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FOREST STAND PREFERENCES OF RECREATIONISTS

*ULKOILIJOIDEN METSIKKÖARVOSTUKSET*

Seppo Kellomäki



SUOMEN METSÄTIETEELLINEN SEURA

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## PREFACE

This work is part of a larger study in which the environmental preferences of recreationists for forested areas (outside the scope of this study) have been dealt with in a separate study. The other members of the group under the guidance of professor Päivis Riihimäki has been responsible for planning the complete study. The other members of the group are: Lyyti M. Sc., Timo Kauppi M.A., and the author of this manuscript. A study dealing with the socio-economical background factors of recreation activity has already been published (Jaarinen 1974) using the material collected to date.

The environmental preferences of recreationists, at the stand level in particular, have been dealt with in this study. The fact that this work represents only a part of the earlier mentioned larger study, under certain limitations, should be kept in mind when used in this study.

It has been possible to concentrate only on some of the environmental preferences of recreationists for forested areas (outside the scope of this study).

In addition to the members of the above study group, I would like to thank acting professor Antti Haapanen, professor Perttu Mäkelä, Veli-Pekka Järveläinen Ph.D., and Heikki Joutsen M.Sc., who in addition to professor Päivis Riihimäki have given me much help and advice in drawing up this manuscript. The manuscript has been translated into English by John Ferguson B.Sc. Finally I would especially like to thank those students not mentioned who carried out the work often under very difficult conditions.

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SEPPO KELLOMÄKI

## TIIVISTELMÄ:

## ULKOILIJOIDEN METSIKKÖARVOSTUKSET

Helsinki 1974

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## PREFACE

This work is part of a larger study in which an attempt has been made to clarify, by various approaches, the different phenomena connected with recreation activities. A working group under the guidance of professor Päiviö Riihinen has been responsible for planning the complete study. The other members of the group are Lasse Loven M. Sc., Timo Kauppi M.A., and the author of this manuscript. A study dealing with the socio-economical background factors of recreation activity has already been published (JAATINEN 1974) using the material collected to date.

The environmental preferences of recreationists, at the stand level in particular, have been dealt with in this study. The fact that this work represents only a part of the earlier mentioned larger study, has set certain limitations on the empirical material used in this study. For this reason it has

been possible to concentrate only on some of the essential hypotheses concerning the recreation environment. For instance, elucidation of the environmental preferences of recreationists for forested areas remains outside the scope of this study.

In addition to the members of the above mentioned study group, I would like to thank acting professor Antti Haapanen, professor Peitsa Mikola, Veli-Pekka Järveläinen Ph.D., and Heikki Juslin M.Sc., who in addition to professor Päiviö Riihinen have given me much help and advice in drawing up this manuscript. The manuscript has been translated into English by John Derome B. Sc. Finally I would especially like to thank those students not already mentioned who carried out the interviews, often under very difficult conditions.

Helsinki 1974

SEPPO KELLOMÄKI

The environmental preferences of recreationists can be examined for example on the basis of the standing trees, the topography, or the type of terrain to be found in the recreation area. In the management of forested recreation areas, recreationists' preferences of the standing trees are of prime importance. Both individual stands and their position in the whole recreation forest are points of interest in this respect.

It has generally been presumed that recreationists prefer mixed stands (cf. e.g. HAYNOR 1971; PIRKILAINEN 1972; MIKOLA 1973). In addition to coniferous and deciduous mixed stands, the central position held by mature stands has also been stressed as far as the management of recreation forests is concerned. Studies carried out in Central Europe, in particular, back up this hypothesis (cf. HANSTRAIN 1967; MAYER 1969; WEIMANN 1969; WARDENBACH 1971). It has been suggested that mixed and mature stands are preferred above all because they exhibit a wide variety of colours, shapes, scents, sounds and diversity of light patterns which are considered to alleviate nervous tension and to have a recharging effect (cf. e.g. FÄLTHYSSON-

1972). The environmental preferences of recreationists are not necessarily in accordance with or at least resembling the virgin state. In particular, a varied and stimulating environment, which simultaneously satisfies the environmental requirements of different forms of outdoor activity, has been stressed (PIRILAINEN 1972; SAARINEN 1972; MIKOLA 1973).

### 12. The study and its limitations

When considering the environmental preferences of recreationists from the point of view of forest management, it is essential to consider their relationship to the ecological limitations set by the environment (cf. HAYNOR et al. 1969). In actual fact, an essential part of the problem of recreational forest management can be outlined as follows: what is the relationship between the environmental preferences of recreationists and the ecological development of stands and forest areas. Thus any information about stands is essential above all because most of the decisions and measures concerning the treatment of forests are

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## 1. INTRODUCTION

### 11. Background of the study and a review of the literature

The planning bases involved in the management of forest areas designated for recreational purposes can be roughly divided into three groups: ecological and techno-economical factors and environmental preferences of recreationists (e.g. Metsähallitus 1970; Keskusmetsälautakunta Tapio 1970; PITKÄNIEMI 1972). Environmental preferences in this study refer to the attitude taken by recreationists in accepting or rejecting different outdoor environments on the basis of their natural element (cf. ESKOLA 1962, 1963). The extent to which emphasis is placed on the last mentioned group of factors during planning, depends decisively amongst other things on the intended use to which the area under consideration is to be put (cf. MIKOLA 1970).

The environmental preferences of recreationists can be examined for example on the basis of the standing trees, the topography, or the type of terrain to be found in the recreation area. In the management of forested recreation areas, recreationists' preferences of the standing trees are of prime importance. Both individual stands and their position in the whole recreation forest are points of interest in this respect.

It has generally been presumed that recreationists prefer mixed stands (cf. e.g. HÄYRINEN 1971; PITKÄNIEMI 1972; MIKOLA 1973). In addition to coniferous and deciduous mixed stands, the central position held by mature stands has also been stressed as far as the management of recreation forests is concerned. Studies carried out in Central Europe, in particular, back up this hypothesis (cf. HANSTEIN 1967; MAYER 1969; WEIMANN 1969; WEIDENBACH 1971). It has been suggested that mixed and mature stands are preferred above all because they exhibit a wide variety of colours, shapes, scents, sounds and diversity of light patterns which are considered to alleviate nervous tension and to have a recharging effect (cf. e.g. FRILUFTSOM-

RÅDET ... 1970; JACSMAN 1971; SAASTAMOINEN 1972; Talousneuvosto 1972).

Environmental preferences of recreationists for forested areas are not as clear as the corresponding stand evaluations. However, as a rule the proportion of mature stands should be greater in forest areas intended for recreational use than in normal commercial forests (cf. e.g. MAYER 1969). As well as mature stands, the part played by a balanced proportion of open spaces and young stands in increasing the diversity of recreation environments has been emphasised (cf. e.g. WEIDENBACH 1971). The study carried out by HAAKENS-TAD (1972) in the vicinity of Oslo shows that a diversified distribution of development stages should be strived for in which both mixed stands and pure stands made up of single tree species are represented. It is essential that these form the entirety which the recreationist experiences as being in a virgin state or at least resembling the virgin state. In particular, the role played by this kind of forest area in forming a varied and stimulating environment, which simultaneously satisfies the environmental requirements of different forms of outdoor activity has been stressed (PITKÄNIEMI 1972; SAASTAMOINEN 1972; MIKOLA 1973).

### 12. The study and its limitations

When considering the environmental preferences of recreationists from the point of view of forest management, it is essential to consider their relationship to the ecological limitations set by the environment (cf. HENDEE et al. 1968). In actual fact, an essential part of the problem of recreational forest management can be summed up as follows: what is the relationship between the environmental preferences of recreationists and the ecological development of stands and forest areas. Thus any information about stands is essential above all because most of the decisions and measures concerning the treatment of forests are

carried out at the stand level. A stand also forms an entirety in the environment which is relatively easy to ascertain. A rough description of its structure can be made using comparatively simple concepts, too.

In order to characterise the stand preferences of recreationists, an attempt is made to clarify the following questions:

- 1: What or which tree species are preferred by recreationists
- 2: What kind of stands, made up of different tree species mixtures, appeal to recreationists
- 3: Which development stages of stands appeal to recreationists

Elucidation of these questions can be considered to give some premises for drawing conclusions for instance about the aims of recreational forest management and about methods which should be applied to realize them, especially when the most important structural features and the successional changes of forest stands can concentratedly be described in terms of tree species, tree species mixtures and development stage.

It was earlier suggested that environmental preference refers to the approval or rejection of a stand on the basis of the different natural elements of an environ-

ment. According to ESKOLA (cf. 1963), it can be characterised as the logical occurrence of verbal or actual reactions which are aimed at the same elements. It is regarded as expressing part of the background and earlier experience in the individual's total behaviour, or in other words as transmitting the earlier experience or experiential background into an actual observation and into the verbal and actual expressions caused by it.

Although verbal reactions usually reflect very weakly real action inclinations, their importance in studying the bases needed for recreation forest management cannot be denied. CAMELL (1963) considers that the inconsistency which exists between verbal expressions and actual behaviour is caused by the different degrees of difficulty involved in forming verbal expressions or in carrying out actions. Thus a person who is walking for instance through a spruce stand and who says that for one reason or another he is particularly fond of birches, is not necessarily behaving inconsistently. On the contrary, he could be considered as belonging to one of two extreme types: those who have clear selection inclinations as regards both words and actions, and those who have no clear selection inclinations in either case (ESKOLA 1966, pp. 223-224).



## 2. METHODS AND MATERIAL

### 21. Study approach

#### 211. Questionnaire

Selection of the method and the research approach for an attitude study is linked above all with the nature of the attitude object in question and the reactions caused by it (ESKOLA 1966, p. 174). As the environment preferences of recreationists have been limited to include only their verbal reaction inclinations, the only research methods which could possibly be used were either questionnaires or interviews, or else different combinations of these two. In addition, the systematic observations which preceded the study showed clearly that it is not possible to obtain any worthwhile information about the stand preferences of recreationists if different observation methods are used. This conclusion is also supported by observations made by JAA-TINEN (1974) concerning the leisure time activities of people using the study areas. According to this study the study areas are most commonly used for different kinds of active recreation, the direct connections of which with the forest environment remain quite unclear.

The usage of different descriptive and emphatic emotional content concepts and appraisements are specific to the reactions caused by the environment and the changes in it (Twiss 1969). A good example of this is the usual way in which scenery can be described by different types of adjective attributes or the inclination to put tree species in a certain order of beauty on the basis of their visual effect.

It can be concluded from some foreign examples (e.g. DEGENER 1963), that the forest stand preferences of recreationists can be studied in particular by means of the latter reaction inclination. When the variables were chosen, a forest stand was roughly defined as being a homogeneous part of a forest which, as an independent unit of forest land or as part of it, is clearly different from the surrounding environment (cf.

SUKACHEV and DYLLIS 1964, p. 24; ILVESSALO 1965, p. 159). The variables used in the questionnaire were formed from properties which described the main tree species of a stand, the tree species mixture, the tree species frequency, and the development stage, by asking the recipient to set into order of beauty three alternatives for each of the forest stand characteristics under study, e.g. the tree species of a stand — pine, spruce and birch stand. Apart from the research carried out by DEGENER which was mentioned earlier, this type of ordinal measurement for the characterisation of the opinions of recreationists has been applied in numerous other recreation studies (cf. SHAFAR 1964; FISCHER 1965; HANSTEIN 1967; HENDEE et al. 1968; MUTSCH 1968; BICHELMAYER 1969; MAYER 1969; WEIMANN 1969; KETTLER 1970; SHAFAR and MIETZ 1970; JACSMAN 1971; WEIDENBACH 1971; HAAKENSTAD 1972; SAASTAMOINEN 1972). The variables which have been used in the questionnaire and the way in which they have been presented, are shown in Appendix 2.

#### 212. Interview

##### 2121. Construction of dependent variable

Since the results of the questionnaire do not really represent the real recreation situation, the possibility of using real stands and stand views as attitude objects, was also studied. The inclination to describe impressions resulting from the environment with different descriptive adjective attributes seemed to be rather suitable for this purpose. Apart from the possibility of controlling the quality of the results obtained by the questionnaire it was also presumed that it would be possible to get some information about the relationships between verbal expressions and actual behaviour.

The method chosen from those available was the one in which the people being interviewed were asked to express an opi-

nion about the interview stand using a number of adjectives which had been given a numerical value. These were summed together and used to elucidate the preference relations of the interview stands. Such scales formed from corresponding lists of adjectives have earlier been used in some studies concerning the quality of the environment (cf. TWISS 1969; SHAFAR and MOELLER 1971).

At the same time, some of the essential principles used in the drawing up of such a scale can be elucidated. First of all, the suitability of the scale depends to a great extent on the choice of words used in the assessment. Since the quality of the environment is being studied, it is only natural to choose the adjectives in such a way that they express an individual's preferences for the environment (ESKOLA 1966, pp. 252–253). According to LOVÉN (1973 b), those adjectives which are commonly used for describing experiences resulting from the visual environment and which by using them the intensity of the experience can be stressed, can be employed. In addition, the adjectives which are used should be semantically stable, i.e. completely independent as far as meaning is concerned from the attitude object or observer (cf. ÖUNAP 1966).

The adjectives used in the scale were selected by showing a number of slides of different stand aspects and natural views to two experimental groups consisting of school children and students. The members of the groups were asked to write down the first couple of adjectives they thought of each time a slide was shown. The 72 most commonly occurring adjectives were separated and the distinguishing ability of the adjectives tested in the study carried out during the preliminary investigation LOVÉN (1973 b).

Since many of these adjectives proved to be neutral or otherwise rather vague, an attempt was made to remove such adjectives from the basic group. This was carried out by asking people familiar with the terminology used in describing scenery to estimate with a seven class scale, how positive or negative they considered the property expressed by the adjective used in connection with the scenery concept to

be. The test was used to eliminate those adjectives where the frequency of the opposite estimates was, inclusive of nought, greater than or as great as 25 % of the total number of replies ( $N = 215$ ), or which had some significant dependence upon the background of the estimators (LOVÉN 1973 b).

The following adjectives and participles used as adjectives remained: inspiring, pleasant, ugly, original, repulsive, soothing, attractive, monotonous, delicate, varying, depressing, unpleasant, beautiful, revealing, interesting, startling, expressive.

In the factor analysis they were considered to form a valuation dimension rather ambiguously interpreted which explained the main part (over 50 %) of the mutual variation of the adjectives in the solution of three factors (LOVÉN 1973 b). The adjectives were drawn up to form a Likert-type sum scale, in which the items were given numerical values in such a way that the adjectives expressing positive valuation had values of 4–7, and adjectives expressing negative valuation 4–1 (see Appendix 1).

## 2122. Choice of independent variables

It was considered that the scale which was developed gave a possibility for describing, in addition to the preference relationship between stands, the part which individual stand properties play in the preference, or in other words to use them for explaining the variance in the preference variable.

When choosing the independent variables, account must first be taken of the fact that to form a preferred view the stand must fulfill certain physical or rather ecological premises. However, these premises are not necessarily a sufficient precondition for a stand view to be given a high rating in the preference order. Apart from the ecological premises, the way in which these factors together form a stand view is obviously decisive (cf. e.g. MILES 1967). It is also very important whether or not the observer considers the stand view to live upto his expectations. However this does not necessarily have to mean that the variables describing the ecological state of the environment could not have their own independent explanatory power as regards



the variance of the preference variable. This can be the case especially when the stand fulfills the premises set upon it as a preferred view as far as its ecological state is concerned, but from the point of view of its structure does not fulfill those demands in accordance with the natural state which are possibly connected for example with a stand view. The analysis can best be illustrated by the scheme in Fig. 1.

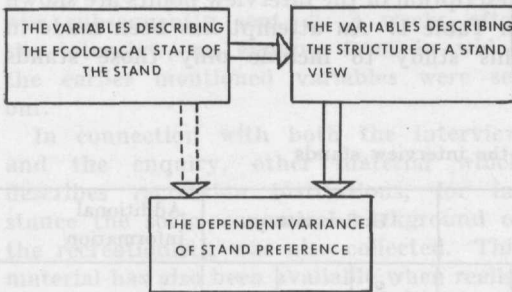


Fig. 1. The analysis scheme

When applying the scheme presented in Fig. 1 to the choice of independent variables, those stand properties which had been considered as being relevant study objects, were primarily of interest. At the same time, it has also been presumed that, as the literature supports (cf. e.g. PITKÄNIEMI 1972; MIKOLA 1973), recreationists prefer in particular mixed stands made up predominantly of large trees which appear diverse and natural to them.

When analysing the last mentioned hypothetical stand model, the variables describing the development stage of the standing trees and the tree species mixture for instance can be distinguished as ecological variables. The structure of the stand and its organization as a stand view are described by the concepts of diversity and natural state. Since as far as views are concerned, these concepts are used in an even wider meaning to describe a preferred recreation environment, they have been chosen to express the organization of a stand to form a view in this study. These factors act as certain kinds of interviewing variables, and by analysing the relationships between

them and the environment, additional information can be obtained about the ecological properties of preferred stand views. It can thus be presumed that, independent of the ecological state of the stand, the stands which appear to be diverse and in a natural state are relatively preferred as far as their views are concerned.

When choosing the variables, the degree of natural state of the stand experienced by the recreationist has been described by asking the person interviewed to express by means of a four classed scale, in what degree of natural state he considers the stand view in question to be. As far as the diversity of the stand view is concerned, it has been described by means of the estimate of colourfulness made by the person being interviewed, also using a four classed scale. In point of fact, this variable only expresses one characteristic of environmental diversity, although it can be considered as being correlated with other variables describing the diversity of the environment. This variable also proved to be more usable in the preliminary study interviews than for instance the concept of diversity.

Apart from the concepts of diversity and natural state, variables describing the ecological state of the stands were also used for explaining the variance in the independent variable within the framework of the analysis scheme. Since no clearly accurate hypotheses could be used as the basis for the study, material describing the interview environment and the state of it when the interview took place was collected rather widely. In order to facilitate the practical side of the study, normal forest mensuration terminology has been used as much as possible for the stand descriptions, despite the fact that the relevance of this terminology to landscape research is not yet known. The variables can be seen in Appendix 3.

## 22. Study material

The empirical material used in this study was collected during interviews with recreationists in two recreation areas owned by the City of Helsinki. The interviews were subsequently supplemented by a pos-

tal enquiry. One of these recreation areas, the so-called Central Park, is situated in the immediate vicinity of densely populated areas of the City of Helsinki, and attracts people taking part in outdoor activities during both daily and weekend leisure time. The other study area, Luukkaa recreation area, is on the other hand located at a distance of about 30 km from the center of Helsinki, on both sides of the main road to Pori. This recreation area is mainly used at the weekends. Despite the different facilities provided for recreational activity, both areas bear the mark of the original natural environment. In Central Park in

particular, most of the stands consist of mature spruce stands. A more accurate description of the areas pertaining to this study can be found in the study carried out by JAATINEN (1974) concerning the recreational utilization of these areas and its socio-economical background.

The interviews which took place in the recreation situation were carried out at fixed points, in forest stands, through which on both areas a constructed recreation route passed. The areal distribution and rough description of the interview points are shown in Table 1. An attempt has been made in this study to include only those stands

Table 1. Overall picture of the interview stands

General information		Upper storey						Under storey			Additional information
Number and location of stand	Site type	Development class	Predominant tree species	Height m	Basal area m <sup>2</sup> /ha	Density 0-9	Volume m <sup>3</sup> /ha	Presence or absence	Type	Density 0-9	
1 Central Park	OMT <sup>1)</sup>	1 <sup>2)</sup>	mä <sup>3)</sup>	20	6	2	50	present	lhp <sup>4)</sup>	9	Football pitch in sight
2 »	MT	4	ku	22	18	6-7	190	present	hvp	2-3	Riding path in sight
3 »	MT	4	mä	23	18	6-7	180	present	hvp	2-3	Ground vegetation deteriorated
4 »	VT	0	—	—	—	—	—	—	—	—	Stand partly on rocky terrain, electricity power line
5 »	VT	2-3	mä	7	16	9	60	absent	—	—	Stand partly on rocky terrain
6 »	MT	1	ku	2	1-5	9	10	absent	—	—	
7 »	OMT	4	ko	22	12	3-4	120	present	hvp	5-6	
8 »	MT	1	mä	2	1-5	8	10	absent	—	—	
9 Luukkaa	VT	1	mä	2	1-5	9	10	absent	—	—	
10 »	MT	0	—	—	—	—	—	—	—	—	Harvesting residues and aspen saplings
11 »	MT	2-3	mä	22	24	7	240	present	hvp	2-3	View of lake, ground vegetation deteriorated
12 »	IR	2-3	mä	6	6	3-4	20	present	hvp	2-3	
13 »	OMT	4	ku	26	28	9	350	present	hvp	2-3	Virgin forest

1) Site type                      2) Development class                      3) Predominant tree species                      4) Type of under storey  
 OMT = Oxalis-Myrtillus type    0 = Clear cut area                      mä = Scots pine                      lhp = Deciduous  
 MT = Myrtillus type              1 = Seedling stand                      ku = Norway spruce                      hvp = Coniferous  
 VT = Vaccinium type              2-3 = Middle aged stand                      ko = Birch  
 IR = Pine bog                      4 = Mature stand

which are clearly defined as far as their tree species composition and development stage are concerned. The variables used for describing the stands, and which were used when the material was analysed, are to be found in Appendix 3.

The attention of the person being interviewed was drawn during the interview situation to the view formed by the interview stand and he was then asked to describe, by means of given adjectives, his impressions of the view. The name and address of the interviewee was asked for and he was subsequently sent, 2–3 weeks after the interview, an enquiry form in which the earlier mentioned variables were set out.

In connection with both the interview and the enquiry, other material which describes recreation institutions, for instance the socio-economical background of the recreationists, was also collected. This material has also been available when realising the proposed research objectives. The material used in this part of the study is shown in its entirety in Appendices 1–3.

A systematic sample was taken from the annual user group of the areas, each sample unit comprising an individual recreationist and/or recreation group consisting of several

people together taking part in some outdoor activity. The samples were chosen in the following manner: the interviewer interviewed the first recreationist or group of recreationists who happened to come to the interview stand after he had arrived at the interview point. Every third recreationist or group of recreationists which arrived at the interview point was subsequently interviewed. People who the interviewer considered to be less than 15 years old were not included in the material. One person was chosen by each of the groups interviewed to answer the questions. However, the individual members of the groups were allowed to influence the answers given by the group's spokesman. The material was collected from both areas during the weekends.

Apart from three interview points in Luukkaa, the research material is distributed such that the winter interviews were carried out during February–March, the spring ones during April–May, the summer ones during June–August, and the autumn ones during October–November. Their relative distribution by season and by study area is shown in the following table which includes only satisfactory interviews (JAA-TINEN 1974).

	Winter	Spring	Summer	Autumn		
Central Park, % .....	28	24	23	25	(100)	(N = 969)
Luukkaa, % .....	16	19	46	19	(100)	(N = 354)
Total, % .....	25	22	30	23	(100)	(N = 1323)

Altogether 1582 interviews were carried out, the majority of them being done in 1971. However, the Luukkaa material includes 60 interviews which were carried out during winter 1972 since the weather during the previous winter was of such a nature that none of the interviews in this area could have been done under typical winter conditions. Altogether 1323 replies were received to the postal enquiry. After one reminding letter had been sent out, the reply percentage rose to 84. Every recreationist who answered the enquiry forms an accepted observation in this study, so the total material comprises 1323 observations.

### 23. Analysis of the material

The choice of analysis methods used in this study is limited by a number of factors, for instance the nature of the research problem, the research approach of the problem and the quality of the material collected (KULOKARI 1970). In this case the choice of the method has been influenced by the fact that the aim of this study is the description of the stand preferences of recreationists. Depending upon the way in which the problem is approached, all the variables of the material cannot be considered to be causally at the same level. The main goal in the analysis of the interview material has been the

search for the statistical connection between the variables used to measure the preferences and the descriptions of the interview stands. However, it must be borne in mind that the existence of statistical dependencies does not necessarily indicate the existence of any causal connections between variables (ESKOLA 1966 pp. 258–259). On the other hand, they should give some indication about which stand properties recreationists prefer.

The tabulation technique in which the variables would be characteristics describing either the individual stand properties or typologies formed from them were chosen for the analysis of the enquiry material. Since the latter method was considered to be more graphical than the former descriptive method, the choice alternatives for every stand property were formed by tabulating the typologies (e.g. pine/spruce/birch, spruce/pine/birch etc.). Their frequency of occurrence is presented in the results. The statistical significance of the results has been studied by means of a binomial test (cf. e.g. MÄKINEN 1968, pp. 124–126). The way in which the background of the recreationist affects the choice, has been studied by means of tabulations and the  $X^2$ -test carried out at a variable level.

The preference order of interview stands as standwise entireties have been illustrated using adjective score means. Considering

the level of measurement, it would however have been theoretically more justified to use some other mean number, for instance the mean (cf. e.g. VASAMA and VARTIA 1971). Since it is possible in practice to place a meaningful interpretation on the means, they have been used (cf. VALKONEN 1971, p. 19). Thus it has also been considered justifiable to use variance analysis for testing the statistical significance of the preference differences found between interview stands.

The part which individual stand properties plays in the stand preference have been analysed using multiple regression analysis. Both variables describing the structure of the stands and their ecological state were used as independent variables (cf. Fig. 1). The last mentioned variables were selected stepwise for the constructed model by the step-up method. All the variables used for describing the ecological state of the interview stands were thus selection objects (cf. Roos 1971). However it should be stated that the material does not in all respects, for example as regards the level of measurement, correspond to the premises set on the application of regression analysis. Nevertheless, in practice the usability of the results does not have to decrease except under quite exceptional conditions (cf. KULLOKARI 1970). Correlation analysis and factor analysis are used for studying the reliability and the validity of the results.



### 3. RESULTS

#### 31. Questionnaire

##### 311. Tree species and tree species mixture preferences

The idea that birch in particular but also pine has greater scenic value than spruce seems to have become quite common (cf.

e.g. MIKOLA 1973). In order to study this hypothesis, the questionnaire recipients were asked to place stands formed purely of pine, spruce or birch into order of beauty. The choice combinations calculated from those replies which had been answered in full are presented in Table 2. It can be seen from the table that the combinations:

Table 2. Tree species choice combinations

Choice combination <sup>1)</sup>	Number of times chosen	Distribution of choices, %	Statistical significance of the choices, %
ko/mä/ku .....	472	38.6	99.9
mä/ko/ku .....	441	36.1	99.9
----- Predicted choice percentage 16.7 % -----			
ko/ku/mä .....	122	9.9	99.9
mä/ku/ko .....	111	9.1	99.9
ku/ko/mä .....	42	3.4	99.9
ku/mä/ko .....	35	2.9	99.9
Total .....	1223	100.0	

<sup>1)</sup> mä = Scots pine  
ku = Norway spruce  
ko = Birch

birch/pine/spruce — and pine/birch/spruce occurred more frequently than any other choice combination. On the other hand, those combinations in which spruce took first or second place remain quite insignificant. These results correspond to that which was expected and do not show any deviating characteristics from commonly held ideas.

The quality of the recreation environment as regards the tree species preferences has been studied elsewhere. The observations made in Norway by HAAKENSTAD (1972) are rather interesting. He found that recreationists from the Oslo area showed

the same preference for pine as was found in this study. On the other hand, they showed a negative preference for spruce and birch. In Denmark, DEGENER (1963) found that recreationists regarded beech as being more beautiful than any of the tree species to be found in Denmark. According to DEGENER, the relative commonness of different tree species and the background knowledge of the recreationists concerning trees in general had an important effect on the results. However, these observations obviously do not explain the results which were obtained in this study, and the explanation for the preference

ratios between different tree species must be sought from the background of the recreationists and from the morphological and phenological differences between different tree species. The factors influenced by national traditions and mythology might also give some ideas about the reasons for these differences.

The position of different tree species in the recreation environment has also been studied by observing the real behaviour of the recreationists. For instance, in the United States it has been observed that campers more frequently choose pine forests than deciduous forests (FRISSEL and DUNCAN 1965; KUKAS and DUNCAN 1967; LIME 1971). When attempting to explain the behaviour of the recreationists in this case, attention must be paid to visual factors as well as to other properties of the environment which increase the recreation value of pine forests in comparison to forests made up of other tree species. The observations made both in Holland and Switzerland that recreationists, in response to tempera-

ture changes in the environment, prefer stands made up of different tree species should also be mentioned (JACSMAN 1971).

The tree species preferences of recreationists has most often been studied in a contrast setting formed by coniferous and deciduous forests without distinguishing individual tree species from each other. Such a setting was also used in the preliminary study and it was found that recreationists preferred coniferous forests to deciduous forests (HUHTAMO 1971). A similar result has been found in most foreign studies (cf. FISCHER 1965; HANSTEIN 1967; MUTSCH 1969; BICHELMAYER 1969; MAYER 1969; WEIMANN 1969; KETTLER 1970; WEIDENBACH 1971; HAAKENSTAD 1972). The question has not been more closely studied in this paper. However, it is partly covered by the question in which the recipients were asked to place the stands formed of mixtures — pine-spruce, spruce-birch and pine-birch into order of beauty. According to Table 3, recreationists do not at all prefer pine-spruce coniferous stands. This

Table 3. Tree species mixture choice combinations

Choice combination <sup>1)</sup>	Number of times chosen	Distribution of choices, %	Statistical significance of the choices, %
mäko/kuko/kumä .....	489	39.8	99.9
mäko/kumä/kuko .....	261	21.3	99.9
----- Predicted choice percentage 16.7 % -----			
kuko/mäko/kumä .....	207	16.9	99.9
kumä/mäko/kuko .....	118	9.6	99.9
kuko/kumä/mäko .....	99	8.1	99.9
kumä/kuko/mäko .....	53	4.3	99.9
Total .....	1227	100.0	

<sup>1)</sup> mä = Scots pine, ku = Norway spruce, ko = Birch

may be caused by the mutual preference ratios between the individual tree species. This tends to confirm the impression that pine and birch are clearly more preferred than spruce.

### 312. Tree species abundance preferences

It was found in the preliminary study that the recreationists considered mixed forests formed of coniferous and deciduous species



to be more beautiful than pure deciduous or coniferous forests (HUHTAMO 1971). A corresponding preference has also been reported in several recreation studies carried out elsewhere (cf. HANSTEIN 1967; MUTSCH 1969; BICHELMAYER 1969; WEIMANN 1969; KETTLER 1970; WEIDENBACH 1971; HAAKENSTAD 1972).

In this study preference ratios of stands formed from only one tree species and different tree species mixtures has been elucidated by asking the recipients to place stands formed of one tree species, two tree species, and three or more tree species in order of beauty. The choice combinations are presented in Table 4.

Table 4. Tree species abundancy choice combinations

Choice combination <sup>1)</sup>	Number of times chosen	Distribution of choices, %	Statistical significance of the choices, %
3/2/1/ .....	574	47.2	99.9
1/2/3 .....	223	18.3	99.9
----- Predicted choice percentage 16.7 % -----			
2/1/3 .....	145	11.9	99.9
2/3/1 .....	125	10.3	99.9
1/3/2 .....	95	7.8	99.9
3/1/2 .....	55	4.5	99.9
Total .....	1217	100.0	

- 1) 1 = Stand formed from one tree species  
 2 = Stand formed from two tree species  
 3 = Stand formed from three or more tree species

The results confirm the hypothesis that there is a positive relationship between the tree species abundancy and the attractiveness of the environment (PITKÄNIEMI 1972; SAASTAMOINEN 1972; MIKOLA 1973). Apart from this interaction, the tree species abundancy also has, through ecological processes, an indirect effect on the quality of the recreation environment. However, more detailed discussion of these questions does not fall within the scope of this study.

### 313. Development stage preferences

Apart from tree species composition and tree species abundancy, the character of the stand is to a large extent determined by the development stage which it has reached. In general, mature stands are

considered to be more beautiful than stands at other development stages (HÄYRINEN 1971, pp. 299–300; PITKÄNIEMI 1972; MIKOLA 1973). Of course the actual dominant tree species and tree species abundancy sets some qualifications upon this statement. According to some observations, the situation as regards the recreation suitability of forests areas is not however quite so straightforward (cf. Friluftsområdet ... 1970; JACSMAN 1971; Planering ... 1971; HAAKENSTAD 1972), for apart from the size of the standing trees the presence of undergrowth below the main standing trees may to a great extent increase the scenic value of the stand.

The preference ratios of stands at different development stages have been studied by asking the recipients to place in order of beauty, seedling stands, middle aged stands,

Table 5. Development stage choice combinations

Choice combination <sup>1)</sup>	Number of times chosen	Distribution of choices, %	Statistical significance of the choices, %
3/2/1 .....	672	55.1	99.9
2/3/1 .....	270	22.1	99.9
Predicted choice percentage 16.7 %			
2/1/3 .....	119	9.8	99.9
3/1/2 .....	105	8.6	99.9
1/2/3 .....	39	3.2	99.9
1/3/2 .....	14	1.1	99.9
Total .....	1219	100.0	

- <sup>1)</sup> 1 = Seedling stand  
 2 = Middle aged stand  
 3 = Mature stand

and mature fully aged stands. The results presented in Table 5 would indicate that recreationists prefer mature stands more than stands which are at a younger development stage.

#### 314. Relationship between the stand preferences and the background of the recreationists

It is possible to distinguish groups which differ from each other as regards their backgrounds from amongst those people

who use the recreation areas (JAATINEN 1974). In order to be able to stress the management of the recreation areas in this sense correctly, the environmental preferences of the different groups should be known (cf. HENDEE et al. 1968). The relationship between the different stand preferences and the background of the recreationists also gives us some idea about what kind of inaccuracies a possible sampling error can produce in the results previously described and what sort of effect the factors depending on the background of the recreationists have on the results. Reliability

Table 6. The relationship between sex of the recreationists and the stand preferences

Sex	Tree species preferences			Tree species abundance preferences			Development stage preferences		
	Pine	Spruce	Birch	One species	Two species	Three or more species	Seedling stand	Middle aged stand	Mature stand
Female .....	1.69	2.70	1.58	2.26	1.93	1.77	2.75	1.73	1.49
Male .....	1.65	2.67	1.65	2.32	1.87	1.75	2.70	1.79	1.48
Total mean ....	1.67	2.69	1.62	2.29	1.90	1.76	2.72	1.76	1.48

Table 7. The relationship between occupational status of the recreationists and the stand preferences

Occupational status	Tree species preferences			Tree species abundance preferences			Development stage preferences		
	Pine	Spruce	Birch	One species	Two species	Three or more species	Seedling stand	Middle aged stand	Mature stand
1 <sup>1)</sup> .....	1.86	2.67	1.33	2.00	1.67	2.14	2.83	1.50	1.57
2 .....	1.65	2.71	1.63	2.12	1.87	2.00	2.86	1.80	1.33
3 .....	1.51	2.74	1.74	2.23	1.92	1.82	2.82	1.81	1.35
4 .....	1.66	2.74	1.58	2.42	1.83	1.73	2.79	1.77	1.42
5 .....	1.67	2.68	1.62	2.24	1.92	1.79	2.71	1.77	1.49
6 .....	1.71	2.65	1.59	2.26	1.99	1.69	2.60	1.81	1.53
7 .....	1.76	2.57	1.62	2.28	1.85	1.80	2.61	1.72	1.62
8 .....	1.77	2.67	1.47	2.73	1.76	1.38	2.48	1.67	1.68
9 .....	1.89	2.49	1.61	2.45	1.89	1.65	2.64	1.67	1.67
Total mean ....	1.72	2.66	1.58	2.30	1.86	1.78	2.70	1.72	1.52

<sup>1)</sup> 1 = Profession with highest status

9 = Profession with lowest status

and validity of results is discussed in detail later.

The relationship between the preferences and the background of the recreationists was studied by means of tabulation in which the variables describing the background of the recreationists were sex, social group,

age, place of childhood residence, and education level. The classification of occupational status formulated by RAUHALA (1966) was used in the determination of social group. The following statistically significant differences ( $P < .05$ , Tables 6–10) were found in the stand preferences as

Table 8. The relationship between age of the recreationists and the stand preferences

Age, years	Tree species preferences			Tree species abundance preferences			Development stage preferences		
	Pine	Spruce	Birch	One species	Two species	Three or more species	Seedling stand	Middle aged stand	Mature stand
0–19 .....	1.45	2.90	1.55	2.30	1.92	1.55	2.70	1.70	1.30
20–29 .....	1.47	2.77	1.62	2.39	1.84	1.59	2.80	1.73	1.38
30–39 .....	1.52	2.72	1.71	2.27	1.86	1.79	2.74	1.75	1.45
40–49 .....	1.62	2.76	1.57	2.77	1.93	1.65	2.68	1.71	1.56
50–59 .....	1.69	2.68	1.61	2.32	1.90	1.74	2.69	1.83	1.46
60–69 .....	1.75	2.64	1.60	2.23	1.90	1.85	2.76	1.75	1.47
70– .....	1.82	2.48	1.68	2.34	1.83	1.82	2.69	1.73	1.56
Total mean ....	1.61	2.71	1.62	2.37	1.88	1.71	2.72	1.74	1.45

Table 9. The relationship between childhood residence environment of the recreationists and the stand preferences

Childhood residence environment	Tree species preferences			Tree species abundancy preferences			Development stage preferences		
	Pine	Spruce	Birch	One species	Two species	Three or more species	Seedling stand	Middle aged stand	Mature stand
Scattered rural settlement ....	1.59	2.66	1.60	2.32	1.92	1.72	2.60	1.77	1.59
Rural church village .....	1.53	2.74	1.58	2.27	1.79	1.85	2.59	1.79	1.53
Market town/city less than 500 inhabitants	1.30	2.69	1.62	2.34	1.98	1.62	2.89	1.80	1.30
Market town/city more than 5000 inhabitants .....	1.38	2.67	1.61	2.26	1.88	1.79	2.83	1.75	1.38
Helsinki .....	1.42	2.68	1.67	2.32	1.90	1.76	2.80	1.75	1.42
Total mean .....	1.45	2.69	1.62	2.31	1.89	1.75	2.74	1.77	1.44

Table 10. The relationship between educational level of the recreationists and the stand preferences

Educational level	Tree species preferences			Tree species abundancy preferences			Development stage preferences		
	Pine	Spruce	Birch	One species	Two species	Three or more species	Seedling stand	Middle aged stand	Mature stand
Elementary school .....	1.77	2.56	1.58	2.36	1.92	1.64	2.50	1.73	1.68
Elementary school and vocational training .....	1.71	2.65	1.60	2.30	1.86	1.76	2.64	1.76	1.55
Intermediate school .....	1.71	2.69	1.56	2.41	1.88	1.67	2.67	1.73	1.53
Intermediate school and vocational training .....	1.59	2.71	1.67	2.35	1.83	1.79	2.78	1.72	1.47
Matriculation examination ...	1.81	2.87	1.32	2.35	2.10	1.55	2.74	1.84	1.42
Matriculation examination and vocational training .....	1.69	2.65	1.67	2.22	1.96	1.80	2.88	1.79	1.34
Academic degree	1.57	2.74	1.67	2.26	1.89	1.82	2.81	1.83	1.33
Total mean .....	1.69	2.69	1.58	2.32	1.92	1.72	2.72	1.77	1.47



far as the different variables are concerned. The fact that while the number of points increases, the preference decreases and vice versa is worth mentioning.

#### Tree species preferences:

- women preferred birch more than men
- preference for pine increased and for spruce decreased when going up the social group scale
- preference for pine decreased and for spruce decreased as the age of the interviewee increased
- preference for pine increased as the degree of urbanisation of the place of childhood residence increased
- preference for pine and birch increased and for spruce decreased as the education level increased

#### Tree species abundance preferences:

- preference for stands formed by three or more tree species increased when going up the social group scale

#### Development stage preferences:

- preference for seedling stands decreased and for mature stands increased when going up the social group scale
- preference for seedling stands increased as age increased
- preference for seedling stands decreased and for middle aged and mature stands increased as the degree of urbanisation of the place of childhood residence increased
- preference of seedling stands and middle aged stands decreased and for mature stands increased as education level increased

It is difficult to create any uniform hypothesis on the basis of these observations which would explain the relationship between the preferences and the background of the recreationists, especially since no earlier studies on this problem have been carried out. However it is possible to detect some regularities in the preferences, in particular in the preferences for tree species and development stages. In the former case the preference for pine and in the latter case the preference for mature stands seems to be connected in different ways with the urban living environment; on the other hand, fea-

tures contrary to this trend were found in the preferences for spruce stands and seedlings stands. The differences which have been observed in the development stage preferences in particular, might be affected by the alienation from primary production resulting from urbanisation, and from the forest environment which is treated in different ways. Thus it is obviously not always easy to understand the role played by all types of forestry practice and the development stage of the stands in the production process. Independent of the reasons for the preferences, the attention paid to the background of the recreationists accentuates the important role of large-sized development classes in the management of recreation forests.

## 32. Interview material

### 321. Preference order of the interview stands

The adjective score means for the interview stands are presented in Fig 2. It can

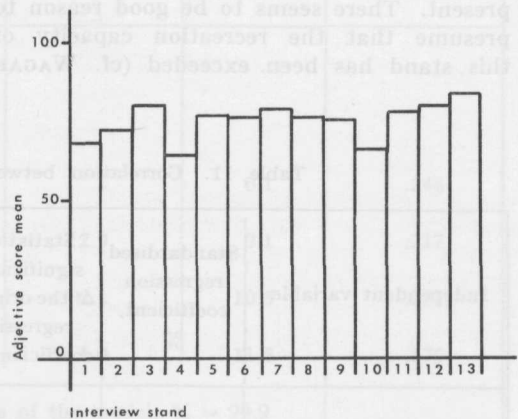


Fig. 2. The preference order of the interview stands

be seen from the figure that there are preference differences between stands which are statistically very significant ( $P < .001$ ) when classified according to stands and season. When the score values are compared with the corresponding standing tree in-

formation for the stands (Table 1), it can be seen that the stands with abundant and large-sized standing trees received to some extent higher score values than other stands. Another relatively clear result is that open stand patterns have been given lower score values than other stands. On the other hand, seedling stands have been given higher score values in comparison to other stands than would have been expected judging by the questionnaire material. One feature which is worth mentioning, is that the stands which can be considered to be in the most natural state, (stands no. 12 and 13) received higher score values than other stands. Stand no. 11 was not given an exceptionally high value of scores although a lake formed an important part of this view. It is generally held that an expanse of water is one of the most important constituents of attractive scenery (cf. e.g. SIMOJOKI 1970). However such a result is easily explained by the fact that the stand in question has deteriorated as a result of recreation activity and was situated at one of the junctions in the recreation network of the area where, during the interview, there might have been rather a lot of people present. There seems to be good reason to presume that the recreation capacity of this stand has been exceeded (cf. WAGAR

1964; LAPAGE 1967; LIME and STANKEY 1971).

If every individual interview stand is considered to represent one aspect of a forest, then the preference for the individual stands varied in such a way that it was highest during the summer and lowest during early spring. The preference for the stands was about the same during autumn and winter. As far as different stands were concerned, the seasonal preference variation was not completely uniform. However, it can be stated that stands which differ from each other ecologically speaking can as far as the views are concerned also be different. The same stand, depending on the season, can also be perceived to be different.

**322. Correlation between the environment and the preferences**

An attempt was made in the second stage of the analysis to find the most important correlations between the preferences and the environment. The results of the regression analysis designed to determine the factors producing the preference differences between the interview stands is presented in Table 11. The selection of ecological

Table 11. Correlation between preferences and environment

Independent variable	Standardised regression coefficient, %	Statistical significance of the original regression coefficient, %	Loss in explanatory power of model by deletion, %	Cumulative explanatory power, %	Total correlation between the dependent and independent variables
(40) Colourfulness .....	.363	99.9	11.8	30.7	.497
(56) Natural state .....	.170	99.9	2.5	35.3	.341
(220) Basal area of the predominant storey .....	.085	99.0	.3	37.4	.429
(222) Density of the predominant storey .	.231	99.9	2.9	39.2	.399
(228) Coniferous undergrowth .....	.142	99.9	1.3	40.5	.266
Statistical significance of the model, % = 99.9					



variables to be included in the model has been terminated when the increase in the explaining power given by the variables exceeding the new formal test value ( $P < .1$ ), has dropped below 1 %.

It can be seen from Table 11 that the variables describing the structure of the interviews stands explain, as was to be expected, the main part of the explained variance of the dependent variable. On the other hand, the part played by ecological variables in the total degree of determination of the model is insignificant. These variables can be considered to describe the abundance of the standing trees and the biomass of the interview stand. The last mentioned properties, according to the enquiry material, can be presumed to be characteristic of a preferred stand as regards its appearance.

In actual fact the stand level of these variables is characteristic for stands with large sized dominant trees and which had not been subjected to silvicultural treatment for a long time.

Some additional information about the environmental preferences of recreationists can be elucidated by studying what kinds of stands have been organized into entireties estimated as being colourfull and in a natural state. This question has been investigated by using colourfullness and natural state estimations as dependent variables in regression analysis, the independent variables of which are the variables describing the ecological state of the stand. The results of this regression analysis can be seen in Table 12.

Table 12. Correlation between estimations of colourfullness and natural state and environment

Independent variable	Standardised regression coefficient, %	Statistical significance of the original regression coefficient, %	Loss in explanatory power of model by deletion, %	Cumulative explanatory power, %	Total correlation between the dependent and independent variables
Estimate of colourfulness					
(220) Basal area of the predominant storey .....	.042	90.0	.1	6.1	.248
(11) Amount of leaves on deciduous trees	.175	99.9	2.9	9.1	.217
(222) Density of predominant storey .....	.194	99.9	2.1	10.5	.231
(228) Coniferous undergrowth .....	.126	99.9	1.0	11.5	.170
Statistical significance of the model, % = 99.9					
Natural state estimate					
(236) Clear cut area .....	-.162	99.9	1.7	10.1	-.318
(11) Amount of leaves on deciduous trees	.107	99.9	1.0	12.5	.205
(238) Thinning stand ...	.172	99.9	2.5	13.9	.178
(226) Total undergrowth	.192	99.9	2.1	15.0	.220
(218) Presence of harvesting residues ...	-.135	99.9	1.2	16.3	-.118
Statistical significance of the model, % = 99.9					

Both variables can be considered to represent some type of sum variables which describe the abundance and size of the standing trees and the biomass of the interview stands. Although it is not possible to show any clear connection between the cloudiness and/or illumination and colourfulness when the interviews were carried out, we can however come to the conclusion that as far as the biomass of large and abundant standing trees is concerned, the illumination level and shade variation and thus also the different colour hues must be relatively greater in such stands than in other type of stands (JACSMAN 1971). The negative correlation of the natural state estimation between the clear cut area and the presence of harvesting residues shows that this variable also gives an indication of the effect of human activity on the stand view. In addition, the relatively low mutual correlation ( $r = .203$ ) between the natural

state and the colourfulness indicates that these variables measure features which deviate from each other in the organization of the stand view. The material available for this study does not however provide premises for a closer analysis of these differences.

### 33. Reliability and validity of the results

From the point of view of the reliability and validity of the results, the magnitude of the measuring error and the sampling error are the most important questions. In other words, in what way do the variables used reliably and correctly describe the environmental preferences of the recreationists and to what extent can the results obtained be considered as generalisations which cover the basic group of the sample.

Table 13. Some characteristics describing the distinguishing ability and reliability of the scale containing the various adjectives

Item	Statistical significance of the distinguishing ability of the item, %		Variance — mean ratio, %	Error variance of item, %
	Season	Interview stand		
Inspiring .....	95.0	99.9	19	89
Pleasant .....	95.0	99.9	18	78
Ugly .....	99.9	99.9	19	78
Original .....	95.0	95.0	19	95
Repulsive .....	95.0	99.9	9	87
Soothing .....	95.0	99.9	19	88
Attractive .....	95.0	99.9	20	85
Monotonous .....	95.0	99.9	29	86
Delicate .....	95.0	99.9	18	89
Varying .....	95.0	99.9	19	89
Depressing .....	99.9	99.9	16	81
Unpleasant .....	95.0	99.9	14	81
Beautiful .....	99.9	99.9	19	78
Revealing .....	95.0	99.9	14	81
Interesting .....	95.0	99.9	19	90
Startling .....	95.0	95.0	16	95
Expressive .....	95.0	95.0	20	95
Total mean .....			18	86

Table 14. The four factor solution applied to the item scale used in the interview

Item	Factor				Communality estimate <sup>1)</sup>		
	1	2	3	4	$h_j^2/1$	$h_j^2/2$	$h_j^2/3$
Inspiring .....	.667	.222	-.075	.069	.445	.495	.500
Pleasant .....	.776	-.011	-.298	.021	.602	.603	.691
Ugly .....	.603	-.430	-.026	-.016	.363	.548	.549
Original .....	.338	.248	.323	-.089	.114	.195	.299
Repulsive .....	.351	-.527	.196	.114	.125	.402	.439
Soothing .....	.635	.175	-.109	.205	.403	.434	.446
Attractive .....	.758	.253	-.089	.082	.575	.639	.647
Monotonous .....	.650	-.125	-.114	-.289	.423	.439	.452
Delicate .....	.598	.287	.051	.138	.357	.440	.442
Varying .....	.627	.211	.065	-.285	.393	.438	.442
Depressing .....	.573	-.554	.700	-.032	.328	.636	.641
Unpleasant .....	.511	-.580	.176	.032	.261	.597	.628
Beautiful .....	.794	.079	-.199	-.012	.631	.637	.677
Revealing .....	.482	-.542	.127	.062	.233	.526	.542
Interesting .....	.731	.282	.125	-.033	.058	.588	.603
Starling .....	.225	.410	.336	.017	.051	.219	.331
Expressive .....	.435	.465	.139	.066	.189	.405	.425
Eigen values .....	6.001	2.238	.517	.271			
Eigen values as a percentage .....	35.3	13.2	3.0	1.6			
Cumulative eigen values as percentage .....	35.3	48.5	51.5	53.1			

<sup>1)</sup>  $h_j^2/1$  = communality after the first factor

Since the statistics concerning recreation in both research areas are inadequate as regards quantity and quality, the latter question remains open — as has been the case in most studies concerning the users of a certain area (cf. e.g. DEGENER 1963; MUTSCH 1968; WEIDENBACH 1971). However, it has been possible to detect certain basic characteristics of the background of the recreationists studied here, which are characteristic of recreationists who actively use forest areas (cf. e.g. HENDÉE et al. 1968; SAASTAMOINEN 1972). Thus attention should be drawn to the fact that the sample consisted of people belonging to a relatively high social group and whose age group distribution was of a rather youngish nature (JAATINEN 1974). As far as the size of the sample is concerned, it appeared to be sufficient for this purpose.

The factors decreasing the reliability and validity of the results are usually separated out in the measuring error (VALKONEN 1971). Since no independent measurements were carried out at the same time as the material was being collected, the reliability of the questionnaire material cannot be checked. On the other hand, the validity problem concerning the questionnaire material cannot be considered to be of prime importance since the questions have not been used to measure theoretical concepts.

However, some estimations regarding the measuring error of the interview material can be presented. First of all, the variance of the scale adjectives is on average 18 % of the corresponding means. The uncontrolled variance of the items is at the same time on average 86 % of the corresponding total variance (Table 13). Since the ecological

variables describing the interview instance did not explain the variance of the adjectives, the uncontrolled variance is primarily caused by the low reliability of the items and the background factors concerning the interviewed recreationist (LOVEN 1973 b). The reliability of the scale formed from the sum of the adjectives, increases to quite a high level since the so-called alpha coefficient of Cronbach (VALKONEN 1971, pp. 58–59) in this case is .88.

Apart from the reliability of the interview material, its validity can also be estimated by carrying out factor analysis on the scale adjectives (VALKONEN 1971, pp. 113–114). It can be seen from the solution presented in Table 14, that the first factor explains the main part of the explained mutual variance of the items. Thus it appears that the adjectives which were used, were measured mainly in one dimension. According to expectations, it can be interpreted as the preference dimension. The

communality indicates that the distinguishing ability of the scale could have been increased by excluding in particular the adjectives original, repulsive and startling which do not very clearly measure the preference dimension (LOVÉN 1973 b). Although the measurements turned out to be neutral and to a certain extent misleading, they were included in the scale. Since the reliability of the scale as a whole was rather high, the effect of a decrease in the validity of the random factors as far as the whole scale is concerned can be found to be quite insignificant.

When the research method to be used in the interview was drawn up, an attempt was made to eliminate the effect of the factors connected with the background of the recreationists on the results. In order to check this, the correlations between the individual scale adjectives and the age, sex, occupational status, place of childhood residence, income and education level of

Table 15. The correlations between the items of the adjective scale and some of the characteristics describing the socio-economic background of the recreationists

Item	Background variables					
	Sex	Profession	Age	Childhood residence environment	Income level	Education level
	(12)	(68)	(71)	(72)	(180)	(182)
Inspring .....	-.006	.089	-.051	-.081	-.047	-.120
Pleasant .....	-.005	.034	-.063	.011	.058	.000
Ugly .....	-.050	.043	-.111	-.072	.071	.067
Original .....	-.033	.163	.011	-.060	-.066	-.199
Repulsive .....	-.057	-.032	-.072	-.046	-.032	.006
Soothing .....	.037	.023	-.089	-.055	.008	-.048
Attractive .....	.004	.081	-.072	-.041	-.022	-.103
Monotonous .....	.005	.069	-.076	-.072	.005	-.096
Delicate .....	-.050	.080	.019	-.003	-.036	-.067
Varying .....	-.032	.066	-.042	-.074	-.029	-.086
Depressing .....	-.027	.009	-.056	-.030	.036	-.037
Unpleasant .....	-.064	.029	-.089	-.032	.047	-.046
Beautiful .....	-.016	.081	-.037	.005	.022	-.049
Revealing .....	-.034	-.031	-.089	-.053	.068	.017
Interesting .....	-.021	.155	.013	-.058	-.069	-.138
Startling .....	-.017	.090	.108	-.044	-.011	-.093
Expressive .....	-.017	.091	.102	-.022	-.086	-.064



the recreationists was first calculated. There appeared to be statistically significant correlations between the different adjectives and the earlier mentioned background factors, especially the age, occupational status and education level, which however, had absolute values of less than 0.200 (Table 15). On the other hand, the sum of the adjectives showed significant correlations only with the occupational status ( $r = .110$ ) and education level ( $r = -.121$ ) of the interviewee. Since the background factors show significant correlation ( $r = -.564$ ) with each other, they can be considered to form a background dimension describing the education level of the recreationists which

would be expected to have some effect on the results (LOVÉN 1973 b). However, standardisation of these factors had no effect on the results.

Apart from having direct effects, the factors connected with the background of the recreationists can also affect the analysis results through the natural state and colourfulness estimations which were used to describe the organization of the stands to form a scenic aspect. The correlation between these variables and the earlier mentioned background factors however proved to be insignificant, as the following table indicates.

#### Dependent variable

	Sex (12)	Social group (68)
Colourfulness (40) .....	-.102	.053
Natural state (56) .....	-.123	.119

#### Background variables

Age (71)	Place of childhood residence (72)	Income level (180)	Education level (182)
.000	-.002	-.050	-.008
-.014	-.017	-.094	-.118

Only as regards the natural state estimation can any definite continuity in the dependence on the background of the recreationists be seen. In this case, recreationists belonging to lower groups as far as both social group and education are concerned have considered the interview stands to be in more of a natural state than

recreationists belonging to other groups. It is possible to discern some differences in the estimations given by men and by women. However, when the effect of these factors was considered in the analysis of the material, it did not change any of the earlier mentioned results.

#### 4. DISCUSSION

When the results obtained from the questionnaire and interviews are compared, it can be seen that it was not possible to explain the preference differences between the interview stands by means of tree species as the questionnaire material would have led us to suppose. The mass of the standing trees or the biomass of it and the organization of them to form the scenic aspect, would appear to have a stronger effect on the preference of a stand than the tree species composition. Thus there is obviously no reason to presume that only the mature stands composed of several tree species like pine or birch would satisfy the recreationists as regards the scenery, as can be concluded from the questionnaire material. The questionnaire material is inadequate for determining the ideal stand from the recreationists point of view since the objects of the measurement are individual stand characteristics and not stand characteristic combinations. However, the interview material does indicate that, independent of the main tree species, those stands with relatively large and abundant standing trees are satisfying as far as their views are concerned.

It was not possible to study the explaining power of tree species abundance and mixture as regards the preference difference of the interview stands, since for technical reasons an attempt was made to choose stands which were simple and clearly distinguishable from each other for the interview stands. As the tree species composition did not however explain the preference difference between individual stands, it appears unlikely that the tree species abundance and/or tree species mixtures would have had any clear explaining power as regards the dependent variable. However, these factors might play an important role in the organization of the scenic aspect; for instance, the tree species abundance is in general regarded as increasing the diversity of the forest environment (cf. e.g. MIKOLA 1973).

The relationship between the environmental preferences of recreationists and natural stand development from the point of view of silviculture is an important question. Since both the questionnaire and the interview material show that recreationists prefer a diverse environment, overlong rotation periods should not be used in the management of recreation forests since, for instance, resulting differences occur in the ecology of tree species. However, it is true that the interview material gives some indication of the fact that the size of the standing trees from the point of view of the real behaviour inclinations of the recreationists might be a more important factor in the recreation environment than the tree species composition. In addition, the development stage preferences of the recreationist in the questionnaire material indicate that the management of recreation forests should perhaps include longer rotation periods than is used in normal commercial forestry practice. However, it is possible that even normal commercial forests which have a structure that is diverse and in a natural state can satisfy the environmental preferences of most recreationists (cf. PITKÄNIEMI 1973; MIKOLA 1973). When the questionnaire and interview material are compared, it can be seen that the more concrete the measurement directed at the real natural environment is, the more the stands seem to satisfy the environmental preferences of the recreationists. Some other studies carried out elsewhere (cf. FISCHER 1965; HANSTEIN 1967; HAAKENSTAD 1972; KARDELL 1972), also indicate that from the point of view of the real behaviour inclinations of recreationists, very many different types of stands apart from clear cut areas, are satisfying as far as the scenery is concerned. LUCAS's studies (1963, 1964) in the United States also indicate that forest areas used for recreation purposes can under certain conditions be handled rather intensively without the recreationists being



aware of the fact (cf. also KARDELL 1972; SMITH and MATHEWS 1972).

The environmental preferences of recreationists can also be considered as a question of landscape management. An interesting problem is formed by their relationship in together creating different scenic aspects. The diversity in the internal scenery of the stand which is preferred by the recreationists might be cancelled out in the external scenery and form unbroken monotonous areas which have an indistinct organization in the scenic aspect (cf. e.g. GABRIELL 1972, p. 79). Since however, we are accustomed to regard variation as a factor which increases the attractiveness of external scenery (cf. e.g. Metsähallitus 1970), an attempt should obviously be made in the management of recreation forests to try and create in addition to variation within the stands, also variation between stands using for instance variation in tree species composition and development stage. Stands, which receive a low rating in the preference order such as pure spruce stands, seedling stands, and obviously also clear cut areas, would thus play a positive role in the forest area

entirety from the point of view of recreation (cf. HAAKENSTAD 1972). More detailed elucidation of these questions will however to a large extent depend on later research.

The concept of recreation capacity (cf. e.g. WAGAR 1964) is one point at which the environmental preferences of recreationists can be examined. From the purely ecological point of view, we can see that those stands which have a rather low capacity to withstand usage, are most preferred as recreation environments (cf. e.g. HOLMSTRÖM 1970; KELLOMÄKI 1973). It is possible by silvicultural methods to protect the ground vegetation of recreation areas or to increase their ability to withstand wear by favouring those deciduous trees which conform to the environmental preferences of recreationists. On better sites at least, the part played by grass species which well withstand wear is relatively greater in deciduous stands than for instance in stands where pine or spruce are prevailing. In this respect the practical management alternatives are fertilization and the favouring of stands made up of relatively few large trees (cf. WAGAR 1964, 1965).

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## 5. SUMMARY

The environmental preferences of recreationists has been studied at the forest stand level in this study. The hypothesis which has been drawn up on the basis of the literature has been studied by attempting to elucidate the environmental preferences of groups using two recreation areas owned by the City of Helsinki using interviews and questionnaires. The material consisted of 1323 interviews supplemented by questionnaires.

The following conclusions were drawn from the replies to the questionnaires:

- recreationists consider birch and pine to be more beautiful than spruce
- recreationists consider stands made up of several tree species to be more beautiful than stands of single tree species
- recreationists consider mature stands to be more beautiful than young stands.

During the interviews, the attention of the recreationists was directed at the view formed

by the interview stand. The scenic preferences for the stands were measured using adjectives which the interviewee was asked to use in describing his or her impression of the view which was pointed out. First of all, the results clearly indicated that from the point of view of the scenic value of the stand, the way in which the stand is organised to form a scenic aspect or a stand view is more important than its ecological structure. However, it is obvious that stands containing large sized trees in particular are in many ways more preferred from this point of view than stands which are younger as regards their development stage. This should therefore be the case when changes in the stand view resulting from management measures are insignificant or difficult to see. The main tree species in the stand does not seem to have from the point of view of scenic preference as much significance as would have been expected judging by the questionnaire material.

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**Tiivistelmä**

**ULKOILIJOIDEN METSIKKÖARVOSTUKSET**

Tässä työssä on tutkittu ulkoilijoiden maisemahoidollisia arvostuksia metsikkötasolla. Kirjallisuuden perusteella muodostettuja hypoteeseja on tutkittu selvittämällä kahden Helsingin kaupungin omistaman ulkoilualueen käyttäjäjoukon ympäristöarvostuksia haastattelu- ja kyselytekniikalla. Aineiston muodostaa 1323 kyselyllä täydennettyä haastattelua. Kyselyn perusteella havaittiin ulkoilijoiden:

- pitävän koivua ja mäntyä kuusta kauniimpina
- pitävän usean puulajin metsiköitä kauniimpina kuin yhden tai kahden puulajin metsiköitä
- pitävän uudistuskypsiä metsiköitä nuorempia metsiköitä kauniimpina

Haastattelussa kohdistettiin ulkoilijoiden mielenkiinto haastattelumetsikön muodostamaan maisemaan. Metsiköiden maisema-arvostusten mit-

taamiseen käytettiin adjektiiveja, joiden avulla pyydettiin haastateltavaa ilmaisemaan vaikutelmaansa hänelle osoitetusta näkymästä. Tulokset antoivat ensinnäkin selviä viitteitä siitä, että metsikön maisema-arvon kannalta on sen ekologista rakennetta tärkeämpää se, kuinka metsikkö jäsentyy maisematilaksi tai metsikkönäkymäksi. On kuitenkin ilmeistä, että erityisesti puustoltaan järeät metsiköt ovat maisemallisesti monessa suhteessa arvostetumpia kuin kehitysvaiheeltaan nuoremmat metsiköt. Näin lienee erityisesti silloin, kun hoitotoimenpiteistä aiheutuvat muutokset metsikkönäkymässä ovat vähäisiä tai vaikeasti havaittavissa. Metsikön pääpuulajilla ei maisema-arvostuksen kannalta näytä olevan niin ratkaisevaa merkitystä kuin pelkän kyselyaineiston perusteella voitaisiin päätellä.

- 0 Not at all
- 1 Slightly
- 2 Rather
- 3 Very

Interviewer's name .....

Address .....

## RECREATION AREA STUDY

(Interview form)

- 1-4 Number
- 5-6 Site of interview .....
- Interviewer .....
- 7 Date, month .....
- Interview started at ....., finished at .....
- 8 Day of the week 1 2 3 4 5 6 7  
Mo Tu We Th Fr Sa Su
- 9 Cloudiness 0 1/4 2/4 3/4 4/4
- 10 Not raining 0 Raining 1 Snowing 3
- 11 Illumination 21 Din:  
3-4 5-6 7-8 9-10 11-12 13-14 15-16 17-18  
0 1 2 3 4 5 6 7
- 12-13 Temperature °C  
-16, -15-12, -11-9, -8-6, -5-3, -2-0, 0-2, 3-5, 6-8, 9-11,  
04 05 06 07 08 09 10 11 12 12  
12-15, 16-19, 20-23, 24-  
14 15 16 17
- 14 Snow cover on the ground 0 1 2
- 15 Trees in leaf 0 1 2
- 16 Male 1 Female 0
- .
- .
- .

44 How colourful do you consider this view to be?

- 0 No at all  
 1 Slightly colourful  
 2 Quite colourful  
 3 Very colourful

In the following questions, consider that the scenery can be described by certain adjectives. How do these adjectives correspond to your opinion of the area in front of us.

	not at all	slightly	quite	very
1. Inspiring .....	4	5	6	7
2. Pleasant .....	4	5	6	7
3. Ugly .....	4	3	2	1
4. Original .....	4	5	6	7
5. Repulsive .....	4	3	2	1
6. Soothing .....	4	5	6	7
7. Attractive .....	4	5	6	7
8. Monotonous .....	4	3	2	1
9. Delicate .....	4	5	6	7
10. Varying .....	4	5	6	7
11. Depressing .....	4	3	2	1
12. Unpleasant .....	4	3	2	1
13. Beautiful .....	4	5	6	7
14. Revealing .....	4	3	2	1
15. Interesting .....	4	5	6	7
16. Starling .....	4	5	6	7
17. Expressive .....	4	5	6	7

45-46 Sum .....

61 How natural do you consider the view in front of us to be?

- 0 Not at all  
 1 Slightly  
 2 Rather  
 3 Very

Interviewee's name .....

Address .....

## RECREATION AREA STUDY

(Questionnaire form)

2. What is your profession? .....
5. When were you born? .....
6. In what type of surroundings did you spend the main part of your life upto the age of 15? Mark with a cross next to the number of the corresponding type of surroundings.
- 1 Scattered rural habitation
  - 2 Rural church village
  - 3 Market town or city with less than 5000 inhabitants
  - 4 Market town or city with more than 5000 inhabitants
  - 5 Helsinki

The following questions are in general concerned with the natural element and utilization of recreation areas. We hope that you will answer them according to your own opinions. Mark the suitable alternative which corresponds to your first impression WITHOUT ANY UNDUE DELIBERATION. Of the following alternatives, estimate the type of forest which in your opinion is the most beautiful (I), second most beautiful (II), and third most beautiful (III).

- 19 spruce and pine mixed forest .....
- 20 spruce and birch mixed forest .....
- 21 pine and birch mixed forest .....

And the following (I, II and III)?

- 22 Forests made up of one tree species .....
- 23 Forests made up of two tree species .....
- 24 Forest made up of three or more tree species .....

And the following (I, II and III)?

- 25 Young seedling forests .....
- 26 Middle aged forests .....
- 27 Fully aged mature forests .....

And finally (I, II and III)?

- 28 Pine forest .....
- 29 Spruce forest .....
- 30 Birch forest .....



108 Could you estimate, what is your total monthly income?

..... mk/month gross.

110 What kind of education have you had?

- 1 Elementary school
- 2 Elementary school + vocational training
- 3 Intermediate school
- 4 Intermediate school + vocational training
- 5 Matriculation examination
- 6 Matriculation examination + vocational training
- 7 Academic degree

Please, check once again that you have answered all the questions.

THANK YOU FOR YOUR COOPERATION

### APPENDIX 3. VARIABLES USED IN THE ANALYSIS

The numbering of the variables corresponds to the numbers used elsewhere in the study and indicates the numbering of the variables of the material used.

#### Dependent variables

- 85–96. Stand choices. See Appendix 2.  
41. Sum scale formed from the adjectives. See Appendix 1.

#### Independent variables

##### Ecological variables

- a: The internal structure of the interview stands and the connection of the stand with other stands
213. The degree to which the interview stand can be distinguished from its surroundings. Dummy variable. Classification: 0 = bad distinction, 1 = good distinction
  214. The density of the standing trees in the viewed stand. Classification: 0–9. See ILVESSALO (1965).
  215. Presence of water expanses in the view. Dummy variable. Classification: 0 = not at all, 1 = 1 = in sight.
  216. Soil type. Dummy variable. Classification: 0 = Interview stand situated on mineral soil, 1 = Interview stand situated on peatland.
  217. Visibility in the interview stand. Classification: 0 = less than 20 m, 1 = 20 – 39 m, 2 = 40 – 59 m, 3 = 60 – 79 m, 4 = more than 80 m.
  218. Presence of harvesting residues in the interview stand. Dummy variable. Classification: 0 = harvesting residues not present, 1 = harvesting residues present.
  219. Average height of the dominant standing trees.
  220. Basal area of the dominant standing trees.

221. Volume of the dominant standing trees.
222. Density of dominant standing trees. Classification: 0–9. See ILVESSALO (1965).
- 223–225. Main tree species (pine, spruce, birch) of the dominant standing trees. Dummy variable. Classification: see Roos (1971, pp. 83–85).
226. Presence of undergrowth. Dummy variable. Classification: 0 = undergrowth not present in the interview stand, 1 = undergrowth present in the interview stand.
228. Type of undergrowth. Dummy variable. Classification: 0 = undergrowth mainly deciduous species, 1 = undergrowth mainly coniferous species.
229. Density of undergrowth. Classification: 0–9. See ILVESSALO (1965).
- 236–239. Development class in the interview stand (clear cut area; seedling stand; young and mature thinning stands; regeneration-ripe and over aged stands). Dummy variable. Classification: see Roos (1971, pp. 83–85).
- b: Variables describing seasonal changes in the interview stand
- 183–196. Season. Dummy variable. Classification: See Roos (1971, pp. 83–85).
8. Illumination. Light intensity measured in millivolts with the light meter directed upwards. Classification: 0 = conductivity 3–4, 1 = conductivity 5–6, . . . , 7 = conductivity 17–18.
10. Presence of snow cover in the interview stands. Classification: 0 = no snow, 1 = snow cover not complete, 2 = complete snow cover.
11. Amount of leaves on the deciduous trees in the interview stands. Classification: 0 = no leaves, 1 = deciduous trees putting out their first buds or part of the leaves shed, 2 = deciduous trees in leaf.
- c: Variables describing transient changes in the interview stands
6. Cloudiness. Classification: 0 = cloudless sky, 1 = 1/4 cloud cover, 2 = 2/4 cloud cover, 3 = 3/4 cloud cover, 4 = complete cloud cover.
7. Temperature, °C. Classification: –16 or lower = 04, –15 – –12 = 05, . . . , +20 – 23 = 16, +24 or higher = 17.

#### Attitude variables

40. Colourfulness. See Appendix 1.
56. Degree of natural state. See Appendix 1.

#### Additional independent variables

68. Professional status. Classification: 0–9. See RAUHALA (1966).
71. Age, years.
72. Childhood residence environment. See Appendix 2.
180. Income level. Classification: See Appendix 2.
182. Education level. See Appendix 2.

KELLOMÄKI, SEPPÖ

O.D.C. 907.2: 907.1

1975. Forest stand preferences of recreationists. — ACTA FORESTALIA FEN-  
NICA Vol. 146, 36 p. Helsinki.

The environmental preferences of recreationists has been studied at the forest stand level in this study. The hypothesis which has been drawn up on the basis of the literature has been studied by attempting to elucidate the environmental preferences of groups using two recreation areas owned by the City of Helsinki using interviews and questionnaires. According to the results of the questionnaire recreationists prefer birch and pine to spruce, stands made up of several tree species to stands of single tree species, and mature stands to stands of earlier development stages. During the interviews, the attention of the recreationist was directed at the view formed by the interview stand. First of all, the results of interviews clearly indicated that from the point of view of the scenic value of the stand, the way in which the stand is organised to form a scenic aspect or a stand view is more important than its ecological structure. However, it is obvious that stands containing large sized trees in particular are in many ways more preferred from this point of view of scenic value than stands which are younger as regards their development stage. The main tree species in the stand does not seem to have from the point of view of scenic preference as much significance as would have been expected judging by the questionnaire material.

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