisted of coniferous production forests, often planted as monocultures. In addition, 87% of the forests were younger than 60 years. The SKB argued that these monocultures did not even deserve the name 'forest'. 'They are monotonous pastures with wood, which only from look like real forests from a distance' (SKB-cofounder Harm van de Veen in Schmit, 1977). The SKB aimed for more natural forest without exotic species[53]. These natural and societal developments had a big influence on forest management, which began to focus on mixed forest. Rotation periods were extended, forest regeneration became less systematic and natural regeneration was used more often (Kerssies, 1984; Maas, 2005). However, it took several years before the attitude towards a more natural forest was incorporated at field level. The following quotation about 'growing trees' from a recreational leaflet for Dwingelderveld (1979) is illustrative:

> 'If you visit the forest on a weekday, you will notice what kind of forest maintenance is carried out. Amongst other means, we use fjord horses, which, for all the ingeniousness of machines, are still the cheapest workers for some activities. In every forest there is a lot of work to do. Not only to keep paths passable for both visitors and rolling stock, but also to grow small trees. That all those trees produce some wood might be an added extra for you, but in the government's housekeeping, wood production from our own forests is indispensible!' (Staatsbosbeheer, 1979)

The less intensive management in the forest areas was contrasted with the more intensive management of the heath during the 1970s and 1980s. Young trees and grasses had spontaneously begun to overgrow the heath as a consequence of low grazing

[53] According to the SKB, human intervention is sometimes necessary in the transition towards more natural forests. Nature development without human intervention take a long time: 20-40 years is necessary to reach a natural forest without harvest (Kerssies, 1986).

pressure with only one flock of sheep. In 1970 Natuurmonumenten removed the top layer of the soil on small areas of the heath. Topsoil removal is effective for renewing the heath, but the manual character of the labour made it expensive and time consuming. In 1979 Natuurmonumenten started a test to mechanically remove the top layer. This was successful and it is still common practice. In 1987 Natuurmonumenten started a second flock of sheep to increase grazing pressure and prevent grasses and trees from growing on the heath (Maas, 2005; Staatsbosbeheer, 2008). This second sheep farm is located in the middle of Dwingelderveld and is less accessible (further from the car park) than the first one.

The changing policies and views resulted by the end of the 1970s in a different, more ecologically oriented water management regime in Staatsbosbeheer's forests. Staatsbosbeheer started to accept that the lower sections of the forest should be wet, and it decreased the heavy drainage efforts. However, the area was kept dry enough for forest. Only during wet periods were parts of the forest extremely wet. In the mid 1980s Staatsbosbeheer stopped fertilizing the forest (Nationaal Park Dwingelderveld, 2004; personal communication, J. Bouw). Besides management changes, there were also organizational changes within Staatsbosbeheer and Natuurmonumenten. At the beginning of the 1980s, the two Staatsbosbeheer departments 'Forest Management' and 'Nature Conservation' integrated into the department of 'Area Management' (Staatsbosbeheer, 2008). This implied that forest and waste lands were no longer seen as different areas. Indeed, the term 'waste lands' was not used from now on. 'Area management is focused on a harmonic composition of nature conservation, landscape beauty, recreation, and wood production' (Staatsbosbeheer, 1977, p. 2). A change within the organization of Natuurmonumenten was that after the 1970s its lands no longer had to generate income. In other words, wood production changed from a goal to no more than a management practice (Maas, 2005). Natuurmonumenten also made a purchase in this period: in 1972 they bought the former farmhouse Davidshoeve, and the adjacent lands that were located in the heart of Dwingelderveld (Maas, 2005).

Alongside the developments in nature management, recreation advanced as well. From 1970 on, recreation numbers rose substantially. People had more free time and the construction of the A28 highway made the area more easily accessible. The views of both Staatsbosbeheer and Natuurmonumenten on recreation had not changed and still focused on preserving the quiet character of Dwingelderveld (Maas, 2005; Staatsbosbeheer, 2004a). However, gradually, more recreational facilities were offered. Staatsbosbeheer concentrated recreational facilities in the forest, because the heath was more vulnerable. The number of car parks increased from three in 1963 to eight in 1972, and a sixth marked walking route was developed around the nature reserve Lheebroekerzand. This route was intended as a sort of solution to the problem that local people ignored the prohibition against entering. According to Staatsbosbeheer, the local

population still perceived the nature reserve Lheebroekerzand as the property of the former farming community ('marke'), because Staatsbosbeheer had bought the area for 'peanuts' (Staatsbosbeheer, 1973). The creation of the walking route made the area at least visually accessible. Twenty kilometres of bridle paths were also constructed, and in 1981 a seventh marked trail was developed in the area around Staatsbosbeheer's nature campsite. From 1981 onwards, the recreational maps of Staatsbosbeheer depicted both the forest and the heath area, although no information on Natuurmonumenten's marked trails was given yet (Figure 3-4). While Staatsbosbeheer developed recreational facilities to reach the Dutch citizen, Natuurmonumenten focused mainly on its members. In the 1970s the association started distributing a magazine for its members, and its first three visitor centres were built[54]. This helped to expand the association both in membership numbers and in hectares (Maas, 2005). In 1989 Natuurmonumenten purchased the catering facility in Anserdennen (see also section 3.3.2). The building was demolished and, as a concession to the local population, replaced with a teahouse, which Natuurmonumenten considered a more appropriate catering facility in a nature area (Overlegorgaan Dwingelderveld, 1993; personal communication, J. Kleine). This so-called 'tea house affair' made local people sceptical about Natuurmonumenten and also about the possible later designation as a National Park (Dagblad van het Noorden, 1990).

As explained above, nature conservation became an issue on the national policy agenda in the course of the 1970s. In 1969 the Netherlands signed an IUCN agreement to protect important ecosystems, by creating National Parks, amongst other things. An interdepartmental National Parks Commission advises the Dutch House of Representatives on the characteristics, aims and functions of a National Park55. In 1980 a Provisional National Parks Commission was set up to advise the government on suitable areas for National Parks. Four areas were given priority, and one of them was Dwingelderveld. In 1972, the mayor of Dwingeloo, Mr. Hopperus Buma, had already mentioned the idea of a National Park, but the local population around Dwingelderveld was not enthusiastic about this plan[56] (Stuurgroep Voorbereiding Instelling Nationaal Park Dwingelderveld, 1981). The area was their backyard and they were afraid that it would be

[54] In 1970 Natuurmonumenten opened its first three visitor centres, in Corversbos, Wieden en Veluwezoom.

[55] A National Park is a natural area of at least 1000 ha, where management is focused on conservation and development of natural, environmental and cultural values, and where possibilities are created to learn from and enjoy the beauty and value of the area (Samenwerkingsverband Nationale Parken, 2007).

[56] Besides the local people, nature managers had to get used to the idea as well. 'Before we could do anything we thought of as important, now we had to agree with others, so we lost freedom. But we believe in the importance of the National Park, it is the only way to have a barrier from the pressure of the cities'.

gated (Overlegorgaan Dwingelderveld, 1993). In 1976 the Province of Drenthe discussed the possibility of Dwingelderveld becoming a National Park. This became official policy in the regional plan ('streekplan') of 1980. In the same year a Preparation Committee for the Establishment of Dwingelderveld National Park was initiated, but it took another six years to establish the status of a 'National Park in development'. The Committee had to put a great deal of effort into convincing the local people of the added value of the National Park status (Stuurgroep Voorbereiding Instelling Nationaal Park Dwingelderveld, 1981, p. 6):

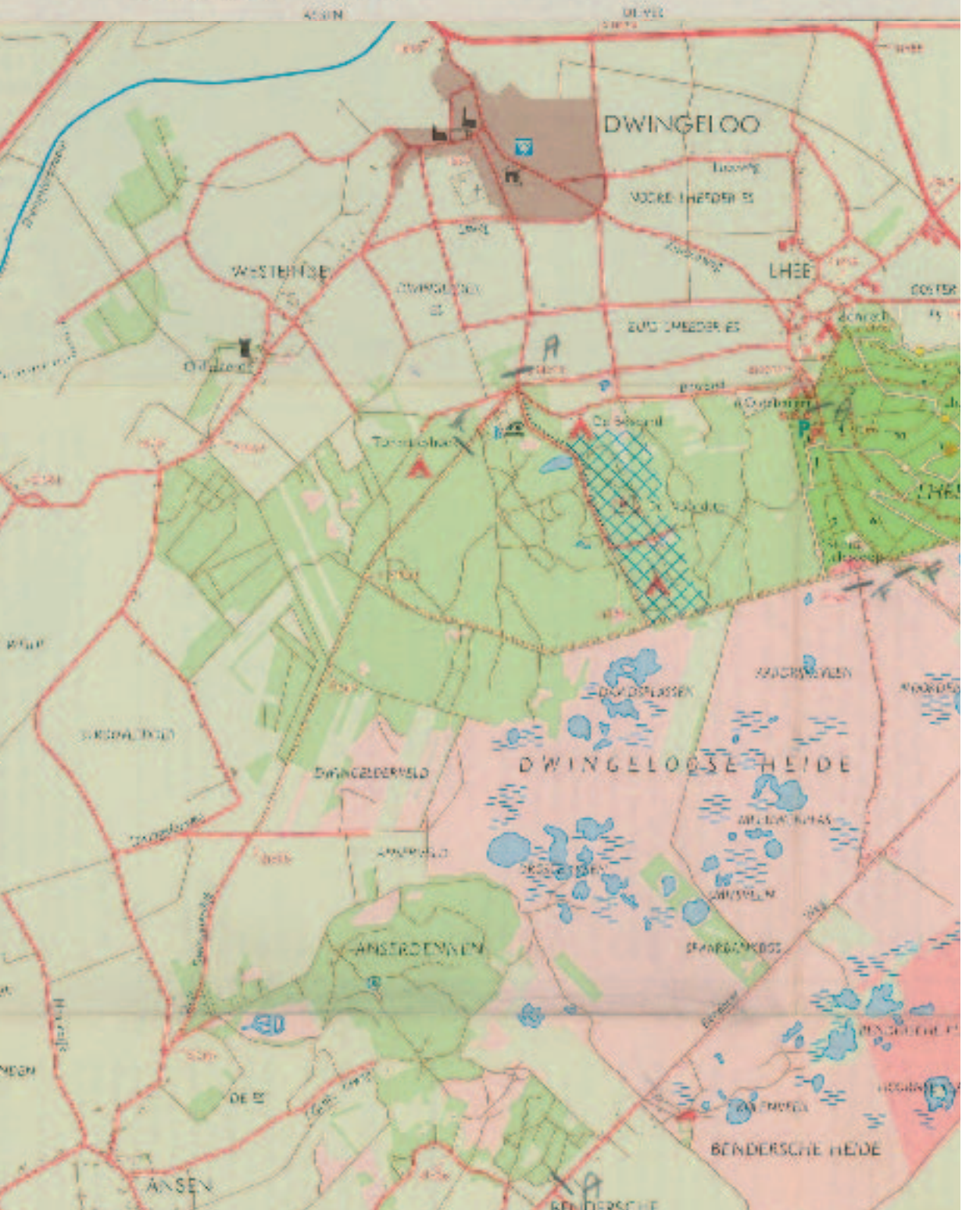
> 'A National Park will not become an inaccessible area because of gates and 'no entry' signs. Neither will it start to draw visitors from far and wide. The quietness and spaciousness that are typical of Drenthe will be conserved and nourished. In the first place for the people from Drenthe, but also for visitors who appreciate it.'

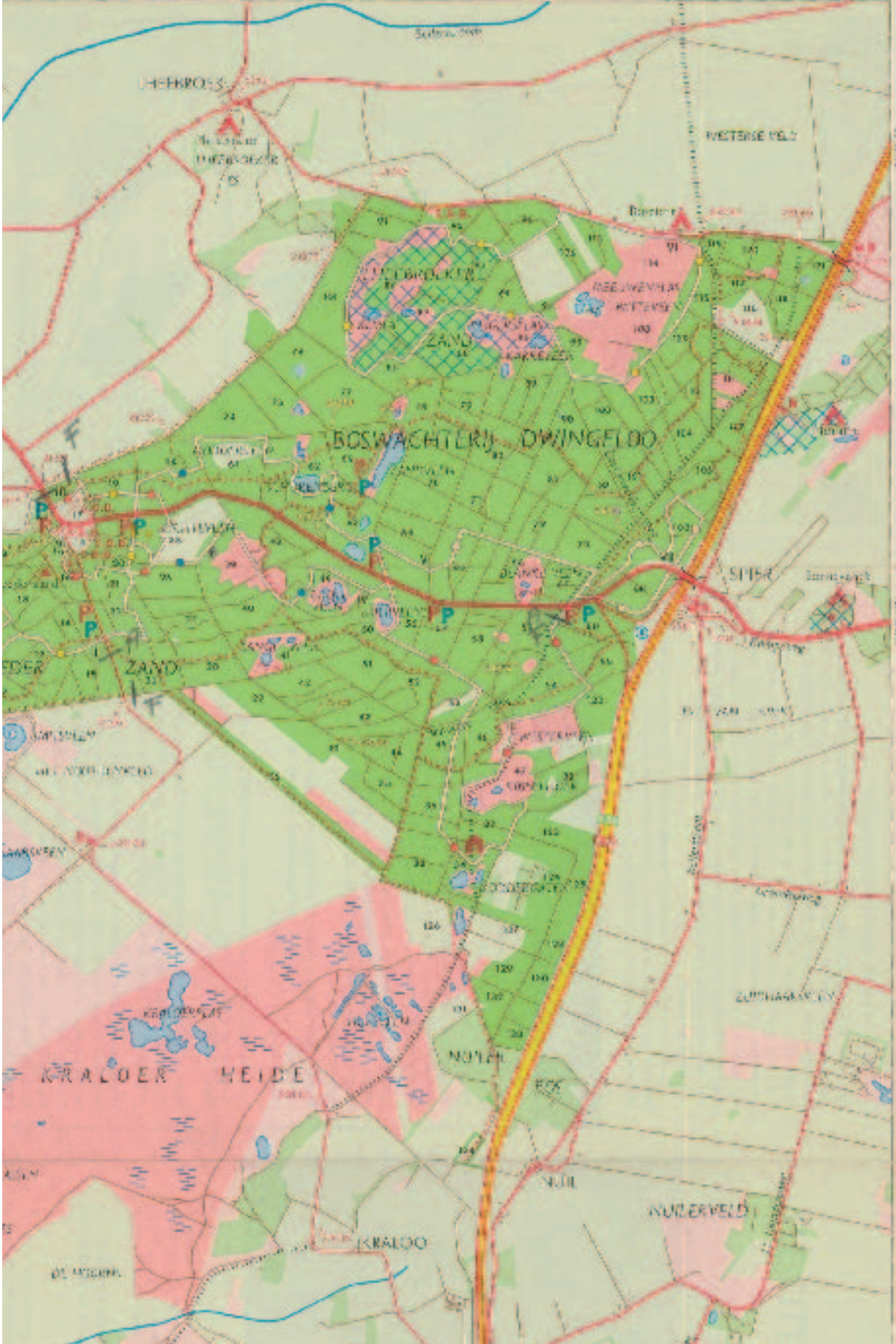
In short, the period 1970-1989 can be characterized by a change in management practices to a new focus on nature development rather than nature conservation, which implied less intensive management in forest areas and more intensive management on the heath. New recreational facilities were mainly concentrated in the less vulnerable areas (forest), and were therefore in Staatsbosbeheer's area. Local people had to get used to inaccessible nature conservation areas in Dwingelderveld, and feared that National Park status would imply even less accessibility. Despite their fears, in 1986 Dwingelderveld did finally become a National Park in development.

Figure 3-4: Recreational map Staatsbosbeheer 1981

See next page. Characteristics 1981-recreational map: whole area depicted (but only facilities Staatsbosbeheer) ; one new marked trail; one trail adjusted (extra, fen); four new camp sites; two car parks within the area removed; cars only allowed on bigger roads.

GEMARKEERDE WANDELROUTES




BOSWACHTERIJ DWINGELOO
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3.3.4 National Park with recreation and nature development (1990-2008)

The previous section described the change in management practices from nature conservation to nature development. However, in the 1980s nature management focused on expanding existing nature types, e.g. natural forest and heath. At the end of the 1980s the idea arose that new nature could be created. The introduction of a National Ecological Network with National Parks as key areas, and the Birds and Habitats directive contributed to the construction of a wet image for Dwingelderveld's nature (Kuindersma et al., 2007). Plans were made to return the whole Dwingelderveld area to a more natural state, referring to the situation of around the year 1850, when the area was wetter and more open.

Just after the official inauguration of the National Park in 1991, two projects were executed: at Holtveen and at Koelevaartsveen. These projects entailed cutting down exotic trees, removing the topsoil from the former forest soil, and returning to the former water regime (Nationaal Park Dwingelderveld, 2004; personal communication, A. Henckel). However, according to a respondent, the project at Koelevaartsveen was unsuccessful:

> 'They sprang a leak in the boulder clay when removing the topsoil, and consequently it does not hold the water. It is a steppe-like situation at the moment. Nature development is OK, but sometimes things go wrong. It may take hundreds of years before the situation is rectified; we won't experience it and I regret that.'

A third project involved diverting the watercourse to the east of the National Park. Before 1991 the influx of nutrient-rich water from surrounding agricultural areas negatively influenced the quality of the nature. Dams were created that helped maintain a higher water level and reduced the loss of water to the surrounding area. Besides these three larger projects, several smaller ones were executed to increase nature values and decrease harmful human influences. For instance, Natuurmonumenten cleared the Davidsplassen and other smaller bogs to improve their vitality[57]. And north of the Anserdennen, ditches were filled in to raise the water level.

In 2003 Staatsbosbeheer started a larger project to transform the lower section of the forest (ca 150 ha) into a more natural forest. The transformation involves removing exotic

[57] The cleaning of the Davidsplassen was no success either according to a respondent: 'About eight years ago they completely cleaned them. They opened an old dig, and when the bogs were empty they removed the mud. I remember an enormous loss of water birds. I can demonstrate in my reports for example how many ducks were present. They removed a lot of foliage. In the past they did everything themselves, but now they consult me'.

tree species – which were planted in monocultures – and closing ditches to raise the groundwater level. Ultimately, a half-open forest will develop with, in the lower parts, peat bogs and, it is hoped, peat moorland (Nationaal Park Dwingelderveld, 2006). By 2008 most parts of the forest had been transformed, and only the northern part of the Dwingeloo Forest remained to be done (A. Henckel, personal communication). In general, nature restoration interventions regularly meet with opposition and criticism from different groups such as residents and recreationists (Berg, 2004; Swart et al., 2001). Dwingelderveld was no exception, and in 2005 local residents organized themselves in a foundation to protect the forest. They enjoy the huge trees and are protesting against the 'incomprehensible deforestation and devastation' in Dwingelderveld[58] (Woudreus, 2008). Besides this organized protest, there is a lot of resentment, which nature managers explain as being related to the local people's agrarian background. Their feelings of attachment are reflected in this statement:

> *'*They see us as a new landowner that has taken over their area – and there's some truth in that … Many local people experienced the reclamation around 1950. That was seen as progress then. And now Natuurmonumenten is letting it go again. For a lot of people, this is too much of a switch. It was manual labour, and they put a lot of time and energy into cultivating the worthless heathland. And now we just leave the valuable land to itself*'.*

Still, managers can get irritated by people who think the area is theirs: 'they just have to respect the rules', they say. Finally, Staatsbosbeheer's employees (and former employees) also have difficulty accepting the project. 'As a young forestry worker, he planted the trees, and 40 years later they are harshly removed. He told me 'I don't understand it at all…'.

Several (uninvolved) experts link the negative response to the restoration efforts to the fact that many hectares are cut down simultaneously: 'If you fell slowly, people get time to get used to it'. Another explanation is that local people have not been kept informed. It looks as though the management organizations have learned their lesson, since they are communicating extensively about their newest project – the transformation of the former agricultural area Noordenveld, in the middle of the National Park, back into a wet heath area. This area was cultivated between 1930 and 1960. After 40 years of negotiations, Staatsbosbeheer and Natuurmonumenten finally bought the last 17 hectares in November 2007. The project comprised the removal of the topsoil, the raising of the ground water level, and the removal of the Lhee-Kraloo road. The means of communication were a brochure (June 2007), an extra edition of Veldspraak (2008), an

[58] Woudreus contacted the producers of the TV programme 'Landroof' (land robbery) to draw the attention of the public to the felling of exotic trees and wetting of Dwingelderveld. See http:www.landroof.nl/group/Dwingelderveld

information and discussion evening (April 2008), and the publication of related documents on the website of the National Park (www.nationaalpark-dwingelderveld.nl). But local people still had complaints. They were afraid that raising the groundwater level would attract mosquitoes and negatively impact the neighbouring houses and agricultural lands. They were also upset about the removal of the road, because keeping the road accessible to motorized vehicles was – in their view – one of the conditions in the agreement on National Park status in the 1980s[59]. They asked the municipal council, which takes the final decision on restoration projects, to *'*take sub-goals[60] of National Parks more into account, for the sake of the inhabitants, recreation, education, tourism and further development of the municipality' (Dorpsbelangen Dwingeloo, 2008, p. 1). In response to their protest, the municipal council slightly changed the plans and decided in September 2008 to remove the road, but to construct a dirt road that may be used by local people who apply for an exemption permit.

The foundation of the National Park acted as an accelerator for recreation. From the moment Dwingelderveld became a National Park in development, visitor numbers increased. In 1990, 1.2 million people visited the park (Visschedijk, 1990); more recent estimates vary from over 1.5 to 2 million visitors a year (Bezemer, 2007; LNV, 2005). Zoning of recreational activities reduces pressure on valuable areas. The 'quiet zones', for example, contain fewer trails than other areas, and can be closed from March to July (Overlegorgaan Dwingelderveld, 2004). *'*With the growing number of visitors, zoning is most important', according to a respondent. 'Zoning in Dwingelderveld is quite successful: there is only one path through the heathland. Large parts are very wet so people simply cannot come there. We want to keep it that way'. Not without reason, the heath is referred to as 'the big quiet heath'[61] (Laan et al., 2004).

While there is only one path on the heath, the path network in the forest is very dense - too dense, according to some (independent) experts. 'You have to zone, and to close paths. They closed paths in the new open areas in the forest, and that's an improvement. You will get larger units. The fewer people, the less disturbance'. Other comments on zoning have to do with the location of the visitor centre in Ruinen. With the official designation as a National Park, a visitor centre has been built. The municipality of De

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[59] In 1984 the Minster of Agriculture and Fisheries decided, as required by the municipal council of Ruinen, that the Lhee-Kraloo road would not be closed without the approval of the municipal council. In 2008 the municipal council indeed approved the removal and the road was clear to remove the road.

[60] The four goals of Dutch National Parks are nature conservation and development, education, outdoor recreation and research. The nature conservation and development goal prevails in Dwingelderveld (Overlegorgaan Dwingelderveld, 2004).

[61] 'On the big quiet heath' is a Dutch children's song written by Pieter Louwerse in 1878.

Wolden did not want to cooperate with the designation of the National Park unless the visitor centre was built on their property[62]. A Natuurmonumenten manager explained the situation: 'The location was a political choice, so it is located on this side of the heath….' Natuurmonumenten manages the visitor centre because it is located on their land. 'On designating National Parks we discuss who will manage the visitor centre. If Staatsbosbeheer manages this one in Dwingelderveld, the one in Drents Friese Wold[63] will be managed by Natuurmonumenten'.

Other facilities that have been established are an ATB-route, routes for horse and carriage riding, a trail for the disabled, and car parks at the edges of the area. The number of pole routes increased from 7 in 1972 to 15 in 2004. Other organizations have developed routes too, such as GPS-routes and long-distance routes. Even newspapers and the national railway[64] developed routes. In fact, 'there is hardly a path in Dwingelderveld that is not part of one trail or another' (Overlegorgaan Dwingelderveld, 2004, p. 5). In the 1990s Natuurmonumenten was ably to buy the Anserdennen area where the local catering facility was located. Natuurmonumenten encountered strong resistance to their plan to tear down the facility, and decided not to close is down, but to change its formula. According to an employee, 'now it fits the area'.

Interestingly, the Management and Design Plan mentions that the expansion of some facilities (not specified) was not the result of former Management and Design Plans. In other words, many decisions are made 'on the ground', and are not subject to supervision.

Facilities are one way to 'steer' visitors. Another way is to inform visitors about possible activities and interesting facts. Since 1991 the information bulletin 'Veldspraak' ('Field talk') has kept people informed about developments in the area and forthcoming activities. A further source of information is the recreational map of the area.

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62 The income earned from recreation forms the main motive for municipalities to support the designation of a National Park. A study in 1994 revealed that the total revenues from visitors for the local economy amount to 10-13 million Euros, of which 83% comes from nature-related recreational activities. A study in 2002 showed that the recreation sector is the main pillar of the municipal economy (Overlegorgaan Dwingelderveld, 2004).

63 Drents Friese Wold is the second National Park in the province of Drenthe, and is also managed by both Staatsbosbeheer and Natuurmonumenten. Drents Friese Wold became a National Park in 2000. According to an interviewee, the situation of the visitor centre in Drenths Friese Wold was also a political issue. 'The municipality of Appelscha got the visitor centre, although Diever wanted to have it as well'.

64 A former manager of Natuurmonumenten explained that the National Railway (NS) developed a marked trail along the south side of the heath, 'I removed the signs myself'. Later NS changed the route.

Staatsbosbeheer (see Figure 3-5) and Natuurmonumenten still both publish a map of Dwingelderveld, but there are differences. For example, Natuurmonumenten's map does not show a path at the south end of the heath, in the hope that fewer people will go there. Visitors' spatial behaviour is also influenced by verbal information provided at the visitor centre, as a manager of Natuurmonumenten explained. *'I advise the average visitor to walk the red or the white route from the visitor centre. For somebody who doesn't know the area, it is quite a nice route. However, we know there are nicer ones'.*

From both the goals of the management organizations (Box 3-1) and the approach to recreation described above, it becomes clear that Staatsbosbeheer seems to be more easy-going about recreation than Natuurmonumenten. This conclusion is confirmed by statements by several interviewees who pointed to differences between the two organizations. An employee of Natuurmonumenten, for example, stated: 'Staatsbosbeheer has a very heavy additional goal, recreation, while Natuurmonumenten has that less. Staatsbosbeheer is semi-governmental; they have to serve other groups as well, like less nature-oriented visitors'.

A local resident who works in the area as a volunteer also commented on the difference between the two organizations with regard to recreation: *'*Staatsbosbeheer is more easy-going, more tolerant with regard to recreation. Natuurmonumenten is sometimes very strict*'*. A Natuurmonumenten manager agrees that they are stricter: 'but, if you want to conserve nature, you have to be strict once in a while'. He adds, 'Staatsbosbeheer is starting to go back on their policy of allowing dogs off the lead and horse riders everywhere. Together we will start to develop a common vision on what is allowed.'

Interestingly, while Natuurmonumenten is more conservative than Staatsbosbeheer in developing recreational facilities, they have planned to construct a new path through the recently purchased Kloosterveld, starting from the visitor centre. This area is not officially part of the National Park, but lies just on its border. Currently, visitors who start at the visitor centre and want to go to the heath or the sheep farm have to walk on a paved road. *'*That is not the sort of showpiece we want.*'* Natuurmonumenten wants to construct a new path through the quiet area of Kloosterveld. 'We attract people with the visitor centre, so we have to offer them the chance to enjoy the area. On other terrains we would not make such a choice, but now we feel we can justify it. We have to make concessions[65] [to nature, RvM].*'* This example shows that ecology is not always the leading principle in area development.

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[65] What makes this story even more interesting, is the protest against this path by an employee of Staatsbosbeheer whose house it passes. Others object to the plan too: 'You lure people in the direction of the quiet part of the heath. But you have to keep that part quiet.'

The last statement on the differences between Natuurmonumenten en Staatsbosbeheer with regard to recreation shows that opinions on recreation are not necessarily related to professional affiliation, as a manager of Staatsbosbeheer expressed his approval for the recreation strategy of Natuurmonumenten: 'I really think that the policy of Natuurmonumenten is very good, they consciously keep the area quiet. Quieter than Staatsbosbeheer does. Natuurmonumenten, for example, did not want to cooperate with the construction of a mountain bike trail. Now it only goes through the area of Staatsbosbeheer'.

While Staatsbosbeheer tends to be more easy-going than Natuurmonumenten with regard to recreation, with the establishment of the National Park, they share – at least on paper – the goals of the National Park[66]. While the *Stichting Nationale Parken* (National Parks Foundation) does not elucidate whether the four goals of National Parks are equally important or not, the Consultative Body of Dwingelderveld made it clear that 'nature goes first' (Overlegorgaan Dwingelderveld, 2004, p. 1). Recreation, research and education are secondary goals. However, to some (non-managerial) respondents it seems that recreation is the main goal.

> 'I have suspected them of doing too much for recreationists. It could be a bit less. I understand that they get orders from above. In Driebergen and 's Graveland[67] they have a finger in the pie. Sometimes they have to do something they disagree with. But the National Park is assigned because of its nature values, so you have to maintain them. And take care that recreation doesn't go too far.'

Figure 3-5: Recreational map Staatsbosbeheer 2004

See next page. Characteristics 2004-map: show also facilities in area of Natuurmonumenten (since 1993); visitor centre (since 1991); wheelchair friendly trail (since 1993), several marked trails adjusted (no need to cross roads anymore); three new marked trails, two car parks within area removed, two new car parks.

[66] National Parks in the Netherlands have four goals: nature conservation and development, education, outdoor recreation and research (SNP, 2007).

[67] The head offices of Staatsbosbeheer and Natuurmonumenten are at Driebergen and 's Graveland, respectively.


DWINGELOO
DWINGELDERZAND
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24
NATIONAAL PA
DWINGELOOSE
HEID


RK DWINGELDERVELD
KRALOFR HEIDE

Some managers agree that they listen too much to the wishes of recreationists. When many visitors complain about wet paths, the managers raise the paths. As a result, the area becomes less adventurous. 'Dwingelderveld is a wet area, it is known for that. If you want to enjoy that, enjoy it in an adventurous way – you have to wear boots'. Some suggest that visitors have become more critical. 'Each user group wants their own path, a horse trail, a mountain bike trail, a hiking trail'. And 'people don't want to make an effort any more to see certain things. They want to reach points of interest by bike. Walking even a bit is too much'. This last comment is demonstrated by the (illegally) parked cars next to the sheep farm, while the car park is a 500 metre walk away. Still, recreation is seen as something easy to understand, compared to nature. This remark by a member of the Consultative Body is illustrative: 'We need to monitor nature development because otherwise you have no insight in it. We don't do research into recreation. We once made a zoning plan, but that was not based on research. It was based on where the wettest areas are. You don't need research to see what types of visitors come here'. (…)

Finally, according to some non-managers, it would be best for nature if there was one manager for the whole area. 'It is a pity that there are 2 managers. I have my doubts about it. For example, a trainee at Natuurmonumenten carried out research into the crested newt. She only did research in Natuurmonumenten's area and not in Staatsbosbeheer's area. That is a missed opportunity. I cannot completely understand that. It would be nice if there was one managerial authority.'

A Natuurmonumenten manager agrees but states that Staatsbosbeheer and Natuurmonumenten increasingly tune their activities with each other.

> 'In the past there was a sharp border between their area and ours. Staatsbosbeheer did what it wanted to do, and we did what we wanted to. Now we sit together more often. However, some things are still strictly separate, such as inventorying, monitoring, and research. This should be done in cooperation. It would also be more cost effective.'

The first signs of closer cooperation have become visible. In December 2008 eight parties[68] signed an agreement for cooperation on the design of Dwingelderveld. Together these parties will make efforts to combat dehydration of the area and to create a large, quiet heath land. 'By tuning plans Dwingelderveld can become more valuable and attractive'. The implementation will start in 2010 and will take about four years. 'After that, nature will do its work and it is expected to develop into a large quiet heath landscape that visitors can enjoy' (www.nationaalpark-dwingelderveld.nl).

[68] Natuurmonumenten, Staatsbosbeheer, Province of Drenthe, Municipalities of Westerveld and De Wolden, Waterboard Reest and Wieden, and Rijkswaterstaat

To sum up, after the official designation as a National Park in 1990, nature management focused on returning Dwingelderveld to its 1850 state, i.e. wetter and more open. From the same year, visitor numbers started to increase. Visitor management included zoning of recreational facilities and providing information at the visitor centre. Staatsbosbeheer is still more tolerant towards recreation than Natuurmonumenten. However, close cooperation on water management may lead to more coherence.

3.3.5 Analysis of nature management in Dwingelderveld National Park

The foregoing sections described area management in Dwingelderveld from 1904 to 2008. In the early 20th century, the functions of wood production, nature conservation and agriculture were developed. The ecological value of several areas in Dwingelderveld was already acknowledged in the 1920s, and both Staatsbosbeheer and Natuurmonumenten steadily expanded their property. They aimed to preserve the characteristic wet heath land and bought large parts of it between 1929 and 1942. However, some of these 'waste lands' were simultaneously cultivated for agriculture and wood production. The last cultivation project – in the middle of the heath area – ended in 1960. In the meantime, recreation started to develop in Dwingelderveld. In the 1950s the first campsites were established. However, it took until 1965 for Staatsbosbeheer to officially acknowledge the recreational value of the area and to develop facilities such as walking trails, car parks, a bike path and picnic places. In 1963 the first recreational map for the northern part (owned by Staatsbosbeheer) was produced. Wood production had become less important and management techniques were altered in order to positively influence the visual quality of the forests. Natuurmonumenten focused less on recreation. Areas were accessible, but were not specifically developed for recreation. In the 1970s nature conservation came in for a lot of attention due to international binding agreements and the vulnerability of monocultures to natural disasters. This resulted in a more ecologically oriented management of the area, with less intensive management in the forest, more intensive management of the heath, and a higher ground water table. Since the 1970s, visitor numbers rose substantially and gradually more facilities were offered. Closed areas were made (visually) accessible, with walking routes as a concession to the former owners: the local people. The possibility of becoming a National Park was mentioned in 1972, but the official designation took another 19 years. After the 1970s, the focus of nature management shifted from nature conservation to nature development. Dwingelderveld should become more natural, resembling the situation around 1850. From the 1990s, this led to intensive management interventions (felling exotic trees, removing topsoil from former production areas, returning to a former water regime). In other words, the focus of nature conservation shifted from conserving to creating and developing. The accompanying management practices met with opposition from local people, and still do. Keulartz (2004) called the shift from defensive to offensive

as a new paradigm: the predominance of ecology. However, while nature conservation and development goals often guide developments in Dwingelderveld, concessions have sometimes been made. For example, recreation has become more important, and since the area gained National Park status in 1991, visitor numbers have greatly increased. A related example of a concession is the (planned) construction of a new path from the visitor centre through the quiet Kloosterveld to the sheep farm. This path is seen as a showpiece for Natuurmonumenten, and as having added value for recreation. However, concessions may also be dictated by other motives, even motives not directly related to the goals of a National Park. The visitor centre, for example, is illogically located in Ruinen, due to politics. And the catering facility in Anserdennen still exists – albeit in a different form – due to resistance from local people. Nature managers in Dwingelderveld hope to develop a natural water regime in the area and have started to work together more closely.

Table 3-2 summarizes the developments in Dwingelderveld in terms of use, experience, narrative and appropriation value from the management point of view. In other words, the table captures their visions on area management and the role and content of each value. In fact, the historical development of management practices reveals how much the values are interrelated, as explained in chapter 2. With regard to the use value, the focus in Dwingelderveld changed from wood production, agriculture and nature conservation in the early 20th century to nature development and recreation in the 1990s and still today. An explicit focus on recreation began for Staatsbosbeheer and Natuurmonumenten in the 1970s. Campsites had already been constructed by private parties, and the nature managers wanted to control and guide visitor flows.

Table 3-2: Summary of management practices in Dwingelderveld

	1904-1950	1950-1969	1970-1989	1990-2008
Use v alue	Three main functions: wood production, agriculture and nature conservation Spatial separation of functions First recreational visits at the end of the 1940s	Importance of wood production diminished Importance of nature conservation increased Establishment of recreational facilities (campsites, trails) by private parties, as a reaction SBB produced first recreational map Agriculture less important; cultivation of heath land prohibited >1962	Nature conservation and recreation as main functions Wood production no longer goal Expansion of tourist facilities (walking trails, car parks) New recreational map and brochures	Last agricultural area bought by SBB and NM Nature development as important management strategy (felling exotic trees, towards natural water regime) Diversification of recreational product (for different user groups)
Experience value	Experience value did not guide developments in Dwingelderveld: wood production and agriculture developed for economic reasons Nature conservation based on intrinsic values, not so much for people	Attractiveness of nature acknowledged by managers Recreational facilities developed at 'suitable' places, not the most beautiful ones	Quietness is important experience value Change to mixed forests for both higher ecological value and higher experience value Sheep flocks not only for cultural history, but also add to recreational experience	Many possibilities created to experience the area Zoning plan to keep areas quiet Wet forest more beautiful than production forest

(Table 3-2 continued)

	1904-1950	1950-1969	1970-1989	1990-2008
Narrative value	Term 'waste lands' used for uncultivated land without agriculture, horticulture or forestry Parts of heath were both 'waste land' and 'nature reserve' Heath in Dwingelderveld is most typical heathland of Drenthe and should be preserved Establishment of the sheep flock strengthens cultural-historic value: 'tells' story of original agricultural system Cultural-historic value subordinate to economic value, given the water management regime	Nature conservation is linked to scientific importance Recreational values became more important than wood production Ecological values more important than recreational values (e.g. inaccessible Lheebroekerzand) Recreational map helps visitors not to 'get lost in the extensive area'	Forest and waste lands were not treated separately but part of complex (after 1980 the term waste lands was abandoned) Natural, environmental and cultural values acknowledged by installation of 'National Park in development' Establishment second sheep flock	Creation of 'new nature' Natural situation of 1850 is point of reference Water is leading principle in design of Dwingelderveld, cultural-historic value Instruments to inform visitors (visitor centre, web page, Veldspraak) on developments in area and interesting activities and sights Special places only for visitors who make more effort, casual visitor directed to a marked trail 'Big quiet heath' as important narrative concept Ecological values often leading principle, but sometimes concessions (e.g. for recreation, local people, politics)

(Table 3-2 continued)

	1904-1950	1950-1969	1970-1989	1990-2008
Appropriation value	Besides SBB and NM, also private owners possess parts of land within the borders of the current Dwingelderveld. Easier for SBB to buy land (state money and political instruments) than for NM (dependent on generosity of members) Ownership does not imply control: despite NM's resistance construction of drainage ditch through the heath	Slowly Staatsbosbeheer and Natuurmonumenten purchase parcels of land Resistance from local people to removal of 'their' café Lheebroekerzand closed for public	Separate recreational maps from SBB and NM (first depicting only their own area or trails, later whole area) indicate that they focus on own land and not on park as a whole Resistance among local people towards NP-designation, afraid that 'their' area would be fenced	Resistance among local people towards forest transformation project and removal of road Facilities adjusted to the average visitor (to keep them satisfied). Still separate SBB and NM maps , but depicting all facilities in the park. More close cooperation in management. Status of park as a whole more important than focus on own areas NM's map does not show certain existing paths where they want no visitors

SBB=Staatsbosbeheer

NM=Natuurmonumenten

The experience value did not play a role in area management until 1950, but gradually gained importance among nature managers in the 1950s. In their management plans, they mentioned the attractiveness of the forest. The focus on experience value may be linked to the change from economic (wood production, agriculture) to ecological leading principles (nature conservation and nature development). Interestingly, nature managers regard areas of high ecological value (wet forest, wet heath, bogs) as the most beautiful. These places were not opened up to recreationists until the 1970s, when the nature reserve Lheebroekerzand, for example, became visually accessible from a path. The sheep flocks, which were initially only mentioned in relation to the management of the cultural-historic heath area, became recreational attractions. And the large size of the area enabled visitors to experience rural peace. Although more and more people visit the area, especially since its designation as National Park in 1991, the naturalness and peacefulness remained the main sources of experience. In order to keep areas quiet, zoning

instruments were applied such as design of routes, placement of facilities and provision of visitor information on use possibilities.

Interestingly, in terms of the narrative value, heath was seen as both waste land (from the economic perspective) and as valuable nature (from the cultural-historic perspective). Experts defined which areas were most valuable and those areas were preserved. Other parts could be cultivated, for example to feed the local population during the Second World War. However, after the 1960s the economic perspective disappeared and preserving the characteristic wet heath became an important management goal, which was also linked to scientific and recreational interests. The first recreational map that was developed by Staatsbosbeheer aimed to help visitors 'not to get lost in the area'. Indirectly, this tells us that the area is large and that visitors might not be able to find their way themselves. The installation of a National Park in development in 1986 mentioned that the area was widely considered to bear important ecological and cultural historical values. The new status attracted new visitors and new instruments were developed to inform and guide them. However, as the area developed, history (specifically the year 1850) became the reference point for area development. The poor land of the past is the rich nature of today.

Finally, the appropriation of the area by management organizations started in 1904. The purchase of land was not always easy, because local people wanted land for cultivation. In the 1960s both Natuurmonumenten and Staatsbosbeheer were very much focused on their own area and its management, without an eye for each other or for local people. Resistance made them aware of the need to take into account the views of local people who wanted to experience the area as well, and felt the nature management organizations had taken over their land. Considerable effort was put into convincing local people of the added value of National Park status, and that their fears were ungrounded. They were assured that the area would stay accessible. And indeed, more and more people visit – and mentally appropriate – the area. This is shown by the resistance of local people to management interventions such as the felling of exotic trees and the removal of a road. Staatsbosbeheer and Natuurmonumenten have not only increased their focus on informing and consulting the public, but over the last decade they have started to treat both properties as part of one area. The first steps towards coordinated area management have been taken.

As already indicated, the different values are interrelated. For example, both use (nature conservation and development, and recreation) and experience values (peacefulness, spaciousness of the heath, diversity of landscape types, sheep flocks) relate to the narrative value: the situation of around the year 1850 when the area was wetter and more open due to the traditional farming system. The management activities that are involved in returning the area to its 1850 state meet with criticisms from local people who

regard the area as their backyard (appropriation value). Despite protests, the felling of trees went on. It seems that managers in the field have a lot of influence on the design of the area[69]. In fact, they seem to use the interrelatedness of the values to legitimate their actions. The rich cultural history (wet heath) is also ecologically important, and is, moreover, very beautiful. The managers sometimes have difficulty understanding that local people do not appreciate their actions. One nature manager reflects on this by stating:

> 'We have a vision, a vision for the area, to do good to nature. And if I see that… the new project in Noordenveld meets with criticism as well, I have difficulty understanding that. We are doing it for nature. We are not just doing anything.'

Finally, values are not static but evolve over time. This counts not only for the area as a whole, but also for individuals. One interviewee, for example, explained that the way he valued the area depended on his motivation for visiting the area:

> 'Early in the morning, when the area is very quiet, with beautiful light shining on it, it's magnificent. But on the other hand you also look at it practically. For example, I know what birds and plants I ought to see. I look at the area in two ways, emotionally and rationally. When I want to relax, than I approach the area differently. I listen to the sounds, take some pictures…'

This example shows that the use value may be linked to more rational behaviour, while experience value is linked to emotions. Visitors to nature areas go there to gather experiences as well. The next chapter deals with those visitors: who are they and how do they interpret the environment?

3.4 Conclusion

The area of the current Dwingelderveld National Park developed from an agricultural area at the beginning of the 20th century into a National Park with both natural and recreational functions today. Although the natural value of certain areas was already acknowledged in the 1920s, the water management regime favoured wood production, which indicates that the economic value of forestry was more important than nature conservation. In the 1950s, the simultaneous decline of the forestry sector and rise of recreation in the Netherlands resulted in explicit attention to the area's experience value. However, ecological values were more important and recreation was only allowed in

[69] Recently, the House of Representatives uttered worries about Staatsbosbeheer that, in their opinion, develops too much its own policy. 'Staatsbosbeheer acts as an estate-agent-guru. This can only stop when Staatsbosbeheer loses its independent status' (Dagblad van het Noorden, 2008).

certain suitable places. The creation of the National Park in 1991 led to increasing visitor numbers. As area managers increased the number of recreational facilities, their nature management interventions became more intensive as well. The management strategy of nature conservation changed into one of nature development. And even though the protection of nature in Dwingelderveld remained the most important goal, concessions to recreation and local people became possible.

4 Meanings of the environment

4.1 Introduction

People invest places with meaning and significance (Werner et al., 1985). Chapter three showed how managers of Dwingelderveld have endowed the area with meanings for over a century. 'The largest wet heath land in Europe', and 'the situation of 1850' have become powerful narrative storylines underpinning current management strategies and the consequent actions such as the planned removal of the Lhee-Spier road, the felling of exotic trees, the raising of the groundwater table, and the transformation of the remaining agricultural lands in the area back into nature. With these actions, nature managers influence and adapt the physical (observable) environment, and may in turn influence visitors' interpretations as well. The fact that some people protest against these plans[70] might indicate that they interpret the area differently. Visitors not only use protected nature areas as the physical setting for recreational activities, but also attach meanings and emotions to them (Davenport & Anderson, 2005). Managers and researchers cannot afford, therefore, to ignore the dynamics of how certain places become special to users (Moore & Scott, 2003).

The analysis in this chapter[71] focuses on the constructs underlying the four environmental values from the visitors' perspective. In addition, I describe a typological classification of visitors based on their interpretations of the environmental values. Although such a visitor typology may inform nature managers on how visitors consider and give meaning to the area they visit, it may be difficult for the manager to recognize different visitor types from their appearance. For this reason, the typology will also be described in terms of more easily recognized visitor characteristics such as age and group composition.

In addition to the interpretation of Dwingelderveld as a whole, people may value certain sites as being special to them or distinctive to the area. Some researchers have suggested that visitors may attach different meanings to a general area than they do to specific places within that area (Kaltenborn, 1997; Moore & Scott, 2003). These differences might be a result of differing spatial scale (Gustafson, 2001). Dwingelderveld is being promoted as the 'biggest wet heath area of Western Europe'. Is the heath also a special place for visitors? Some places are special to managers but not accessible to visitors, such as a drifting sand area near Kolenveen. Are only those places special that can be visited by the public? In this chapter, after describing the meanings of the environment and the visitor typology, I explain what places in Dwingelderveld are special for visitors, why they are

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[70] In chapter 6 I go into more detail about the public resistance to nature restoration activities in Dwingelderveld.

[71] Parts of this chapter have been published in Forest, Snow and Landscape Research (Marwijk et al., 2007).

special and whether different visitor types mention different places as being special.

4.2 Methods

4.2.1 Research approach

Visitors to Dwingelderveld were surveyed in 2006. Two instruments were developed to measure visitors' interpretations of the environment of Dwingelderveld and their spatial behaviour:

- A questionnaire with questions on motivations, environmental values, behaviour (e.g. entry point, destinations, attractions visited, marked/unmarked trails), special places, and socio-demographics (see Appendix 1)
- A geographical position system (GPS) device carried by the visitors during their visit registered their spatial behaviour. The questionnaire contains some behavioural information as well (spatial goal of visit, places visited, following of marked trails, choice of starting point, place of rest during hike).

The results in this chapter are exclusively based on the questionnaire. Chapter 5 focuses on visitors' spatial behaviour and will therefore elaborate on methodological issues relate to the use of GPS devices.

4.2.2 Data collection

The targeted survey population was hikers, as they form the largest group of visitors to Dutch National Parks. Moreover, – in contrast to cyclists – their points of origin and departure are often the same, thus making it easier to return the GPS device to the researcher. Visitors were asked to participate in the research at five (of the total of nine) different entrances in the park; two main entrances close to a visitor or information centre, and three smaller ones. The five car parks were chosen to cover the entire area (i.e. visitors can visit the entire park from the five car parks, see Figure 4-1).

The survey was carried out over seven days (weekend and weekdays) in spring and summer 2006. The total research population consisted of 461 hikers. The response rate to the survey was 63%. When they arrived, visitors were asked to carry a GPS device during their visit. They completed the questionnaire when they returned the GPS device at the end of their visit. The final sample contains responses from 461 hikers. Survey participants were evenly divided between the genders, and their age ranged from 17 to 85 years.

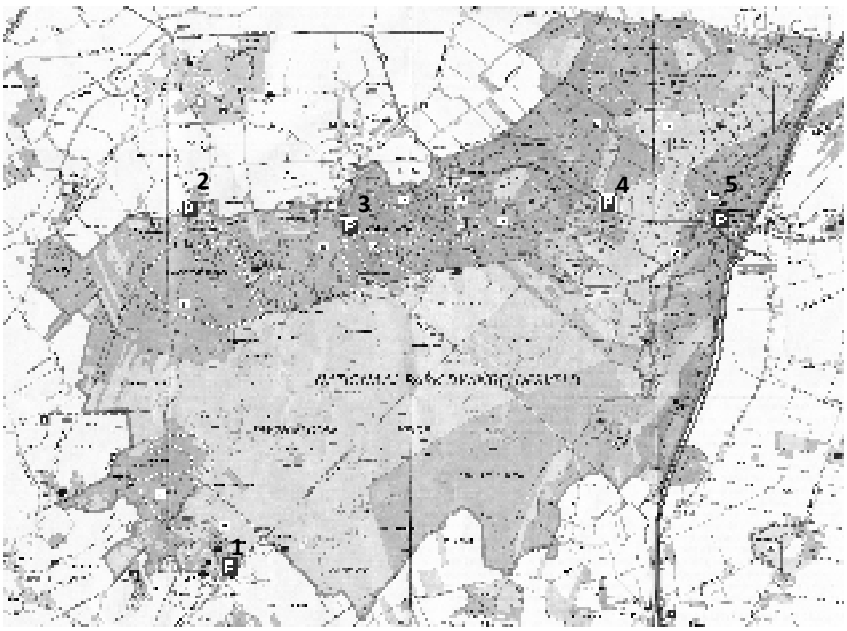

Figure 4-1: Fieldwork locations

1 = Car park at Visitor Centre Natuurmonumenten at Ruinen

2 = Car park Vijfsprong

3 = Car park Lheederzand

4 = Car park Diepveen

5 = Car park Spier

The sampling strategy in this study produces a form of non-probability sample, which implies that the different units of the population being studied do not have an equal chance of being included in the study. More specifically, the convenience sample strategy refers to the 'selection of participants based on their proximity to the researcher and the ease with which the researcher can access the participants' (Jennings, 2001, p. 138). Only people who opted to spend their leisure time in the research area at the time of the research could be interviewed. Because the sample is not a probability sample[72], the findings are generalizable only to groups possessing similar characteristics, i.e. hikers in Dwingelderveld. But because the goal of the study was not so much generalizability as the exploration of potentially significant patterns and correlations among key variables, it was assumed that a convenience sampling method would be adequate for this study[73].

[72] In a probability sample, each unit of the population being studied has an equal chance of being included in the sample (Jennings, 2001).

[73] Convenience samples are common in leisure research due to the nature of the research population and the constraints imposed by the study sites (Yiannakis & Gibson, 1992; Young, 1999)

4.2.3 Data analysis

The interpreted environment

The four environmental values were measured using a series of 42 semantic differential scales, each containing five points. A semantic differential measures people's reactions to stimulus words and concepts in terms of ratings on bipolar scales with contrasting adjectives at each end (Heise, 1970). Subjects are less likely to record socially agreeable responses on semantic differential scales than on Likert scales, because they have to form a discrete opinion on the judgement in question (Jennings, 2001). The semantic differential scales were drawn from literature review and expert advice. As a result, a total of 42 items were defined: 12 items related to use value, 13 items related to experience value, 9 items related to narrative value and 8 items related to appropriation value. Principal axis factor analysis (varimax rotation and pair-wise deletion of missing data) was used to determine meaningful constellations of items relative to the four environmental values. Several items loaded on factors that were related to environmental values other than the one to which they were initially hypothesized to relate. For example, two of the items hypothesized to relate to use value loaded on a factor related to experience value, one of the narrative value items loaded on the appropriation value factor, and two appropriation items loaded on an experience value factor.

Based on the outcomes, a second set of analyses of the items that loaded on factors related to each environmental value was conducted[74]. Thus, the items loading on the factors of use value were analysed using Varimax rotation. Subsequently, the same procedure was applied to the items loading on the factors of experience value, narrative value and appropriation value. The criteria used to designate factors were as follows: own values greater than or equal to 1.0; loadings greater than 0.4; exclusion of items with loadings of 0.4 or greater on multiple factors; and interpretability of the category (Hair et al., 1995; Nunnally, 1978).

The results of the second round of factor analyses were used to create scales that characterize an individual's perspective on each factor. Among the items loading on a given factor, an unweighted average item score was calculated. These unweighted factor scores provide a basis for describing subjects in relation to the derived factors.

[74] Some might argue that I 'mined' the initial factor analysis to derive the second set of factors. However, the items loaded onto discrete factors that appeared to describe independent dimensions of the four environmental values. The procedures followed were informed by both a priori logic and empirical analysis of the data.

Visitor typology

Stepwise cluster analysis was used to group visitors on the basis of the unweighted factor scores. Firstly, a hierarchical cluster analysis was applied to determine the appropriate number of clusters on the basis of the dendrogram and the agglomeration schedule. Ward's method was adopted to gain insight into the data structure. Secondly, on the basis of the outcome of the hierarchical cluster analysis, a selected number of K-means cluster analyses were performed. The number of clusters that made most sense with respect to the contents was chosen. The result of this cluster analysis was a visitor typology based upon their perspectives on the four environmental values. Next, correlations were calculated between the visitor typology, demographics (age, place of residence, group composition) and motivation. Finally, only statistically significant findings were presented ($p < 0.05$). The results of the study were discussed separately with two nature managers from Natuurmonumenten and Staatsbosbeheer, who are involved in and responsible for nature management in Dwingelderveld. They recognized the described visitor typology in the field, and thus confirmed the findings described in this chapter.

Motivation

Respondents' motivations for visiting Dwingelderveld were measured using 17 items on a 5-point scale[75] (ranging from very important to very unimportant). These items were selected from the battery of items[76] developed and tested by Driver and colleagues (Driver, 1983; Driver et al., 1991). While Manfredo et al. (1996) recommended including all scale items to reduce content validity concerns, most researchers choose to include a limited set of items due to the length of the questionnaire and the desire to examine other issues of theoretical and practical interest (e.g. Kyle, Mowen et al., 2004; Payne et al., 2004; Yoshioka et al., 2002). Items that are often included relate to escape, solitude, being close to nature, and social interaction (Graefe et al., 2000). The choice of items in this research is based on expert opinions and reviews of past investigations conducted in similar contexts. For this research, 17 items were chosen that relate to: family togetherness, physical fitness, meeting similar people, learning, enjoying nature, introspection, achievement-stimulation, escaping personal/social pressures, teaching/leading others, and escape physical pressure. The 17 items were factor analysed using Varimax rotation. The criteria used to designate factors were the same as for the

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[75] Within the social sciences, 5 and 7-point scales are often applied to measure social constructs such as satisfaction levels and perceptions. A recent study showed that data from 5- and 7-point scales produced similar results (Dawes, 2008). However, scientists are not unanimous on what number of points is desirable (Coelho & Esteves, 2007). In this study I decided to use a 5 point scale, in order to prevent the task of rating 42 environmental and 17 motivational statements from becoming too tedious for respondents.

[76] 328 items representing 19 domains (Driver, 1983).

factor analyses related to the interpreted environment. The results of the factor analyses were used to create scales by calculating participant's average ratings of the items that formed the motivational dimensions. One-way analysis of variance was used to compare motivations for the visitor types that resulted from the cluster analysis.

Socio-demographics
Descriptive statistics were used to describe age, group composition, place of residence, and visit frequency. Differences between the visitor types were then examined.

4.3 Results

4.3.1 The interpreted environment of Dwingelderveld

Before I explain the interpreted environment of Dwingelderveld, I will first give a brief introduction to the visitors of Dwingelderveld. In general, most people visit Dwingelderveld in pairs (52%) or in a family with children (26%). One in ten visitors comes alone. About 23% bring a dog. A large proportion of the visitors (68%) have been to Dwingelderveld before, and half of them have been coming for over 10 years. Of those who spend their holiday in the area (37%), as many as 80% are repeat visitors. Almost two thirds of the visitors live locally, which means not more than 20 km from the park[77]. In short, most hikers in Dwingelderveld come in a group, have been in the area before and live locally. But this brief overview of the facts does not yet make clear how visitors actually perceive Dwingelderveld.

Hikers in Dwingelderveld rated 42 statements related to use, experience, narrative, and appropriation values. A factor analysis revealed 10 underlying dimensions: three factors were derived to describe use value, four factors were derived to describe experience value, two factors characterized narrative value, and appropriation value was represented by a single factor. Table 4-1 shows these dimensions and the related statements[78].

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[77] 20 km might seem far in the Dutch context, but Drenthe is a relatively quiet province with scattered towns and villages.

[78] All factor analyses explain more than 54% of the total variance, which is considered to be a moderate to good result for field research (Hair et al., 1995). The KMO criteria results were strong (between 0.7 and 0.8) and very strong (>0.8) (ibid.). The items defining each of the ten factors generally have reliability coefficients exceeding 0.6, and in three instances they exceed 0.7. For evaluating reliability in cognitive tests (e.g. intelligence tests), a Cronbach's Alpha reliability coefficient exceeding 0.8 is appropriate. When exploring psychological constructs, values between 0.6-0.7 are acceptable (Kline, 1999). The items on the 'non-annoyance' factor have a lower reliability coefficient, but they are exploring diverse themes. The development of these items needs improvement.

Table 4-1: Environmental value dimensions, statements and statistics

	Dimension	Statements	Statistics		
			CA	EV	KMO
Use value	Good orientation	Many signs Many recognition points/land marks Many (marked) routes Difficult to lose track	0.750	59.2	0.770
	Many facilities	Many places to eat (picnic) Many toilets Many possibilities to relax	0.498		
	High accessibility	Many car parks Very accessible	0.534		
Experience value	Attractiveness	Exciting Beautiful Variation Cosy	0.625	55.4	0.774
	Tranquillity	Few People Quiet paths Not touristy Silence	0.638		
	Naturalness	Natural Unspoiled nature	0.646		
	Non-annoyance	The management by Staatsbosbeheer and Natuurmonumenten does justice to the area For me, other visitors are not like intruders There are many people similar to me here	0.340		

Narrative value	Familiar with cultural history/ stories	I know about the writer who lived in the house on the Benderse Berg I know many famous stories about Dwingelderveld I know what the Comm. Cramerpad[79] is known for The cultural history of Dwingelderveld is recognizable for me	0.710	54.4	0.739
	Uniquely prototypical	The sheep flocks are an essential part of Dwingelderveld Dwingelderveld is typical of Drenthe Dwingelderveld is unique; there are no similar areas in the Netherlands The radio telescope is an essential part of Dwingelderveld	0.564		
Appropriation value	Personal attachment	I feel very attached to Dwingelderveld I miss it when I haven't been here for a long time Dwingelderveld is my favourite place to be I live here and do not want to move I come here to reminisce Dwingelderveld is like a home to me I have personal memories of Dwingelderveld	0.864	56.7	0.873

CA= Cronbach's Alpha

EV= explained variance (%)

KMO = Kaiser-Meyer-Olkin criterion

The table shows the following results for each value:

- the use value of a nature area consists of three factors: orientation (finding your way), facilities (to eat, relax, use the toilet), and accessibility;
- the experience value contains four factors: attractiveness (e.g. variation, beauty), tranquillity or crowdedness of the park, naturalness (natural character of the park), and annoyance (by both other people and management actions);
- the narrative value combines two factors: stories (general stories, cultural history) and uniquely prototypical aspects (uniqueness of the park within the country, prototypical landscapes in this part of the Netherlands);

[79] Commissioner Cramer was the queen's superintendent for the province of Drenthe for years, and campaigned for the stimulation of cycling in the province. The first paved cycle path in Drenthe is named after him.

- the appropriation value reveals a single, highly reliable dimension, which is consistent with previous research (Stedman, 2002).

4.3.2 Visitor typology

A general outcome of studies among participants in leisure activities is that they differ in their perception of the environment, and as a consequence they may be grouped according to their different perceptions and interpretations (Cohen, 1984; Cottrell et al., 2005; Elands, 2002). To research whether visitors to Dwingelderveld differ in their interpretation of the environment, I conducted a cluster analysis. This analysis revealed four different groups (see table 4-2[80]), which are described below. The names chosen for the four groups are based on the dimensions which are presented in table 4-1 and described below. Quotations from the respondents that were also gathered by means of the questionnaire are used to bring the descriptions of the four groups to life.

Table 4-2: Comparison of interpreted environment between visitor types

	Dimension	Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker
Use value	Good orientation	+	+	--	+
	Many facilities	--	+	--	+
	High accessibility	0	+	-	+
Experience value	Attractiveness	+	++	--	-
	Tranquillity	+	+	++	---
	Naturalness	+	+	-	--
	Non-annoyance	-	+	-	--
Narrative value	Familiar cultural history/ stories	+++	-	--	-
	Uniquely prototypical	+	++	--	--
Appropriation value	Personal attachment	+++	-	-	--

0=0

+/- difference less than 0.5 SD

++/-- difference between 0.5-1.0 SD

+++/---difference more than 1.0 SD

[80] The symbols in table 4-2 are derived by subtracting the total mean (of all four groups on all 10 factors) from the mean for a specific group on a specific factor, and dividing the result by the total standard deviation (of all four groups on all 10 factors). This standardization of means enables comparison of symbols between both groups and factors.

The connoisseur (25%, N=89)

The connoisseur is also well oriented in Dwingelderveld, which he considers highly accessible. The connoisseur perceives facilities as less plentiful than does the happy hiker. Interestingly, the connoisseur also finds the area less attractive than does the happy hiker – although he does think it is natural and neither busy nor noisy. A reason for the lower attractiveness might be annoyance with both management actions and other visitors. The connoisseur possesses a lot of knowledge about the park and is highly attached to it. He perceives Dwingelderveld as prototypical of landscapes in this part of the Netherlands, but otherwise very unique within the country. The connoisseur points out the importance of the park as a nature area, but that it should not be turned into a 'primeval forest'. He can be disturbed by the logging of exotic trees and the raising of groundwater level, which makes the area less accessible and attracts midges. On the other hand, he is of the opinion that the area should not be too organized and touristy.

The happy hiker (31%, N=112)

The happy hiker is well oriented in Dwingelderveld and acknowledges the existence of many facilities (to eat, to relax, toilet). The highly accessible park is perceived by the happy hiker as natural and beautiful. The area is also seen as tranquil and the happy hiker is not annoyed by management actions or by other visitors. Although the happy hiker is neither familiar with stories about Dwingelderveld nor particularly attached to it, he thinks the park is prototypical of landscapes in this part of the Netherlands, but otherwise very unique within the country. The happy hiker points out that it he likes to maintain the area as it is ('keep it like this!') and that the park is well managed. The number of organized activities should not be increased, because that would affect the peace and quiet in the area. However, the happy hiker does feel a need for extra benches and garbage bins. As almost all environmental values are sufficiently recognized, the happy hiker seems to have an unproblematic experience of nature.

The demanding hiker (25%, N=92)

The demanding hiker is much less well oriented in the park than are the other visitor types. He perceives fewer facilities and less accessibility, compared to the other hiker groups. Although he perceives Dwingelderveld as very quiet and calm, the demanding hiker rates its attractiveness the lowest of all groups. He rates the park as less natural than do the happy hiker and the connoisseur. Like the connoisseur, the demanding hiker is annoyed by management actions and by other visitors. He has little knowledge of the area, and does not recognize the park as prototypical of landscapes in this part of the Netherlands, or as unique within the country. He does not feel attached to the area. The demanding hiker desires more and clearer signage in the area. He is easily irritated by issues such as a closed tourist information office in neighbouring villages on Sundays, the small size of the eateries, the limited menu, cyclists on footpaths, wet paths, and areas that are closed for hikers.

The disturbed hiker (19%, N=68)
Like the happy hiker, the disturbed hiker is well oriented in the highly accessible park and perceives the existence of many facilities. At the same time the park is perceived as very busy and noisy, more artificial than natural, and less attractive than it is in the eyes of the happy hiker, connoisseur or demanding hiker. The disturbed hiker is more annoyed by management actions and other visitors than the other hiker groups. He is not familiar with stories and the park's history, and does not see the park as very prototypical of landscapes in this part of the Netherlands, or as unique within the country. He does not feel attached to Dwingelderveld. The disturbed hiker would like to see various user groups (e.g. hikers, cyclists, dog walkers) separated spatially from one another. He is also annoyed by the noise of an adjacent highway. The disturbed hiker believes that the area is quite accessible; it is easy to follow marked trails, but not very exciting. The disturbed hiker would like to leave nature more to itself.

The results highlight the variation in how Dwingelderveld is valued by different visitor types. Visitor experiences of nature vary from problematic to unproblematic. An unproblematic experience of nature means that all values are perceived in the landscape in a positive manner. The happy hiker has the most unproblematic experience of nature. Although he does not feel very attached to Dwingelderveld, he perceives the park as more attractive than any other visitor group does. The other groups are more critical. The connoisseur, who is most familiar with, and feels most attached to the park, is more critical of the way the area is managed by Staatsbosbeheer and Natuurmonumenten. The connoisseur's high level of familiarity with the park apparently grants him the prerogative of being critical. The demanding hiker is critical of the availability of services and facilities relating to comfort. Although the area is perceived as tranquil and natural, the demanding hiker gives the park the lowest rating for attractiveness of all the groups. Finally, the disturbed hiker is critical of the crowded and noisy places and the naturalness of the park. The views of the demanding and disturbed hiker seem to be a result of high expectations and too little 'knowledge/acquaintance' with the area. They may feel unable to escape places perceived to be too touristy or to find 'user friendly' facilities and services.

4.3.3 Motivations and demographics

Motivations
Besides differences in experiences, respondents were asked their reasons for going for a walk in Dwingelderveld. In addition to information on visitors' interpretations of the environment, information on motivations can enhance the effectiveness of management strategies by making it possible to target specific visitor needs and characteristics (Ballentyne et al., 1998). Table 4-3 reports the incidence of the various motivations among hikers. The commonest motivations are 'to enjoy the environment', 'to get

exercise', and 'to be close to nature'. While motivations such as 'enjoyment of the natural environment' and 'being close to nature' are often mentioned in other Dutch researches, the 'exercise' motive is not always as prominent as it appears to be in Dwingelderveld (Berends & Veeneklaas, 2003; Luttik et al., 1999; Staats, 1998). Interestingly, among the more social motivations, only 'to do something with my family' is rated as relatively important. Being with similar people, friends or meeting new people are relatively unimportant, as were being away from crowds of people and being alone. This might be because the visitors *expect* to meet other people in Dwingelderveld, so that people who want to get away from other people do not go to Dwingelderveld. Although this is speculative, it is based on the contrast with researches on motivations in more remote areas in, for example, Australia and the USA, which reported the importance of escaping crowds (e.g. Galloway, 2002; Graefe et al., 2000). In addition, it might be that Dwingelderveld is not particularly suited to 'sensation seeking': Galloway (2002) reported high values on the three least important statements in table 4-3 (to test endurance, to teach others, to meet new people) among so-called sensation seekers.

Table 4-3: Motivations for visiting Dwingelderveld

	Motivation statement	Importance 1=very important 5=very unimportant	N
1	To enjoy the environment	1.3	432
2	To get exercise	1.7	427
3	To be close to nature	1.8	410
4	To have a change from everyday life	2.1	392
5	To do something with my family	2.4	401
6	To get peace of mind	2.5	390
7	To learn more about nature	2.5	392
8	To discover something new	2.7	384
9	To learn more about Dwingelderveld	3.0	381
10	To be away from crowds of people	3.2	381
11	To be with similar people (who have similar values and enjoy the same things)	3.3	383
12	To be with friends	3.5	379
13	To think about my personal values	3.7	380
14	To be alone	3.8	379
15	To test my endurance	4.1	390
16	To share what I have learned with others	4.2	386
17	To meet other people in the area	4.5	375

It would be interesting to discover whether the four visitor groups defined in the previous section differ in motivation. To this end, I first conducted an exploratory factor analysis to explore the underlying dimensions of the motivations[81]. The analysis revealed four underlying dimensions[82]: learning, enjoyment, introspection, and social contact. Table 4-4 shows these dimensions and the related statements[83].

Table 4-4: Motivational dimensions

Motivation dimension	Statements	CA	EV (%)
Learning	To learn more about nature To learn more about Dwingelderveld To share what I have learned with others To discover something new	0.74	29
Enjoyment	To enjoy the environment To be close to nature To get exercise To have a change from everyday life	0.74	11
Introspection	To be alone To be away from crowds of people To get peace of mind To think about my personal values	0.72	10
Social contact	To be with friends To be with similar people (similar values, enjoy same things)	0.77	9

CA= Cronbach's Alpha; EV= explained variance (%)

Next, the four motivational dimensions were correlated to the four visitor types. Only two of the dimensions – enjoyment and introspection – show significant differences between

[81] The statements on 'testing endurance' and 'meeting other people' have been removed because of loadings of 0.4 or greater on multiple factors. The statement on 'being with family' had loadings below 0.4 and was also removed.

[82] The naming of the dimensions is based on the content of the items that load on each dimension.

[83] The factor analysis explained more than 59% of the total variance. The KMO criteria result was strong (0.811), as was the internal consistency of the factors (Cronbach's Alpha>0.7).

the visitor groups (table 4-5[84]). Compared to the other groups, the happy hiker comes particularly for enjoyment. The connoisseur and – to a lesser extent – the disturbed hiker come for introspection. The difference between the connoisseur and the disturbed hiker is that while the connoisseur also mentions enjoyment as a motivation, the disturbed hiker does not. These results support the naming and profile description of the happy hiker (who comes for enjoyment), the disturbed hiker (who comes for introspection and is disturbed by other users) and the connoisseur (who comes for both enjoyment and introspection and is disturbed by management practices). The fourth type, the demanding hiker, does not show specific motivations; this group can be characterized by a lack of specified motivations. A possible explanation might be that indeed, compared to other groups, this hiker does not have a specific motivation. However, since not all of Driver's motivation dimensions (Driver, 1983) were included in the questionnaire (see 4.2.3), this explanation is speculative.

Table 4-5: Comparison of motivations between visitor types

Motivation dimension	Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker	Significance
Learning	--	+++	---	+	0.080
Enjoyment	0	+++	---	---	0.007
Introspection	+++	---	--	+	0.001
Social contact	0	0	0	0	0.999

0=0

+/- difference less than 0.5 SD

++/-- difference between 0.5-1.0 SD

+++/---difference more than 1.0 SD

Socio-demographics

Although the visitor typology and the related motivational dimensions inform nature managers on how visitors perceive the area they visit, it may be difficult for the manager to recognize them from their appearance. Age and group composition are more easily recognized visitor characteristics. Do visitors with children perceive the area differently than, for example, a person who is alone? Table 4-6 shows that indeed they do.

[84] The symbols in table 4-5 are derived by subtracting the mean of the factor-loading scores across the four groups on a motivation dimension from the mean for a specific group on that motivation dimension. The remainder is then divided by the standard deviation among loading scores for that dimension. This standardization of means enables comparison between the four groups on each dimension.

The adults who come alone are mainly connoisseurs, while families with one or more children tend to be evenly distributed among happy, demanding or disturbed hikers. Like single adults, the elderly can also be categorized as connoisseurs. Most of the other couples (under 65 years of age) are happy hikers. Larger groups of adults are mainly either connoisseurs or happy hikers. While all these relationships are statistically significant, they are not one-to-one. More than adults alone and adult couples, the other three visitor groups (elderly couples, groups of adults and families with children) tend to be diverse when it comes to the mix of values they derive from their nature experiences.

Table 4-6: Demographic characteristics of visitor types

	Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker	Total	N
Adult alone (16+)	53%	6%	32%	5%	100%	34
Elderly couple (65+)	35%	25%	28%	13%	100%	32
Adult couple (< 65 years)	22%	40%	21%	17%	100%	164
Group adults (>2 persons)	32%	32%	24%	11%	100%	37
Family with children	12%	26%	32%	30%	100%	92

Cramer's V demographic: 0.208 (P<0.001)

This interweaving of different experiences within demographic groups makes it difficult to classify visitors solely on the basis of their demographic characteristics. It also suggests the importance of research into visitor experiences, because members of a single demographic group may derive a variety of meanings from their nature experiences. Prentice et al. (1998) found similar results for visitors to heritage parks.

Other factors that help managers identify visitor groups are the place of residence (in the vicinity of the protected nature area or further away), whether visitors have been to the area before, and the frequency of their visits to a specific park (table 4-7). Interestingly, 71% of the connoisseurs live near Dwingelderveld, compared to less than 29% of each of the other groups. Also, most connoisseurs (95%) are repeat visitors, whereas at least one third of the other groups are visiting the protected nature area for the first time. Almost half (49%) of the demanding hiker group are first-time visitors. This might explain why it is especially this group that focuses on the use values (orientation, facilities, accessibility) of Dwingelderveld.

The connoisseur is a very frequent visitor to the park; more than 50% of the connoisseurs come at least every week. Although the happy hiker is a less regular visitor than the connoisseur, he visits the park more frequently than the demanding or disturbed hiker.

Sixty-two percent of the latter groups report themselves as seldom visiting the park. The relation between number of visits, knowledge and familiarity has also been found by Hwang et al. (2006 p.1060): 'The more familiar the tourist is with the location, the more knowledge one has of different kinds of local activities and attractions'. They know not only the best places to visit, but also the places that should be avoided (because of crowding, noise, unnaturalness etc.).

Table 4-7: Additional characteristics of visitor types

	Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker
Local resident (%)	71	29	20	22
First-time visitor (%)	5	32	49	37
Visit frequency (%):				
• Seldom (once a year)	14	50	62	63
• 2-12 times per year	35	41	25	31
• Weekly/daily	51	9	13	6
Group composition (nr):				
• Group size	2.3	2.6	3.0	3.4
• Number of children	0.2	0.4	0.8	1.0

Cramer's V local resident: 0.425 ($p<0.001$), first time visitor: 0.351($p<0.001$), visit frequency: 0.353 ($p<0.001$), group size: 0.044 ($p<0.001$), number of children: 0.069 ($p<0.001$)

4.3.4 Special places in Dwingelderveld

So far, I have focused on the interpretations of nature by hikers in Dwingelderveld, which informed my typology of four visitor types. To analyse their interpretations, I cut the environment into 42 separate pieces, so to speak. However, from a transactional viewpoint, it is interesting to look at the environment as a whole. I therefore also asked visitors to describe places in Dwingelderveld that they find special. They could name a maximum of three places, and were asked to describe why these places were special. The results show that not all visitors were able to identify three special places (table 4-8). Interestingly, the connoisseur mentions the most places (2.5), while the demanding hiker only names an average of one.

Table 4-8: Special places mentioned per visitor type (min=0, max=3)

Visitor type	Nr of special places	Std. Deviation
Connoisseur	2.5	.96
Happy hiker	1.5	1.3
Demanding hiker	1.0	1.3
Disturbed hiker	1.3	1.3

Eta^2 0.164 ($p<0.001$)

About 61% of the visitors mention at least one place, and in total 665 places are mentioned. Table 4-9 shows the 10 most frequently mentioned places. These 10 places cover almost 92% of all the mentioned places. Figure 4-2 shows the location of these places.

Table 4-9: Top 10 special places in Dwingelderveld

	Special place	Nr of times mentioned	Percentage
1	Heath	190	28.6
2	Water	105	15.8
3	Anserdennen	79	11.9
4	Lheebroekerzand	65	9.8
5	Visitor Information	58	8.7
6	Lheederzand	52	7.8
7	Noordenveld	21	3.2
8	Sheep farm	17	2.6
9	Dwingeloo Forest	13	2.0
10	Catering facilities	10	1.5
	Total		91.9

Obviously, the heath is mentioned the most frequently as a special place. In Dwingelderveld, there are two main heath areas, namely the Dwingelose Heide and the Kraloërheide (respectively west and east of number 1 in Figure 4-2). The Dwingelose Heide is mentioned more often than the Kraloërheide, probably because it is more accessible. The second most frequently mentioned place, 'the water', comprises several fens. The most often-named places are Davidsplassen (2a) and Holtveen (2b), at both of which there is a bird observation unit, which may be a draw. The 'number three' special place is Anserdennen. This area is close to one of the major car parks next to the visitor centre. In addition, the only two marked routes from this car park go through Anserdennen, and the teahouse (10a) is located there. To sum up, I note that it is the

places that are relatively easy to 'use' that are most frequently mentioned.

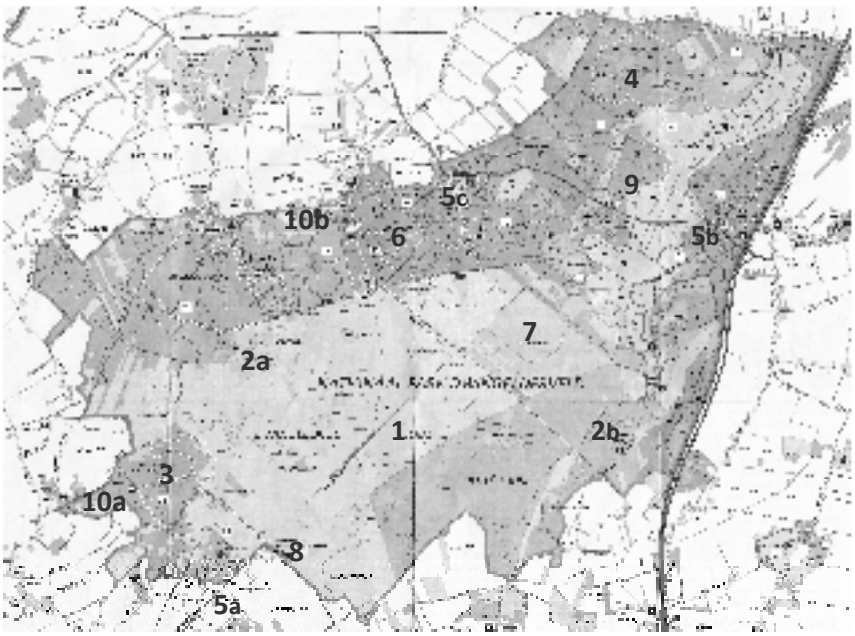

Figure 4-2: Locations of special places

Seven of the ten places are related to the natural environment, the other three are types of visitor facilities. Of the visitor centres, the main centre in the south (5a) is mentioned most, followed by the unstaffed ones in Spier (5b) and Lhee (5c). The sheep farm (8) is mentioned more often than the catering facilities. Of the last group, the teahouse (10a) is mentioned most. Only a few people mention the Forest Pub (10b), while nobody mentions the snack bar at Spier (next to 5b). This is probably not because visitors do not use the snack bar (which was always busy during fieldwork days), but that it is not 'special' to the area.

A conclusion that may be drawn from the special places mentioned is that a specific spot has to be accessible to be considered special. Of all the pools and fens, the two that are designed to attract visitors (with a bird observation unit) are mentioned most. Of the two heath areas, the one that can be crossed and walked around is mentioned most. And the less accessible western part of the area (with no car parks and few trails) is not mentioned at all.

This conclusion begs the question as to why certain places are mentioned. To look at this in more depth, I categorized the reasons in terms of the four environmental values as they are described in chapter 2. Thus, reasons associated with use opportunities, such as

orientation (e.g. marked trails), facilities (e.g. a place to eat), and accessibility (e.g. a car park) are classified as related to use value. Reasons referring to attractiveness (e.g. beautiful scenery), tranquillity (e.g. quietness) and naturalness (e.g. unspoiled nature) are classified as related to experience value. Reasons referring to cultural history (e.g. recognition of artefacts) and prototypical and unique elements (e.g. unique vegetation) are classified as related to narrative value. Finally, reasons related to personal attachment (e.g. memories) are classified as related to appropriation value. Table 4-10 shows the reasons for the five most frequently mentioned places[85].

Table 4-10: Interpretations of special places in terms of environmental values (%)

	Special place	Use value	Experience value	Narrative value	Appropriation value
1	Heath	6	79	14	2
2	Water	7	76	11	7
3	Anserdennen	31	65	1	3
4	Lheebroekerzand	16	80	4	0
5	Visitor Information	23	30	48	0

Obviously, special natural spots are mainly mentioned for reasons related to experience value. Views, diversity, colours, scents, spaciousness, and beauty are often mentioned. A special experience was mentioned at Lheebroekerzand: the characteristic juniper trees that grow there are often mentioned as beautiful. Compared to the more open landscape types of heath and water, the forested area of Anserdennen is more often mentioned for its use value, such as opportunities for biking, hiking or resting in the teahouse. Visitor information centres are mainly mentioned for their narrative value (e.g. information about the area, such as cultural history). Only a few people give reasons for their choice of special places that relate to appropriation value: these mainly refer to memories from their youth. As table 4-11[86] shows, these persons are mainly – and unsurprisingly – connoisseurs, most of whom who have been able to construct these memories because they are 'locals' and are regular visitors.

[85] Because of the relatively lower number of people that mentioned places 6 to 10, I decided to calculate percentages only for the five most popular places.

[86] The percentages in table 4-11 are derived from the average number of times a visitor type mentioned variables categorized as related to use, experience, narrative, and appropriation value.

Table 4-11: Categories of interpretations by visitor types (%)

Visitor type	Use value	Experience value	Narrative value	Appropriation value
Connoisseur	20	60	11	8
Happy hiker	12	75	12	0
Demanding hiker	17	76	7	0
Disturbed hiker	10	78	10	1

Compared to the other groups, the connoisseurs mention experience values as reasons for special places less often, but overall, experience values are mentioned most often by all the visitor types. Two other observations are worth making. Firstly, use value is mentioned most by two very different types of group: the connoisseurs and the demanding hikers. Apparently, the connoisseur uses the area so much that he knows the best places for a walk or a bike ride. The demanding hiker, on the other hand, hardly knows the area and therefore focuses on use value. Secondly, the connoisseur does not mention narrative value more often than hikers from the other groups when defining special places. Surprisingly, while this visitor type does know more than the other visitor types about cultural history and the unique aspects of the area, he does not mention them more often.

Finally, I checked whether groups differ in the actual places they mention (table 4-12). The differences prove to be significant for only the following places: heath, Anserdennen and Lheebroekerzand. Obviously, the percentages are related to the total number of places mentioned by the visitor types (table 4-8). The connoisseur mentions the most places, and the demanding hiker the least. While all groups mention heath the most, the demanding hiker differs from other groups in that an almost equal number mention Lheebroekerzand as a special place. It would be interesting to check whether the results in table 4-12 relate to the actual places visited. The next chapter will focus on the spatial behaviour of walkers in Dwingelderveld.

Table 4-12: Special places mentioned by visitor types (%)

		Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker	Significance
1	Heath	44	28	15	21	0.000
2	Water	26	17	20	15	0.290
3	Anserdennen	37	15	4	9	0.000
4	Lheebroekerzand	28	7	12	10	0.000
5	Visitor Information	12	13	4	7	0.243

4.4 Conclusion

The results suggest that subsets of interpretations of an environment do exist among visitors to Dwingelderveld. The types of meaning may be classified under use, experience, narrative, and appropriation values. Furthermore, different types of visitors appear to construct different meanings in terms of these four dimensions. Differences among visitor groups in their use of these dimensions in interpreting the environment are not clearly explained by visitor demographics.

Interestingly, the use value is not uniformly recognized by visitors to Dwingelderveld, where paths, marked trails, signage, visitor centres etc. are present. The interpretation of the different dimensions of the use value (orientation, facilities, and accessibility) differs between visitors. In particular, it emerged that new visitors rate orientation lower than repeat visitors do.

The experience value consists of visitor's perceptions of attractiveness, tranquillity, naturalness and annoyance (with other visitors and with management actions). Experience value is not monolithic; rather it is constructed with varying combinations of these dimensions by different user groups. These findings are linked to the difficulty of defining parameters for experiential quality, since the naturalness of a National Park and its quietness, for example, are rated differently by different groups of visitors. This finding is similar to Hull and Stewart's finding (1995) that the quality of one's experience while viewing a landscape seemed to depend on more than just the biophysical attributes of the views one encountered. They suggest that site-independent factors such as expectations and fatigue may influence the overall subjective experience. Or, as Prentice et al. state, 'the same product can be experienced in different ways' (1998 p. 14).

The different interpretations of the narrative value show that it is not necessary to be familiar with cultural history or stories about the environment to be able to value the uniqueness of Dwingelderveld or its prototypical character. However – and here narrative value is closely related to appropriation value – it seems that it takes time and personal involvement to develop an understanding of narrative value in the sense of being able to recognize cultural history in an area (Vervloet et al., 2005). It also takes time and personal involvement to develop a sense of place (Hammitt et al., 2006; Hammitt et al., 2004).

Based on the underlying dimensions of environmental values, I was able to define four groups of hikers. Both the happy hiker and the connoisseur experience nature in an unproblematic way, meaning that all values are more or less recognized in the landscape. The difference between these two groups is that the happy hiker has little knowledge of the park (cultural history, stories) and feels less attached to it than the connoisseur does. Although these groups interpret the environment similarly, they differ in terms of additional visitor characteristics. The connoisseur lives locally (71%), is a frequent visitor,

and feels very attached to the park. The happy hiker comes from further away and comes less often. The experience of nature is most problematic for the demanding and the disturbed hikers. While the demanding hiker is critical of the quantity and quality of the services and facilities, the disturbed hiker is more critical about crowding, noise and unnaturalness. Both groups have little knowledge of the area and do not feel attached to the park. The demanding hiker group tends to consist of first time visitors, and they rate the area as the least attractive. It is possible that their expectations of the provision of facilities and services are not met by Dwingelderveld National Park.

The results show no one-to-one relationships between visitor types and their demographic characteristics (see also Prentice et al., 1998). This implies that a visitor segmentation based on demographic characteristics does not accurately portray the range of environmental meanings within Dwingelderveld (see also Frochot, 2005). I realize that it is difficult for managers to recognize a 'happy hiker' or a 'disturbed hiker'. However, when I discussed the findings with two nature managers, they did recognize the four hiker types. They mentioned a 'trend':

> 'The number of hikers for whom facilities and easy way-finding is most important, the ones without special interest or attachment, is growing'.

And they felt, moreover, that:

> 'Policy is focusing too much on this type of visitor'.

The growing number of demanding hikers is generally defined as a 'market development' in the Netherlands (Coenen, 2007). These individuals often have a limited amount of free time, and seem to expect an efficient provision by park managers of high quality services and experiences. However, the existence of the happy hiker in this research suggests that not all recreationists are critical and demanding.

We have seen that insight into the visitor types' motivations can provide nature managers with additional information on differences between the four types. While the happy hiker comes especially for enjoyment purposes, both the connoisseur and – to a lesser extent – the disturbed hiker come for introspection, while the demanding hiker does not express specific motivations, compared to the other groups. Of course, it is important to research not only who the visitors are, but also what they do. Effective nature management should be based on a thorough understanding of visitors' motivations, preferences, personal characteristics, *and* behaviour (Ballentyne et al., 1998). These are closely related, as is illustrated by the insight, based on respondents' selections of special places in Dwingelderveld, that a spot has to be accessible to be considered special. The next chapter will thoroughly scrutinize the spatial behaviour of walkers in Dwingelderveld.

5 The spatial behaviour of visitors

5.1 Introduction

An understanding of visitor use, including temporal and spatial distributions, is necessary for sustainable recreational use and effective park management. Nature managers can influence recreationists' spatial behaviour by means of several steering measures such as concentration points and marking (Boerwinkel & Philipsen, 1999). In this chapter, I focus on the physical environment, including such steering measures. Although researchers in recent decades have focused increasingly on the relation between the physical environment and individuals' behaviour, most of their research is from a phenomenological perspective that describes the environment as experienced by individuals to explain their behaviour. How elements in the physical environment influence individual's behaviour has received relatively little attention (Kumar et al., 2008), and most of it has been restricted to urban environments (e.g. Brown et al., 2007; Foltête & Piombini, 2007; Golicnik, 2004; McCormack et al., 2008; Zacharias, 2001, 2006). An exception is a study by Taczanowska, Arnberger et al. (2006; 2008), which showed that recreationists are sensitive to type of surface, width of paths and trail signage in a nature area, and concluded that a comprehensive picture of a visitor (i.e. visitor typology and behaviour characteristics, including the spatial dimension) is of great value for management purposes and visitor flow simulation. For managers, it is essential to measure the impact on visitors' behaviour of measures intended to redistribute visitor patterns. This chapter[87] focuses on the spatial behaviour of hikers in Dwingelderveld. It describes to what extent visitor behaviour can be explained by environmental characteristics, and whether different visitor types show different spatial behaviour patterns.

From the interviews with managers mentioned in chapter 3, we gather that the majority of hikers in Dwingelderveld walk predefined routes. However, I would expect that people who are better acquainted with the area are less likely to follow predefined routes. This implies that connoisseurs – who are regular visitors and feel attached to the area – are likely to be less easy to steer than the other visitor groups. By the same token, the demanding hiker – who feels less able to orientate himself – may be easier to steer. However, the relationship between visitor types and spatial behaviour might be less straightforward than this suggests, since others have reported difficulties in explaining

[87] Parts of this chapter have been published in the conference proceedings of the Fourth International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas (Ligtenberg et al., 2008; Marwijk & Pitt, 2008).

spatial behaviour in terms of visitor characteristics and their perception of the physical environment (Elands, 2002; Taczanowska, Arnberger et al., 2008; Zacharias, 2001).

This chapter starts by describing the method of collecting and computing data. I then give an impression of the environment in use, documenting the temporal and spatial arrival of visitors, and describing their activities. I go on to describe the physical environmental variables which influence the different spatial behaviour patterns. I look specifically into the behaviour of the four visitor types that are based on different interpretations of the environment (chapter 4). I conclude with an analysis of the main landscape features for hikers that are relevant to protected area design and management.

5.2 Methods

5.2.1 Research approach

In order to research the spatial distribution of hikers in Dwingelderveld and to determine which environmental factors affect their behaviour, three types of data were collected:

1. Visitor data such as visitor characteristics, place and time of departure, and places visited: by means of a questionnaire[88];
2. Spatial behaviour of visitors: by means of a GPS-device that visitors carried with them during their visit;
3. Environmental data on the spatial structure of, and features within, Dwingelderveld.

Tracking visitors with GPS[89] is a relatively new monitoring technique. Roughly, there are three other methods of researching recreational behaviour (Elands, 2002; Muhar et al., 2002):

- *Direct observation*: the researcher accompanies or follows the respondent (e.g. Hartmann, 1988);
- *Interview*: the researcher interviews the respondent at the end of the activity/day on routes and activities (e.g. Keul & Küheberger, 1997);
- *Self-registration*: respondents systematically register their use of time over a given period in what is known as a 'space-time-diary' (e.g. Elands, 2002; Taczanowska, Arnberger et al., 2008).

Each method has advantages and disadvantages (see e.g. Muhar et al., 2002 for an overview). The main disadvantage of the 'identify, follow, observe, and map' method of

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[88] See section 4.2.1 for a detailed description of the fieldwork.

[89] The best known and most commonly used Global Positional System is the US Department of Defense's system, which has been open to public use since May 2000 (Shoval & Isaacson, 2007).

direct observation (Thornton et al., 1997) is that it is incredibly time-consuming. This method can be applied in both a participatory manner (by accompanying the subject in person) and a non-participatory one (by following the subject at a distance). The advantage of participatory direct observation is that it allows the observer to be constantly aware of what subjects were doing, and possibly why. However, there is also the risk that subjects tailor their behaviour and explanations to the presumed expectations of the accompanying observer. Non-participatory observation, on the other hand, fails to unveil the reason and meaning underlying the subjects' decisions and activities (Shoval & Isaacson, 2007). GPS resembles non-participatory direct observation in this respect. On the other hand, however, it overcomes the disadvantage of the time involved in gathering data (see table 5-1). The interview method enables respondents to reflect on issues such as motivation and experiences, but it has one major drawback, in that it relies on the memory of the respondent. The method of self-registration is the most common method for gathering data on human time-space patterns in the social sciences in general, and in leisure studies in particular (Shoval & Isaacson, 2007). Its advantages are that it is relatively cheap and that it provides comparatively large samples. Its disadvantages are the varying quality of the diaries and the considerable effort the method demands on the part of the respondents (Elands, 2002).

Table 5-1: (Dis)advantages of GPS tracking as visitor monitoring technique

Advantages	Disadvantages
• High resolution of data	• Accuracy of data depends on nature of environment (e.g. tree cover) and weather conditions
• Data more accurate than self-registration	• Respondents might tailor their behaviour due to awareness of tracking
• Offers elaborate information on behaviour (speed, duration and location of stops, off-trail use)	• Analysis of data is very time-consuming
• Requires little effort by respondents, compared to self –registration	• Fails to unveil the purpose and meaning underlying respondents' decisions and activities
• Data collection less time-consuming than direct observatin	• GPS devices are relatively costly

Source: Shoval & Isaacson (2007); Taczanowska, Muhar et al. (2008)

Bearing in mind the pros and cons of the different methods, researchers often combine different methods. This research combines GPS with a form of interview, namely a questionnaire, to be able to capture data on the motives and meanings underlying decisions and activities. In total, 461 respondents completed a questionnaire, and 400 of them carried a GPS with them. However, due to data losses, only 311 GPS tracks were

valid, which was almost 78%[90].

In addition to the survey with GPS, environmental data were gathered to describe the spatial structure of Dwingelderveld. Specifically, data on both the morphology of the environment and particular features within it (e.g. recreational facilities, as well as environmental features such as water bodies) were collected and measured, and stored in GIS. These data were derived from existing cartographic material and complemented with information from managers and observation during area visits. Figure 5-1 presents the methodological steps of this study.

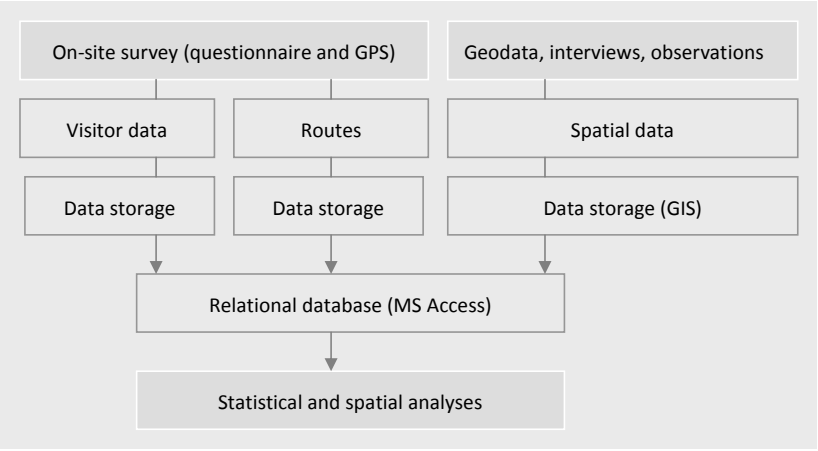

Figure 5-1: Methodological steps (based on Taczanowska, Arnberger et al., 2008, p. 164)

Since I have already explained the research approach to visitor data in chapter 4, I focus in the next section on the type of spatial data gathered for this study.

5.2.2 Spatial data

In order to study the relation between the spatial behaviour of hikers in Dwingelderveld and the physical environment, it is necessary to distinguish specific physical environmental features in the environment. What elements in the physical environment make people choose a certain route, or visit a specific spot? People may choose certain routes based on route qualities such as specially designed walking trails, views or attractive destinations along a path segment (Joseph & Zimring, 2007; Lee & Moudon, 2006), paved or unpaved paths, and marked trails (Taczanowska, Arnberger et al., 2008). However, it is acknowledged that in addition to preferences for specific environmental

[90] There is hardly any research published on the quality of GPS data. The only research I came across of is that of Taczanowska, Muhar et al. (2008), who gathered only 59% valid tracks.

features, the movements of recreationists are constrained by the path network configuration in the area. The idea that the structure of the environment plays a role in the distribution of movements on a network is one of the key concepts of space syntax. In general, paths that are more accessible within the path network tend to have more people walking along them (Bafna, 2003; Hillier & Hanson, 1984; Peponis & Wineman, 2002). To sum up, the use of a path is a function of the path network configuration and related physical environmental features:

$$\text{Visitor density}(x) = f\,[\text{Network configuration}(x), \text{Environmental features}(x)]^{91}$$

Visitor density is the frequency of use of path segments in Dwingelderveld. The area contains 1865 path segments. A path segment is a section of the path network between two decision points; that is, a path segment ends at an intersection. The GPS-recorded visitor routes were defined as a sequence of path segments and stored in a relational database (MS Access). Since visitor density is the variable I want to explain, it is the so-called dependent variable. The two independent variables are 'network configuration' and 'attractiveness of physical environment'. I first elaborate on these independent variables before listing the specific set of independent variables used in this study.

Network configuration is characterized in this study by two measures of space syntax, known as integration and connectivity, which can be used to calculate the level of accessibility of path segment from all other path segments within a spatial system, making it possible to estimate the theoretical accessibility (uninfluenced by preferences). Integration is an indicator of how easily one can reach a specific path segment, reflecting the average number of spaces one needs to pass through to reach a specific path from the other paths in the network. Connectivity denotes the number of paths that are directly connected to a specific path. Space syntax theory posits that paths that are most directly linked to other paths (i.e., high on integration and connectivity) will tend to attract higher densities of movement (Foltête & Piombini, 2007; Hillier, 1996; Nubani & Wineman, 2005). Space syntax methodology is already well developed, and the file extension Axwoman to ArcGIS was used for calculating integration and connectivity[92] (Jiang, 2008a, 2008b).

However, I also felt it necessary to include two additional network configuration variables. Space syntax only deals with space, while behaviour occurs in space and *time*. This is especially relevant for recreational behaviour, which takes place during people's

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[91] Inspired by the work of Matthiopoulos, who developed a modelling framework that treats the use of space by animals as a joint function of preference and accessibility (2003, p. 240).

[92] Space syntax is mainly designed for and applied in architectural and urban design. An exception is the study of Findlay and Southwell (2004), who used space syntax techniques in their study on forest way finding.

limited free time. The general picture in Dutch National Parks is that people access and then later leave the area from the edges (a car park in this research). Depending on the size of the area, they may not be able to reach the centre of the park – which is best integrated according to space syntax theory. For this reason, I added a variable for network configuration, namely 'distance to car park'. For each path segment in the network, the distance to the nearest car park was calculated[93]. I hypothesized that path segments in the vicinity of car parks have higher visitor densities. The second variable I added was the length of path segments. Joseph and Zimring (2007) found that the length of path segments was strongly related to path use for recreational walking (in contrast to instrumental walking). In view of the big differences in length between path segments in Dwingelderveld (ranging from 7 metres to 2.8 kilometres), I assume it to be relevant to take this variable into account.

Environmental features can be related to the environmental values (use, experience, narrative, and appropriation value). In chapter 3 I characterized recreational facilities and attractions in Dwingelderveld as related either to use, experience or narrative value. *Use value variables* relate to use opportunities, such as orientation (e.g. is the path a marked trail?), accessibility (e.g. is the path close to a car park?) and facilities (e.g. is the path close to a bench or a catering facility?). *Experience value variables* relate to attractiveness (e.g. width and slope type of visible nature in the surrounding of the path), tranquillity (e.g. noise of roads) and naturalness (e.g. heath in the vicinity of the path). *Narrative value variables* relate to cultural history (e.g. distance to a sheep farm), prototypical unique elements (e.g. distance to the radio telescope) and information (e.g. distance to the visitor centre from a path). In line with the argumentation in chapter 3, I decided not to allocate features to the appropriation value as this value is highly subjective (see also section 2.4.4). The other three values are less subjective: visitors would agree that a bench is a bench and the heath is heath. But whether a bench is 'the bench I always use to enjoy and relax' is not generalizable in this research, so I decided not to include appropriation value in the analysis. Table 5-2 summarizes the independent variables related to network configuration, use value, experience value and narrative value used in this study. The special places (table 4-9) mentioned by visitors are also incorporated in the table[94].

[93] For the measurement of this variable I included only the five car parks where I carried out the fieldwork.

[94] The areas Anserdennen, Lheebroekerzand, Lheederzand, Noordenveld and Dwingeloo Forestry are characterized by square meters of visible agricultural land, waste land, deciduous, coniferous, mixed, or wet forest. The other special places – heath, water, visitor information, sheep farm, catering facilities – are separate categories in table 5-2.

The second and third columns in table 5-2 explain each variable, how I measured it, and what measurement scale I applied. Table 5-2 reveals that I used different strategies to measure the independent variables:

- The file extension Axwoman to ArcGIS was used for calculating integration and connectivity. Integration was measured on a scale from 0 to 1, where 1 means highly integrated. The minimum figure for connectivity is one (a path is connected to at least one other path); the maximum number of connections to other paths in Dwingelderveld is eight (for five paths).
- The numbers of benches and signposts were measured within a buffer zone of 50 meters around the path segment, since this distance included all benches and signposts. I decided to use a buffer zone of 50 meters too, to calculate the percentage of slope greater than 12%, on the assumption that the path segment would show a slope. The level of 12% was chosen since this presents a moderately steep gradient.
- I assumed that roads may disturb hikers for two reasons: they are a source of noise, and they may act as a barrier to cross during a hike. I calculated Euclidian distances – rather than network distances – from each path segment to the motorway passing the area and the regional highway going through it, because sound carries through the air.
- I measured the surfaces of different landscape types around path segments based on visibility. The advantage of a visibility (3D) strategy over a strategy based on maps (2D) can be illustrated by an example: a building might block the view of a beautiful bog behind it. The surface area of distinguishable landscape types around the path segment was calculated with ViewScape Software[95] (Jochem, 2007). I decided to focus the analysis of visible landscape types on an area of 250 meters around a path

[95] A 'viewscape' is a description of all landscape types that are visible from a path segment. The results are based on raster based GIS input files. A landscape type raster (10 meter cell size), provides the items to be observed. All landscape types have an object height and may obstruct the view of cells behind the currently observed cell. In addition to the landscape type, ViewScape Software uses an elevation raster file with the same dimensions as the landscape type raster. This file is used for both the observer height and the total height of view-obstructing objects. A third (vector) file contains the observer viewpoints. On the vector file, every 10 meters of trail a viewpoint is defined. Short trails with a length shorter than 10 meters obtain a viewpoint on the centre point of vector. The observer height is based on the sum of the eye height of a person (1.50 m) and the elevation at the viewpoint. The total height of the landscape is the sum of the elevation and the object height of the landscape type. All cells larger than the observer height will block the visibility of cells behind that cell. For each observer point, a 360 degree viewscape is made. The viewscape consist of the number of cells seen per landscape type and the blocking landscape types (horizon). The maximum view range is 3000 meters, and the statistics are defined in three view zones: foreground (0-50 meters), middle ground (50-1200 meters) and background (1200-3000 meters). The shortest distance to a certain landscape type is calculated, too.

segment[96].

- The distances to catering facilities (use value variables) and most narrative value variables were calculated based on the path network. These facilities are marked on maps and often also signposted in the area. Visitors might plan their route beforehand so that they can visit a certain facility. A network distance is therefore more logical than a visible distance. The only exceptions to this are juniper trees, which are characteristic for the area but are not signposted or mentioned on the visitor maps. I therefore decided to calculate distances to visible juniper trees, rather than network distances.

Table 5-2: Independent variables of physical environment

	Mode of measurement	Scale
Network configuration variables		
Integration	Axwoman (GIS extension)	0-1
Connectivity	To how many other paths does this path connect?	Total N
Distance to car park	Network distance to nearest car park	Meters
Length	Path segment length	Meters
Use value variables		
Pole path	Is the path part of a designated pole route?	1-no; 2-yes
Leaflet path	Is the path part of a designated leaflet route?	1-no; 2-yes
Paved	Is the path unpaved or paved?	1=unpaved, 2=paved
Bench/picnic tables[a]	Total number of benches/picnic tables on the path	Total N
Signpost[a]	Number of signs on the path	Total N
Spier snack bar	Network distance to snack bar	Meters
Teahouse	Network distance to teahouse	Meters
Forest pub	Network distance to forest pub	Meters
Bridle path	Is the path a bridle path? (loose sand)	1-no; 2-yes
Cycle path	Is the path a cycle path? (paved)	1-no; 2-yes

[96] The decision as to which viewscape distance to take into account is arbitrary; it depends on the type of environment, the goal of the 'journey', and the pace at which a person moves through the environment. The U.S. Forest Service identifies a zone of 0.25-0.5 miles (40-80m) as the main visual resource for the viewer (Bacon, 1979; U.S. Forest Service, 1974). However, Ham and Iding (1971) defined a zone of 500 meters. Based on the landscape types in Dwingelderveld, the relatively low speed (of walking) and the assumption that discernable environmental cues might influence a walker's spatial behaviour, I chose a viewscape distance of 250 metres.

Experience value variables		
Width	What is the width of the path?	1 <2m; 2 >2m
Slope[a]	% area slope >12%	Percentage
A28 motorway[b]	Distance to A28 motorway	Meters
N855 regional highway[b]	Euclidian distance to N855 regional highway	Meters
Heath	Area of visible heath	Square meters
Agricultural[c]	Area of visible agriculture	Square meters
Deciduous forest[c]	Area of visible deciduous	Square meters
Coniferous forest[c]	Area of visible coniferous forest	Square meters
Mixed forest[c]	Area of visible mixed forest	Square meters
Wet forest[c]	Area of visible wet forest	Square meters
wasteland[c]	Area of visible wasteland	Square meters
Water[c]	Area of visible water	Square meters
Water[c]	Distance to visible water	Meters
Openness[c]	Area open environment	Fraction area open environment
Narrative value variables		
Radio telescope	Distance to radio telescope	Meters
Lookout Davidsplassen	Distance to Davidsplassen	Meters
Benderse Berg House	Distance to Benderse Berg House	Meters
Holtveen lookout	Distance to Holtveen lookout	Meters
Sheep farm north	Distance to sheep farm north	Meters
Sheep farm south	Distance to sheep farm south	Meters
NM Visitor centre	Distance to Natuurmonumenten visitor centre	Meters
SBB Info centre	Distance to Staatsbosbeheer information centre	Meters
Juniper	Distance do visible juniper trees	Meters

[a] Measured within 50 meters off the path

[b] Measured in Euclidian distance

[c] Measured within 250 meters off the path, using ViewScape software

Data storage

All spatially referenced data (routes, environmental information) were stored in ArcMap, while the non-spatial data (visitor characteristics) were stored in SPSS. The two types of data were integrated in a relational database[97]. Since the path segment is the unit of analysis[98], all the paths in the area were digitized based on the Dutch topographic map 1:10,000. The GPS-recorded routes were linked to the path segments and stored in the database. As there is no efficient automated method of doing it yet, linking the GPS tracks to the path network was a tedious process. However, the advantage of a relational database is that this offers extensive scope for SQL queries (Taczanowska, Arnberger et al., 2008). For example, it is possible to select certain visitors (e.g. first time visitors) and show their spatial behaviour in ArcGIS. Besides visitor density, environmental variables were also linked to the path segments. Subsequently, the spatial data were entered into SPSS.

5.2.3 Data analysis

First, I calculated descriptive statistics to generate an impression of the used environment. In order to compare the four visitor types (connoisseur, happy hiker, disturbed hiker, demanding hiker), I ran correlations with behavioural characteristics such as entry point, weekend/week day, duration of visit, destinations/goals, marked/unmarked trails, hiked length, and attractions visited.

Second, I constructed regression models for visitor density. Without knowing a priori which environmental variables have a significant influence, I aimed to construct a model which minimizes the redundancies between them. I therefore applied stepwise regression, which minimizes the collinearities between explanatory variables (Field, 2004). I also applied a hierarchical multiple regression in which the order of entry is based on logical and theoretical considerations. As explained above, visitor density on each path segment was treated as the dependent variable. As independent measures, I entered the network composition variables first. The result is considered to be a 'null model' of use (Foltête & Piombini, 2007). Then I entered the use value variables (which influence the accessibility of the area and may help visitors to orientate themselves), the experience value variables (which are supposed to provide a generally pleasurable experience), and the narrative value variables (for an extra experience). After every step, the output was checked for collinearities within the data. Variables that produced a variance inflation

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[97] I am greatly indebted to COSTAction E33 (Forest Recreation and Nature Tourism) for subsidizing a 'short term scientific mission' to BOKU University in Vienna, and to Karolina Taczanowska for instructing me on how to develop the relational database (see also Marwijk, 2006).

[98] It is compulsory for visitors in Dwingelderveld to confine their hikes to designated paths.

factor (VIF) of 10 or greater were removed (Field, 2004). I devised several hierarchical regression models for different subgroups of visitors (e.g. the four visitor types).

One limitation of the regression method is that it does not take into account the sequence of paths that make up hikers' routes. However, the network composition variables take the composition of the network into account (i.e. a more integrated path has a bigger chance of being walked upon) and the applied method is assumed to evaluate the importance of physical features in the environment, in addition to the role of the network structure (Foltête & Piombini, 2007).

5.3 Results

5.3.1 An impression of the environment used

Temporal and spatial arrival

The fieldwork was carried out on three weekdays, three weekend days and one public holiday (Ascension Day). The majority of the respondents were enlisted on a weekend day (67%). Most visitors start their hike between 11 and 13 hours. At weekends, visitors tend to start slightly later than on weekdays (Figure 5-2).

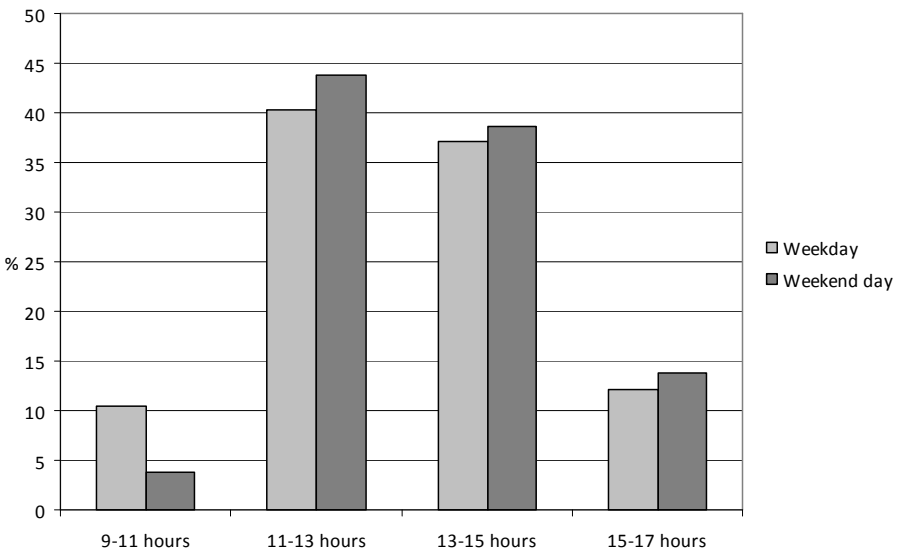

Figure 5-2: Arrival of visitors in Dwingelderveld

The average length of time that people stay in the park is 1:50 hours (ranging from 0:14 to 6:35 hours). Over half of the respondents (53%) arrive at one of the two big car parks in the area (Figure 5-3).

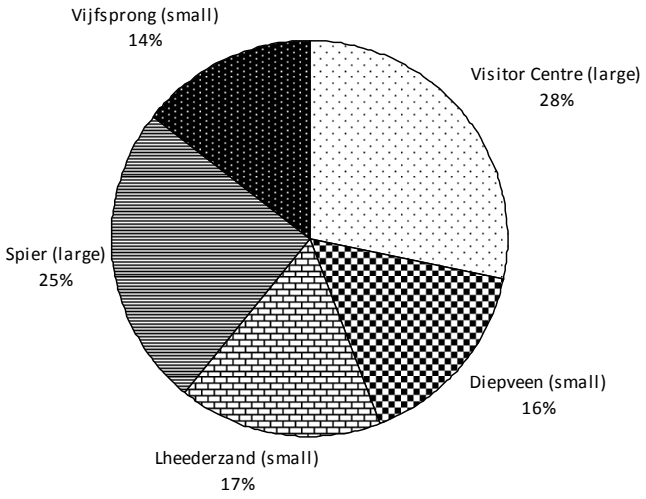

Figure 5-3: Distribution of visitors over car parks

Interestingly, visitors mention different reasons for starting their hike at a particular car park[99] (see table 5-3). While accessibility is the reason given for starting at Spier or Vijfsprong, people start at the visitor centre because of its proximity to the sheep farm. Diepveen is especially referred to as quiet and as the starting point of a specific hike that the respondents intend to make. People start at Lheederzand to visit a particular spot in the area, usually the radio telescope.

[99] Two of the five car parks included in this study can be classified as large (>100 car places), well equipped (information centre, catering), and well advertised from the highway. The other three are relatively small with few facilities (only picnic tables).

Table 5-3: Reasons for a specific car park[100]

	Visitor centre Ruinen	Diepveen	Lheederzand	Spier	Vijfsprong
Accessible	-	0	-	+	+
Sheep farm	++	-	-	0	-
Catering	-	0	-	++	-
Quiet	-	+	-	-	0
Visit certain spot	0	0	++	0	-
Start specific hike	0	++	0	0	-
By accident	-	+	-	-	+

0=0

+/- difference equal to or less than 1.0 SD

++/-- difference more than 1.0 SD

Hiking activity

A relatively large proportion of all visitors (66%) walk a predefined route (marked by coloured poles or described in a leaflet). The signposting in the area seems to be adequate, since only a few people (4%) get lost. Interestingly, half of these are repeat visitors. The most popular route is the red route at Spier. Other popular routes are the white route at Vijfsprong (car park 2, Figure 4-1), the red route at Diepveen (car park 4, Figure 4-1), and the blue and white routes at Spier[101] (car park 5, Figure 4-1).

The dense trail network in the area enables hikers to shorten or extend the predefined route. Predictably, the most common reason for shortening a predefined route is because it is too long, while extending it is generally a result of losing the way. Another obvious behaviour pattern among the non-predefined route hikers is a stroll from the visitor centre to the sheep farm. To sum up: the hikers show five dominant behaviour patterns, which differ significantly from each other (Figure 5-4).

[100] The signs in table 5-3 are derived by subtracting the mean score of all visitors for a reason from the mean for a group for a specific car park for that reason. The remainder is then divided by the standard deviation among mean scores for that reason. This standardization of means enables comparison between the car parks for each reason.

[101] The total number of visitors on these routes: the red route at Spier (n=34), the white route at Vijfsprong (n=19), the red route at Diepveen (n=19), and the blue (n=18) and white route (n=18) at Spier.

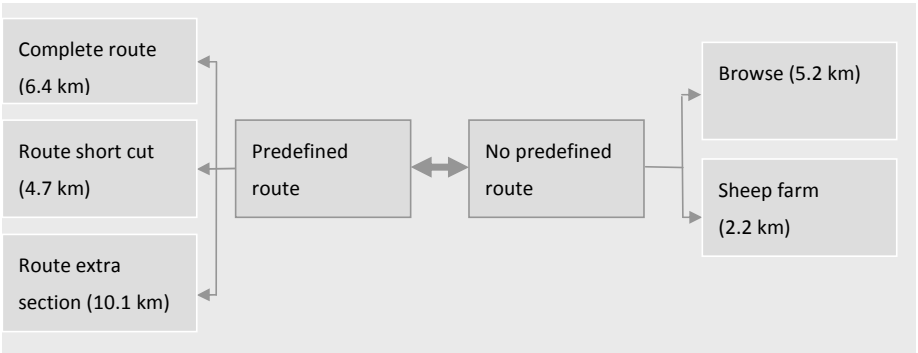

Figure 5-4: Dominant behaviour patterns in Dwingelderveld

Figure 5-5 (a-e) maps out these five behaviour patterns in Dwingelderveld. It becomes clear that the sheep farm (e) is the shortest and simplest route. The predefined routes with short cut (a) tend to concentrate around car parks, while predefined routes with an extra section (b) cover more path segments. The complete route behaviour pattern (c) clearly shows which pole routes are popular. The last browsing behaviour pattern (d) is the most diverse.

Figure 5-5a: Route short cut

Figure 5-5b: Route extra section

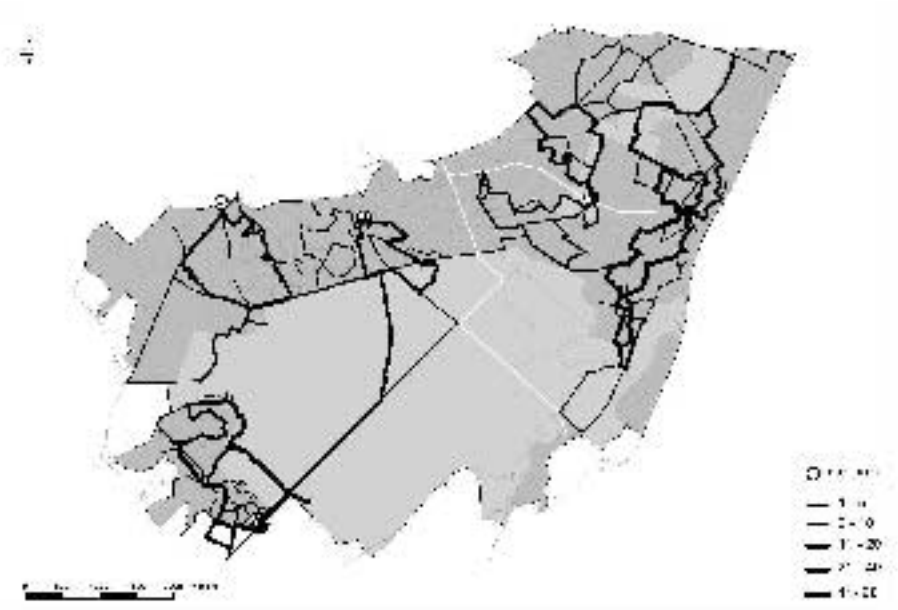

Figure 5-5c: Complete route

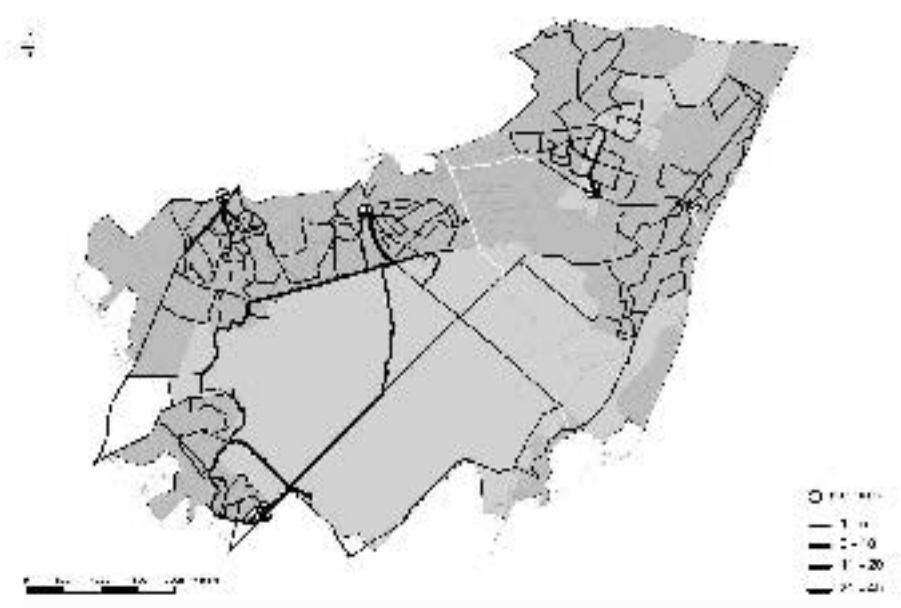

Figure 5-5d: Browsing behaviour pattern

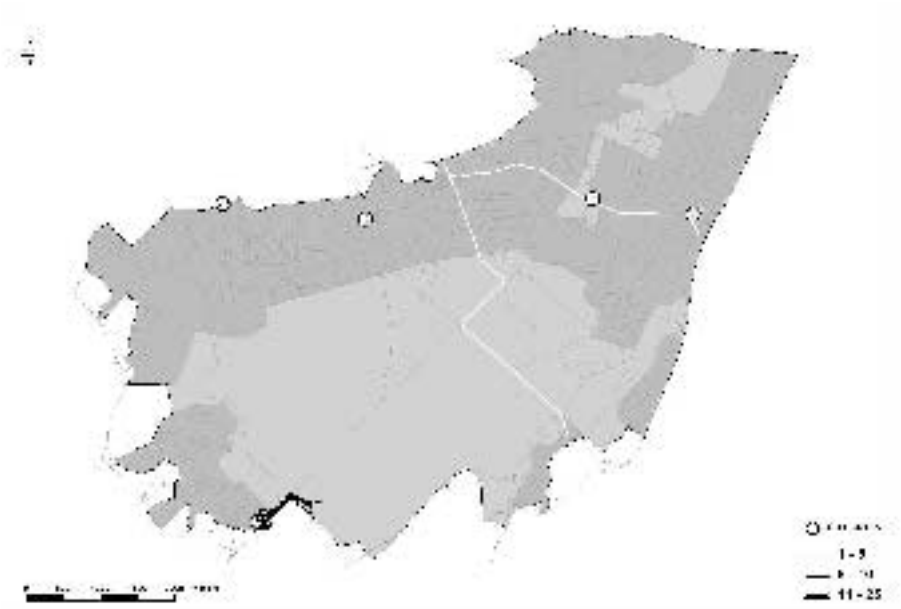

Figure 5-5e: Sheep farm behaviour pattern

Figure 5-5: Mapping dominant behaviour patterns in Dwingelderveld

Only a relatively small group of hikers (N=82, which is about 18%) have a particular spatial goal in the area that they want to visit. Popular goals are the heath (N=15), several bogs (N=12), the sheep farm (N=9) and the teahouse (N=8). These places were also mentioned in the top 10 of special places in section 4.3.3 (table 4-9). Remarkably, while parts of the forest were mentioned as special places as well (Anserdennen, Lheebroekerzand and Dwingeloo Forestry), they were not mentioned as the goal of the hike.

The spatial overview of visitors' stopping behaviour (Figure 5-6) shows that people stop mainly at the heath, close to water, at the teahouse and at the sheep farm[102].

Figure 5-6: Location of stops (based on average stop time per visitor)

While visitors are not very goal-oriented, they may be more oriented towards the environment in general. To locate themselves, visitors mainly use coloured poles in the area (65%) and a visitor map (22%).

[102] Obviously the car parks are – necessarily – places where people make stops.

In conclusion, most hikers in Dwingelderveld start their walk between 11.00 and 15.00 hours and walk about 6 km. They mention different reasons for starting at a particular car park: the sheep farm starting at the car park at the visitor centre, the catering facility at Spier, the quietness and starting point for a specific hike at Diepveen, the chance to visit the telescope at Lheederzand, or the accessibility of Vijfsprong. Most visitors walk a predefined route. The ones who 'browse' walk shorter distances. While only one out of five persons mentions a spatial goal – in particular, the heath, several bogs, the teahouse and the sheep farm – the GPS-recorded routes show that those spatial goals are interesting places to make a stop. Thus, the physical environment clearly influences spatial behaviour. The next section explores this topic further.

5.3.2 The influence of the physical environmental on spatial behaviour

Having given a general description of the environment used, I will now examine the influence of physical environmental variables on visitor behaviour. I have already suggested that there are two main behaviour patterns: the predefined route pattern and the browsing pattern (Figure 5-4). The route choice of people who follow predefined routes is primarily determined by coloured poles. By contrast, those who walk further or take a short cut, and those who display a browsing behaviour pattern may be influenced by other environmental variables as well.

I identified linear correlations between behaviour patterns and environmental variables to get an impression of the relations among them. Table 5-4 displays the significant correlations ($p<0.05$) with average values of 0.1 or greater across the five behaviour patterns[103]. The complete table with all the values can be found in Appendix 2.

[103] For this reason, only one experience value variable is included in table 5-4, for example.

Table 5-4: Correlations between environmental variables and behaviour patterns

	Route complete	Route extra section	Route short cut	Browse	Sheep farm
Network configuration variables					
Integration	.099	.232	.108	.211	.108
Connectivity	.111	.094	.120	.089	n.s.
Distance to car park	-.180	-.147	-.225	-.235	-.107
Use value variables					
Pole route	.721	.427	.446	.294	.138
Leaflet route	.326	.399	.219	.315	.074
Bench/picnic	.254	.292	.262	.350	.125
Paved	.081	.172	.136	.157	.079
Signpost	n.s.	.185	.075	.174	.062
Distance to tea house	n.s.	-.202	-.056	-.167	-.117
Distance to Forest Pub	.157	.087	.124	-.072	.082
Cycle path	.148	.247	.187	.223	n.s.
Experience value variables					
Distance to water	-.189	-.216	-.177	-.122	-.124
Narrative value variables					
Distance to house Benderse Berg	-.066	-.220	-.116	-.204	-.141
Distance to sheep farm south	-.096	-.274	-.136	-.207	-.204
Distance to NM visitor centre	-.108	-.281	-.150	-.205	-.210
Distance to SBB info centre	.102	.133	.101	n.s.	.108

n.s. = not significant

= significant correlation coefficient <0.100

= significant correlation coefficient between 0.100-0.299

= significant correlation coefficient between 0.300-0.499

= significant correlation coefficient =/>0.500

What can be read into this table? Take a look at the Route extra section column. The relatively strong correlation with integration implies that the behaviour pattern of following a route with an extra section takes place on better integrated paths. In other words, visitors do not stay at the edges of Dwingelderveld. The value for connectivity is

lower, but still significant. The positive correlation indicates that the visitor who shows this type of behaviour tends to favour better connected paths. In addition, the negative value of distance to car park implies that he tends to stay relatively close to the car park.

The pole and leaflet route variables show the highest correlations, which implies that the paths that are part of a predefined route are highly likely to be walked upon. This is no surprise, since this behaviour pattern is largely based on a predefined route. Other path characteristics that have a less strong but still noteworthy impact on route choice are whether there are benches along the trail, whether the trail is paved, whether there is signage along the path, and whether the path is a cycle path. The negative correlation with distance to the teahouse implies that this behaviour pattern tends to be concentrated in the area of the teahouse. The distance to the forest pub correlates positively, so it is not visited, although the effect is less strong than in the case of the teahouse.

With respect to experience value variables, only distance to water shows significant correlations ($p<0.05$) with average values of 0.1 or greater across the five behaviour patterns. The negative correlation of -.216 for Route extra section implies that paths in the vicinity of water have a relatively high chance of being correlated with this type of behaviour. The same holds for paths close to the house on the Benderse Berg, and those close to the sheep farm and the Natuurmonumenten visitor centre in the south (all narrative value variables). The Staatsbosbeheer visitor centre at Spier is negatively correlated with the Route extra section behaviour pattern, which implies that this behaviour pattern occurs less in the neighbourhood of Spier than in other areas.

Comparing the four types of variable in table 5-4, we see that the use value variables show the highest correlations. The pole and leaflet route variables show especially strong correlations. In other words, the paths that are part of a pole or leaflet route are much more walked upon than other paths. Remarkably, only one experience value variable shows relatively high correlations. This implies that the visitor densities are not significantly related to a specific type of landscape. Finally, network correlation variables and some of the narrative variables also show relatively high correlations with behaviour patterns. The correlations of the network configuration variables imply that placement of a car park strongly influences the path segments that are used, and that behaviour generally takes place on the better integrated paths, which are situated in the centre of the area.

Comparing the different behaviour types, it is obvious (and expected) that the pole route variable is most important for the behaviour types that follow predefined routes. Nevertheless, the ‘browse’ patterns and, to a lesser extent, the behaviour patterns related to the sheep farm are significantly correlated with pole routes. A possible explanation is that pole routes start from car parks, and to get away from a car park,

visitors almost automatically follow a pole route for a while. This is especially the case for sheep farm-related patterns. Another explanation is that the path segments that are part of predefined routes may be better equipped and maintained than other paths, and therefore more inviting. Path segments that are part of a pole route, for example, have significantly more benches along them than other paths (correlation of 0.21, $p<0.01$). This implies that the relationship between benches and complete route patterns is not so much that path is chosen because of the presence of a bench, as that the bench is placed along a predefined route[104]. In the rest of this section I offer an in-depth analysis of the browsing behaviour pattern.

Browsing behaviour pattern

In general, the network configuration is related to browsing behaviour patterns. Visitors who do not follow a predefined trail tend to walk upon better integrated paths that are in the heath area (correlation .23, $p<0.01$). The correlation table does not make clear whether the degree of integration influences browsing behaviour patterns, or whether it is the heath that attracts visitors who do not follow marked trails (I will come back to this issue below). Furthermore, browsing behaviour patterns are generally shorter than route patterns (with the exception of the sheep farm pattern), which is illustrated by the tendency to make more use of paths in the vicinity of car parks.

Use value variables correlate with browsing behaviour as well. Although the behaviour is not based on predefined routes, it does correlate with paths that are part of such a route. I have already explained that these paths might be more inviting because they feature benches and picnic tables, for example. Paths that have signs also correlate with browsing behaviour. This may be explained by the fact that – unlike the route pattern, which is based on a decision made beforehand – the browsing pattern emerges from a series of off-the-cuff decisions, for which signs are helpful (Findlay & Southwell, 2004).

By contrast, only a few of the experience value variables correlate significantly with browsing behaviour patterns, and the correlations are relatively low. The strongest correlation concerns visible water: browsing behaviour patterns often take place along paths that are close to visible water. The finding that water is attractive has often been documented in academic literature (e.g. Arriaza et al., 2004; Kaplan et al., 1998; Pitt, 1989; Real et al., 2000). However, the findings in table 5-4 suggest that visible water close by is more important than visible water in the wider vicinity: the variable 'area of visible water within 250 meters of the path' does not correlate with browsing behaviour patterns (see Appendix 2). In this regard it is not surprising that the two bogs that can be

[104] I am aware that other independent variables may correlate among themselves as well. Joseph and Zimring (2007) also found associations among predictor variables, such as the length and location of a path (indoor or outdoor). Later in this section I conduct a multivariate analysis to identify variables that account for unique variances.

experienced from nearby – Davidsplassen and Holtveen – are mentioned most as special places in section 4.3.4. The experience value variable 'distance to A28' has a significant but lower correlation (.116, see Appendix 2), implying that browsing behaviour takes place away from the A28 motorway, which is a source of noise. For browsing, heath land (with a correlation of .106) – which is highly correlated with openness (.95, $p<0.01$) – is preferred over mixed and wet forest (with correlations of -.073 and -.057, respectively: see Appendix 2).

Finally, some narrative value variables correlate with browsing behaviour patterns as well. Apparently, the attractions situated on the heath land are the most strongly correlated with browsing behaviour: the radio telescope, Davidsplassen, the house on the Benderse Berg, the sheep farm and the visitor centre (see Appendix 2 for all correlations). However, is it because of these attractions that browsing behaviour patterns are most often created on heath land, or might integration (the paths on the heath) and openness be more important variables? To evaluate the importance of the different variables, I applied a stepwise multiple regression model which minimizes collinearities between explanatory variables.

Table 5-5 shows the results of the regression model for both browsing behaviour and complete route patterns. The model shows that 32.7%[105] of the variation in browsing behaviour (R^2) is explained. The network configuration variables explain 10.1% of the variation. The use value variables explain the largest increase in R^2 (.176). The experience and narrative value variables increase the value of R^2 only marginally. Global integration, distance to car park, predefined routes and benches have the largest β-values (which inform us about the relationship between browsing behaviour and each predictor). The experience and narrative value variables have lower β-values, except for the Staatsbosbeheer information centre, around which there tends to be little browsing behaviour. These findings might be positive news for managers of Dwingelderveld: the position of car parks and benches and the assignment of marked trails – which strongly influence browsing behaviour patterns – are under the direct control of managers, giving them a certain amount of scope for influencing browsing behaviour patterns (R^2 =.327).

For comparison purposes, I also included the regression model for the complete route behaviour pattern in table 5-5. Compared to browsing behaviour patterns, route patterns are – unsurprisingly – easier to predict (R^2 =.628). However, this regression model is somewhat artificial, since the pole and leaflet route variables fully account for route behaviour patterns, and the other variables are a function of where the predefined routes

[105] Foltête and Piombini (2007) reported a value of R^2 of .56 for non-recreational pedestrian behaviour in an urban area with 1750 path segments (compared to 1864 in Dwingelderveld). I have not come across any study that analyses recreational behaviour in nature areas at path segment level.

are situated. In fact, I can only compare the coefficients of the pole and leaflet route variables for the two behaviour patterns. It is logical that the pole route variable has a greater influence on route behaviour (.669 compared to .177). Unexpectedly, however, the leaflet route variable influences browsing behaviour patterns slightly more than route patterns (.175 compared to .114). A possible explanation for this is that the diverse browsing behaviour pattern (see also Figure 5-5d) happens to coincide with the leaflet routes in Dwingelderveld that are shown in Figure 5-7a.

Figure 5-7a: Described leaflet routes

Figure 5.7b: Marked pole routes

To sum up, network configuration and use value variables explain the majority of browsing behaviour patterns. It is assumed that the importance of specific experience and narrative value variables is mainly due to their geographical position in the area. In other words, experience and narrative value variables do not primarily influence browsing behaviour patterns. It might be that the experience values (e.g. the heath, water, forest, openness) and narrative values (e.g. cultural historical and prototypical unique elements such as the sheep farm or the Davidsplassen) act as a pull factor for visiting the area in the first place, but that the path network configuration and use value variables (e.g. predefined routes, situation of car park) determine visitors' actual spatial behaviour in the field.

Table 5-5: Regression model for browsing behaviour and predefined route pattern

Variable	Browsing behaviour			Complete route		
	Standardized coefficient (β)	R^2	R^2 change	Standardized coefficient (β)	R^2	R^2 change
Network configuration variables		.101	.101		.045	.045
Integration	.207					
Path density	.028			.067		
Distance to car park	-.195			-.109		
Connectivity				.009		
Use value variables		.277	.176		.561	.517
Pole route	.177			.669		
Leaflet route	.175			.114		
Paved	.059			.106		
Bench/picnic	.215			.063		
Cycle path	.095					
Bridle path				.049		
Experience value variables		.290	.012		.583	.024
Slope	-.063			-.071		
Wet forest	-.054					
Distance to water	-.043			-.114		
Coniferous forest				.060		
Narrative value variables		.327	.038		.628	.042
Distance to SBB info centre	.159					
Distance to Holtveen lookout	.100					
Distance to radio telescope				.206		
Distance to NMM visitor centre				-.107		

Now that we have gained more insight into different behaviour patterns, I am interested in the relationship between the spatial behaviour of visitors and the meaning they ascribe to the area. Does recreational behaviour differ between different agent types? The next section looks into the behavioural patterns of the four visitor types portrayed in chapter 4.

5.3.3 Spatial behaviour of the four visitor types

In chapter 4, I described four visitor types in terms of their interpretation of the environment: the connoisseur, the happy hiker, the demanding hiker and the disturbed hiker. Each visitor is assigned to one of the four types. Do these groups show differences in spatial behaviour?

Behavioural characteristics of the four visitor types

Table 5-6 shows differences in characteristics between the four groups of hikers. The data show a strong correlation between visitor type and the starting point of the hike. As expected, the connoisseur knows his way and tends to use the smaller car parks. Surprisingly, the demanding hiker also often finds his way to the smaller and more poorly served car parks, whereas I would have expected him to start mainly at larger and better-equipped car parks. The disturbed hiker starts his visit at bigger car parks – although he might conceivably be less disturbed if he started at smaller car parks[106]. The happy hiker tends to start at large car parks as well, even though he rates tranquillity significantly higher than the disturbed hiker does. The happy hiker also usually starts at the large car parks. If he starts at the main visitor centre, it is not because of its accessibility but because of its proximity to a popular attraction relating to the park's sheep flocks.

Most visitors keep to marked trails, with the exception of the connoisseur. This is not surprising, since the connoisseur is the best acquainted with the area. This reinforces the idea that familiarity increases the scope for 'off the beaten track' behaviour (Hwang et al., 2006). Likewise, the connoisseur less often uses sources of information such as maps or information panels in the area.

[106] Disturbed hikers who start at small car parks rate naturalness, attractiveness and annoyance slightly higher than disturbed hikers who start at large car parks, although the difference is not significant.

Table 5-6: Characteristics of hikers

	Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker
Car park (%)				
• large and equipped	39	57	42	75
• small and simple	61	43	58	25
Follow marked trail (%)	44	73	77	69
Use of information[a] (%)	27	57	48	55
Places visited during hike (%)				
• Ruinen visitor centre (NM)	17	29	17	35
• Spier orientation centre (SBB)	2	8	10	15
• tea house	8	19	5	16
• sheep farm	7	21	7	22
Make stop during hike (%)	40	64	57	62
Average time of stay (hours)	1:36	1:56	1:44	2:11
Day of visit (%)				
• weekday	62	41	29	22
• weekend day	38	59	71	78

[a]Examples of information are maps, hike descriptions, poles and information panels in the area, and oral information from the visitor centre

Cramer's V car park: 0.262 ($p<0.001$), marked trail: 0.271 ($p<0.001$), information: 0.235 ($p<0.001$), Ruinen visitor centre: 0.172 ($p<0.05$), Spier Orientation centre: 0.151 ($p<0.01$), tea house 0.174 ($p<0.05$), sheep farm: 0.216 ($p<0.01$), stop: 0.191 ($p<0.005$, day of visit: 0.153 ($p<0.05$). Eta^2 time: 0.038 ($p<0.01$)

Significant differences exist between the types of facilities visited by different visitor groups. While the disturbed hiker goes to the visitor centre most frequently, the connoisseur and the demanding hiker visit it the least. The tea house, an establishment that has served refreshments to park visitors for many years, is most popular with the happy hiker, and is generally popular among hikers who want to meet like-minded others. The disturbed hiker is attracted to the tea house too. This is probably due to the fact that many disturbed hikers tend to begin their visit at the largest car park, which is close to the tea house. The tea house is situated along one of the marked trails. Interestingly, the currant trees are mostly visited by the connoisseur. They are marked on a map, but are probably less of an attraction than the sheep farm, which is visited mainly by the happy hiker and the disturbed hiker.

The connoisseur makes the fewest stops during the hike. He lives close by and visits the area more often than members of other groups. His visits are also the shortest (1:36 hours), while the disturbed hiker spends longer in the park (2:11 hours). Average hike

length does not differ significantly across the four groups (despite being highly correlated with average length of stay: 0.839, P<0.001) and ranges from 5.6 km for the connoisseur to 6.5 km for the disturbed hiker.

All four groups tend to begin their visits at approximately the same time of day. However, while the majority of the disturbed, demanding and happy hikers visit the park mainly during the weekends, the connoisseurs tend to come mainly during weekdays.

To summarize, in several respects the connoisseur behaves differently to the other three groups. He is least likely to follow marked trails, starts at smaller car parks, visits special places, and often comes for relatively short walks that involve few stops. The disturbed hiker and the happy hiker start at large car parks and they follow marked trails, but they experience the environment quite differently. The park is busier, less attractive and less natural for the disturbed hiker than it is for the happy hiker. The demanding hiker tends to begin his trip at less obvious car parks. From those places he walks on a marked trail. The question is why this hiker starts elsewhere. In chapter 4, I explained that this group does not specify explicit motivations: compared to other groups it can be characterized by a lack of motivations. I also explained that this group is the least positive about the attractiveness of the area. Arguably, due to his focus on comfort factors, the demanding visitor would like to have nature as a convenience product, presented in bite size chunks that can be consumed at any moment.

Spatial behaviour of the four visitor types

Figure 5-8 depicts the spatial behavioural patterns of the four visitor types by means of density maps for seven days[107]. The maps suggest some differences in spatial behaviour between the four groups. The behaviour pattern of the demanding hiker (Figure 5-8a) shows the importance of pole routes for this visitor type (77% walk marked trails). At each of the five car parks, one or more pole routes are used. At the Diepveen and Spier car parks (no. 4 and 5), hikers can choose to walk north or south of the N855 road. The demanding hiker mainly stays north of the road, and thus does not have to cross it. The other three hiker types do cross the road at Spier (no. 5).

Compared to the demanding hiker, the happy hiker (Figure 5-8b) tends to visit the west side of Dwingelderveld more, but the red route at Spier is popular too. Like the demanding hiker, the happy hiker tends to follow marked trails (73%). It seems that almost all marked trails that the happy hiker follows pass through at least part of the heath – the special place most often mentioned by visitors in chapter 4. The Anserdennen area is another popular area for the happy hiker (the third most mentioned). Although fewer connoisseurs follow marked trails (44%), the popular ones are clearly recognizable

[107] The gathering of visitor data took place on seven days; see also section 4.2.2.

(Figure 5-8c). Visits are concentrated around the routes at Lheederzand, Diepveen and Spier (no. 3, 4, and 5), as well as on paths across the heath. The three predefined routes all allow visitors an experience of water – the second most frequently mentioned special place. Finally, the disturbed hiker tends to focus on the marked trails from Spier (both sides of the N855 road), on the paths on the heath and in Anserdennen, close to the visitor centre (no. 1).

In conclusion, the spatial behaviour of the four visitor types differs to some extent: while the demanding hiker tends to follow any marked trail, the other groups seem to be distributed around specific routes and places. The happy hiker seems to focus more on open areas, whereas the connoisseur walks on paths beside water bodies. The behaviour of the disturbed hiker focuses around the two main car parks but cannot be identified with a specific landscape type.

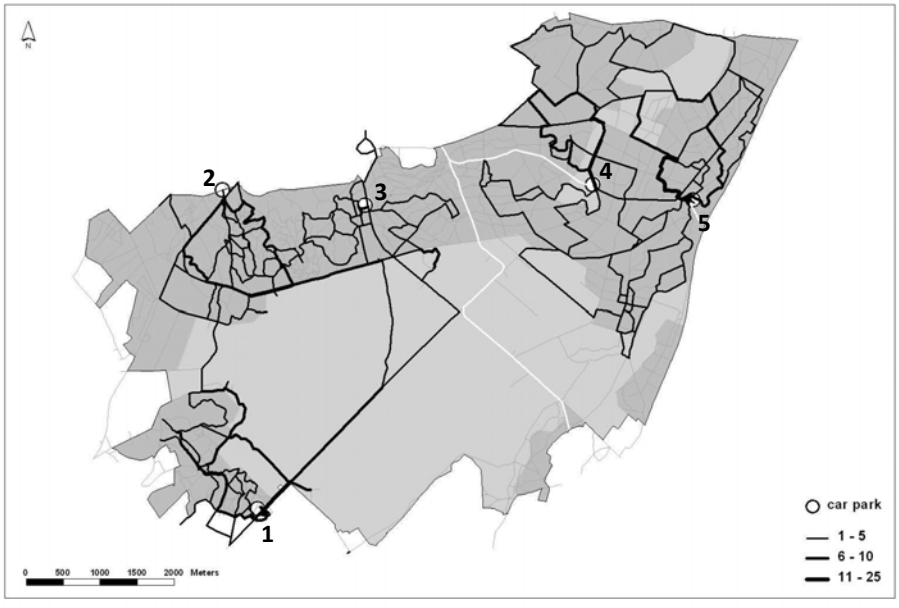

Figure 5-8a: Spatial behaviour demanding hiker

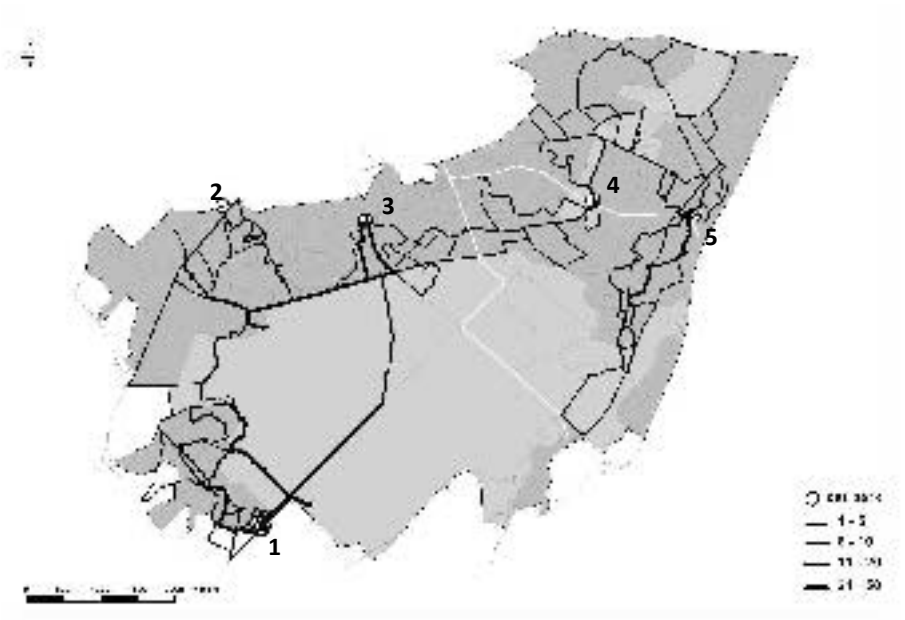

Figure 5-8b: Spatial behaviour happy hiker

Figure 5-8c: Spatial behaviour connoisseur

Figure 5-8d: Spatial behaviour disturbed hiker

Figure 5-8: Density maps of four visitor types as recorded by GPS during fieldwork

While I interpreted the behaviour patterns of the four groups qualitatively, a quantitative analysis of their behaviour may reveal whether the happy hiker really does focus more on the heath, and the connoisseur more on water. To further analyse the spatial behaviour of the four visitor types, I conducted linear correlations between the visitor densities, the four types and environmental variables. Table 5-7 presents significant correlations ($p<0.05$) with average values of 0.1 or greater across the four visitor types. The complete table with all values can be found in Appendix 3.

The correlations are broadly similar to those for the behavioural patterns described in the previous section. Again, the network configuration variables show that the visitor types' spatial behaviour correlates with path segments that are more integrated. In other words: visitors do not stay at the edges. However, the pattern for the demanding hiker correlates less, which may be because this visitor mainly follows pole routes that do not cross the heath (and are therefore the best integrated path segments). This was also clearly visible in Figure 5-8a. A second observation related to the network configuration is that the distance to the car park is an important factor for the spatial behaviour of the four types. The correlation is least strong for the disturbed hiker, who walks the longest distances and consequently may go further away from the car park.

Table 5-7: Correlations between environmental variables and the behaviour of the four visitor types

Variable	Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker
Network configuration variables				
Global Integration	.216	.186	.055	.148
Connectivity	.083	.109	.117	.122
Distance to car park	-.232	-.195	-.246	-.155
Use value variables				
Pole route	.481	.577	.648	.505
Leaflet route	.398	.300	.355	.260
Paved	.080	.134	.087	.121
Benches/picnic	.369	.305	.228	.264
Cycle path	.151	.185	.165	.157
Experience value variables				
Distance to water	-.172	-.196	-.121	-.236
Narrative value variables				
Distance to house Benderse Berg	-.149	-.187	-.054	-.114
Distance to sheep farm south	-.072	-.238	-.079	-.171
Distance to NM visitor centre	-.072	-.248	-.088	-.182
Distance to SBB info centre	-.069	.134	.061	.150

= significant correlation coefficient <0.100
= significant correlation between coefficient 0.100-0.299
= significant correlation between coefficient 0.300-0.499
= significant correlation coefficient =/>0.500

When it comes to the use value variables, the pole route is obviously the most important for the types that mostly follow predefined routes: the demanding, disturbed and happy hikers. Still, connoisseurs tend to use path segments that are part of a predefined route as well. The equally frequent use of paths that are part of a leaflet route may confirm the assumption that visitors favour paths that are better maintained or look more used. Since these paths are not marked in the field, visitors without a route description would not know that the path is part of a leaflet route. In addition, all four groups tend to favour marked trails and paved cycle paths over unpaved paths. But most paths in

Dwingelderveld are unpaved, so hikers do not always have the choice between paved and unpaved paths. However, most cycle paths run alongside an unpaved path. Managers of Dwingelderveld explained that, when hikers have the chance, they often (and maybe not deliberately) walk on the paved path, which can irritate cyclists. Managers explained that they are aware of these tensions. A Natuurmonumenten manager explained that they planned to construct an extra (unpaved) path next to a paved path that is part of a predefined route from the visitor centre. Currently, both hikers and cyclists make use of the same path and complain about each other's presence.

The only experience value variable that shows relatively strong correlations with the behaviour of the visitor types is distance to water. In particular, the disturbed hiker and to a lesser extent the happy hiker and connoisseur tend to hike on paths that afford views of water. From the visual analysis of spatial behaviour, I expected that it would mainly be the connoisseur who would hike on paths close to water.

Moreover, with regard to experience value, I expected that heath would be related to spatial behaviour, particularly that of the happy hiker. However, the correlations for heath are in general relatively low and are therefore not shown in table 5-7. The correlations in Appendix 3 demonstrate that heath is positively correlated with the behaviour of the connoisseur, the disturbed hiker and the happy hiker. In other words: the behaviour of the happy hiker in relation to the heath is not different to that of the connoisseur and disturbed hiker.

Finally, some narrative value variables are related to the spatial behaviour of the four types. The happy and the disturbed hiker are the most inclined to stay close to the house on the Benderse Berg, the sheep farm and the Natuurmonumenten information centre. The spatial behaviour of the connoisseur differs from that of the other groups in that he does visit paths in the vicinity of the information centre of Staatsbosbeheer as well. An examination of the four types' density maps did not suggest that the connoisseur more often stays close to Spier than other groups do. A second look at Figure 5-8 indeed shows that connoisseurs – who stay for the shortest time of all the groups – stay relatively close to Spier (car park no. 5) and less often visit the Ruinen area (which is negatively correlated with Spier, being at the other side of the park). The correlation therefore gives some added insight into visitor behaviour at area level.

In order to evaluate the importance and the mutual correlation of the different independent variables, I applied stepwise multiple regression models for each visitor type (see table 5-8).

Table 5-8: Regression models for visitor types' spatial behaviour[a]

Variable	Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker
R^2	.425	.522	.533	.443
Network integration variables				
Integration	.199	.149		.214
Connectivity		.037	.017	.049
Distance to car park	-.213	-.159	-.170	-.179
Use value variables				
Pole route	.350	.509	.583	.438
Leaflet route	.226	.096	.161	.107
Paved	.059	.131	.086	.123
Bench/picnic	.180	.121	.026	.082
Experience value variables				
Cycle path			.040	
Bridle path	.054	.037	.053	
Distance to forest pub		.120	.143	
Slope	-.076	-.065	-.059	-.079
Agriculture	-.025	-.036	-.045	
Heath			.041	
Mixed forest	-.038	-.046		
Wet forest	-.076	-.069		
Coniferous			.041	
Wasteland		-.039		
Distance to water	-.061	-.091	-.093	-.094
Narrative value variables				
Distance to SBB info centre	.193			.342
Distance to sheep farm north	.123			
Distance to Davidsplassen		-.287		.142
Distance to Holtveen lookout			.106	
Distance to juniper			.035	

[a]Since large numbers of the four visitor types follow predefined routes, the regression analysis is somewhat skewed or artificial (like the regression analysis for complete route behaviour pattern in table 5-5). Since – with the exception of the connoisseur – most visitors follow predefined routes, the effect of physical environmental features on behaviour has more to do with their proximity to marked trails than with

visitors' spatial behaviour alone. However, the table shows differences in the importance of predefined routes between the four groups, which are in accordance with the percentage of visitors that walk predefined routes.

Particularly striking are the large β-values[108] for some of the network integration and use value variables, compared to those of the experience and narrative value variables. Global integration is important for the connoisseur, and for the happy and disturbed hikers. It proved to be less significant for the demanding hiker, who aims – the most of all the types – to follow marked routes. Accordingly, the β-value for pole route is also largest for this visitor type. The distance to car park is important for all types. The β-value for the connoisseur is the largest; probably because this visitor stays the shortest time. The β-value for pole route is lowest for the connoisseur, which is consistent with the finding that this group walks the least predefined routes (44%, compared to over 69% of other groups). Still, the variable pole route is the largest of all values in the regression, meaning that this explains most of the variability in connoisseurs' spatial behaviour.

Table 5-9 shows the change in R^2 for the different steps in the regression. The use value variables contribute the most to the improvement of R^2. The experience and narrative value variables increase the value of R^2 only marginally. The size of the change in R^2 matches the percentage of the visitor types that follow predefined routes: the higher the percentage of people who follow a marked trail, the more important use value variables.

Table 5-9: Change in R^2 for the network, use, experience and narrative value variables

	Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker
Model 1 (network)	.106	.073	.072	.057
Model 2 (add use)	.288	.349	.441	.264
Model 3 (add experience)	.021	.026	.011	.039
Model 4 (add narrative)	.010	.029	.010	.083

[108] The values of β represent the change in the outcome resulting from a unit change in the predictor (Field, 2004).

In conclusion, the design of the area, including the path network, proves to exert a strong influence on visitor behaviour: the siting of car parks and the designation of marked trails influence the spatial behaviour of different visitor types in similar ways. Experience and use value variables have much less influence on the spatial behaviour of all the types, and differences between the groups are small. Water, for example, is attractive to all groups. Which physical feature related to narrative value influences visitors of a given type seems to be a function of its position in the network and the distance from the car park where the visitors start, rather than a decisive factor in their motivation. This is in line with responses to the questionnaire, which showed that only 18% of the visitors have a specific spatial goal in the area. In other words, most visitors visit what is within reach from the car park where they start. The finding that visitors mention different motivations for different car parks may offer a clue. In the following section, I will explore differences in spatial behaviour at the area level.

5.3.4 Spatial behaviour from different car parks

Obviously, behaviour patterns of hikers differ significantly between car parks, since it is likely that only a part of the area can be visited in an average of 2 hours. Figure 5-9 shows the patterns of hikers who start at each car park. While some hikers cross the heath to the other edge of the park, most visitors stay relatively close to the cark park.

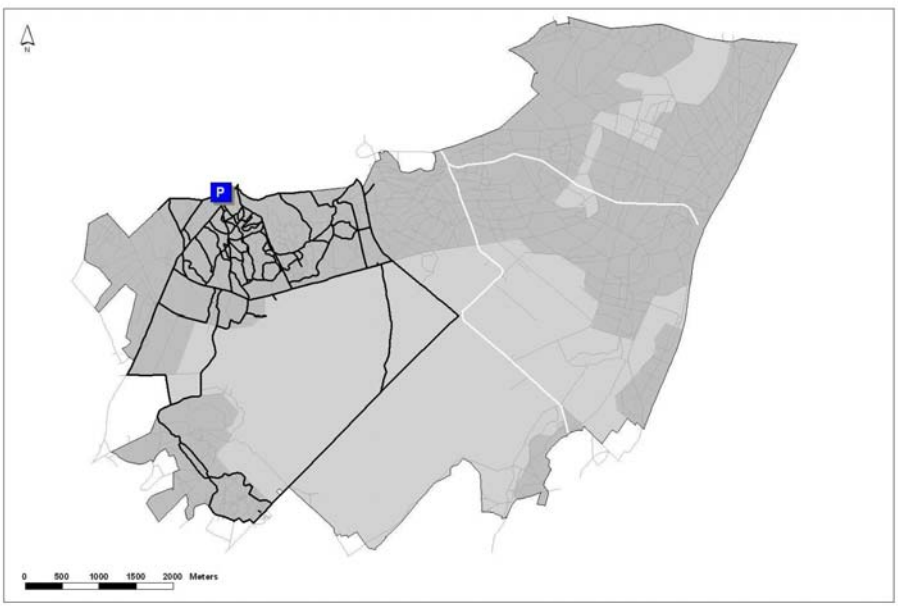

Figure 5-9a: distribution from Vijfsprong

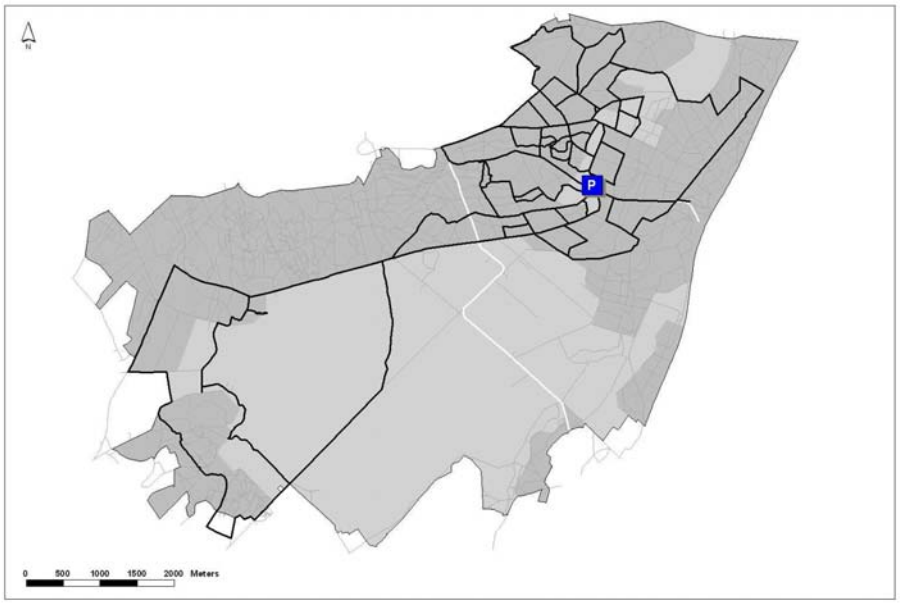

Figure 5-9b: distribution from Diepveen

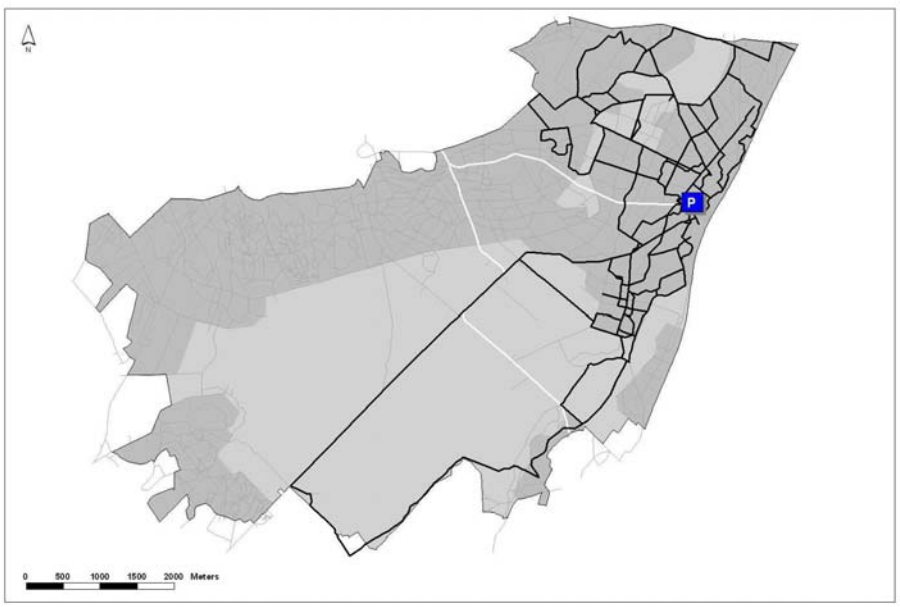

Figure 5-9c: distribution from Spier

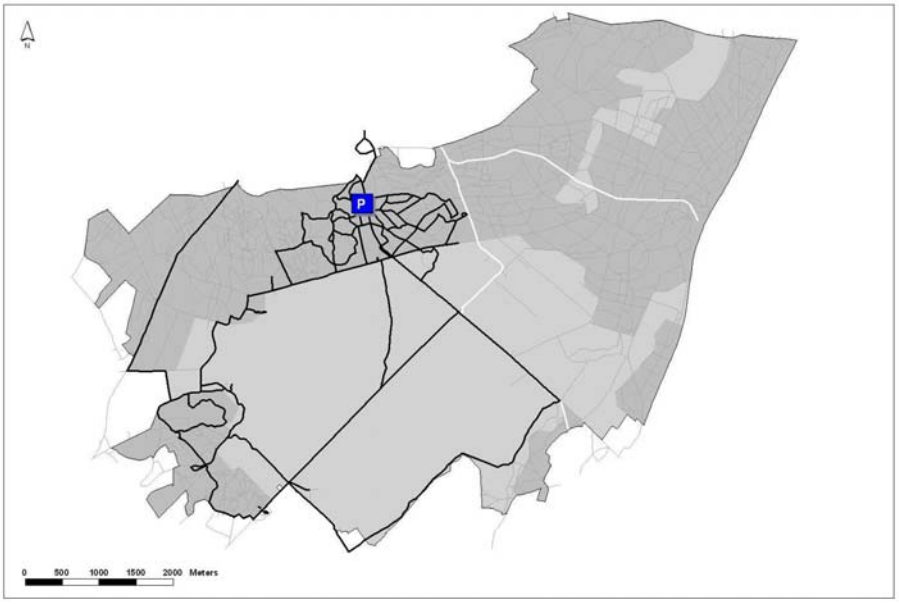

Figure 5-9d: distribution from Lheederzand

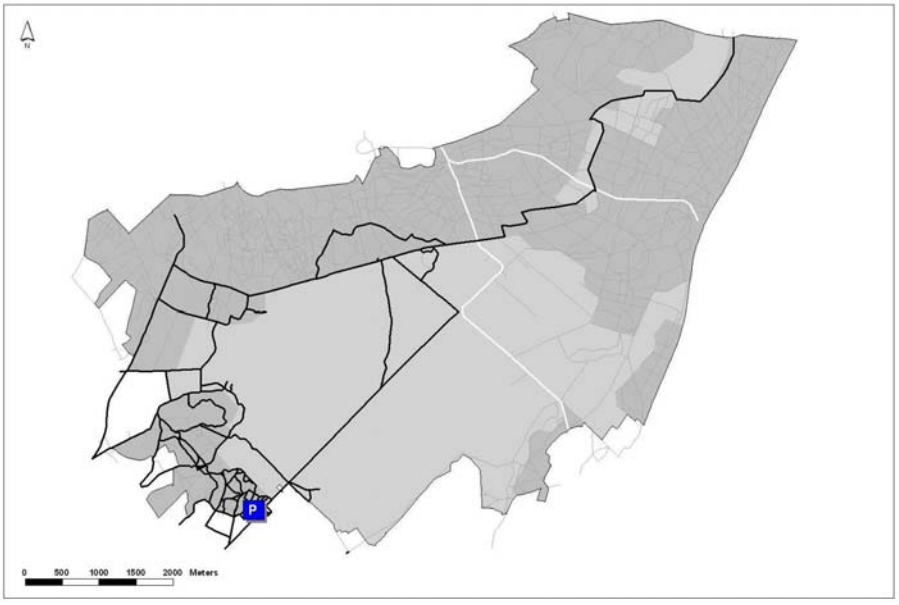

Figure 5-9e: distribution from the visitor centre at Ruinen

Figure 5-9: Spatial behaviour from each car park

Table 5-10 shows significant relations ($p<0.01$) between spatial behaviour and the five car parks. The correlations of network configuration variables vary greatly among the five car parks. Integration, for example, is not an influential factor for hikers starting at Spier. Rather, they stay on the eastern side of the area, which happens to be close to the two roads (A28 and N855). The negative correlations show that visitors do indeed tend to stay near the roads. This shows that the noise is not so important that they decide to visit other parts of the area.

Pole route correlations are relatively high, especially at the two main car parks. A possible explanation may be that these two car parks attract a relatively high number of first time visitors (32% at Spier and 44% at the visitor centre) who tend to follow marked trails. However, the smaller car park at Vijfsprong also attracts relatively many newcomers (39%), but their patterns are less correlated to pole routes. Indeed, relatively many hikers who start at Vijfsprong show browsing behaviour patterns (44% compared to an average of 34% for all five car parks).

Table 5-10: Correlations between spatial behaviour per car park

Variable	Spier	Visitor Centre	Vijfsprong	Lheederzand	Diepveen
Network integration variables					
Integration	n.s.	.114	n.s.	.288	n.s.
Connectivity	.115	n.s.	n.s.	n.s.	n.s.
Distance to car park	-.069	-.118	-.141	-.134	-.084
Use value variables					
Pole route	.387	.328	.195	.166	.258
Leaflet route	n.s.	.244	n.s.	.177	.363
Paved	n.s.	.109	.086	.066	n.s.
Bench/picnic	.161	.137	n.s.	.321	.142
Signpost	n.s.	.112	n.s.	.155	n.s.
Distance Spier snack bar	-.327	.238	.181	n.s.	-.173
Distance to tea house	.252	-.291	-.164	-.066	.139
Distance to Forest Pub	.186	.170	-.192	-.210	n.s.
Bridle path	.078	n.s.	n.s.	n.s.	.155
Cycle path	.084	.075	.218	.079	n.s.
Experience value variables					
Slope	-.086	n.s.	n.s.	n.s.	n.s.
Width	-.082	n.s.	.060	n.s.	n.s.
Distance to A28	-.323	.146	.233	.060	-.125
Distance to N855	-.211	.318	.085	-.047	-.180
Area heath	n.s.	.076	n.s.	.078	n.s.
Deciduous forest	n.s.	n.s.	-.062	n.s.	n.s.
Coniferous forest	n.s.	n.s.	.148	n.s.	n.s.
Mixed forest	n.s.	-.088	-.130	n.s.	.121
Wet forest	.085	n.s.	n.s.	n.s.	n.s.
Distance water	-.155	-.142		-.066	n.s.
Openness	n.s.	.062	n.s.	.156	n.s.
Narrative value variables					
Distance to radio telescope	.165	.104	-.146	-.267	n.s.
Distance to sheep farm north	n.s.	.207	n.s.	-.214	-.100
Distance to Davidsplassen	.263	n.s.	-.288	-.141	.101
Distance to Benderse Berg house	.149	-.226	n.s.	-.241	.062
Distance to Holtveen lookout	-.296	.194	.179	n.s.	-.111

Distance to sheep farm south	.203	-.379	n.s.	-.111	.116
Distance to NM visitor centre	.197	-.397	n.s.	-.096	.113
Distance to SBB info centre	n.s.	.261	n.s.	-.134	-.154
Distance to juniper	-.129	n.s.	.067	n.s.	n.s.

n.s. = not significant

= significant correlation <0.100

= significant correlation between 0.100-0.199

= significant correlation between 0.200-0.299

= significant correlation =/>0.300

Note: the variables 'length of path', 'area wasteland', 'area agriculture' and 'area water' do not correlate significantly to visitor densities.

The correlations of experience and narrative value variables are fairly easy to explain: people tend to visit what is within reach. At Spier, this is the snack bar and Holtveen. Hikers from the visitor centre visit the sheep farm close by and the house on the Benderse Berg (in the middle of the heath). Hikers from Vijfsprong go to see the Davidsplassen. Hikers from Lheederzand visit the radio telescope and the sheep farm close by, while hikers from Diepveen visit the information centre and the adjacent snack bar at Spier. Clearly, the choice of car park largely determines the type of attractions that are visited. For example, since connoisseurs tend to start at smaller car parks, they do not visit the sheep farm and the tea house very often, compared to the happy hiker and the disturbed hiker, who start at large car parks. Thus, while managers are largely able to steer hikers' behaviour in Dwingelderveld, it is important to understand why visitors start at a certain car park (see table 5-3) and to attract visitors to the most appropriate car park for them. The disturbed hiker for example, might experience naturalness, quietness and attractiveness more positively if he is guided to start at smaller car parks.

In order to evaluate the importance and the mutual correlation of the different independent variables, I applied stepwise multiple regression models for each car park (see table 5-11). The values for R^2 show that – compared to the regression models for the visitor types – the models are relatively weak when it comes to explaining spatial behaviour.

Table 5-11: Regression models for spatial behaviour per car park

	Spier	Visitor Centre	Vijfsprong	Lheederzand	Diepveen
R^2	.343	.340	.236	.200	.193
Network configuration variables					
Integration		-.082		.213	
Path density	.033		.098		-.082
Distance to car park	-.185	-.060	.070	-.093	-.064
Connectivity	0.014			-.058	
Use value variables					
Pole route	.372	.278	.242	.087	.155
Leaflet route	-.063	.145	-.070	.050	.299
Paved	.112	.100	-.072		
Bench/picnic	.061	.074		.233	
Signpost	-.080	-.036		.064	
Cycle path	.026		.245		
Bridle path					.091
Distance to tea house					.110
Distance to Spier snack bar				.143	
Experience value variables					
Slope	-.055			-.050	
Width	-.099	-.017	.084		
Agriculture				-.051	
Distance to water	-.013	-.093			
Mixed forest	-.056				
Deciduous forest				.055	
Coniferous forest	.012	-.005	.078	-.047	
Openness			.130		-.060
Narrative value variables					
Distance to Holtveen	-.348				
Distance to Davidsplassen		.171	-.393		
Distance to Benderse berg House			.257		
Distance to juniper	-.040				.057
Distance to SBB info centre	.342			-.079	
Distance to NM visitor centre	.224	-.485			

[a]Since most of the routes per car park are predefined routes, the regression analysis is somewhat skewed or artificial (like the regression analysis for complete route behaviour pattern in table 5-5). Since most visitors follow predefined routes, the effect of physical environmental features on behaviour has more to do with

their proximity to marked trails than with visitors' spatial behaviour alone. However, the table shows differences in the importance of predefined routes per car park.

Although pole routes generally influence spatial behaviour, this is less true for the car park at Lheederzand. Here, visitors tend to walk on the paths that are best integrated, i.e. paths in the middle of the area. Indeed, these paths are most easily and quickly accessible from Lheederzand. At Vijfsprong a cycle path circuit of ca. 5 km is present, which is tempting for people to walk on. Other influential variables are related to the narrative value: the Holtveen lookout, which is visited from Spier, the Natuurmonumenten visitor centre, which is visited from the car park next to it, and the Davidsplassen, which are visited from Vijfsprong. For Lheederzand and Diepveen, no narrative value variables are highly influential on behaviour. The explanatory value of these models is also the lowest of all the car park models.

Table 5-12 shows the change in R^2 for the different steps in the regression. Again, use value variables improve R^2 considerably. However, for Lheederzand, network variables are the most important, while for behaviour patterns from Spier, Visitor Centre and Vijfsprong, narrative value variables add substantively to the improvement of R^2.

Table 5-12: Change in R^2 for network, use, experience and narrative value variables

	Spier	Visitor Centre	Vijfsprong	Lheederzand	Diepveen
Model 1 (network)	.018	.026	.028	.102	.030
Model 2 (add use)	.174	.136	.087	.087	.157
Model 3 (add experience)	.027	.014	.030	.008	.003
Model 4 (add narrative)	.124	.164	.091	.003	.003

Clearly, the models for behaviour per car park are less able to predict visitor behaviour than the models per visitor type (see table 5-8). However, the car park models show which specific attractions, related to narrative value, are important. In conclusion, insight into both spatial behaviour patterns per visitor type, and characteristics of behaviour patterns per car park are useful for managers when rethinking area design and developing visitor management plans.

5.4 Conclusion

In general, hikers in Dwingelderveld show five spatial behaviour patterns: complete predefined routes, a predefined route with a short cut, a predefined route with an extra section, a sheep farm behaviour pattern and a browsing behaviour pattern. These behaviour patterns are influenced by the physical environment. In particular, network

configuration and use value variables are related to recreational walking behaviour. Since 66% of the respondents walked a marked trail, marking is clearly a very effective tool for guiding visitors in Dwingelderveld. Recently, Dann (2003) put this more strongly by suggesting that signs represent a form of social control to constrain visitor movements. The considerable influence of marked trails might explain why the extent of integration (the tendency to visit better integrated paths in the network) is less important, a finding that was also reported for recreational behaviour on retirement community campuses (Joseph & Zimring, 2007) and for urban pedestrian behaviour (Foltête & Piombini, 2007). Indeed, integration is more highly correlated with the behaviour of visitors who do not tend to follow marked trails, such as the connoisseur, although their behaviour correlates with marked trails as well, albeit to a lesser extent. The distance to car parks proves to be another important variable for explaining behaviour. Visitors stay on average 1:50 hours in the park, which is not long enough to visit the whole area. Paths that are closer to car parks therefore have higher visitor densities. Experience and narrative value variables tend to be less predictive of visitor density. These variables might have more influence on the choice of the car park at which to start the walk. Respondents explained, for example, that they chose the car park at the visitor centre because of its proximity to the sheep farm.

The relationship between the interpreted environment and spatial behaviour is not straightforward. The happy hiker and connoisseur show similar interpretations of the environment, while they differ in, for example, their preferences for types of car parks (small or large), their use of marked trails, places visited, and day of visit. Also, small car parks attract both connoisseurs and demanding hikers (similar behaviour), but the two groups construct very different patterns of interpretation. These findings show that insight into the interpreted environment is not enough to predict spatial behaviour. Variation in the interpretations among visitor groups can explain some but not all inter-group differences in visitor behaviour.

This study confirms that the starting point of the hike largely determines which type of landscape visitors will experience, which kind of trail they can use, and which kind of attraction they can visit. People tend to visit whatever is within reach. Similar results have been found for larger scale leisure environments by Elands (2002), who stated that the tourist behaviour patterns are a reflection of the supply structure of a region. It is therefore essential that nature managers clearly communicate the recreational possibilities accessible from each car park to the public (Findlay & Southwell, 2004).

6 Visitors' perceptions of the attractiveness of nature restoration

6.1 Introduction

This chapter further explores one specific dimension of the experience value of Dwingelderveld, namely its attractiveness as a setting for walking. It builds upon knowledge and insights outlined in the preceding empirical chapters. The restoration project[109] that Staatsbosbeheer started in 2003 (described in chapter 3) has met with criticism from a group of residents. According to them, the forest – before the restoration – was 'exquisitely beautiful, intimate and sheltered, and varied in all seasons' (Woudreus, 2008). In other words, their protest is based above all on the attractiveness dimension of the experience value[110] . The analysis of spatial behaviour (chapter 5) did not provide any additional insight into visitors' aesthetic[111] perception of restored nature in Dwingelderveld, or, put differently, whether increasing the naturalness of the forest makes it more aesthetically appealing to the public. However, understanding site-specific perceptions is important since this can be applied to particular planning situations to ultimately increase acceptance of resulting practices (Kearney et al., 2008). For effective planning of restoration projects, it is also important to know whether public perceptions of aesthetics match the ecological objectives of nature managers (Junker & Buchecker, 2008). The relationship between aesthetics and naturalness, however, is ambiguous. Some researchers found a positive relationship between attractiveness and naturalness (Junker & Buchecker, 2008; Ode et al., 2009; Purcell & Lamb, 1998). Others found no clear relationship (Williams & Cary, 2002), or even a negative relationship (Gobster, 1995). Finally, some researchers state that the relationship between attractiveness and

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[109] The project aims to transform the lower section of the forest (ca 150 ha) into a more natural forest that contains wet forest and bog communities.

[110] Chapter 4 focused on the interpretation of Dwingelderveld by its visitors and showed that the experience value of the environment encompasses four dimensions: attractiveness (e.g. variation, beauty), tranquillity or busyness of the park, naturalness (natural character of the park), and annoyance (by both other people and management actions). Three of these four dimensions are related to the Staatsbosbeheer restoration project:

a. Attractiveness – of the forest before restoration, for the protest group. But also the attractiveness of the forest after restoration, which is becoming more varied according to Staatsbosbeheer.

b. Naturalness – of the wet forest and heath areas: Staatsbosbeheer's argument for undertaking the restoration project;

c. Annoyance – at the restoration actions taken by Staatsbosbeheer. For some visitors, the management of the area by Staatsbosbeheer does no justice to the area.

[111] The term aesthetic in this chapter refers to visual attractiveness.

naturalness is assumed to be context specific (Daniel, 2001; Sevenant & Antrop, 2008).

Although the physical properties of the landscape are a major factor in perceived attractiveness (Kearney et al., 2008), characteristics of individuals such as previous knowledge and experience, attitudes, and familiarity with the setting are also important (Kaplan & Kaplan, 1989; Ribe, 2002; Zube et al., 1982). The four visitor types described in chapter 4 differed in their interpretation of attractiveness of Dwingelderveld in general: the happy hiker and the connoisseur were more positive about the attractiveness of Dwingelderveld than the demanding and disturbed hiker were. I expected to find differences between perceptions of attractiveness in traditional and in restored nature settings. More specifically, I expected that the connoisseur and happy hiker would perceive both settings as more attractive than the demanding and disturbed hiker would. In addition, I expected that connoisseurs, who are more familiar with the area and thus with productive forest as a setting for recreation, would rate the traditional settings as more attractive than would the other groups. They are highly attached to the area, which might influence their perceptions.

A further expectation of mine was that perceptions of attractiveness could be influenced by information. Several researchers have suggested that the perception of environments and their (changing) attributes can be influenced by information on for example nature management techniques (Ribe, 2002). Thus, informing the public about the positive impact of restorations on the naturalness of the sites is expected to raise the attractiveness as well (Junker & Buchecker, 2008). This is interesting since Dutch nature managers have indicated that visitors' nature images and expectations often differ from theirs (Bezemer et al., 2001). Public education can help managers to influence public beliefs about ecosystem management and acceptance of related practices (Brunson & Reiter, 1996). This chapter[112], which is the result of a joint research project[113], explains how visitors perceive the attractiveness of nature under both traditional and restoration management. In addition, it explains the impact of information on their perceptions.

[112] Parts of this chapter have been published in the book Landscape, leisure and tourism (Marwijk, 2008).

[113] The presence of Dr. David Pitt from the University of Minnesota at Wageningen University in the year 2007 and the willingness of MSc student Sander Terlouw to undertake a study on landscape perception offered me the opportunity to develop a joint study. I am very indebted to both for their extensive contributions to this research (see also Terlouw, 2008).

6.2 Methods

6.2.1 Study design and variables used

Within landscape perception studies, photographs are often used to depict the scenery[114] (e.g. Berg & Koole, 2006; Fairweather & Swaffield, 2002; Palmer, 2008; Ribe, 2005). Because photographs are quite realistic representations and enable the researcher to control the conditions under which the landscape will be perceived (weather conditions, light, type of elements present, etc.) (Real et al., 2000) they are used to research perceptions of attractiveness. In particular, photographs of settings before and after restoration are used to research perceptions of attractiveness of nature types before restoration (e.g. forest) and after it (e.g. heath and wet forest). However, since the effects of landscape change are usually talked about in negative terms (Gobster et al., 2004), I decided not to include photographs of the process of restoration itself. The Staatsbosbeheer managers aim to create two types of landscapes through restoration activities in drained forests: to transform forest into heath landscape, and into wet forest landscape. These landscapes differ on several dimensions, for example whether there is water visible or not. There has been considerable research into different dimensions or attributes of landscapes that seem to relate to beauty or attractiveness ratings (Real et al., 2000)[115]. However, in a recent study aiming to establish a conceptual basis for landscape perception, Sevenant and Antrop (2008) found that the importance of attributes for the perception of attractiveness is not constant. Different attributes were related to different settings. They conclude that the landscape context should be taken into account when introducing landscape attributes as predictors for perception of attractiveness. An example may clarify this. The presence of trees is generally associated with increased attractiveness across a range of settings (Kaplan & Kaplan, 1989; Kearney et al., 2008). However, in the agricultural landscapes in the north of the Netherlands, the

[114] Critics are concerned that the photographic quality, photographer position and film type account for variance in preferences among viewers (McCool et al., 1986). However, several studies reported high positive correlations between perceptual judgments and preferences based on photographs, and parallel responses based on direct experience of the represented landscapes (1998). Jacobsen (2007) concludes that photographs can be regarded as valid substitutes for site visits if the photographs are appropriately sampled.

[115] These studies are based on the assumption that the process of selection of important attributes in the environment is innately determined and that most people consider the same attributes as important (Appleton, 1975; Kaplan & Kaplan, 1989) (cf. Sevenant & Antrop, 2008). Purcell and Lamb (1998), for example, reported that naturalness, extent, topographic variation, and the presence of water are important attributes related to perception of attractiveness. Real et al. (2000), on the other hand, reported presence of water, artificiality, roughness, and human presence as important attributes. It is generally believed, however, that people tend to prefer natural over human-influenced environments (Coeterier, 1996; Hartig, 1993; Kaplan et al., 1998; Ulrich, 1983).

absence of trees and other vegetation that obstructs views is preferred (Coeterier, 1996).

The landscape types before and after restoration in Dwingelderveld can be characterized in terms of at least four attributes, which – as I will explain shortly – have proved to be relevant for perceptions of attractiveness. It was assumed that these four attributes represented the range of landscape types in Dwingelderveld. Figure 6-1 shows nature settings under traditional management and Figure 6-2 shows nature settings after restoration.

The first attribute that can be used to characterize landscapes in Dwingelderveld is *vegetation type*. The restoration activities in Dwingelderveld result in different vegetation types. Coniferous and deciduous forest stands are transformed into wet forest areas or heath. These restored vegetation types are regarded by nature managers as more natural than the two forest types. Indeed, Purcell and Lamb (1998) report that vegetation is related to naturalness. However, there may be differences between actual naturalness and perceived naturalness (Tveit et al., 2006). For this reason I refer to the different vegetation types and not to naturalness.

The second attribute that I use to characterize these landscapes is the notion of *openness*. The restoration interventions in Dwingelderveld result in a more open landscape. The attractiveness of openness has been related to evolutionary theories. Orians (1980) explained human preference for open landscapes by the fact that these landscapes provided an evolutionary advantage for hunters and gatherers living on the savannah of East Africa at a time when the human brain was developing. Other writers related preference for open landscapes to other survival needs, such as the opportunity for prospect and refuge (i.e. seeing potential predators and prey without being seen oneself (Appleton, 1975; cf. Williams & Cary, 2002), and to visibility, which may be related to Kaplan and Kaplan's theoretical predictor of legibility (Herzog & Kropscott, 2004; Kaplan & Kaplan, 1982). Visual access enhances a person's ability to find his way around in a setting. This seems to be highly relevant for a study in the Netherlands, since a common belief about recreationists among forest managers is that they are afraid of getting lost (Suurmond, 2006).

Figure 6-1: Nature settings under traditional management

Figure 6-2: Nature settings after restoration

The third attribute that I use to characterize landscapes in Dwingelderveld is the *presence of water.* The presence of water is often perceived positively (Arriaza et al., 2004; Kaplan et al., 1998; Pitt, 1989; Purcell & Lamb, 1998; Real et al., 2000). This has been explained in various ways. Some argue that water contributes to perceived naturalness (Real et al., 2000; Tveit et al., 2006) while others point out that water contributes to openness (Coeterier, 1996). A third explanation is concerned with the aesthetic value of water itself: the image of water is continuously changing and people can see a variety of attractive elements (such as sky and trees) in its reflection (Nasar & Li, 2004).

Finally, the fourth attribute that I use to characterize landscapes in Dwingelderveld is *stand age*. This attribute relates to forest landscapes. In general, people prefer stands of tall trees over stands of small trees, unless the latter form the lower canopy layer of a two-storeyed stand (Silvennoinen et al., 2001). In other words: older trees are perceived as more attractive than young trees.

Table 6-1 summarizes the landscape attributes included in this study[116]. Openness is divided into three degrees: closed (<10m depth of view), semi-open (10-100m depth of view), and open (>100m depth of view). Vegetation type is divided into four types: deciduous forest, coniferous forest, bog, and wet forest. The presence of water is related to some of the restored nature areas; in the plantation no visible water is present. The variable stand age only applies to forested sites. These sites are divided into two categories based on their age: either pole timber or saw timber.

[116] Besides the four attributes that I described in section 6.2.1, landscape preference researchers have taken many other attributes into account, ranging from natural attributes – such as level of succession, geometry of patches, fragmentation (Ode et al., 2009), landscape type (Palmer, 2004; Patsfall et al., 1984), landscape composition and configuration (Wherrett, 2000), landform (Sevenant & Antrop, 2008) – to man-made attributes such as roads and houses (Manning et al., 2005). Recent research confirmed the difficulty and undesirability of having a set of unitary attributes as predictors for landscape preferences: the landscape context in which the attributes are applied strongly influences the suitability of the attribute (Morris et al., 2005).

Table 6-1: Landscape attributes related to perceived attractiveness

Attribute	Traditional nature	Restored nature
Openness	Closed (<10m depth of view) Semi-open (10-100m depth of view)	Semi-open (10-100m depth of view) Open (>100m depth of view)
Vegetation type	Deciduous forest Coniferous forest	Wet forest Bog
Presence of water	Not present	Not present Present
Stand age	Pole timber (<25 years) Saw timber (>40 years)	(not applicable)

Combining the attributes for both traditional and restored nature, eight landscape types can be identified that represent the variety of landscapes in Dwingelderveld. For nature under traditional management, these landscape types are: young coniferous forest, old coniferous forest, young deciduous forest and old deciduous forest. The restored landscapes types are: bog with visible water, bog without visible water, wet forest with visible water and wet forest without visible water.

Based on the above literature review, it was hypothesized that the wet forest areas in Dwingelderveld, which are semi-open landscapes with visible water, would be perceived as more desirable than landscapes with dense, especially young, forest.

6.2.2 Stimuli

The study used photographs of forest scenes before and after restoration practices. The stimulus set consisted of 32 colour slides showing eight different landscape types (young coniferous forest, old coniferous forest, young deciduous forest, old deciduous forest, bog with visible water, bog without visible water, wet forest with visible water and wet forest without visible water). The set included four pictures of each of these eight landscape types. Based on Jacobsen's (2007) review of photo-based landscape perception research, it was decided to conduct an on-site study among visitors to Dwingelderveld. Characteristics of the pictures used in the current study are:

- All photographs, except four, were made on the same day (in May 2007, between 9 am and 5 pm) to minimize differences in light conditions and seasonal variation. The four photographs that were not made on that day consisted of three nature settings that had already been transformed and could therefore not be reproduced by the researchers on the same day. They were taken by the forester prior to the restoration. The fourth photograph was also taken by the forester and depicted a restored site that fulfilled the criteria better than the one taken by the researchers.
- The sky on the photographs was uniform. The horizon was set at the same level for all forest settings. All open areas were set at the same horizon level too, although it was different to that of the forest settings, to avoid having too much sky on the photographs.
- All the photographs were taken in Dwingelderveld. All photos of the forest stands were taken within the stand itself and no evidence of active management was visible. Also, a broad range of visual access in terms of depth of view was required. Care was taken to avoid introducing the positive influence of distinctive landmarks such as large or unusually shaped trees in the photographs (Herzog & Kropscott, 2004; Kaplan et al., 1998). Moreover, no setting contained people or visitor facilities. All photographs were orientated horizontally and presented in full-colour and laminated on 14 x 21 cm (A5) cards. The photographs were randomly ordered.

In order to get respondents to evaluate the setting and not the picture itself (Scott & Canter, 1997), the respondents were instructed both orally and in writing to judge the setting depicted on the photograph and not the photograph itself, nor the weather conditions depicted on it.

6.2.3 Procedure on site

Participants used the forced Q-sort method to elicit judgements in a more realistic decision-making context (Pitt & Zube, 1979; Scott & Canter, 1997; Stephenson, 1953). Participants were asked to sort 32 photos into eight piles, following an evaluative protocol. First, the participants divided the 32 photos into two piles containing the 16 most attractive and the 16 least attractive landscapes for their main activity. Then both piles were further divided into piles of eight photographs, again containing the most and least attractive landscapes, and finally the four piles of eight photographs were sorted into eight piles of four photographs. Eventually this led to eight different piles, each containing four landscapes sorted by the participant's perception of the attractiveness of the landscape for walking. Pile one contained the landscape views that the participant regarded as least attractive, and pile eight the landscape views considered most attractive. In this way, each landscape view was given a number from one to eight. The higher the number, the more highly the participant valued the landscape on the given

photograph for attractiveness for walking.

As explained in the introduction, aesthetic perceptions of nature are affected by information on ecosystem management. Positively framed narratives describing nature management strategies such as felling trees or leaving dead trees, can positively influence perceptions of sites (Bliss, 2000). In this research, the interviewers presented almost half (46.2%) of the participants with an information sheet (Appendix 4) explaining the ecological benefits of the restoration management strategy. These benefits were:

- Protecting the wet heath by improving water quality and regime;
- Creating higher biodiversity values;
- Benefiting rare flora and fauna.

The information sheet, which was developed in collaboration with Staatsbosbeheer foresters working in Dwingelderveld, also explained that the landscape would change to become more varied and open. The participants started the sorting procedure after this explanation.

In addition to the photo sort task, participants also completed a questionnaire that asked them about their interpretation of the environment (questions 8, 10, 22 and 24 in Appendix 1) and about socio-demographics.

6.2.4 Respondent sample

Data were collected in Dwingelderveld National Park on two days in May, four days in June and two days in July 2007. People returning from a walk in Dwingelderveld were asked to participate in this research. Like the empirical study described in chapters 4 and 5, this research also focused on hikers, who were interviewed on weekdays as well as weekend days.

Subjects in this study were interviewed at four car parks situated in or next to the forest area that has been or will be transformed. The rationale behind the decision to only interview visitors at car parks close to the restored sites is that the respondents have actually visited the restored sites.

In total, 247 people took part in the research (142 males, 105 females), yielding a response rate of 57%[117]. The mean age of the respondents was 52 years, and ranged between 16 and 84 years. Slightly more men (58%) than women took part in the study.

[117] The response rate for this research is slightly lower than for the GPS study described in chapter 4 and 5 (respectively 57% and 63%). This is probably due to the bigger task of sorting photographs and completing a questionnaire, compared to carrying a GPS and completing a questionnaire in the GPS study.

6.2.5 Data analysis

Comparing landscape types

The data were analysed using the statistical software contained in the Statistical Package for the Social Sciences (SPSS). The raw pile number scores assigned to the photos were used for analysis, unless stated otherwise.

In this study, subjects rendered the same judgement of attractiveness across multiple instances of an experimental treatment (i.e. 16 traditional nature sites and 16 restored nature sites). A repeated measures design was used to account for the sharing of variance across the multiple measurements of attractiveness within a subject. The use of 'repeated measures' means that the same subjects participate in all the components of an experiment. For example: every subject rated four types of pole conifer stands. Thus, a subject's evaluative biases were present in their perceptual judgements of all 32 sites. The raw scores assigned to this landscape type are treated as repeated measures. This method allows comparison of mean attractiveness scores of different landscape types. A repeated measures design partitions variance in a manner that accommodates the non-independent nature of measurements repeated by subjects (Field, 2004).

A general linear model (GLM) repeated measures analysis of variance procedure was used to examine the means of three or more groups of sites (of the eight landscape types). The raw scores (i.e. pile values) assigned to photos within a group of sites were treated as repeated measures (because each respondent rated both the traditional nature sites and the restored nature sites). This method allowed comparison of the mean attractiveness scores of different groups of sites, for example across the four vegetation types (coniferous forest, deciduous forest, bog, wet forest). Mean values for different groups of sites were identified using the Bonferroni procedure with Greenhouse-Geisser estimates of the F statistics. Such procedures enable robust analysis of post-hoc tests that establish valid homogeneous subsets of mean values (Field, 2004). With this method, the mean attractiveness scores of different groups of sites (such as the eight landscape types) could be compared. When only two groups of photos were compared (e.g. traditional nature and restored nature), a paired-samples t-test was used to compare the means. This test is generally used when there are two experimental conditions (in this case traditional and restored nature) and the same subjects took part in the experiment under both conditions (Field, 2004).

Differences in attractiveness for different visitor types

In order to compare differences between visitor types, the respondents were assigned to one of the four types described in chapter 4 (connoisseur, happy hiker, demanding hiker, disturbed hiker) based on their factor scores for the 10 dimensions of environmental values, also described in chapter four. I decided not to conduct a cluster analysis based on the factor scores of the respondents, since the respondents in this study are only visitors

to the north-eastern section of Dwingelderveld. Visitors who entered the area on the southern or western part are not included. The assigning of visitors to one of the four clusters was done by a K-means procedure (classifying only). As a result, 21% of the visitors are classified as connoisseurs, 31% as happy hikers, 21% as disturbed hikers, and 27% as demanding hikers.

Next, a general linear model (GLM) repeated measures analysis of variance was used to examine the means of the eight landscape types for each visitor type. Mean values for the eight landscape types were identified using Gabriel's procedure, since the four visitor groups are slightly different in size (Field, 2004).

Understanding attractiveness

The contribution of multiple environmental characteristics in explaining the variance in the mean attractiveness scores of the photographs was examined using linear regression analysis. Mean pile values were calculated across all 247 subjects and treated as dependent measures. The measures of environmental parameters, including the presence or absence of water, openness of the site, and dominant vegetation type were treated as independent measures. Such methods eliminated a significant amount of variance, as mean scores across all 247 subjects were used. However, they permit regression of the mean attractiveness scores on a multivariate model of environmental parameters.

A forward stepwise model was used to create a final model explaining the effect of the independent variables on the dependent variable. Such a model is unbiased as to which variables to include in the model first. Decisions about variables to include are based entirely on mathematical criteria, as this gives the best idea of the importance of the variables in explaining variance. Since the forward stepwise model made clear which variables were of importance, a hierarchical multiple regression analysis was used to check whether one single independent variable (e.g. water) made a unique contribution over and above the other variables (Field, 2004). The criterion for entering in regression analysis was set to 0.049, and that for removal at 0.05. In order to ensure valid results regarding the importance of any of the predictor variables, the model was checked for multicollinearity. Multicollinearity exists when two or more predictors in a regression model show strong correlation. The variance inflation factor (VIF) indicates whether a predictor has a strong linear relationship with the other predictor(s). The value of the VIF should be well below 10 (Field, 2004).

6.3 Results

6.3.1 Effect of restoration on perception of attractiveness

Table 6-2 shows significant differences in perceptions of the attractiveness for walking between the restored nature sites and the traditional ones. The higher the mean, the higher the attractiveness of the nature type as a setting for walking.

The mean score of 5.8 for restored nature implies that restored natural sites are perceived as more attractive to walk in than traditional nature sites, with a mean of only 3.2. Thus, hikers would rather have views of bogs and wet forest along the path than of coniferous and deciduous forest. At first sight, this result seems surprising, because it is difficult to walk in bogs and wet forest. However, the survey explicitly stated that the respondent was walking on a dry path, and that the view depicted in the picture related to the view from the path. The preference for wet areas may indicate that the respondents understood the survey as it was designed.

Table 6-2: Attractiveness of traditional and restored nature[a]

Variable	Mean (scale 1-8)	Standard error of mean
Traditional nature	3.2	0.04
Restored nature	5.8	0.04

[a]Paired-samples t-test of 16 sites managed with restoration management strategies and 16 sites with old nature management strategies (t-value = 33.31, df = 246, $p<0.001$).

I have already explained that traditional nature and restored nature each include four landscape types. Table 6-3 shows the mean attractiveness scores of all eight landscape types, as perceived by visitors to Dwingelderveld.

Table 6-3: Attractiveness of eight landscape types [a]

Variable	Mean (scale 1-8)	Standard error of mean
Traditional nature		
Young conifer forest	1.9	0.06
Young deciduous forest	2.6	0.06
Old conifer forest	3.6	0.07
Old deciduous forest	4.8	0.08
Restored nature		
Wet forest without water	5.7	0.06
Wet forest with water	6.3	0.07
Bog without water	4.5	0.08
Bog with water	6.6	0.06

[a] GLM repeated measures tests revealed significant differences between landscape types ($F = 547.24$, $df = 4.83$, $p<0.01$).

The four landscape types that are labelled traditional nature sites are generally perceived as less attractive than the four landscape types labelled restored nature sites. One exception, however, is old deciduous forest, which is perceived as more attractive (4.8) than bog without water (4.5). With regard to traditional nature areas, deciduous forest is perceived as more attractive than coniferous forest, and old forest is perceived as more attractive than young forest. Similar findings related to tree age and tree size have been reported by Silvennoinen et al. (2001) and Ribe (1989). They explain that young forests are denser, which allows no visual penetration. In other words, openness might explain the difference in attractiveness between young and old forest.

With regard to restored nature, water seems to be an important factor in determining which landscape type is the most attractive. When no water is present, wet forest is perceived as more attractive than bog. However, bogs with water are slightly more attractive than wet forest with water. Other researchers have shown that people differentiate between landscapes with and without water, and favour landscapes with water (Pitt, 1989; Wherrett, 2000). As indicated above, without water, wet forest is perceived as more attractive than bog. It may be that the presence of trees is appreciated (Silvennoinen et al., 2001), yet this does not explain why bog with water is more attractive than wet forest with water. With the addition of the water element, the complexity of the image increases (Nasar & Li, 2004). Speculatively then, the degree of openness (which is higher in bogs than in wet forest) might be more important in complex landscapes than in more simple landscapes.

In order to understand differences in attractiveness between different traditional and restored landscape types, the next section explores the effects of the four landscape attributes on perceptions of attractiveness.

6.3.2 Effect of landscape attributes on perception of attractiveness

To further explore the differences between traditional and restored nature sites, the mean scores for the four landscape attributes were compared. Table 6-4 shows the results for the four landscape attributes included in this study: stand age, vegetation type, presence of water and openness.

The attribute stand age refers only to forest sites (and not to bogs), and is therefore relevant to 16 photographs that are rated as traditional nature. The sites containing old forest (4.2) are clearly preferred over sites with young forest (2.3).

The second attribute is vegetation type. Four vegetation types are distinguished: coniferous forest, deciduous forest, wet forest and bogs. Each type is represented by eight photographs. Table 6-4 shows significant differences between the four groups. As a setting for walking, coniferous forest is perceived as least attractive (2.8), and wet forest as most attractive (6.0). The low preference ratings for young forest, closely followed by higher preferences for older forests is consistent with previous research (e.g. Brunson & Shelby, 1992). The lower ratings for young forest in particular, and to a lesser extent those of older forest, are also supported by the literature, which explains that young forest decreases visibility (Herzog & Kropscott, 2004; Kaplan & Kaplan, 1989).

Deciduous forest was rated higher than coniferous forests, perhaps because the coniferous forests consist largely of exotic tree species, which have been shown to be less popular than native species (Herzog et al., 2000). Neither coniferous nor deciduous forest sites contain water, and they are less spacious than sites containing bogs and wet forest. The scores for those two parameters suggest possible explanations for the difference in perceived attractiveness of the four vegetation types. For example, the presence of visible open water (the third attribute) is perceived as more desirable for walking (6.4) than sites without water (3.9). This ties in with results from previous research (Kaplan & Kaplan, 1989; Pitt, 1989; Wherrett, 2000). In addition, the effect of openness (the fourth attribute) is also significant across the three openness conditions. Closed sites are seen as the least desirable as a setting for walking (2.3), while open sites are rated highest (5.5). This last finding might explain why bogs with water are preferred over wet forest with water (section 6.3.1).

It was hypothesized that semi-open landscapes containing water would be perceived as more desirable than landscapes with dense (especially young) forest. Indeed, semi-open landscapes (which contain old forest and wet forest, with 10-100m depth of view) are

rated as more attractive as a setting for walking than young forest stands (5.1 versus 2.3). However, semi-open landscapes are rated significantly lower (5.1) than open landscapes (5.5). This lower rating for semi-open landscapes was assumed to be caused by the rating for older forests (4.2), which were defined – like wet forest (6.0) – as semi-open. Indeed, analysis of open landscapes with and without water proved that open landscapes are seen as especially desirable when water is present. Open landscapes with visible water have a mean rating of 6.6, compared to 4.5 for open landscapes without visible water.

Table 6-4: Attractiveness of landscape attributes[a]

Variable	Mean (1-8)*	Standard error of mean	Test
Stand age			T-test:
Young forest	2.3	0.05	t-value = -27.02
Old forest	4.2	0.05	df = 246, p<0.001
Vegetation type			
Coniferous forest	2.8	0.05	Greenhouse-Geisser
Deciduous forest	3.7	0.05	F(672.05)
Bog	5.5	0.04	df = 2.36, p<0.001
Wet forest	6.0	0.04	
Presence of water			T-test
No water	3.9	0.02	t-value = 35.09
Water	6.4	0.06	df = 246, p<0.001
Openness			
Closed	2.3	0.05	Greenhouse-Geisser
Semi-open	5.1	0.03	F(1049.51)
Open	5.5	0.06	df = 1.81, p<0.001

[a] Paired samples t-tests (for stand age and presence of water) and GLM repeated measures tests (for vegetation type and openness) show significant differences between classes of landscape attributes.

In conclusion, the analysis of the four landscape attributes of stand age, vegetation type, presence of water and openness reveals higher attractiveness ratings, respectively, for old forest than for young forest; for bog and wet forest than for coniferous and deciduous forest; for sites with visible water than for sites without visible water; and for open than for closed landscape types.

6.3.3 Differences among visitors

The foregoing sections described the general differences between different landscape types. This section explores whether there are differences among the four visitor types: connoisseurs, happy hikers, demanding hikers, and disturbed hikers. In contrast to my expectations, there are no significant differences among visitors in their ratings of the attractiveness of different landscape types. Table 6-5 shows the mean ratings per visitor type. Connoisseurs and happy hikers do not rate any landscape type as significantly more attractive than demanding and disturbed hikers do. And the connoisseurs, who live locally and are assumed to know the area well and to be familiar with traditional nature (e.g. timber plantations), do not rate traditional nature as more attractive than other groups do. This outcome is in sharp contrast to the views of the Woudreus action committee, which vehemently protests against the nature restoration project. Kearney et al. (2008) reported similar findings for a national treasure in North America. They conclude that the discovery of shared perspectives among groups (such as nature managers and visitors) may facilitate a resolution of the controversy. Hagerhall (2001) also reported consensus in landscape judgements, and suggested that people have developed a strong commonly shared mental representation for especially well-liked landscape types. These mental representations result in a high level of consensus in judgements.

Table 6-5: Differences in preferences for landscape types among connoisseurs, happy hikers, demanding hikers and disturbed hikers[a]

Landscape type	Connoisseur N=53	Happy hiker N=76	Demanding hiker N=66	Disturbed hiker N=52
Traditional nature	*3.2*	*3.2*	*3.2*	*3.4*
Young conifer forest	1.8	1.9	1.8	2.0
Young deciduous forest	2.5	2.6	2.6	2.7
Old conifer forest	3.6	3.4	3.7	3.9
Old deciduous forest	4.9	4.7	4.8	5.0
Restored nature	*5.8*	*5.8*	*5.8*	*5.6*
Wet forest without water	5.9	5.7	5.6	5.6
Wet forest with water	6.2	6.3	6.4	6.0
Bog without water	4.4	4.6	4.4	4.3
Bog with water	6.6	6.6	6.7	6.5

[a] GLM repeated measures test revealed no significant differences between visitor types.

6.3.4 Understanding attractiveness

Since no significant differences for visitor types were reported, a regression model for attractiveness was developed, based on the average ratings of all visitors (N=247). A regression model gives insight into the relative contribution to attractiveness of each independent variable (in this case the landscape attributes). The independent variables are to some extent correlated, e.g. open areas may contain water, and bogs and wet forest are by nature more open than coniferous and deciduous forest. A regression model presents the unique variances that each independent variable accounts for.

The study includes four landscape attributes (stand age, vegetation type, presence of water and openness) that serve as independent variables. However, when creating a model to assess the relative effects of the four landscape attributes, stand age has to be omitted, since this only applies to the forest stands (16 of the 32 photos). As a result, the regression model only takes vegetation type, presence of water and openness into account. Mean attractiveness values across all 247 subjects were calculated and treated as dependent variables.

Table 6-6 shows the regression model based on three independent variables. In order of magnitude, openness (.82), vegetation type (.54) and the presence of water (.34) predict the attractiveness score for walking quite successfully. The explained variance (R^2) of .89 implies that 89% of the variance in the outcome (for predicting attractiveness for walking) is accounted for by the three variables of water, openness and vegetation type. This is slightly higher than found in other researches (Eleftheriadis & Tsalikidis, 1990; Palmer, 2004; Pukkala & Kellomäki, 1988; Silvennoinen et al., 2001; Ulrich, 1986).

Table 6-6: Linear regression model predicting attractiveness for walking

Variable	Standardized coefficient (β)	R^2	R^2change
Openness	.82	.50	.50
Vegetation type	.54	.80	.30
Water	.34	.89	.09

6.3.5 Effects of information

Finally, we are interested in the differences in perceptions of attractiveness between visitors who were informed of the benefits of the restoration management strategy and those who were not. Table 6-7 shows that receiving information does indeed influence visitors' perceptions. The table shows that visitors who were informed about the benefits of the restoration management strategy perceive sites under traditional management as significantly less attractive (3.2) than visitors who were not informed (3.3). Also, visitors

who were informed about the benefits of the restoration management strategy perceive sites after restoration as significantly more attractive (5.8) than visitors who were not informed (5.7).

Table 6-7: Effects of information on attractiveness[a]

Type of nature management	Informed	Mean (1-8)	SD
Traditional management	No	3.3	0.6
	Yes	3.2	0.5
	Total	3.2	0.6
Restoration	No	5.7	0.7
	Yes	5.8	0.5
	Total	5.8	0.6

[a] A GLM repeated measures test shows significant differences between visitors ($F = 3.851$, $df = 1$, $p<0.051$).

In short, informing visitors about the restoration management strategy leads, as expected, to perceptions of greater attractiveness for restored sites (bog and wet forest), and perceptions of less attractiveness for sites under traditional management (coniferous and deciduous forest).

6.4 Conclusion

The present research examined Dwingelderveld visitors' perceptions of the attractiveness of different landscape types as a setting for walking. The results show that landscape types that result from restoration measures – taken by forest managers to enrich the quality of nature – are more attractive as a setting to walk in than landscapes under traditional management, especially when people are informed about the ecological benefits of the restoration strategies.

The mean attractiveness score among 247 participants for traditionally managed sites is 3.2, compared to 5.8 for restored nature sites. Thus, people would rather walk through bog and wet forest than through deciduous and coniferous forest plantations. The more natural sites are thus perceived as most attractive, a finding similar to that of Kearney (2008). While other researchers also found preferences for natural over more managed settings (e.g. Arriaza et al., 2004; Berg & Koole, 2006; Buijs et al., 2004), Berg and Koole (2006) reported higher preferences for more managed nature among residents than among non-residents. However, whereas I only asked respondents to visually assess the picture, Berg and Koole added information to each picture about its status (actively or passively managed).

Further analysis of the landscape types showed low attractiveness ratings for young

forest, and higher ratings for older forests. Deciduous forest was rated higher than coniferous forests, perhaps because the coniferous forests consist largely of exotic tree species, which have been shown to be less popular than native species. Landscapes containing open water were rated significantly higher than those without visible open water. The lower ratings for young forest, in particular, might be explained by lower visibility in these stands. In fact, a linear regression model revealed that openness is most important, explaining 49% of the variance. Vegetation type explained another 31%, followed by presence of water, which explained 10% of the variance. Together, these three landscape attributes explain 88% of the mean attractiveness of a landscape in Dwingelderveld.

Contrary to expectations, there are no differences in attractiveness ratings among the connoisseurs, happy hikers, demanding hikers, and disturbed hikers. All groups rated restored sites as more attractive than traditionally managed sites. This result implies the existence of a shared perspective among nature managers and visitors. However, the existence of resistance to the restoration strategies implies that the experience of nature is more than only visual. Possibly, photographs are not suitable for capturing appropriation value, which I assume is also affected when restoration practices take place.

In addition to the influence of specific properties of nature scenes on perceptions, the results show that the presentation of information positively influences the mean attractiveness scores of nature sites that result from new nature management strategies. Thus, carefully crafted and positively framed narratives describing management intentions can elevate people's ratings of scenic quality. An earlier example of this was given by Anderson (1981), who found that photos that were labelled as 'wilderness area' or 'National Park' were preferred over the same scenes labelled as 'recreation area' or 'commercial timber stand'. Berg and Koole (2006) stated that there had been local resistance to nature development in their research area, and argued that 'higher preferences for managed nature by residents of this area may have reflected a momentary influence of the planned-change context' (p. 370). Thus, narratives addressed the appropriation value of locals who did not want the landscape to change.

The restoration project in Dwingelderveld met with local resistance too. The findings of this study show that landscape aesthetics and preferences entail more than only visual aesthetics. In order to fully understand local resistance, we need to consider the scale and time horizon of ecological restoration, as well as contextual factors such as knowledge of the targeted ecosystem, and understanding and appreciation of management objectives (Shindler et al., 2002).

7 Simulation of outdoor recreation

7.1 Introduction

Managers of nature areas need reliable and valid data about visitor use in order to make effective decisions on both nature protection and recreational use. In the past decades, recreation simulation models have been developed as a tool for understanding and predicting how distributions of recreational use are likely to change in response to management actions (e.g. development of new trails, installation of new car park). Besides measuring visitor use levels and testing alternative management practices, simulation models can also help to improve the communication of ideas between managers and the public (Gallagher et al., 2007; Lawson et al., 2008). Colas et al. (2008) reported that modelled visual representations of visitor densities for different management options (e.g. closure of car parks) 'almost totally obviated opposition to management changes' (p. 167).

If recreation simulation models are really to be used in decision making, it is essential that the model output is reliable and valid[118]. Reliability refers to the consistency of the measurement, or the degree to which an instrument measures the same way each time it is used under the same conditions with the same subjects. Validity refers to the degree to which a study targets what the researcher had in mind. In other words, reliability is concerned with the accuracy of the measuring procedure or instrument, while validity[119] is concerned with the study's success at measuring what it is supposed to measure (Howell et al., 2005; Nooij, 1990). With regard to modelling, methods have been developed to test both reliability and validity. Itami et al. (2008; 2005) developed a methodology to estimate the number of replications needed to obtain desired levels of precision for the model output. This methodology can be applied to develop a reliable simulation model.

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[118] One problem in the scientific community of modelling is the confusion on terminology. The terms validation and verification, for instance, are used with different, and sometimes interchangeable meaning by different authors (Refsgaard & Henriksen, 2004). For example, real data may be used to test simulation models, which is referred to by different authors as verification (Skov-Petersen, 2005), calibration (Law & Kelton, 2000; Lawson et al., 2003), and validation (Howell et al., 2005; Nooij, 1990). In this chapter I use definitions for reliability and validity from a social science perspective (Howell et al., 2005; Nooij, 1990).

[119] In fact, researchers should be concerned with both internal and external validity. Internal validity refers to the question whether the means of measurement are accurate and whether they are actually measuring what they are intended to measure. External validity refers to the ability to generalize the results to other settings (Manning et al., 2005; Skov-Petersen & Gimblett, 2008). In this chapter I focus on the internal validity only: whether MASOOR is able to simulate behaviour in Dwingelderveld accurately.

With regard to validity, the most powerful technique is to compare model output data with data from the actual system the model is designed to replicate (Law & Kelton, 2000).

This chapter addresses the validation of the recreation simulation model MASOOR[120] (Multi Agent Simulation Of Outdoor Recreation) (Jochem et al., 2008). MASOOR is a rule-based simulation model[121], which implies that it makes use of autonomous agents[122] that are able to gather information, make decisions and adjust their behaviour according to the specific environmental circumstances (Itami et al., 2005). The challenge for MASOOR – as for any simulation model – is to capture the essential behaviour of the system being modelled. In outdoor recreation, this means capturing and representing the characteristics of the physical environment, and modelling the behaviour of multiple visitors as they interact with the environment and with each other (Cole, 2005; Manning et al., 2005). In order to do this, scientists agree that the design of simulation models should be grounded in reality, i.e. the behaviour of agents should be based on empirical data (Gimblett et al., 1996; Taczanowska, Arnberger et al., 2008). However, in practice it is often too costly to conduct an empirical study to gather input for simulation models (oral statement Itami, 2008[123]). The requirement of providing initial data – e.g. spatial

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[120] MASOOR was built by René Jochem, who works as a modeller on the Ecological Models and Monitoring team at Alterra. I am very grateful to him for familiarizing me with simulation models and for offering me the chance to cooperate on the application and development of MASOOR.

[121] Besides rule-based models, there are broadly two other approaches to outdoor recreation modelling: trace, and probabilistic models (Manning et al., 2005; Skov-Peterson & Gimblett, 2008). Trace models simulate routes that are collected in the field. Survey data reveal points of arrival, itineraries and duration of stops at destinations, which are directly simulated in a trace simulation. These kinds of simulation are useful for examining existing use patterns. However, the problem with this approach is that there is no room for variation: the trips collected are only a sample of the actual behaviour patterns. Probabilistic models are able to take random variation into account. The simulated routes consist of segments. The probability of selecting the next segment is based on the probability distribution of all segments that originate from the current position. Probabilistic simulation assumes that the distribution of routes will remain the same, even if the environment changes. This assumption may be inappropriate for environments that change, for example when new paths are constructed, or when behaviour may change due to different recreation types. Rule-based simulation models may be most appropriate for simulating outdoor recreation. These models use autonomous agents that are able to gather information, make decisions and adjust their behaviour according to the specific environmental circumstances.

[122] An 'agent' may represent a single person or a group of recreationists. An agent can be described by variables such as group size, speed, environmental preferences, and time budget. O'Sullivan describes agents as 'a piece of computer code capable of autonomous, goal-directed actions' (O'Sullivan, 2008, p. 541).

[123] During a two-hour parallel workshop on the Fourth International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas, a group of scientists and practitioners discussed application, management and communicative aspects of agent-based simulation models (d.d. October 16, 2008).

data, data specific to various user groups, and ecological data – frequently leads to a rejection of the modelling approach, simply due to the lack of resources (Pröbstl et al., 2008). An often applied solution is to work with qualitative input data from stakeholder interviews on recreational behaviour (e.g.Itami, 2008). It is important that the available data is of high quality , since 'any computer simulation is only ever as good as the data on which it is based' (Loiterton & Bishop, 2008, p. 115). I will investigate how the validity of MASOOR can be improved with the empirical data presented in chapters 4 and 5, which showed that the majority of all the hikers in Dwingelderveld walk predefined routes (66%). This implies that a relatively large proportion of all walking behaviour in Dwingelderveld can be predicted without a simulation model[124]. Less easy to predict are browsing behaviour patterns, so that a simulation model may have more added value here. For this reason, this chapter focuses on simulating browsing behaviour patterns.

This chapter starts with a description of the methods, including an explanation of MASOOR, and of how three simulation models were developed. The results section then elaborates on the output of each model and describes their validity. The chapter ends by reporting the main findings.

7.2 Methods

7.2.1 Model description[125]

MASOOR is a visitor simulation model for front country areas containing high density trail networks. The behaviour of recreationists is an outcome of the dynamic interaction of cognitive agents capable of determining a route according to their own preferences and characteristics with the social and physical configuration of the environment. The agents in MASOOR respond to specific events (e.g. seeing an attraction or crowds of people and changing direction), but also have a knowledge of the total environment in which they operate.

Environment

MASOOR uses GIS data to represent the environment. The path network consists of path segments that are stored as vector data and to which attributes can be attached, such as surface type (e.g. paved or unpaved), attractions and attractive areas. Attractions (e.g. viewpoints, visitor centres, catering outlets) are represented as point data. Attractive areas such as water bodies are represented as raster data.

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[124] In fact, you do not need a simulation model to simulate where the marked route followers go, as long as you know what percentage of the population follow marked routes and where they start.

[125] The description of MASOOR is based on Jochem et al. (2008) and Jochem & Greft (2002).

Agents

In the context of MASOOR, visitors become individual agents in a multi-agent system. An agent acts according to behavioural rules and is described by behavioural characteristics (e.g. speed and duration of visit). Different types of agent can be included, such as family group, dog owner, jogger, or cyclist. Each agent has its own importance values for behavioural rules and behavioural characteristics.

Behavioural rules

Agent behaviour is based upon various behavioural rules. Each behavioural rule gets an importance value ranging from 0 (not important) to 10 (very important for behaviour). The behavioural rules are:

- Global heading: setting importance for heading towards the location of desired destinations (e.g. attractions);
- Path appeal: setting importance for agent's preferences for different types of path design and surfaces;
- Homing direction: setting importance for directing agent to the exit gate;
- Chunking direction (or local heading): setting importance for continuing on path segments that continue in an established direction;
- Path segment history: setting importance for previously unvisited paths;
- Shortest distance: setting importance for choosing path segments that require the least time to reach a destination (e.g. the exit);
- Crowding: setting importance for agent to choose alternative path segments with fewer other agents;
- U-turn: setting importance for agent not to choose the path that has just been just used;
- In time: setting importance for agent not to exceed his time budget.

Behavioural characteristics

Besides the behavioural rules, behavioural characteristics need to be specified for each agent type. These are:

- Time: duration of visit (average and standard deviation) and time spent per attraction;
- Preferences: for different path types and attractions;
- Speed (average and standard deviation).

In addition to those characteristics, the number of agents needs to be determined per entrance. It is possible to define different distributions of agent types per entrance (e.g. more cyclists at an entrance close to a cycle path).

Behavioural model

An agent's behaviour pattern along a path network is segmented into four phases: entry, immersion, exit and direct exit. During the first phase (entry), agent behaviour is modelled toward moving away from the entrance. In the immersion phase, attractiveness of the track and the environment play a more important role in navigation. When trip goals have been attained (e.g. an attraction has been visited), or the time allotted for the journey is up, the agent heads for its exit point. This segmentation in phases makes it possible to alter the importance settings of behavioural rules as the internal state of an agent changes.

7.2.2 Study design

In order to research whether the simulation model MASOOR can be improved by basing the behavioural rules and behavioural characteristics on empirical data, three models were developed:

1. Original model with uniform agent type[126]
2. Extended model (based on empirical data) with uniform agent type
3. Extended model (based on empirical data) with four agent types

The three models can be roughly distinguished from each other by (1) type of input data (on behavioural rules and behavioural characteristics) and (2) type of agents. Four types of data are used:

- Researchers' input (Elands & Marwijk, 2008; Elands et al., 2005);
- Secondary data (a report (Visschedijk, 1990) and recreational maps[127]);
- Interviews with nature managers in Dwingelderveld;
- Empirical data gathered in Dwingelderveld National Park[128].

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[126] Model 1 was developed as part of a research project that aimed to explore the possibilities of MASOOR in developing and evaluating different spatial design scenarios for both ecological and recreational qualities (see Elands & Marwijk, 2005; Elands et al., 2005). This study included the nine main car parks in Dwingelderveld. In order to compare the output of the simulation model with the GPS tracks – gathered in the field from five car parks – the simulation was rerun for five car parks that were used in the empirical study (see section 4.2.2).

[127] Recreational maps are provided by Staatsbosbeheer and Natuurmonumenten and show hiking routes, recreational facilities and other points of interest.

[128] The fieldwork was carried out over 7 days in spring and summer in 2006 to investigate recreational use in Dwingelderveld. Hikers in Dwingelderveld were asked to carry a GPS and complete a survey after their visit (see section 4.2.2 for a more detailed description of the data collection). The total research population consists of 399 hikers. The response rate to the survey was 63%. Of the 399 collected GPS tracks of hikers, 311 (78%) were complete. A total of 85 (27%) tracks revealed browsing behaviour.

Table 7-1 lists the differences between the three models. Let me now elaborate briefly on these differences.

The importance of each *behavioural rule* in model 1 is set by the team of researchers. In models 2 and 3, these settings are – where possible – based on empirical data gathered in Dwingelderveld National Park. Analysis of browsing behaviour patterns in chapter 5 provided information on the importance settings of four behavioural rules: global heading (74% visited at least one attraction), path appeal (marked paths especially attract hikers), path segment history (visitors may walk on paths they have been on before) and U-turn (visitors may turn and walk back on the same path). Since the empirical study did not provide evidence for the importance settings of the remaining behavioural rules, their settings in models 2 and 3 are kept similar to those of the first model.

Table 7-1: Characteristics of the three simulation models

	Model 1	Model 2	Model 3
Agent type	Uniform hiker	Uniform hiker	Four hiker types
Behavioural rules:			
- Global heading (attr.)	Researchers' input	Empirical data	Empirical data
- Path appeal	Researchers' input	Empirical data	Empirical data
- Homing direction	Researchers' input	Researchers' input	Researchers' input
- Chunking direction	Researchers' input	Researchers' input	Researchers' input
- Path segment history	Researchers' input	Empirical data	Empirical data
- Shortest distance	Researchers' input	Researchers' input	Researchers' input
- U-turn	Researchers' input	Empirical data	Empirical data
- In time	Researchers' input	Researchers' input	Researchers' input
Behavioural characteristics:			
- Duration visit	Secondary data	Empirical data	Empirical data
- Speed	Researchers' input	Empirical data	Empirical data
- Attractions	Secondary data	Empirical data	Empirical data
- Time at attractions	Managers	Managers	Managers
- Path type preferences	Researchers' input	Empirical data	Empirical data
- Absolute nr of visitors	Secondary data	Secondary data	Secondary data
- Spread across car parks	Managers	Empirical data	Empirical data

In addition, the *behavioural characteristics* in the first model are based on secondary data (reports, leaflets) and management information. Secondary data provided information on, for example, attractions, visitor numbers and the duration of the visit in model 1. The

settings of the behavioural characteristics of models 2 and 3 are largely based on empirical data. Since the empirical study did not include visitor counts, the absolute number of visitors in all models is based on secondary data (Visschedijk, 1990). In model 1, interviews with managers revealed information on behaviour type (with browsing behaviour estimated to be 30% of all hiking behaviour) and size of car parks. Based on the size of car parks, the number of agents starting at each car park is calculated. Empirical data provided information on the percentages of visitors with browsing behaviour patterns at each car park (model 2) and the percentages of those visitors that belong to each of the four visitor types (model 3).

Finally, models 1 and 2 both simulate the behaviour of a uniform *agent type*, while model 3 simulates the behaviour of four agents: connoisseur, happy hiker, demanding hiker, disturbed hiker (described in chapters 4 and 5).

Comparing model 2 with model 1 gives an insight into the importance of gathering empirical data for simulation input. I would expect that model 2 provides more reliable output compared to model 1.

Comparing model 3 with model 2 gives an insight into the importance of enriching – but also complicating – a simulation model. This insight is interesting, since the strength of a model lies not only in its reliability, but also in its simplicity (O'Sullivan, 2008). Model users prefer simulation models that require a minimum of data input, yet produce a maximum of recognizable and manageable output (Elands & Marwijk, 2008). I would expect that model 3 provides more reliable output than model 2. However, if the improvement is only marginal, users of the model should discuss the trade-off between the extra efforts involved in gathering detailed empirical data, and the (marginal) improvement to the model.

7.2.3 Settings and data input

Behavioural rules

Table 7-2 shows the settings for the behavioural rules applied in the three models. The settings that have changed in models 2 and 3 compared to model 1 are marked in the table.

Table 7-2: Behavioural rules

Behavioural rule	Simulation model 1				Simulation models 2 and 3			
	Entry	Immersion	Exit	Direct exit	Entry	Immersion	Exit	Direct exit
Global heading (attraction)	10	0	0	0	10	0	0	0
Path appeal	3	3	1	0	7	7	1	0
Homing	0	0	7	0	0	0	7	0
Chunking direction	3	3	0	0	3	3	0	0
Shortest distance	0	0	5	1	0	0	5	1
Path segment history	1	3	1	0	1	1	0	0
U-turn	1	1	1	0	0	0	0	0
In time	1	1	1	0	1	1	1	0

0 = Behavioural rule is unimportant

10 = Behavioural rule is very important

Model 1

The numbers show that in the entry phase the agent is globally heading towards attractions he is able to visit[129] (global heading). This rule is most important in the entry phase, since agents have to go into the direction of the attraction in order to be able to visit it in the specified amount of time. The agent chooses paths that are defined as attractive (table 7-6), and path segments that go in the established direction (chunking direction). In the second phase, the agent wanders around on paths he has not been on before (path segment history, U-turn) without a specific goal. In the exit phase, the agent returns in the direction of the exit he came from. The type of path and whether he has been on the path before are now less important. Finally, in the case of a direct exit, the shortest distance behavioural rule brings the agent back to the exit.

Models 2 and 3

As with model 1, in the entry phase the agent is globally heading towards attractions he is able to visit. One difference is the importance setting for path appeal: the empirical study showed that marked trails are very important for predicting walker behaviour in Dwingelderveld, even for browsing behaviour patterns. Therefore, path appeal has higher importance settings in models 2 and 3 than in model 1. Another difference in the entry phase is the unimportance of U-turns. In the second phase, agents wander on preferred

[129] When an attraction cannot be visited within the agent's time budget, he will not head in its direction.

path types (table 7-6). Path segment history is less important than it is in model 1, since 47% of visitors walk on paths that they have been before. In the exit phase the agent returns to the exit with the help of the shortest distance rule, as in simulation model 1.

The crowding behavioural rule was not applied in any of the models. From the survey I learned that only two respondents actually changed their direction because of crowding. On a five-point scale from quiet (1) to busy (5), 61% rated Dwingelderveld as quiet or relatively quiet, while only 14% rated Dwingelderveld as busy or relatively busy. Visitors' satisfaction averaged 3.2 on a 4-point (1=unsatisfied, 4= completely satisfied) scale. In other words, crowding does not seem to be a big issue for hikers in Dwingelderveld.

Behavioural characteristics

Behavioural characteristics relate to duration of visit, speed, preferred attractions and time spent at attractions, path type preferences, absolute number of visitors, and spread amongst car parks.

Table 7-3 shows that the average speed for agents in model 1 is set at 3.5 km/h. The agent stays an average of 2 hours. In model 2, speed and time budgets differ across the car parks (see table 7-3). Agents starting at Ruinen walk 2.3 km/h, on average, and stay almost 2 hours, while those starting at Lheederzand walk 4.1 km/h and stay just over one hour. Table 7-4 shows that the speed and time budgets of the four agents are different. I decided to keep the speed and time budgets for those four groups constant across the five car parks, because the groups are not large enough to produce statistically valid differences per car park.

Table 7-3: Speed and time budget in simulation models 1 and 2

	Model 1	Model 2				
		Ruinen	Spier	Diepveen	Lheederzand	Vijfsprong
Speed (km/h)	3.5	2.3	3.5	3.5	4.1	3.5
SD speed (km/h)	0.5	1.3	1.1	1.1	1.5	1.7
Time (min)	130	117	114	72	85	79
SD time (min)	30	69	99	49	71	56

Table 7-4: Speed and time budget in simulation model 3

	Model 3			
	Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker
Speed (km/h)	3.7	3.6	3.4	2.5
SD speed (km/h)	1.8	1.8	1.2	1.5
Time (min)	90	117	95	99
SD time (min)	68	83	64	177

Table 7-5 shows the preferred attractions for the three simulation models. The choice of attractions in model 1 is based on secondary data (recreational maps). The five attractions in model 2 attract over 10% of the visitors with browsing behaviour patterns. Only two of those five attractions (the visitor centre and the sheep farm at Ruinen) showed significant differences across the four visitor types that visited them. For this reason the importance settings in model 3 for the other three attractions (water, radio telescope and juniper) are kept similar to those in model 2.

The time spent at attractions is based upon management information. When an agent in model 1 visits the visitor centre in Ruinen, for example, he has 120-20=100 minutes left for walking or visiting other attractions. The time at different attractions is kept constant across the three models, since the empirical study did not take this variable into account.

Table 7-6 shows the defined path preferences for the three simulation models. In model 1 it was assumed that unpaved paths are preferred over paved ones, and narrow paths over broad ones (Elands et al., 2005). The empirical study revealed that marked trails are particularly preferred, even by walkers who do not follow predefined trails. For this reason, marked trails have a high importance setting in model 2. The analysis of GPS tracks also revealed that paved paths are preferred over unpaved ones. The importance setting for paved small paths (0.6) is therefore larger than that for unpaved paths. However, paved paths wider than 2 meter are not preferred, since cars use them as well. Lastly, in model 3, the preferences for marked trails differ across the four agent types. Marked trails are less appealing to connoisseurs and disturbed hikers, but are still the most appealing of all path types.

Table 7-5: Defined attractions for three simulation models[a]

Attraction	Model 1	Model 2	Model 3				Time spend (min)[b]
			Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker	
Visitor centres:							
- Main visitor centre (Ruinen)	0.8	1.0	0.2	0.6	0.1	0.5	20
- Information centre (Lhee)	0.6						5
- Visitor centre (Spier)	0.6						5
Sheep farms:	0.6						
- Ruinen	0.6	0.7	0.4	0.7	0.4	0.8	10
- Achter 't Zand	0.6						10
Catering	1.0						45
Bird observation unit	0.4						10
Special nature areas (8 areas)	0.2						5
Water		1.0	1.0	1.0	1.0	1.0	5
Radio telescope		0.6	0.6	0.6	0.6	0.6	5
Juniper		0.4	0.4	0.4	0.4	0.4	5

[a]Preference ratings range from 0 (unimportant) to 1 (important)

[b]Time spent at attractions is kept similar across the three simulation studies

Table 7-6: Defined path preferences for three simulation model[a]

Path type[b]	Model 1	Model 2	Model 3			
			Connoisseur	Happy hiker	Demanding hiker	Disturbed hiker
Unpaved narrow	1.0	0.4	0.4	0.4	0.4	0.4
Unpaved broad	0.8	0.4	0.4	0.4	0.4	0.4
Paved narrow	0.4	0.6	0.6	0.6	0.6	0.6
Paved broad	0.1	0.1	0.1	0.1	0.1	0.1
Marked trails		1.0	0.7	1.0	1.0	0.8

[a]Preference ratings range from 0 (unimportant) to 1 (important)

[b] narrow implies paths <2m wide, broad implies paths >2m wide

Finally, the number of agents that enter the area from a car park needs to be defined before a simulation model can be run. The size of a car park determines the number of agents that enter the area from that car park. Table 7-7 (second column) shows the relative size of the five car parks used in this study. Research on visitor counts have shown that on an ordinary Sunday at least 7,000 people visit Dwingelderveld (Visschedijk, 1990). Half of them are assumed to be walking or hiking, and the average group size is assumed to be 2. This implies that 1,750 groups of agents visit the area for a walk starting at one of the nine car parks, i.e. 1435 groups (82%) of agents visit the area from the five car parks mentioned in table 7-7. Based on management information, it was assumed that 30% of all hikers (at each car park) showed browsing behaviour patterns. However, this percentage proved to vary across the car parks (see model 2 in table 7-7). At Spier, for example, only 14% of the hikers show browsing behaviour patterns, compared to 53% at Lheederzand. Model 3 simulates behaviour of four agent types. The percentages of hikers that show browsing behaviour patterns vary across both visitor type and car park (see model 3 in table 7-7).

Table 7-7: Browsing behaviour patterns at five car parks (%)

Car park	Relative size of car park[a] (%)	Model 1 (%)	Model 2 (%)	Model 3			
				Connoisseur (%)	Happy hiker (%)	Demanding hiker (%)	Disturbed hiker (%)
Ruinen	30	30	39	28	28	8	36
Spier	30	30	14	29	36	21	14
Diepveen	8	30	28	50	28	16	6
Lheederzand	8	30	53	42	8	25	25
Vijfsprong	6	30	44	57	13	30	0
N		432	442	156	108	55	106

[a]The five car parks together are assumed to account for 82% of all walkers in Dwingelderveld. The other four car parks, which are not included in this research, account for the remaining 18%.

Obviously, the input for simulation model 3 is relatively very detailed and thus quite labour intensive, compared to models 1 and 2.

Model reliability

Before the simulation can actually start, the number of replications has to be determined. A simulation model like MASOOR uses random numbers to generate input variables such as arrival times and path selection. Therefore, it is not recommended to draw conclusions based on a single replication of a simulation model (Itami et al., 2008). Itami (2005, 2008) developed a method for 'determining the number of replications that are required to

obtain confidence intervals based on a given alpha level and user-defined confidence interval half width, or relative precision'. Based on Itami's so called 'iterative method', I calculated the number of replications needed to obtain a 95% confidence level of reliability for the model output.

The number of replications was based on a 'short run', which is a relatively small number of replications (10 in this case). The output, i.e. density on each path segment, was checked for changes in variance. It proved that the variance did not change much as I increased the number of replications, which implied that the short run had enough replications (personal communication, B. Itami, 2008). Next, the iterative method was used to calculate that 12 replications were necessary in order to meet the criterion for absolute accuracy (which is confidence interval half width) of 10, as applied by Itami (2008). However, as replications of MASOOR are less time-consuming and limited by file size than Itami's RBSim (Recreation Behaviour Simulator), I decided to maintain a stricter criterion for absolute accuracy, namely 1.45, which implied 500 replications[130].

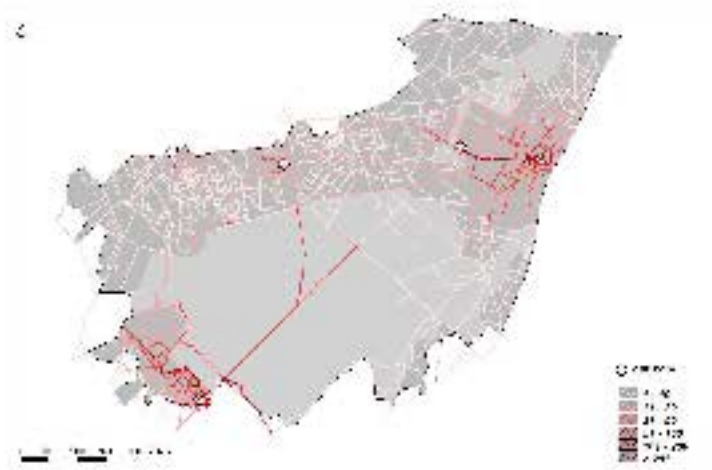
7.2.4 Data analysis

The outcomes of the simulation studies are compared to actual visitor behaviour. In order to make valid comparisons between the three simulation models, the behaviour of agents is only simulated from the five car parks where the empirical (GPS) study was carried out. Correlation coefficients between simulated and observed data sets are calculated.

7.3 Results and discussion

Figure 7-1 presents the output from the three simulation studies. Clearly, agents tend to stay in the vicinity of the car park. While agents in model 1 make use of all the paths around the car parks, the agents in models 2 and 3 tend to concentrate on a selection of paths. This may be related to higher preference settings for marked trails. Another difference is the use of the paths on the heath. In model 1, these paths are used more than they are in models 2 and 3. Which model's simulation of behaviour has the highest validity? To answer this question, the model's output is correlated with actual behaviour. Table 7-8 shows the correlations between the visitor densities derived by the model and the actual densities measured by GPS.

[130] I checked the applied method with B. Itami.



Model 1

Model 2

Model 3

Figure 7-1 Simulated distribution of hikers in Dwingelderveld

Table 7-8: Path usage correlations between model output and actual behaviour[a]

	Model 1	Model 2	Model 3
Actual behaviour (GPS)	.29	.46	.38

[a]All correlations are significant at the 0.01 level (2-tailed)

Obviously, the models that are partially based on empirical data (model 2 and 3) are better than the first model, which is based on management data and secondary data only. This result is in line with expectations. However, it was also expected that model 3, which takes into account differences between the four hiker types, would generate more realistic patterns than model 2, which simulates the behaviour of one hiker type. Yet introducing agent types does not improve the validity of the model output: a result which is counter-intuitive. How can this be explained? One explanation might be that model 3 ascribes a fixed speed and time budget to each agent type, independent of the car parks. Model 2, with a uniform agent that differs in speed and time budget per car park, proved to be able to explain a good deal of variation. However, the sample size was not big enough to calculate valid differences between the four visitor types for each car park separately. It becomes apparent, then, that information on speed and time budget per car park is highly relevant.

The best model yields correlations of .46. This result is very similar to that of a study by Taczanowska et al. (2008)[131], who reported a correlation coefficient of .50 for an area with 343 path segments[132] (also using MASOOR). Loiterton and Bishop (2008) reported a correlation of .92 between simulated and observed path usage, albeit only for four path segments in an urban park (using the iRAS simulation model)[133].

Although MASOOR is fairly well able to simulate the behaviour of visitors who do not follow marked trails, I envisage a couple of potential improvements. Firstly, agents in MASOOR use almost all of the paths in the network, while actual walkers tend to walk on a limited number of paths (see Figure 5-5d). This means that some paths are more appealing to walkers than others, even though they belong to the same category (e.g. small unpaved). An on-site analysis of path characteristics and investigations of choices at

[131] This study was carried out in Lobau (2300 ha), part of Danube Floodplains National Park in Austria, within the boundaries of Vienna. Visitors (N=455) were asked to mark the route they walked, ran or cycled on a map. These routes were compared with model output of MASOOR, for which the input was based on empirical data.

[132] For comparison: the path network of Dwingelderveld consists of 1865 path segments.

[133] Both studies I refer to took only browsing behaviour patterns into account.

junctions might reveal why certain paths are preferred over others. Such decisions by walkers could be built in.

Secondly, the improvement to MASOOR described in this chapter was achieved without adjusting the model structure. In other words, the existing behavioural rules were applied (and no new ones introduced), and each of the three models presented in this study took four phases into account (entry, immersion, exit, direct exit). Arguably, the validity of the model could be improved by adjusting the model structure. For example, in the current set up of MASOOR, agents are only able to visit attractions in the first phase. However this assumption is not grounded in reality but is based upon other multi-agent models that simulate movement in town centres (Jochem & Greft, 2002). It is quite possible that hikers do not visit an attraction such as a restaurant immediately, but at the end of the visit. Additional analysis of the GPS data may clarify when spatial goals such as attractions are visited. Another way to adjust model structure relates to the total set of behavioural rules. Each simulation model contains behavioural rules that are not based on human behaviour logic, but are inserted to prevent the agent from making erratic directional changes or strange repeated loops (Loiterton & Bishop, 2008). Examples of such rules in MASOOR are 'homing direction', 'chunking' and 'in time'. A sensitivity analysis could provide insight into which behavioural rules contribute most to the model output. A sensitivity analysis includes a series of experiments which allows the simulation to run without the inclusion of certain behavioural rules. A study by Loiterton and Bishop (2008) demonstrated that the simulation's directional algorithms contribute the most to the validity of the model output. Insight into the relative contribution of each behavioural rule will help model users to set the importance values for each rule and thus to further improve the validity of the model output.

Finally, even though MASOOR's validity could be enhanced by the approaches described above, it is still unclear what level of validity is good enough for applications. However, in any application, be it as an idea generator for managers or as a communicative tool in participatory processes, it is important that the user understands that the model's validity is not 100%. Recently, MASOOR has proved to be able to support the discussion between the different stakeholders and to help them grasp the spatial processes by depicting the results on maps (Colas et al., 2008). However, the level of validity was not clear, and was therefore not communicated. Would stakeholders still accept the proposed closure of a car park if they knew that the model's correlation with actual behaviour is .46 at best, for example? While simulation models form effective communicative tools by illustrating concepts such as recreation pressure visually, they possess the power of maps to speak for themselves, and so provide a powerful rhetoric (Crampton, 2001). It is this power that may in practice lead to decisions being made which were proposed by the creator (e.g. the manager). Thus, even when it is being applied as a communicative tool in participatory processes, its very nature may hinder real participation in the process.

7.4 Conclusion

The results in this chapter show that MASOOR is able to make a reasonable job of estimating visitor distribution. The best model yields correlations of .46 between simulated and actual hiker behaviour. This model includes a uniform hiker type for which the behavioural rules and characteristics are based upon empirical data. The availability of empirical data clearly improves the outcome of the simulation: a similar model that is based on secondary data and researchers' input (best guess) yielded a correlation of .29.

Against all expectations, a model that included four agent types for which the behavioural rules and characteristics are based upon empirical data did not enhance the level of correlation. This finding confirms the steering function of car parks: specific time budgets and speeds for each car park are more important for model validity than the inclusion of visitor types. However, with a large enough sample it is possible to combine both strategies, i.e. specific time budget and speed per visitor type per car park. It is expected that such a model would yield a higher level of correlation between modelled output and real visitor behaviour.

8 Conclusions and discussion

8.1 Introduction

In this thesis I report on a study of outdoor recreation in Dwingelderveld National Park. The innovative aspect of this study is that I research environmental meanings and the spatial behaviour of visitors in a specific physical context. In so doing, I link people and the environment, which is in line with the transactional perspective. I also relate visitors' spatial behaviour to the physical and the interpreted environment.

In this chapter I reflect on the research questions posed in the first chapter, and endeavour to interrelate the findings of the five empirical chapters. In section 8.2, I describe the interrelations between the environment, environmental meanings and spatial behaviour, and draw some conclusions about the effect of knowledge on environmental meanings and visitor behaviour in nature management. In section 8.3, I place my findings in a larger perspective. I also reflect on theoretical and methodological aspects of the research, and suggest some implications of the findings for nature management and for further research.

8.2 Environment, meanings and behaviour

The first research question posed in chapter one was:

> How can nature visitors' environmental meanings and actual behaviour be understood in response to the environment they visit?

I researched environmental meanings by means of four environmental values among hikers in Dwingelderveld (N=461). While appropriation value appeared to consist of a single dimension – feeling personally attached to Dwingelderveld – the other values consist of several dimensions: use value appeared to include orientation, facilities and accessibility; experience value entailed attractiveness, tranquillity, naturalness and annoyance; narrative value meant stories and uniquely prototypical features. Based on all 10 dimensions, I was able to define four groups of hikers. The happy hiker and the connoisseur experience nature in an unproblematic way, meaning that they recognize practically all these values in the environment. However, the happy hiker has little knowledge of the park (cultural history, stories) and feels less attached to it than the connoisseur does. The experiences of the demanding and disturbed hikers are more problematic. While the demanding hiker is critical of the supply and quality of facilities and services, the disturbed hiker is more critical about crowding, noise and unnaturalness. These results confirm the argument that an environment bears multiple meanings (e.g. Lothian, 1999).

The four visitor types show differences in motivations. The happy hiker, especially, comes for pleasure. The connoisseur and, to a lesser extent, the disturbed hiker come for introspection. The demanding hiker does not express specific motivations; this group can be characterized by a lack of specified motivations. In addition, in comparison to the other types, the connoisseur tends to live locally, and knows the area well. About half of the demanding hikers and one third of the happy and disturbed hikers are visiting the area for the first time – the demanding and disturbed hikers often with children, and the happy hikers less often so. Group composition is one way for a manager to identify visitor types. Other factors include demographics. However, the results show no one-to-one correspondence between visitor type and demographic characteristics. Adults alone are mainly connoisseurs, and adult couples are mainly happy hikers, but other demographic groups show less clear correlations. Elderly couples and groups of adults may be happy hikers, connoisseurs or demanding hikers, while families with children may be demanding, disturbed or happy hikers. We can conclude that a visitor segmentation based on demographic characteristics does not accurately portray the range of environmental meanings within Dwingelderveld.

Although it may be difficult for managers to recognize a happy hiker or a disturbed hiker in the field, Staatsbosbeheer and Natuurmonumenten managers did recognize the four hiker types when they discussed the findings. Moreover, they mentioned that the number of demanding hikers is growing, and according to them, policy is focusing too much on this type of visitor, for whom facilities and finding their way easily are the main priorities.

Of the four environmental values, the most demonstrable are use, experience and narrative values, as it is possible to point at features in the environment that may have a direct link with these values. Signs, catering facilities and car parks, for example, relate to use value. Water bodies, landscape types (naturalness) and openness relate to experience value, and the sheep farm, the characteristic juniper trees and the visitor centre are examples of features relating to narrative value. Managers may influence all these values through management interventions in the physical environment, such as constructing new paths, clearing views over water bodies, or conserving juniper trees. However, management interventions may also have an impact on appropriation value, which is by nature less easy to identify in the environment, as it is less generalizable[134] and is a reflection of a person's feeling of belonging to the area. A clear example is the local protest against the removal of a road through the area that many local people use. The protest is not so much directed against the closure itself as against the way the measure demonstrates that the National Park is not theirs, although they are the users.

[134] One person I spoke to explained to me that her grandfather had created a fen by digging peat, and she felt highly attached to this place. For other visitors, the fen was just one in a million.

Management interventions are evaluated differently by different visitor types. The demanding hiker, who gives use value a relatively low rating, would like to see more signs, benches and garbage bins. However, both the connoisseur and the disturbed hiker would rather keep the area as natural as possible and 'not make it too organized', so they don't want to see too many signs in the area. Thus, interventions aimed at increasing use value for one group may decrease experience value (e.g. naturalness) for another group. In addition, the connoisseur is critical of nature management and the development of new nature. This criticism is based on all four values: part of the forest area will become wet and attract more mosquitoes (use value), trees are beautiful and should therefore not be cut down (experience value), the area is not natural but cultural and we have to accept that (narrative value), and the trees are ours as well (appropriation value). We can conclude from all this that combining nature and visitor management is a highly complex task.

While the historical analysis of nature management in Dwingelderveld shows that more and more recreational facilities and activities are being offered, this trend may not be favoured by all visitors (nor by all managers, as explained above). While the first recreational facilities were offered to prevent the visitor from getting lost, as indicated on the Staatsbosbeheer map of 1965, the management focus has since shifted to the production of experiences. Just as many companies no longer sell just goods and services, but an experience – because people have become increasingly choosy about how they spend their money – so nature management offers experiences – because people have also become increasingly choosy about how to spend their time. Whereas in the past, nature itself was the source of experiences, over the past decade several initiatives have emerged that combine use, experience and narrative value dimensions, such as guided tours with cultural-historic themes, exhibitions in the visitor centre, an adventurous tour with the 'night ranger', or an 'early bird' excursion.

So while psychological (e.g. motivational) and social (e.g. group composition) characteristics proved to be related to the meanings visitors attach to the environment, the findings support the assumption that management interventions in the physical environment influence these meanings as well, in terms of use, experience, narrative and appropriation values.

With regard to spatial behaviour, hikers in Dwingelderveld – who carried a GPS to record their movements – exhibited two main types of behaviour pattern: predefined routes (66%) and browsing behaviour patterns. These behaviour patterns are influenced by the physical environment. In particular, use value variables[135] and network configuration

[135] Use value variables relate to orientation, facilities and accessibility.

variables[136] are related to recreational walking behaviour. Predefined route behaviour patterns are – unsurprisingly – most influenced by coloured poles. Even for browsing behaviour patterns, marked paths are highly influential. These paths may be more inviting because they feature benches and picnic tables, for example. However, the most important variables influencing browsing behaviour patterns are two network configuration variables: integration (the better integrated paths are more likely to be walked on) and distance to car park (people tend to make more use of paths near car parks). Experience and narrative value variables[137] do not primarily influence walking behaviour patterns in Dwingelderveld. Visitors tend to visit whatever landscape types or attractions are within reach from a certain car park. It is argued that these variables act as pull factors to visit the area in the first place, but that path network configuration and use value variables determine visitors' actual spatial behaviour in the field. And this gives managers a lot of scope for influencing the spatial behaviour of visitors.

The four visitor types show a number of similarities in their behaviour patterns. For example, each visitor type starts from a car park and walks an average of 6 km. However, there are some subtle differences as well. The connoisseur visits Dwingelderveld relatively often, mostly during weekdays, but stays a relatively short time (1:36 hours) and walks relatively fast (1.8 km/h). Compared to the other types, he follows the least marked trails (44%, compared to over 69%). Most happy hikers, demanding hikers and disturbed hikers visit Dwingelderveld during weekend days. They stay longer than the connoisseurs (respectively 1:56, 1:44 and 2:11 hours) and stop more often, for example to visit attractions. While most connoisseurs and – rather unexpectedly – demanding hikers start their walk at smaller car parks without facilities, happy hikers and (particularly) disturbed hikers start at large, equipped car parks. Together with the finding that visitors mention different reasons for starting at a particular car park (e.g. accessibility, proximity to specific attractions, quietness, or its being the starting point of a specific hike), these insights point to the importance for managers of seeking not only to influence behaviour *in* the field, but also to influence behaviour *on the way to* the field. The disturbed hiker, for example, might be less disturbed if he started at a smaller car park, and the demanding hiker would be more able to orientate himself from a larger, better equipped car park.

In sum, this research suggests that managers are fairly able to influence the spatial

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[136] Network configuration variables comprise e.g. integration of each path segment, connectivity to other path segments, and distance of a path segment to the nearest car park.

Experience value variables relate to path width and slope, disturbance of roads, and visible landscape types, including openness around paths. Narrative value variables comprise facilities and physical objects that are typical of the area or able to tell the story of Dwingelderveld National Park.

behaviour of visitors. On the other hand, it also shows that the environment bears multiple meanings. Consequently, it is more complicated to design and manage a National Park area for different experiences and meanings than it is to design and manage it for activities alone (confirming Brinkhuijsen, 2008). While in the past, nature management in the Netherlands was mainly focused on use value-related issues such as marking and picnic facilities, over the past decade, nature management organizations have started to focus explicitly on recreational experiences. The existence of the four visitor types in this research – who differ in various way, including their perspectives on orientation, the number of facilities, tranquillity and naturalness – underlines the importance for managers of defining appropriate levels of recreation, types of use and conditions provided by management (such as level of development, routes, regulations) for the area they manage. Even though the same area can be experienced as both touristy and unspoiled at the same time, it is important to provide a range of different opportunities for different visitors. The concept of zoning may help. I will discuss this further in section 8.4.

8.3 Nature management

The goal of nature management in Dutch National Parks is not only to conserve and develop nature, but also to combine nature and recreation goals. Nature management may involve interventions that influence both environmental meanings and visitor behaviour. Some of the interventions initially serve nature goals, but often impact recreational experiences and behaviour as well. This is why I posed the second research question:

> To what extent can information on environmental meanings and visitor behaviour inform nature management so that it can successfully combine nature and recreation?

I answer this question by focusing on two aspects of nature management: nature restoration and public perception, and the use of recreation simulation modelling as a management tool.

Nature restoration and public perception

While nature management in Dwingelderveld used to be focused on conservation, nature development has intensified in recent years. The most recent project aimed at returning parts of the forest area to a more natural state. My study involved using a photo study to research visitors' perceptions of the attractiveness of different landscape types before restoration (forest) and after restoration (heath and wet forest). Although my main focus was on the experience value, I endeavoured to take use, narrative and appropriation values into account as well. Participants in the study were asked to rate photographs on

their attractiveness as a setting for walking. In addition, and with regard to narrative value, almost half of the participants were presented with an information sheet explaining the ecological benefits of the restoration project. Finally, with regard to appropriation value, a questionnaire asked participants about their feelings of attachment to the area. The study was conducted on-site, where we approached hikers who had just visited the area that had been or was to be restored, and asked them to participate in the research.

This project has met with resistance from local people, who argue against the felling of (exotic) trees. While I expected that connoisseurs – who are more familiar with the area, and thus with previously productive forest as a setting for recreation – would find these settings more attractive to walk in than the restored settings, the study revealed no differences between the preferences of the four visitor types: all the groups perceived bogs and wet forest as more attractive than deciduous and coniferous forest plantations.

In general, all visitors rated open landscapes with water as the most attractive. Openness proved to be the main determining factor in visitors' perceptions of attractiveness, followed by vegetation type and the presence of water. Interestingly, the presentation of information on the rationale behind the project positively influenced the mean attractiveness scores of restored nature sites. This implies that informing the public on nature management actions may positively influence the acceptance of such actions. This example shows that environmental values are related: a clear narrative influences experience value. However, the appropriation value is at stake too. Despite the finding that the restored landscapes are visually more attractive, the fact remains that local people protest against the restoration practices. They do not protest because of the implications for use value – which was one of the reasons for protest in the 1980s, when it became clear that Dwingelderveld would become a National Park – but because they do not want 'their' trees to be felled. So whether or not people accept nature management strategies is based on more than just visual aesthetics, which can be overridden in practice by an appropriation value. Although both visitors and managers agree on what landscape is visually most attractive, still a group of local people protest against the restoration practices.

Although I included measures of appropriation value in the research, photographs do not seem to be able to elicit feelings of attachment. In order to clarify the relationship between appropriation value and the acceptability of management interventions, additional methods seem to be required. A detailed reconstruction of the process – from the first idea about restoration to the current practices in the field – may highlight whether, when and how local people are informed or consulted, and what power processes are in play. Such an analysis should consider the scale and time horizon of ecological restoration as well as contextual factors – such as knowledge of the targeted

ecosystem and an understanding and appreciation of management objectives (Shindler et al., 2002).

Finally, the fact that people not only assign diverse meanings to environments but also ground these meanings in a moral language of ecology[138] makes nature conservation a socio-political process (Williams, 2008). I will discuss these conclusions in section 8.4.

Using simulation models

Since the 1990s, recreation simulation models have been developed as a tool for understanding and predicting how distributions of recreational use are likely to change in response to management actions (e.g. development of new trails, installation of new car parks). In order to actually use these models in nature management, it is important that the outcomes of a simulation model resemble real recreational behaviour. My study shows that the availability of empirical data clearly improves the predictive capacity of the recreation simulation model MASOOR. A simulation based on management information and secondary data was able to explain 8% of browsing behaviour patterns. This percentage increased to 21% when input data for the simulation was also based on empirical data. In other words, MASOOR is able to predict almost half of the variation in people's browsing behaviour patterns. It is expected that this percentage may be increased by (1) additional field research into why certain paths are more appealing to visitors than others, which might generate additional behavioural rules, and (2) adjusting the model structure. With regard to this last point, visitors should be able to visit attractions in any phase of their visit, instead of only in the first phase, as is currently the case. A sensitivity analysis may reveal which behavioural rules influence model output the most, and thus what importance values per rule may be appropriate.

In conclusion, MASOOR could provide professionals in Dwingelderveld with a tool that is able to deliver a quick and relatively realistic picture of the possible effects of a measure without the time and expense involved in making actual physical modifications to the real environment and monitoring their effects. However, in any application it is important that the user understands that the simulation model's validity is not 100%. What level of validity is acceptable depends on the application. Managers who use the model as a kind of idea generator might accept a lower level of validity. But if the model output is used to support management interventions, or when communicating and discussing plans to the public (in participatory processes, for example), it is more crucial that the outcomes describe reality accurately. As a matter of fact, a recent project proved that MASOOR was able to support the discussion between different stakeholders, and to help them grasp

[138] According to nature managers, the restoration project increases its biodiversity, which legitimizes the project. According to the local protest group Woudreus, the Natura2000 status that the area had before the restoration project was carried out makes the restoration project unacceptable (www.woudreus.nl).

the spatial processes, by depicting results on maps. The model output provided a strong argument for closing a car park. This measure was accepted because the model output showed the importance of closing that car park for decreasing visitor movements in a certain – vulnerable – area. Would the measure have been accepted if it had been communicated that the validity of the model was only 8%, or 21%? My study does not answer this question; instead, it advocates that a model should not be used as a kind of truth machine, but that its strength lies in its communicative power. I will discuss the strengths and weaknesses of simulation models at greater length in the next section.

8.4 Discussion

In this section I discuss issues touched upon in the conclusions, such as the production of experiences and the concept of zoning, as well as the use of simulation models and the role of social science in nature management. But before doing so, I will take a look at some theoretical and methodological issues.

Theoretical and methodological issues

I have used a mix of theories and methods to critically investigate recreational behaviour and environmental meanings in Dwingelderveld National Park. I have chosen a transactional approach that recognizes both environmental influences on humans and human influences on the environment. For example, the meanings attached to the environment are assumed to be influenced by the physical world, but also by visitor characteristics such as age, familiarity, motivation and group composition. As a result, the approach in this thesis is based on a broad definition of the environment. Four environmental values are distinguished: use value, experience value, narrative value, and appropriation value. The scope of this research therefore goes beyond that of others, which often focus on one aspect, such as use (Cassidy, 1997; Stedman, 2003), experiences (Chhetri et al., 2004), or appropriation (e.g. Bricker & Kerstetter, 2000). The present approach offers a more complete picture of outdoor recreation in the research area then is gained when focusing on only one aspect, such as the visitor or the use value of the area. The picture is made even more complete by developing an approach that also includes the physical environment and by linking visitors with the environment that they visit and interpret.

For analysis purposes, I divided the components of the environment into their constituent parts, related to the four environmental values. However, due to the highly individual nature of appropriation value, it proved difficult to assign appropriation value variables to the physical environment. In addition, visitors' interpretations of the environment also suggested that appropriation value is of a different order from use, experience and narrative values. A time component is a particular feature of appropriation value, as attachment to settings grows when people spend more time in them (Kyle, Graefe, &

Manning, 2004). To a lesser extent, this also applies to narrative value: only connoisseurs who are familiar with the area know about its cultural history and stories about the area. Multivariate analysis (structural equation modelling) similar to that in a study by Stedman (2003) may reveal direct and indirect relationships among the four values. These models can test whether dimensions of use, experience and narrative value, for example, influence attachment value. In addition, the conceptual framework of discursive social psychology may also reveal, in qualitative terms, how different meanings are created, disseminated and contested (Patten & Williams, 2008).

Regarding methodology, I agree with other researchers (Elands, 2002; Jakub Novák, 2007) that registering, storing, processing, and analysing behavioural data is an exceptionally time-consuming process. Although insights into visitor behaviour are often welcomed by nature managers, this type of research is generally too costly and is therefore hardly ever carried out (Shoval & Isaacson, 2007). The availability of GPS offers new scope for researching recreational behaviour. However, like the analysis of conventional space-time diaries, the analysis of spatial behaviour is still a complex undertaking. Thus, while a growing number of researchers use GPS to study visitor behaviour in both natural and urban environments (e.g. Bullivant, 2007; Golicnik, 2004; Harder et al., 2008), they only analyse the gathered data visually. This thesis describes one of the first researches to go beyond a purely visual analysis of behaviour patterns, and to take both the physical environment and the interpreted environment into account. The added value of this can be clarified by an example: although, visually, the happy hiker' behaviour seemed to be focused on heath, the statistical analysis revealed that the relationship was significant but weak, and was, moreover, weaker than that of the connoisseur and the disturbed hiker. Furthermore, the statistical analysis showed differences between variable types which are impossible to reveal visually.

The method I applied to analyse behaviour patterns is based on total visitor densities on path segments. However, I did not take the sequence of paths followed by each visitor into account. The same applies to the research on the visual attractiveness of different landscape types in Dwingelderveld: each picture was assessed for its attractiveness in isolation, not as one of a set of scenes that may be visited along a route. Given the fact that the variation in an area positively influences recreational experiences (McIntyre et al., 2004), a recommendation for follow-up research is to take sequential behaviour and landscapes into account. For behaviour patterns, the sequence alignment method might offer new insights (Bargeman et al., 2002; Elands, 2002). For evaluating a set of landscapes that may be viewed when walking in Dwingelderveld, the choice experiment methods could be applied (Louvière & Timmermans, 1990).

A consequence of using the transactional approach and focusing on a specific event is that the results are not immediately generalizable, for example to all Dutch National

Parks. However, the four hiker types described in this study are also likely to be found in other Dutch National Parks, given their similar design (e.g. every Dutch National Park has a visitor centre, marked trails, cycle and bridle paths, benches, picnic tables, and catering facilities). What might vary, though, is the proportion of each visitor type. Smaller areas would probably attract fewer disturbed hikers. It would be interesting to replicate my research in an area that has fewer (or hardly any) visitor facilities. Would the proportion of connoisseurs be greater? And would the demanding hiker visit these types of nature area at all? And what type of behaviour patterns do visitors create in such areas? Do they make loops or create simpler walks such as same-way-back patterns? And how long do they walk for? I would expect that average distances walked in a National Park close to a city, e.g. Utrechtse Heuvelrug, are smaller than in more distant National Parks. Such parks may also serve as a kind of city park, where people also go for short strolls. Finally, the approach of this study, with its focus on four environmental values, is applicable to other nature areas as well. I come back to this issue at the end of this chapter.

The commodification of nature: creating demanding recreationists?

In the conclusion, I mentioned that the management focus when it comes to recreation in Dwingelderveld has shifted from offering access to providing experiences. An example of such an experience is the Midsummer Night's walk, which also shows the interrelatedness of environmental values[139]:

> 'Once a year you can join a guide from Natuurmonumenten to experience a night in Dwingelderveld. To see the sunset, the moonrise, and listen to the sounds of the night. Halfway, at the sheep farm, coffee is waiting and we take a look at the sleeping sheep. Then we walk back past the burial mounds at Smitsveen. We visit the house on the Benderse Berg where Anne de Vries lived and was inspired to write the book 'The man in the hunters*'* hut'. There we have breakfast and see the sunrise. A unique experience'.

Dwingelderveld is not the only place where this type of recreational development takes place. Such commodification of nature can be seen throughout the Netherlands and beyond: leisure opportunities have become packaged experiences sold as commodities to a consumer culture (King & Stewart, 1996). Examples in other areas are a barefoot trail and a canopy walk for experiencing nature intensively (www.blotevoetenpad.nl, www.hetboomkroonpad.nl). Both facilities, developed by Staatsbosbeheer, attract thousands of visitors yearly[140], and Staatsbosbeheer is pleased to have attracted a new

[139] The sunset, moonrise and sounds of the night are examples of experience value, while the coffee and breakfast refer to use value. Finally the places visited, such as the sheep farm, the burial mounds and the hunter hut all represent strong narratives that are typical of the area and relate to stories about Dwingelderveld.

[140] The canopy walk attracts over 200,000 visitors yearly. This is twice as many as expected (Schreuder, 2005).

target group (Staatsbosbeheer, 2002). Besides these developments, the education organization IVN[141] has collected stories for nature guides to use to educate and entertain visitors (www.natuurverhalen.nl). It may be that the development of more and more sophisticated facilities and attractions in nature will raise visitors' expectations and increase the proportion of demanding hikers, or 'prosumers' (Prins, 2001). According to a manager of a visitor centre in Schoorl 'people nowadays demand things ready-made. They appreciate it if things are set up. They want to experience something fantastic, but only if completely arranged' (Staatsbosbeheer, 2007, p. 17).

Currently, nature managers face the challenge of deciding how far they want to go with the 'entertainizing'[142] of nature (Metz, 2005). There is a limit beyond which the nature itself is threatened. Managers would like to increase the accessibility of nature so that people can enjoy it. It should be not too easily, because then it gets boring, but it should not be too difficult either, because not all visitors want to make extensive preparations. The question is, according to Metz (2005, p. 10):

> '[…] how long the consumer accepts that everything is a route, that everything is prepared, planned and plotted, and part of a marketing concept. You see that when the level of entertainment increases, the need for places without entertainment increases as well – these are communicating vessels'.

Metz calls these places without entertainment 'unsuspecting places'. Especially the connoisseur and the disturbed hiker identified in this research call for these unsuspecting places by asking managers not to make the area too touristy – or too accessible.

Recreation management of National Parks should therefore be aware of the consequences of thematization: it is very possible that a single-layered image will replace the unique qualities of an area (see also Brinkhuijsen, 2008). One manager remarked – when discussing my findings – that current management is focusing too much on the demanding hiker type. This clarifies the existence of a wish for a type of management that caters for a range of experiences[143]. The concept of zoning may be of help with this.

Zoning behaviour and environmental meanings

The concept of zoning, basically a spatial planning concept, is often used in nature management. Originally, it was applied in order to balance reasonable human use with the maintenance of the area's natural integrity (Pigram & Jenkins, 2006). Later, Jacob and

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[141] IVN cooperates with nature managers in all Dutch National Parks to develop educational programs.

[142] 'Verpretting' in Dutch.

[143] It is not just managers who doubt the strategy of offering experiences, as appears from a recent opinion article that mentions six examples of 'how Dutch nature gets ruined' (Hobo & Piël, 2009).

Schreyer (1980) described how to apply zoning to social issues such as conflicts between user groups. In Dutch National Parks, however, the concept of zoning is still mainly applied in order to mitigate conflicts between recreation and nature (e.g. IVN Consulentschap Limburg, 2003; Nationaal Park Zuid-Kennemerland, 2003; Overlegorgaan Drents-Friese Wold, 2008). The explicit attention currently paid by nature management organizations to recreational experiences might influence their zoning plans. This is already happening in the Braakman area in the province of Zeeland. Recently, Staatsbosbeheer developed a recreational management plan that allocated areas to five experiences, namely 'amusement', 'having a break', 'learning something', 'wilderness experience', and 'physical challenge' (Blok, 2008). Thus, in addition to zoning recreational use, this plan prescribes which experiences are to be gathered. In my research results, however, I do not find an argument for a strong focus on thematizing. Experiences are not only informed by the physical environment, but are also subject to personal factors (e.g. motivation) and situational characteristics (e.g. group composition) (see also Elands, 2002). Brouwer (1999) warned of the risk of 'meaning condensation' in thematization: when the spatial meaning is specialized, it may lose other meanings. As a result, people who do not directly benefit from this thematization may become alienated from their surroundings. Nevertheless, this does not mean that zoning should be rejected out of hand; indeed, zoning seems a useful tool that can be applicable to both recreational use and environmental meanings.

Regarding recreational use, my research showed that managers are generally able to influence the spatial behaviour of visitors. The placement of car parks and marked trails strongly influences spatial behaviour patterns. With regard to environmental meanings, my research revealed four hiker types with different interpretations of Dwingelderveld. While the connoisseur knows the area and the best places to start, the situation for the demanding and disturbed hiker could be improved. The demanding hiker would be more able to orientate himself and find facilities within easy reach if he started at larger car parks, such as the Visitor Centre or Spier. The disturbed hiker, on the other hand, would probably experience more solitude and naturalness if he started at smaller car parks. Information on area facilities should be available to help visitors decide where to go. I suggest creating a main gate at each Dutch National Park where area information is provided. The current main gate at Dwingelderveld National Park is situated rather awkwardly, due to political issues at the time of the installation of the National Park. This might be why not all newcomers are able to find this main entrance. I argue for several zones, ranging from relatively natural to relatively developed ones, where more facilities and services are offered. I would agree with Bell (1997) that it the design of facilities and artefacts should maintain and reflect the character of the landscape (p.22):

> 'It is possible to develop designs that are more redolent of the stylized settings of Tolkien or Disney than those reflecting the real qualities of nature. This must be

> avoided, as must all forms of pastiche or superficial imitation, in favour of honest, robust, simple, unobtrusive designs, which serve to provide their function with the minimum of fuss. These must not upstage the greater landscape setting that people have come to enjoy.'

While there are several visitor management models available for use in zoning[144], they have not been applied in the Dutch context. This may be because they were designed for American and Australian protected nature areas and are not directly applicable to Dutch National Parks. Zoning based on the Recreation Opportunity Spectrum (ROS) concept may be a useful tool for planning and communicating about park resources, experiences and appropriate activities (Boyd & Butler, 1996; Clark & Stankey, 1979). Although it was also originally devised for more remote natural areas, Wallsten (2005) recently used the concept successfully in a Swedish National Park. He explains that in the undisturbed zones, the number of facilities and activities is low, while the potential to experience solitude, silence and undisturbed nature is high. The structured zone, on the other hand, offers many facilities and activities, and thus attracts a higher number of visitors. In addition, the ROS proved effective for communicating with different stakeholders, as it is transparent and both theoretically and practically comprehensible to potential users of the park (ibid.). Such a tool would be welcome in Dwingelderveld, where local people criticize management actions. However, its application is only successful when it is not executed as an expert-based, rational-comprehensive planning tool (Stankey et al., 1999). The same applies to simulation models.

Using simulation models

Like zoning, simulation models can also be used as tools in participatory and communicative processes, as well as for testing the effectiveness of (alternative) management practices. We do not yet have any systematic assessments of the success or efficiency of simulation models in terms of stakeholder or public involvement (Skov-Petersen, 2008a). This is a worthwhile avenue to pursue in future research.

If simulation models are to be used in communicative processes, it should be clear how valid the model's output is. The best model in this research had a validity of 21%. However, when model output was presented visually to managers in Dwingelderveld (and this was before the validity testing was done, so it was not clear how valid the results were), they discussed the findings as if they were 100% valid. This example shows that simulation models are a very powerful visualization tool. And even when the map-maker makes explicit statements about the map's imperfections and inaccuracies, maps have a

[144] Examples are Carrying Capacity, Visitor Activity Management Process (VAMP), Visitor Impact Management Framework (VIM), Limits of Acceptable Change (LAC), Tourism Optimization Management Model (TOMM), and Recreation Opportunity Spectrum (ROS) (Hall, 2003).

'ferocious power…. to speak for themselves' (Wood in MacEachren, 1995, p. 340). It is therefore essential to continue to improve model validity. With regard to MASOOR, there is a need for additional field research and model calibration, as explained in section 8.3.

The application of MASOOR in the New Forest enhanced communication with various stakeholder groups in the community. Visual illustrations of management options (e.g. the closure of a car park) improved the discussions (Colas et al., 2008). In Dwingelderveld, a simulation model could also be used in participatory planning. It would be interesting to research the communicative value of a simulation model that is able to visualize the effects of the planned removal of the road through the heath land and the construction of a new car park. However, caution is necessary when presenting the simulation outcomes to the public, since these outcomes reflect only a representation of reality. Transparency is essential in participatory processes: all stakeholders should be able to understand the assumptions, limitations, and potential distortions contained within the model (Carolan, 2009). According to Stankey et al. (1999), planning processes can only succeed when:

- The legitimacy of different groups' values and interest in an area is admitted;
- It is admitted that other knowledge than scientific knowledge is necessary;
- Scientific knowledge is given as information to stakeholders, rather than only being the basis for decision-making;
- Stakeholders are actively involved in the process.

The fact that simulation models are computer models opens up new (additional) modes of participatory planning: teledemocracy via an Internet-based stakeholder forum (Kangas & Store, 2003; Skov-Petersen & Gimblett, 2008). Here again, continuing work on model validity is important.

Social science and nature management

Public participation may enhance the effectiveness of natural resource management (Hockings et al., 2000). Social scientists may help to design participatory processes. In general, the staffing of resource agencies is heavily weighted toward the biological sciences, with the social sciences poorly represented. 'Social scientists are often perceived to be the ones who will help resource agencies manage conflicts and avoid litigation, improve public participation processes, and provide environmental education' (Endter-Wada et al., 1998, p. 892). Moreover, in some cases 'the role of social science is to understand how to 'educate' people so they become more supportive of ecological goals' (ibid.).

However, this thesis has shown that the increasing public use of nature areas in the Netherlands has made the meanings of those areas more diverse and dense. Current disputes among local people about nature management strategies illustrate the greater

potential for establishing – and fighting over – competing meanings of an environment. Understanding these meanings is a pressing research and management priority for natural resource management policy, and for research and development agencies[145]. However, of the 57 researches carried out in Dwingelderveld in the period from 1984 to 2002, only 10 are related to recreational issues[146], compared to 47 researches into ecology, flora and fauna (Overlegorgaan Dwingelderveld, 2004).

Recently, researchers have advised Dutch National Parks to expand their knowledge about recreation: not only about actual and preferred visitor numbers and appreciation, but also about trends and developments in visitor expectations (Pleijte et al., 2008). They also reported that several parks are satisfied with providing global information on recreation rather than quantitative information. This explains why research and consultancy institutes have only incidentally been contracted to conduct research among visitors, and only by a few Dutch National Parks: Kennemerduinen National Park (Jansen et al., 1994), Utrechtse Heuvelrug National Park (Bureau Verten, 2005), Groote Peel National Park (Nijkamp & Kroon, 1989), and Sallandse Heuvelrug National Park (Visser & Peppel, 2008). The resulting researches, however, often lack theoretical underpinning and coordination with one another (Berends & Veeneklaas, 2003). In order to stimulate better coordinated and theoretically underpinned data collection for nature management (Berends & Veeneklaas, 2003), the National Parks foundation could consider collaborating with universities to set up a monitoring system for recreational behaviour and experiences in Dutch National Parks. For reasons of comparability, it is advisable to apply similar methodologies to research recreation in all National Parks. For example, the four environmental values are applicable to any nature area, but the exact phrasing of the related items may depend on each area's characteristics (see also Sevenant & Antrop, 2008). Finally, given the complex relationship between landscape perceptions, recreational behaviour and the physical environment (including ecological quality), there is a critical role for the social sciences in the management and conservation of nature areas, and for holistically designed research approaches. By being aware of the types of visitors, their behaviour patterns, and the meanings related to them, nature managers are

[145] The plea to include the social sciences in natural resource management is not recent (Kessler et al., 1992); however, a number of difficulties are entailed, such as differences between the epistemologies and paradigms which natural and social scientists work with. A recent Australian case study revealed several obstacles to integration, such as the low status of the social sciences (management organizations often view social science as marginal to the natural sciences) and non-acceptance of social science methodology (Roughley & Salt, 2005).

[146] Here I would like to recall the statement of a member of the Consultative Body: 'We need to monitor nature development because otherwise you have no insight in it. We don't do research into recreation. We once made a zoning plan, but that was not based on research. It was based on where the wettest areas are. You don't need research to see what type of visitors comes here'.

better able to manage their areas in a way that makes nature and recreation partners indeed.

The politics of nature management

The approach I applied in this thesis is similar to the 'place-as-meaning' approach taken by Williams (2008), who challenges managers to discover and be open to the wide range of meanings people attach to places. He pleads for a change from a prescriptive management style (in which managers and planners consciously or unconsciously try to impose their own meanings on the environment) to a descriptive one (which is process oriented and receptive to wider arena of meanings). Essentially, Williams argues, nature management is a political process which can be informed by the collaborative efforts by stakeholders and managers to identify and possibly map differences in the uses and meanings of specific places. This is an interesting idea for managers in Dwingelderveld. These managers agree that the 'landscape of around the year 1850' is the ultimate goal for the area. The rather top-down character of the restoration project, launched without any public consultation, led to fierce resistance from local people, for whom the forest is and should remain a forest, and not become a bog or half-open forest - not because this new type of nature is not attractive, but because it does not fit this particular place. With this case, I touched upon the politics of place: a subject that has been receiving increasing attention from researchers (Cheng et al., 2003; Kemmis, 1990; May, 1996; Williams, 2002; Yung et al., 2003). It was beyond the scope of this thesis, but it would be very interesting to further investigate the politics of place in Dwingelderveld, since it could inform nature policy and management, as well as enhance the effectiveness of decision-making processes.

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Summary

In highly urbanized societies, such as the Netherlands, societal demand for leisure and recreation is steadily growing. Natural areas are appreciated for their tranquillity and have proved to be beneficial to human well-being. However, the growing number of visitors to the Dutch national parks, for example, has fuelled concern about the consequent pressures on both the environment and the nature experiences of these visitors. Possible ways of achieving an acceptable balance between nature conservation and outdoor recreation therefore remains a recurring theme in the academic literature and in the field of practice.

The decentralization of national policy placed relatively extensive decision-making powers and executive control in the hands of nature area managers, many of whom lack scientific knowledge on how to effectively design nature areas so as to influence visitor behaviour and enhance recreational experiences. In general, they create recreational zoning plans to prevent and mitigate conflicts between recreation and nature. However, in doing so they mention a lack of expertise on issues related to recreation, e.g. how to determine the exact demand for different forms of recreational experience, or the actual use levels. Monitoring of recreational use, experiences and motivations is important in developing a more coherent recreation planning tradition. A recent development within monitoring and management of visitor flows is computer-based simulation modelling.

With this in mind, the current study aims to understand the relationship between the environment, recreational experiences and behaviour in a natural setting. Furthermore, it uses these understandings in the application of a recreation simulation model. Two research questions have been formulated:

- How can nature visitors' environmental meanings and actual behaviour be understood in response to the environment they visit?
- To what extent can information on environmental meanings and visitor behaviour inform nature management so that it can successfully combine nature and recreation?

Chapter 2 discusses the theoretical framework for this study, starting by describing four perspectives in person-environment research before positioning my study. It combines interactional and transactional perspectives when researching environmental meanings and the spatial behaviour of visitors in a specific physical context, namely Dwingelderveld National Park. This implies that I think holistically (in transactional terms), but am not eschewing a description of the parts (taking an interactional approach). Also, I define the environment both in objective terms (e.g. type of paths, situation of recreational facilities) and in subjective terms (e.g. busy, touristy, natural). Visitors are assumed to

actively give meaning to their environment, which is a result of a transaction between the physical environment and the person. In order to research both the objective and the interpreted environment, I introduce four environmental values: use value, experience value, narrative value and appropriation value. The use value refers to opportunities offered by the surroundings for the pursuit of activities. The experience value refers to mental filters which people use when evaluating an environment. The narrative value refers to interesting facts and specific information on an area. And the appropriation value refers to the intensity of people's (mental) attachment to the environment.

Chapter 3 describes the organization and developments in the management of Dwingelderveld National Park (3,700 ha) since 1904, when the first parcels of the current National Park were bought for both wood production and nature conservation. I explain changes in nature management such as the shift from management favouring wood production to management favouring nature conservation, and the introduction and development of recreation in terms of the four environmental values. Especially since the area gained National Park status in 1991, visitor numbers have greatly increased to a current estimated 2 million per year.

Chapter 4 describes the visitors of Dwingelderveld and their meanings of the environment. A total of 461 hikers completed a questionnaire with questions on motivations, environmental values, behaviour, special places, and socio-demographics. Also, they carried a geographical position system (GPS) device with them to register their spatial behaviour. The results suggest that subsets of interpretations of an environment do exist among visitors, and they appear to construct different meanings in terms of the four environmental values. Based on ten underlying dimensions that were identified for the four environmental values, I was able to define four groups of hikers: connoisseur, happy hiker, demanding hiker, and disturbed hiker. Both the happy hiker and the connoisseur experience nature in an unproblematic way, meaning that all values are more or less recognized in the landscape. However, the happy hiker has little knowledge of the park and feels less attached to it than the connoisseur does. They differ in additional visitor characteristics as well: the connoisseur lives locally and is a frequent visitor, while the happy hiker comes from further away and comes less often. The experience of nature is most problematic for the demanding and the disturbed hikers. While the demanding hiker is critical of the quantity and quality of the services and facilities, the disturbed hiker is more critical about crowding, noise and unnaturalness. Both groups have little knowledge of the area and do not feel attached to the park. Results demonstrate that different interpretations of the environment are not necessarily explained by visitor demographics.

Chapter 5 deals with the spatial behaviour of the visitors. In general, hikers in Dwingelderveld show two main spatial behaviour patterns: the predefined route pattern

(66%) and the browsing pattern. These behaviour patterns are influenced by the physical environment. In order to analyse the patterns, I developed a list of variables related to network configuration, use value, experience value and narrative value. Network configuration and use value variables are particularly strongly related to recreational walking behaviour. Trail marking (related to use value) is clearly a very effective tool for guiding visitors in Dwingelderveld. The distance to car parks (related to network configuration) proves to be another important variable. Visitors stay on average 1:50 hours in the park, which is not long enough to visit the whole area. Variables related to experience and narrative values tend to be less predictive of visitor density. In addition, the relationship between the interpreted environment and spatial behaviour is not straightforward: variation in the interpretations among the four visitor types can explain some but not all inter-group differences in visitor behaviour. The study confirms that the starting point of the hike largely determines which type of landscape visitors will experience, which kind of trail they can use, and which kind of attraction they can visit. It is therefore essential that nature managers clearly communicate the recreational possibilities accessible from each car park to the public.

Chapter 6 focuses specifically on visitors' perceptions of the attractiveness of different types of nature. In 2003 Staatsbosbeheer, which owns and manages 1,900 ha in the area, started a project to transform the lower section of the forest (150 ha) into a more natural forest. The transformation involves removing exotic tree species – which were planted in monocultures – and closing ditches to raise the groundwater level. The ultimate goal is to develop a half-open forest that is as the area was around the year 1850. The project has met with criticism from a group of residents who oppose the felling of trees. For effective planning of restoration projects, it is important to know whether public perceptions of aesthetics match the ecological objectives of nature managers. In total, 247 people took part in the study, which comprised a photo-sorting task and the completion of a questionnaire. The results show that landscape types that result from restoration measures are more attractive as a setting to walk in than landscapes under traditional management. In addition, informing visitors about the restoration strategy leads to perceptions of greater attractiveness for restored sites, and of less attractiveness for sites under traditional management. Contrary to expectations, there are no differences in attractiveness ratings among the connoisseurs, happy hikers, demanding hikers, and disturbed hikers. The existence of resistance to the restoration strategies implies that the experience of nature is more than only visual. It may be that photographs are not suitable for capturing appropriation value, which I assume is also affected when restoration practices take place.

Chapter 7 concludes the survey of empirical findings and describes how the results can be used to refine and improve the recreation simulation model MASOOR (Multi Agent Simulation Of Outdoor Recreation). Three models were developed in order to research

whether MASOOR can be improved by basing the input for the model on empirical data. The results show that models that are partially based on empirical data are better than a model that is based on management data and secondary data only. The best model yields correlations of .46. It is argued that in any application, be it as an idea generator for managers or as a communicative tool in participatory processes, it is important that the user understands that the model's validity is not 100%. While simulation models form effective communicative tools by illustrating concepts such as recreation pressure visually, they possess the power of maps to speak for themselves.

Finally, chapter 8 endeavours to interrelate the findings of the five empirical chapters. The results confirm the argument that an environment bears multiple meanings. The four hiker types (connoisseur, happy hiker, demanding hiker, disturbed hiker) differ in their interpretation of the four environmental values. Managers may influence all these values through management interventions in the physical environment. These interventions influence not only use, experience and narrative values, which are the most demonstrable in the area, but appropriation value as well, which is less generalizable and is a reflection of a person's feeling of belonging. In addition, these interventions are evaluated differently by different visitor types. As a result, interventions aimed, for example, at increasing use value for one group may decrease experience value for another group. Besides, interventions influence spatial behaviour as well. In particular, variables related to use value variables and network configuration are related to recreational walking behaviour. However, it is argued that variables related to experience and narrative values act as pull factors to visit the area in the first place. In order to enhance recreational experiences, managers should not only seek to influence behaviour in the field, but also on the way to the field.

Based on the findings about the meanings of the environment and the spatial behaviour of hikers, I conclude that it is more complicated to design and manage a National Park area for different experiences and meanings than it is to design and manage it for activities alone. The concept of zoning can be applied to both recreational use and experiences. An easily accessible main gate with information on area facilities and character of different areas can help visitors decide where to go. However, too strong a focus on thematization should be avoided.

Regarding the use of information on outdoor recreation within nature management, I discuss the importance of informing the public on nature management actions for their acceptance of them. A clear narrative influences experience value. However, the restoration project influences appropriation value as well. I argue that photographs do not seem to be able to elicit feelings of attachment, and that additional methods are required to clarify the relationship between appropriation value and the acceptability of management interventions.

The availability of empirical data proved important for the predictive capacity of the recreation simulation model MASOOR. Its validity might be improved by additional field research in order to generate additional behavioural rules and adjust the model structure. Simulation models may act as useful tools in participatory and communicative processes, because they enable stakeholders to grasp the spatial processes, by depicting results on maps. It is worthwhile to pursue future research into the effectiveness and efficiency of simulation models for promoting public involvement. However, it is essential to continue to improve model validity.

Finally, I argue that given the complex relationship between landscape perceptions, recreational behaviour and the physical environment (including ecological quality), there is a critical role for the social sciences in the management and conservation of nature areas, and for holistically designed research approaches. By being aware of the types of visitors, their behaviour patterns, and the meanings related to them, nature managers are better able to manage their areas in a way that makes nature and recreation partners indeed.

Samenvatting (summary in Dutch)

In landen met een hoge verstedelijkingsgraad, zoals Nederland, zijn natuurgebieden belangrijke plekken voor mensen om zich in hun vrije tijd te kunnen ontspannen. Er is aangetoond dat natuurgebieden bijdragen aan het fysieke en psychische welzijn van mensen. Echter, een te hoge recreatiedruk kan kwetsbare ecosystemen beschadigen en bovendien de beleving van bezoekers nadelig beïnvloeden. Zo is het groeiende aantal bezoekers aan bijvoorbeeld de Nederlandse nationale parken voor beheerders van deze gebieden een belangrijk aandachtspunt. Ook in de wetenschappelijke literatuur is de balans tussen natuur en recreatie een terugkerend thema.

De decentralisatie van het nationale natuurbeleid heeft geleid tot een relatief grote beslissende en uitvoerende rol voor natuurbeheerders, die vaak wetenschappelijk onvoldoende onderlegd zijn om de natuurgebieden zo in te richten dat er invloed uitgeoefend kan worden op zowel het ruimtelijke gedrag als de belevingen van de bezoekers. Om natuurgebieden effectief te beheren, kunnen zoneringsplannen een nuttig hulpmiddel zijn. Zoneren is het aanbrengen van een ruimtelijke geleding waardoor gebiedsdelen ontstaan die elk bestemd worden voor verschillende activiteiten, ervaringen of bezoekintensiteiten. De ontwikkeling van zoneringsplannen is echter moeilijk als het inzicht ontbreekt in de precieze vraag naar verschillende recreatievormen, belevingen en huidige gebruiksniveaus. De monitoring van recreatief gedrag, beleving en motieven van bezoekers is belangrijk om een meer coherente recreatieplanning te ontwikkelen. De recent ontwikkelde simulatiemodellen die recreatief gedrag voorspellen, kunnen hierbij worden toegepast.

Met het voorgaande als uitgangspunt heeft de huidige studie tot doel om de relatie tussen de omgeving, recreatieve belevingen en het gedrag in een natuurgebied te begrijpen. De studie combineert zogenaamde interactionele en transactionele perspectieven met betrekking tot betekenissen die bezoekers aan de omgeving toekennen en hun ruimtelijk gedrag in dit geval in Nationaal Park Dwingelderveld. Dit betekent dat er wordt uitgegaan van een holistische visie (als uitgangspunt in een transactionele benadering), maar er eveneens een beschrijving wordt toegepast van de onderdelen (behorende bij een interactionele benadering). Ook definieer ik de omgeving in zowel objectieve begrippen (bijv. type paden, ligging van voorzieningen) als in subjectieve begrippen (bijv. druk, toeristisch, natuurlijk). Bezoekers geven betekenis aan hun omgeving als gevolg van een transactie tussen de fysieke omgeving en de persoon. Om zowel de objectieve als de geïnterpreteerde omgeving te kunnen onderzoeken, introduceer ik vier omgevingswaarden: gebruikswaarde, belevingswaarde, narratieve waarde en toe-eigeningswaarde. De gebruikswaarde verwijst naar de instrumentele mogelijkheden voor de verrichting van activiteiten die een gebied biedt. De belevingswaarde verwijst naar de mentale filters die mensen gebruiken wanneer ze een

omgeving evalueren. De narratieve waarde verwijst naar specifieke verhalen en interessante informatie over plekken. De toe-eigeningswaarde verwijst naar de mate waarin mensen het gevoel hebben dat het gebied hun toebehoort.

Waar in de eerste twee hoofdstukken het voorgaande is beschreven, bevat hoofdstuk 3 de organisatie en worden de ontwikkelingen in het beheer van het Dwingelderveld (3700 ha) sinds 1904 geschetst. In dat jaar werden de eerste stukken land in het huidige Nationale Park gekocht voor zowel houtproductie als natuurbehoud. Ik verduidelijk de veranderingen in natuurbeheer zoals de verschuiving van het accent op houtproductie naar natuurbehoud en ontwikkeling en de recreatieve ontwikkelingen aan de hand van de vier omgevingswaarden. Bezoekersaantallen groeien gestaag, vooral sinds Het Dwingelderveld in 1991 de status van Nationaal Park heeft gekregen. Er komen jaarlijks zo'n 2 miljoen bezoekers.

Hoofdstuk 4 beschrijft wie de bezoekers van het Dwingelderveld zijn en welke betekenissen zij toekennen aan het gebied. In totaal hebben 461 wandelaars een vragenlijst ingevuld met vragen over motivaties, omgevingswaarden, gedrag, speciale plekken en sociaal-demografische kenmerken. Tijdens hun wandeling droegen ze een GPS met zich mee dat hun ruimtelijk gedrag registreerde. Uit de resultaten blijkt dat wandelaars verschillende betekenissen aan het gebied toekennen. Op basis van tien onderliggende dimensies van de vier omgevingswaarden heb ik vier typen wandelaars kunnen onderscheiden: de kenner, connaisseur, de makkelijke wandelaar, de veeleisende wandelaar en de verstoorde wandelaar. Zowel de kenner als de makkelijke wandelaar beleven natuur op een onproblematische wijze, wat betekent dat alle vier de waarden min of meer worden herkend in het gebied. Echter, de makkelijke wandelaar heeft weinig kennis van het gebied en voelt zich er minder mee verbonden dan de kenner. Ze verschillen ook in andere bezoekerskenmerken: de kenner woont in de nabije omgeving en is een frequente bezoeker, terwijl de makkelijke wandelaar van verder weg en ook minder vaak komt. De beleving van de veeleisende en de verstoorde wandelaar is problematischer. Terwijl de veeleisende wandelaar kritisch staat tegenover de hoeveelheid en kwaliteit van faciliteiten is de verstoorde wandelaar kritischer ten aanzien van drukte, geluid, en onnatuurlijkheid. Beide groepen wandelaars hebben weinig kennis van het gebied en voelen zich er niet mee verbonden. De resultaten demonstreren dat de verschillende interpretaties van de omgeving niet noodzakelijkerwijs verklaard worden door demografische kenmerken.

In hoofdstuk 5 wordt het ruimtelijk gedrag van wandelaars in het Dwingelderveld besproken. Wandelaars volgen grofweg twee ruimtelijke patronen: het uitgezette route-patroon en de struin-patroon. Deze patronen worden beïnvloed door de fysieke omgeving. Om ze te kunnen analyseren heb ik een lijst met variabelen ontwikkeld die betrekking hebben op de configuratie van het padennetwerk, gebruikswaarde,

belevingswaarde en narratieve waarde. Vooral de variabelen die betrekking hebben op de netwerkconfiguratie en de gebruikswaarde zijn gerelateerd aan recreatief wandelen. Gemarkeerde routes (gerelateerd aan de gebruikswaarde) blijken erg effectief te zijn in de sturing van wandelaars in het Dwingelderveld. Verder blijkt de afstand tot de parkeerplaats (gerelateerd aan de netwerkconfiguratie) een belangrijke variabele te zijn. Wandelaars verblijven gemiddeld 1:50 uur in het Dwingelderveld, wat niet genoeg is om het hele gebied te bezoeken. De variabelen die gerelateerd zijn aan de belevingswaarde en narratieve waarde blijken minder van invloed op het verspreidingspatroon van wandelaars. Verder blijkt dat de relatie tussen de geïnterpreteerde omgeving en het ruimtelijk gedrag van wandelaars niet eenduidig is: ook al lopen mensen dezelfde route, de betekenissen die zij toekennen aan de natuur zijn heel divers. De studie bevestigt dat het startpunt van de wandeling grotendeels bepaalt welk type landschap wandelaars zullen beleven, welk type pad ze kunnen gebruiken en welke attracties ze kunnen bezoeken. Daarom is het belangrijk dat beheerders de recreatieve mogelijkheden per parkeerplaats duidelijk communiceren naar de bezoekers.

Hoofdstuk 6 focust op de percepties die wandelaars hebben van de attractiviteit van verschillende typen natuur. In 2003 is Staatsbosbeheer (eigenaar en beheerder van 1900 ha in het Dwingelderveld) begonnen met het project om het lager liggende bosgedeelte (150 ha) natuurlijker te maken. Dit project omvat het kappen van uitheemse boomsoorten – oorspronkelijk geplant als productiebos – en het dempen van sloten om de grondwaterstand te verhogen. Het uiteindelijke doel is om zich een half open bos te laten ontwikkelen zoals dat hier rond het jaar 1850 voorkwam. Een aantal omwonenden, georganiseerd in Stichting De Woudreus, heeft kritiek op het project en wel voornamelijk op de bomenkap. Voor een effectieve ontwikkeling en uitvoering van dergelijke projecten is het belangrijk te weten wat het publiek ‘mooie natuur’ vindt en of dat overeenkomt met de ecologische doelen van beheerders. In totaal hebben 247 wandelaars deel genomen aan de studie die bestond uit het sorteren van natuurfoto’s en het invullen van een vragenlijst. De resultaten laten zien dat landschapstypen die het resultaat zijn van het omvormingsproject (zoals natte heide en halfopen bos) attractiever zijn voor wandelaars dan landschappen onder traditioneel beheer (monotoon bos). Ook blijkt dat de informatie van bezoekers met betrekking tot het omvormingsproject hun percepties van attractiviteit te vergroten voor omgevormde landschapstypen en te verkleinen voor traditionele landschapstypen. In tegenstelling tot de verwachtingen zijn er geen verschillen in de attractiviteitsbeoordelingen van kenners, gemakkelijke wandelaars, veeleisende wandelaars en verstoorde wandelaars. Het feit dat er wordt geprotesteerd tegen het omvormingsproject houdt in dat de beleving van natuur niet alleen gebaseerd is op visuele percepties. Mogelijkerwijs zijn foto’s niet geschikt om de toe-eigeningswaarde aan te spreken, die waarschijnlijk in het geding is wanneer een omvormingsproject ontwikkeld en uitgevoerd wordt.

Hoofdstuk 7 bouwt voort op de empirische benadering van de voorgaande hoofdstukken en beschrijft hoe de resultaten kunnen worden gebruikt om het recreatieve simulatiemodel MASOOR (Multi Agent Simulation Of Outdoor Recreation) te valideren en te verbeteren. Er worden drie verschillende simulaties ontwikkeld om te testen of de beschikbaarheid van empirische data van invloed is op de validiteit van het model. De resultaten laten zien dat een model dat gedeeltelijk gebaseerd is op empirische data betere voorspellingen doet dan een model dat slechts gebaseerd is op informatie van beheerders en secundair materiaal. Het beste model heeft een correlatie van .46 met de daadwerkelijk in het gebied gelopen routes (gemeten met GPS). Ik beargumenteer dat het bij elke toepassing van simulatiemodellen – zij het als ideeëngenerator of als communicatiemiddel in participatieve processen – belangrijk is dat de gebruikers begrijpen dat de validiteit niet 100% is. Terwijl simulatiemodellen effectieve communicatiemiddelen kunnen zijn omdat ze concepten zoals recreatiedruk visueel kunnen weergeven, spreken (wandel)kaarten ook hun eigen taal.

Tot slot beoogt hoofdstuk 8 de bevindingen van de vorige empirische hoofdstukken in samenhang te bezien. De resultaten bevestigen de aanname dat een omgeving meerdere betekenissen kan hebben. De vier typen wandelaars kenner, gemakkelijke wandelaar, veeleisende wandelaar en verstoorde wandelaar verschillen in hun interpretaties van de vier omgevingswaarden. Beheerders kunnen deze waarden beïnvloeden door te interveniëren in de fysieke omgeving. Deze ingrepen beïnvloeden niet alleen gebruiks-, belevings- en narratieve waarden die het meest aanwijsbaar zijn in het gebied, maar ook de toe-eigeningswaarde die minder generaliseerbaar is en een reflectie is van een persoonlijk gevoel van toebehoren. Bovendien worden deze ingrepen verschillend geëvalueerd door de verschillende bezoekerstypen. Zo kunnen ingrepen die gedaan worden om de gebruikswaarde voor een bepaalde groep te verhogen, leiden tot een verminderde belevingswaarde voor een andere groep. Hiernaast beïnvloeden ingrepen ook het ruimtelijk gedrag van wandelaars. Met name variabelen die gerelateerd zijn aan de gebruikswaarde en netwerkconfiguratie hangen samen met waar mensen wandelen. Maar het is ook mogelijk dat variabelen gerelateerd aan belevings- en narratieve waarden als een pull-factor (aantrekking) werken om het gebied te bezoeken. Als een beheerder recreatieve belevingen wil vergroten, moet hij zich daarom niet alleen richten op beïnvloeding van recreatief gedrag in het gebied maar ook al op weg naar dat gebied.

Op basis van de bevindingen over de betekenissen van het gebied en het ruimtelijk gedrag van wandelaars, concludeer ik dat het ingewikkelder is om een gebied voor verschillende belevingen en betekenissen te ontwerpen de beheren dan enkel en alleen voor activiteiten. Het zoneringsconcept kan worden toegepast op zowel beleving als gebruik van natuurgebieden. Een goed toegankelijke parkeerplaats kan daartoe worden voorzien van informatie over de faciliteiten in het gebied en het karakter van verschillende deelgebieden. Dat kan de bezoekers helpen te beslissen waar naartoe te

gaan. Een te sterke focus op thematisering wordt echter afgeraden.

Met betrekking tot het gebruik van informatie over openluchtrecreatie in natuurbeheer, bespreek ik het belang daarvan aan betrokkenen en bezoekers voor de acceptatie van beheersmaatregelen. Een duidelijk verhaal kan de belevingswaarde beïnvloeden. Echter, een omvormingsproject in een natuurgebied beïnvloedt eveneens de toe-eigeningswaarde. Ik beargumenteer dat foto's in dit onderzoek niet in staat blijken om gevoelens van toe-eigeningen aan te spreken. Aanvullende methoden zijn noodzakelijk om de relatie tussen toe-eigeningswaarde en acceptatie van ingrepen te begrijpen.

De beschikbaarheid van empirische data blijkt belangrijk voor de voorspellende waarde van het recreatieve simulatiemodel MASOOR. De validiteit zou nog verhoogd kunnen worden door enerzijds extra veldonderzoek om aanvullende gedragsregels op te stellen en anderzijds door de modelstructuur aan te passen. Simulatiemodellen kunnen een handig hulpmiddel zijn in participatieve en communicatieve processen omdat het belanghebbenden helpt ruimtelijke processen te begrijpen door ze op kaarten af te beelden. Het is aanbevelenswaardig om de rol en efficiëntie van simulatiemodellen in termen van publieke inmenging te onderzoeken. Het blijft echter essentieel om de validiteit van modellen te blijven verbeteren.

Tenslotte beargumenteer ik dat – gegeven de complexe relatie tussen landschapspercepties, recreatief gedrag en de fysieke omgeving (inclusief ecologische kwaliteiten) – er een kritische rol is weggelegd voor sociale wetenschappers in het beheer en behoud van natuurgebieden en voor holistisch ontwikkelde onderzoeksbenaderingen. Wanneer beheerders zich bewust zijn van de typen bezoekers in hun gebied, hun gedragspatronen, en de betekenissen die zij aan het gebied toekennen, zijn ze beter in staat om gebieden zodanig te beheren dat natuur en recreatie als partners samen kunnen gaan.

Appendices

Appendix 1 Questionnaire

To be filled in by interviewer: GPS number:……..
Departure:……hrs Arrival: ……hrs
Car park:……
Date:……
Interviewer:……

QUESTIONNAIRE FOR VISITORS TO DWINGELDERVELD

You have been walking in Dwingelderveld today. This nature area is visited by about 1.6 m people a year. To help make sure that nature and recreation can be combined, Wageningen University is carrying out a research among visitors. We would like to know which places people visit and what their opinions are on the area. This research has the support of both Staatsbosbeheer and Natuurmonumenten.
Your contribution is very important for this research to succeed. It is an anonymous questionnaire; your data will be treated confidentially. It will take ca. 15 minutes to finish the questionnaire.

Instruction: most of the questions are multiple choice. Please mark the answer that is applicable for you. For some questions you are asked to write your own answer (on a line). There are no right or wrong answers here; your personal opinion is what counts.
It is important that you answer all questions.

QUESTIONS ON YOUR VISIT TO DWINGELDERVELD

1. Are you on holiday in the Dwingelderveld area?
☐ Yes ☐ No

2. How often do you visit Dwingelderveld? (1 answer)
☐ daily
☐ weekly
☐ monthly
☐ 2-4 times a year
☐ today is the first time (go to question 5)
☐ other, namely_____

3. For how long have you been coming here? (1 answer)

□ for 1 year
□ for 1-2 years
□ for 3-6 years
□ for 6-10 years
□ for more than 10 years

4. Do you always walk the same route when you are here?

□ Yes, always
□ Yes, usually
□ Not usually
□ No

5. With how many people are you in Dwingelderveld today?

□ I am alone
□ With ____ adults (including myself) and with ____ children
□ With _____ dogs

6. Why did you come to Dwingelderveld today?

Mark the square on the left if the statement is completely true for you. If it is somewhat true, mark the middle square, and if it is does not apply to you, mark the square on the right.
Please mark all statements.

I went to Dwingelderveld…	Very important for me				Very unimportant for me
… To test my endurance	□	□	□	□	□
… To do something with my family.	□	□	□	□	□
… To be with similar people (who have similar values and enjoy the same things)	□	□	□	□	□
… To be with friends.	□	□	□	□	□
… To give my mind a rest	□	□	□	□	□
…To meet other people in the area	□	□	□	□	□
… To learn more about things in and around Dwingelderveld	□	□	□	□	□
… To be away from crowds of people	□	□	□	□	□
… To enjoy the scenery	□	□	□	□	□
… To think about my personal values	□	□	□	□	□
… To experience new and different things	□	□	□	□	□
… To get exercise	□	□	□	□	□
… To learn more about nature	□	□	□	□	□

… To get away from the demands of daily life	☐	☐	☐	☐	☐
… To be close to nature	☐	☐	☐	☐	☐
… To be on my own	☐	☐	☐	☐	☐
… To share what I know/have learned with others	☐	☐	☐	☐	☐

7. What is the main activity of today (1 answer)?

☐ walking/hiking ☐ picnicking ☐ observe flora/fauna
☐ dog walking ☐ sunbathing/relaxing ☐ sports (running)
☐ taking pictures ☐ visiting restaurant ☐ going to visitor centre
☐ visiting sheep farm ☐ other, namely_____

YOUR OPINION ON THE AREA

8. Your opinion of facilities in Dwingelderveld

Below you see pairs of words that describe the facilities in Dwingelderveld. Taking the first row as an example: if you think there are too few car parks, mark the square on the left. If you think there are plenty of car parks, mark the right-hand square. If you think there are neither very few nor very many car parks, mark the middle square.

Few car parks	☐	☐	☐	☐	☐	Many car parks
Inaccessible	☐	☐	☐	☐	☐	Accessible
Many unpaved paths	☐	☐	☐	☐	☐	Many paved paths
Many dry paths	☐	☐	☐	☐	☐	Many wet paths
Many quiet paths	☐	☐	☐	☐	☐	Many busy paths
Few places to eat	☐	☐	☐	☐	☐	Many places to eat
few places to relax (e.g. benches, grassy fields)	☐	☐	☐	☐	☐	Many places to relax (e.g. benches, grassy fields)
Few signs	☐	☐	☐	☐	☐	Many signs
Few toilet facilities	☐	☐	☐	☐	☐	Many toilet facilities
Few landmarks	☐	☐	☐	☐	☐	Many landmarks
Few marked trails	☐	☐	☐	☐	☐	Many marked trails
It is easy to get lost here	☐	☐	☐	☐	☐	It is difficult to get lost here

9. Summarizing your view of the facilities: how satisfied are you with what the area offers you for your purposes?

☐ unsatisfied
☐ moderately satisfied
☐ satisfied
☐ completely satisfied

10. Your experience of Dwingelderveld

How do you assess Dwingelderveld in terms of the pairs of keywords below?

Ugly	☐	☐	☐	☐	☐	Beautiful
Disorderly/messy	☐	☐	☐	☐	☐	Orderly
Natural	☐	☐	☐	☐	☐	Artificial
Everyday	☐	☐	☐	☐	☐	Unique
Untouched	☐	☐	☐	☐	☐	Managed
Monotonous	☐	☐	☐	☐	☐	Varied
Quiet (no people)	☐	☐	☐	☐	☐	Busy
Not inviting	☐	☐	☐	☐	☐	Inviting
Quiet (no noise)	☐	☐	☐	☐	☐	Noisy
Touristy	☐	☐	☐	☐	☐	Not touristy
Intimate	☐	☐	☐	☐	☐	Spacious
Boring	☐	☐	☐	☐	☐	Exciting
Many people like me come here	☐	☐	☐	☐	☐	Few people like me come here

11. Summarizing your experience: how satisfied are you with your experiences here?

☐ dissatisfied
☐ moderately satisfied
☐ satisfied
☐ completely satisfied

ABOUT YOUR WALK

12. About your walk: did you have a specific place in the area as a goal?

☐ Yes, which _____
☐ No (the walk itself was the goal)

13. Which of the following places/facilities have you visited today (multiple answers possible)?

☐ visitor centre
☐ picnic place
☐ burial site
☐ currant trees
☐ Spier Orientation centre
☐ Lhee Information centre
☐ Forest Pub de Boerdennen
☐ bird watching hut/hide
☐ house on Benderse Berg
☐ juniper
☐ fens
☐ snackbar Spier
☐ Anserdennen tea house
☐ Different, namely_____
☐ view hill
☐ radio telescope
☐ Davidsplassen
☐ sheep farm

14. Did you want to visit a place that you haven't visited in the end?

☐ Yes, namely:_____

Why have you not visited t?:_____

☐ No

15. Did you follow a marked trail?

☐ Yes, a

☐ marked trail with coloured stakes

☐ route from a booklet (e.g. NS hike, Anserdennenroute etc)

☐ other route, namely _____

☐ No (to question 18)

16. Did you complete the whole marked trail?

☐ yes complete (please go on to question 18)

☐ No, only a part

17. Why only a part? (1 answer)

☐ too long ☐ too wet paths ☐ weather changed

☐ too busy ☐ boring/ little variation

☐ other namely_____

18. Choice of car park: why did you start your hike here? (multiple answers possible)

☐ easily accessible from home/address of stay

☐ close to visitor centre / sheep farm

☐ close to catering

☐ quiet, few other visitors start here

☐ close to the spot I wanted to visit (e.g. Bird hut, butterflies, reptiles, currant trees)

☐ other, namely _____

19. Did you make a stop during your hike, e.g. to take a break?

☐ yes: where? _____

☐ No (please go on to question 21)

20. Why did you stop at this spot? (multiple answers possible)

☐ because it was a catering outlet

☐ it was beautiful

☐ it was quiet (no people)

☐ there was a bench

☐ it was lunch time

☐ other, namely _____

21. Which sources of information did you use? (Please leave blank any you did not use)

□ map of Dwingelderveld
□ Route description of the hike
□ information panels in the area
□ oral information from the visitor centre
□ coloured poles in the area
□ information from internet
□ other, namely_____

STORIES AND MEMORIES

22. Stories and memories related to Dwingelderveld

How would you assess Dwingelderveld using the pairs of statements below?

Dwingelderveld is a unique nature area because of the big wet heath	□	□	□	□	□	Dwingelderveld is not unique; there are similar areas in the NL
The sheep flock is part of Dwingelderveld	□	□	□	□	□	Dwingelderveld could do without sheep flocks
I know the name of the writer who lived in the house on the Benderse Berg	□	□	□	□	□	I do not know the name of the writer who lived in the house on the Benderse Berg
The radio telescope is part of Dwingelderveld	□	□	□	□	□	Dwingelderveld could do without radio telescope
Dwingelderveld is typical of Drenthe	□	□	□	□	□	Dwingelderveld is not typical of Drenthe
I know famous stories about Dwingelderveld and about events there	□	□	□	□	□	I do not know famous stories about Dwingelderveld and about events there
I know what the Commissaris Cramer path is famous for	□	□	□	□	□	I do not know what the Commissaris Cramer path is famous for
I have personal memories of the area	□	□	□	□	□	I have no personal memories of the area
The cultural history of Dwingelderveld is clearly recognizable for me	□	□	□	□	□	The cultural history of Dwingelderveld is not recognizable for me

23. Summarizing: how satisfied are you with the opportunities to experience the story of Dwingelderveld (the history of how it was created, its cultural history, famous stories)?

□ dissatisfied
□ moderately satisfied
□ satisfied
□ completely satisfied

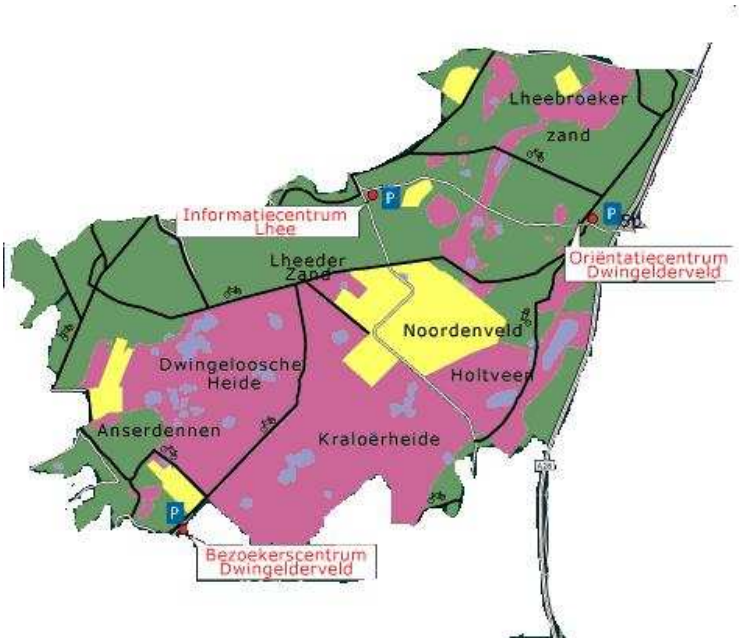
ATTACHMENT

24. Statements on your attachment to Dwingelderveld

I feel very attached to Dwingelderveld	□	□	□	□	□	I feel no different than in other nature areas
I miss it when I haven't been here for a long time	□	□	□	□	□	I don't miss it when I haven't been here for a long time
Dwingelderveld is my favourite place to be	□	□	□	□	□	Dwingelderveld is not my favourite place to be
I live here or I would like to live here	□	□	□	□	□	I don't live here and I don't want to
I come here to reminiscence	□	□	□	□	□	I don't come here to reminiscence
Dwingelderveld is like home for me	□	□	□	□	□	Dwingelderveld is not like home for me
Dwingelderveld stands out for the way it is managed by Staatsbosbeheer and Natuurmonumenten	□	□	□	□	□	Dwingelderveld doesn't stand out for the way it is managed by Staatsbosbeheer and Natuurmonumenten
I can be annoyed by other visitors, as if they were intruders	□	□	□	□	□	Other visitors don't feel like intruders to me

SPECIAL PLACES

25a. Please number (with 1, 2, 3) on the map three places that are most special for you in Dwingelderveld?



25b.

Please describe the 3 spots and why they are special?

Description spot	Why is this spot special to you?
1	
2	
3	

FINALLY SOME QUESTIONS ABOUT YOU

26. Are you:

□ female □ male

27. Which year were you born in?_____

28. How many adults (18 years and older) and how many children (below 18 years) are there in your household?

Adults____

Children ____

29. What is your postal code (only numbers)? _____

30. What is your highest completed level of education?

□ lower (professional) training (12-16 yrs)

□ mid-level (professional) training (16-18 yrs)

□ higher (professional) training (>18 yrs)

31. What is your current situation?

□ student □ employed (paid)

□ unable to work □ job searcher/unemployed

□ retired □ houseman/housewife

□ other, namely_____

32. Please indicate the net monthly income of your household?

□ up to 1200 euro p/month

□ 1200 – 2500 euro p/month

□ over 2500 euro p/month

33. Do you have ideas or comments about this research or about Dwingelderveld National Park?

_____

_____

_____

_____

THANK YOU VERY MUCH FOR YOUR COOPERATION!

Appendix 2 Correlations between behaviour patterns and environment

	All visitors	Route Complete	Route extra section	Route Short cut	Browse	Sheep farm
Integration	.166(**)	.099(**)	.232(**)	.108(**)	.211(**)	.108(**)
Connectivity	.119(**)	.111(**)	.094(**)	.120(**)	.089(**)	.043
Distance to car park	-.223(**)	-.180(**)	-.147(**)	-.225(**)	-.235(**)	-.107(**)
Length of path	.007	-.004	.066(**)	-.009	.030	-.032
Pole route	.612(**)	.721(**)	.427(**)	.446(**)	.294(**)	.138(**)
Leaflet route	.351(**)	.326(**)	.399(**)	.219(**)	.315(**)	.074(**)
Paved	.134(**)	.081(**)	.172(**)	.136(**)	.157(**)	.079(**)
benches/picnic	.320(**)	.254(**)	.292(**)	.262(**)	.350(**)	.125(**)
Signage	.102(**)	.029	.185(**)	.075(**)	.174(**)	.062(**)
Distance to Spier snack bar	.010	-.062(**)	.096(**)	-.035	.107(**)	.093(**)
Distance to tea house	-.104(**)	-.029	-.202(**)	-.056(*)	-.167(**)	-.117(**)
Distance to Forest Pub	.104(**)	.157(**)	.087(**)	.124(**)	-.072(**)	.082(**)
Bridle path	.063(**)	.058(*)	.065(**)	.095(**)	.062(**)	-.034
Cycle path	.192(**)	.148(**)	.247(**)	.187(**)	.223(**)	-.006
slope>12%<50m	-.069(**)	-.054(*)	-.070(**)	-.083(**)	-.049(*)	-.060(**)
Width	-.030	-.036	-.001	-.067(**)	.018	-.061(**)
Distance A28	-.015	-.087(**)	.058(*)	-.059(*)	.116(**)	.045
Distance N855	.079(**)	.027	.153(**)	.045	.092(**)	.149(**)
Area heath	.076(**)	.040	.155(**)	.071(**)	.106(**)	.001
Area agriculture	-.011	-.019	.039	-.029	-.003	.007
Area deciduous forest	.022	-.004	.048(*)	.032	.039	.039
Area coniferous forest	.022	.025	.044	.001	.031	-.046(*)
Area mixed forest	-.076(**)	-.050(*)	-.103(**)	-.075(**)	-.073(**)	-.050(*)
Area wet forest	-.018	.012	-.036	-.021	-.057(*)	-.020
Area wasteland	-.017	-.023	.021	-.023	-.006	-.007
Area water	.030	.026	.047(*)	.018	.029	-.001
Distance to water	-.202(**)	-.189(**)	-.216(**)	-.177(**)	-.122(**)	-.124(**)
Openness	.072(**)	.030	.149(**)	.031	.114(**)	.033
Distance to radio telescope	.040	.106(**)	.005	.061(**)	-.118(**)	.039
Distance to sheep farm north	.060(**)	.082(**)	.058(*)	.063(**)	-.031	.084(**)

Distance to Davidsplassen	.012	.085(**)	-.065(**)	.056(*)	-.141(**)	.011
Distance to house Benderse Berg	-.149(**)	-.066(**)	-.220(**)	-.116(**)	-.204(**)	-.141(**)
Distance to Holtveen lookout	.001	-.055(*)	.060(**)	-.047(*)	.092(**)	.067(**)
Distance to sheep farm south	-.182(**)	-.096(**)	-.274(**)	-.136(**)	-.207(**)	-.204(**)
Distance to NM visitor centre	-.191(**)	-.108(**)	-.281(**)	-.150(**)	-.205(**)	-.210(**)
Distance to SBB visitor centre	.104(**)	.102(**)	.133(**)	.101(**)	.029	.108(**)
Distance to juniper	-.013	-.049(*)	.028	-.036	.049(*)	.026

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Appendix 3 Correlations between visitor types and environment

	Visitor density: connoisseurs	Visitor density: happy hikers	Visitor density: demanding hikers	Visitor density: disturbed hikers
Integration	.216(**)	.186(**)	.055(*)	.148(**)
Connectivity	.083(**)	.109(**)	.117(**)	.122(**)
Distance to car park	-.232(**)	-.195(**)	-.246(**)	-.155(**)
Length of path	.019	-.001	-.008	.018
Pole route	.481(**)	.577(**)	.648(**)	.505(**)
Leaflet route	.398(**)	.300(**)	.355(**)	.260(**)
Paved	.080(**)	.134(**)	.087(**)	.121(**)
benches/picnic	.369(**)	.305(**)	.228(**)	.264(**)
Signage	.092(**)	.110(**)	.039	.091(**)
Distance to Spier snack bar	-.085(**)	.063(**)	-.020	-.019
Distance to tea house	-.002	-.158(**)	-.046(*)	-.072(**)
Distance to Forest Pub	-.036	.106(**)	.072(**)	.187(**)
Bridle path	.114(**)	.046(*)	.072(**)	.040
Cycle path	.151(**)	.185(**)	.165(**)	.157(**)
slope>12%<50m	-.055(*)	-.064(**)	-.029	-.101(**)
Width	-.002	-.036	-.027	-.035
Distance A28	-.058(*)	.025	-.017	-.071(**)
Distance N855	-.073(**)	.132(**)	.021	.094(**)
Area heath	.090(**)	.066(**)	.037	.084(**)
Area agriculture	-.028	-.007	-.042	.005
Area deciduous forest	.030	.033	-.022	.029
Area coniferous forest	.005	.041	.024	.001
Area mixed forest	-.041	-.100(**)	-.027	-.073(**)
Area wet forest	-.029	-.032	-.002	.018
Area wasteland	-.004	-.028	-.023	-.004
Area water	.024	.034	.016	.032
Distance to water	-.172(**)	-.196(**)	-.121(**)	-.236(**)
Openness	.099(**)	.067(**)	.013	.066(**)
Distance to radio telescope	-.097(**)	.031	.048(*)	.120(**)
Distance to sheep farm	-.112(**)	.073(**)	.058(*)	.113(**)

north				
Distance to Davidsplassen	-.002	-.021	.012	.089(**)
Distance to house at Benderse Berg	-.149(**)	-.187(**)	-.054(*)	-.114(**)
Distance to Holtveen lookout	-.096(**)	.032	.023	-.037
Distance to sheep farm south	-.072(**)	-.238(**)	-.079(**)	-.171(**)
Distance to visitor centre NM	-.072(**)	-.248(**)	-.088(**)	-.182(**)
Distance to visitor centre SBB	-.069(**)	.134(**)	.061(**)	.150(**)
Distance to juniper	-.056(*)	.011	-.005	-.042

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

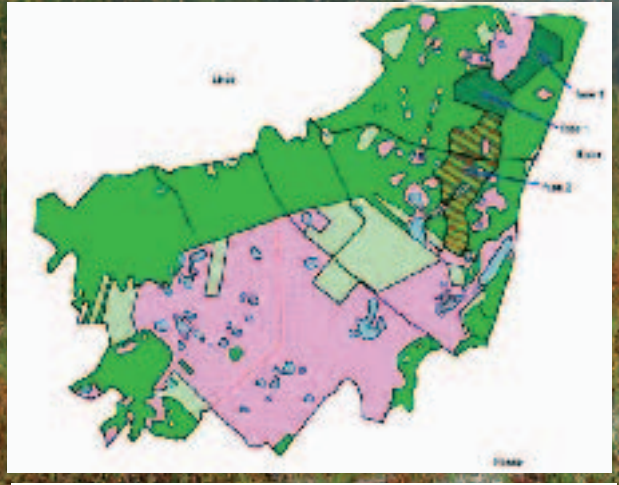
Monotoon productiebos maakt plaats voor open en gevarieerd landschap

Op weg naar een ander bos

Staatsbosbeheer creëert nieuwe kansen voor de natuur in het Dwingelderveld

De werkzaamheden

- Het kappen van ongeveer 150 hectare bos
- Exoten als fijnspar, larix en douglasspar worden deels gekapt
- Inheemse bomen als berk, eik, beuk en wilg worden ontzien
- Het dempen van tientallen kilometers greppels en sloten
- Het ophogen en omleggen van recreatieroutes



Wat verdwijnt?

- Monoculturen productiebos
- Exoten zoals fijnspar, larix en douglasspar

Wat komt ervoor terug?

- Gevarieerd open landschap
- Water krijgt een belangrijke rol
- Nat bos bestaand uit inheemse bomen als eik, wilg, berk en grove den
- Hoogveen met karakteristieke planten als veenpluis en veenmossen
- Nieuwe recreatieve mogelijkheden

Waarom?

- Doelstelling van een Nationaal Park is het behoud en de ontwikkeling van de natuurwaarden
- Om het Dwingelderveld, dat het grootste natte heide gebied van West-Europa is, te beschermen tegen verval moet de waterhuishouding aangepast worden
- Na het herstel zal de natuurlijke situatie hogere natuur waarden herbergen dan de oude situatie
- Van dit herstel zullen vele zeldzame planten en dieren profiteren zoals klokjesgentiaan, veenbes en boomleeuwerik

WAGENINGEN UR
For quality of life

De werkzaamheden van nu zijn bedoeld voor de natuur van de toekomst

Training and supervision plan

Description	Year	ECTS
General courses		
Organizing and supervising MSc Theses	2005	0.75
Writing worth citing, Clare McGregor	2008	3
PhD competence assessment (WGS)	2005	0.3
PhD career assessment (WGS)	2006	0.3
NWO Talent day: negotiation and grant application	2009	0.3
Mansholt-specific part		
Introduction course Mansholt Graduate School of Social Sciences (MG3S)	2004	1.5
Presentation Mansholt PhD-day	2009	1
Presentations at international conferences:		5
- International Symposium on Society and Resource Management (ISSRM), Mid Sweden University, Östersund, Sweden	2005	
- ISSRM, Simon Fraser University, Vancouver, Canada	2006	
- International Conference on Monitoring and Management of Visitor Flows (MMV3), University of Applied Sciences Rapperswil, Switzerland	2006	
- International Association of Landscape Ecology World Congress, Wageningen University	2007	
- MMV4, Montecatini Terme, Italy	2008	
- ISSRM, BOKU University, Vienna, Austria	2009	
Discipline Specific part		
Reading group Socio-spatial analysis (SAL)	2004-2006	1.4
Research seminars Forest and Nature Conservation Policy (FNP)	2005-2009	3
Quantitative research methodology and statistics, WUR	2006	4
Short Term Scientific Mission to BOKU University Vienna	2006	3
Course ArcGIS 9, GisCover	2006	1.5
PhD discussion meetings	2005-2009	1.4
Symposium on Interdisciplinarity in Research Practice (KNAW, NOW & RMNO)	2007	0.75
Urbanism on Track – Expert meeting on tracking-based research (TU Delft)	2007	0.75
Professional visit to Universities of Minnesota and Winnipeg related to Storm vd Chijs fund	2008	2
Teaching and supervising		
Various guest lectures and supervising activities at Wageningen University	2004-2009	4
Total		33.95

About the author

Ramona van Marwijk was born in Stompwijk on the 1st of March 1978. She graduated from High School (VWO at the Alfrink College in Zoetermeer) in 1996. She went on to study Rural Development (specialization Nature, Recreation & Tourism) at Hogeschool Delft (1996-2000), completing internships at a Dutch NGO (ECEAT), at an international one (WWF-Greece), and with a tourism consultant. Eager to gain more theoretical knowledge, she moved to Wageningen to study Land Use Planning with a specialization in Recreation and Tourism. She wrote two Master Theses on two different coastal tourism destinations: the Wadden Island of Terschelling and Malindi in Kenya. Both researches can be characterized by their aim to understand practices in all their complexity, focusing on the actor while also taking the socio-cultural, environmental and economical context into account. Ramona's thesis on small tourism entrepreneurs in Kenya was awarded the Ed van Thijn Thesis Prize. She graduated in 2003 and continued to work as a junior researcher at the Socio-Spatial Analysis Group at Wageningen University. In October 2004 she started her PhD research at the Forest and Nature Conservation Policy Group, and in 2006 she received the Storm-van der Chijs Award for a promising female PhD student from Wageningen University. Since June 2009, Ramona has been working as an assistant professor in the Socio-Spatial Analysis Group at Wageningen University and Research centre, where she continues to analyse recreation and tourism practices in context and aims to build bridges between recreation and tourism practices, policy and design.