Recreational trail planning in the context of seasonality

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Abstract

This study involved comparing the perceived restorative value of the vegetation types in winter and summer to find out how to plan recreation trails that would have maximum restorative value in both seasons. It was found that vegetation classes do have different levels of restorative value. In agreement with the extensive body of knowledge, the park-like and savannah-like vegetation types resulted in higher scores for restorativeness. Also, the smoothness of the ground and the perceived ease of movement through the landscape seemed to positively affect the restorative value of the vegetation class. Apparent seasonal changes in the visibility and smoothness of the ground had an influence on the restorative value of some vegetation types. Views towards and away from the vegetation type tended to elicit higher scores for restoration potential than views within the type.

   In order to maximize the restorative value in both seasons, the recreational trails should provide views towards and away from certain vegetation types in the landscape that have smooth ground cover. Long sections of tracks within forests with a dense understorey should be avoided, although the need for variation should be given equal consideration. Because many forest types in the study area are naturally dense or develop a dense understorey, especially on the woodland edge, a consistent plan for landscape management is needed.
Keywords: landscape seasonality, landscape assessment, landscape management, restorative quality of natural environments, recreation, recreation trails, woodland edge.

1   Introduction

Many outdoor recreation areas are designed to be monofunctional for a set of predominant activities taking place during only one part of the year, e.g. cross-country ski tracks for winter recreation. Hence the compatibility of recreation areas for activities in many seasons is often neglected. More broadly, seasonality can be considered to be a major problem for recreation/tourism management in general, both because of the instability of returns on investment as well as the exhaustion of infrastructure, landscape carrying capacities and natural resources [1]. However, not very much research has been undertaken in finding factors that would broaden the usability of recreation areas throughout the span of natural seasons [2].

It can be hypothesized that different vegetation types or groups of visually similar vegetation types have an influence on landscape character and thus on the people's preferences for recreational environments, potentially becoming an important factor for the designing of facilities and recreational tracks. Although visual preference plays an important part in the formation of landscape perception (i.e. restorative experience) [3], it is not necessarily the only factor in such experiences [4]. Therefore this study uses a more comprehensive model of restorative experience described by Han [5] to determine the factors that influence outdoor recreation.

In planning new recreational environments, it should also be considered that the location of the person within a particular landscape influences the character of the view. Fry and Sarlöv-Herlin [6] suggest designing paths near the edge of a woodland, which, besides having many ecological benefits, also contributes to aesthetically pleasing qualities, and increase the recreation potential of woodlands. It may be hypothesized that forest stands can be more inviting when viewed inwards from visually open landscapes or produce attractive views when looking outwards from such stand-types into the visually open landscape.

It can be inferred that there is a clear need to explore visitors' preferences concerning landscape elements for recreation track planning, and especially to consider the aspect of seasonality in the restorative value of recreational landscapes.

2   Material and methods

2.1 Study area

The Haanja Upland is located in the south-eastern corner of Estonia (Fig. 1). The region covers an area of 816 km^2 [7] and is the highest region in the country (the highest point, Suur Munamägi, at 317.6m above sea level, is also the highest point in the Baltic countries). The Haanja Upland has the country's thickest and longest-lasting snow cover.
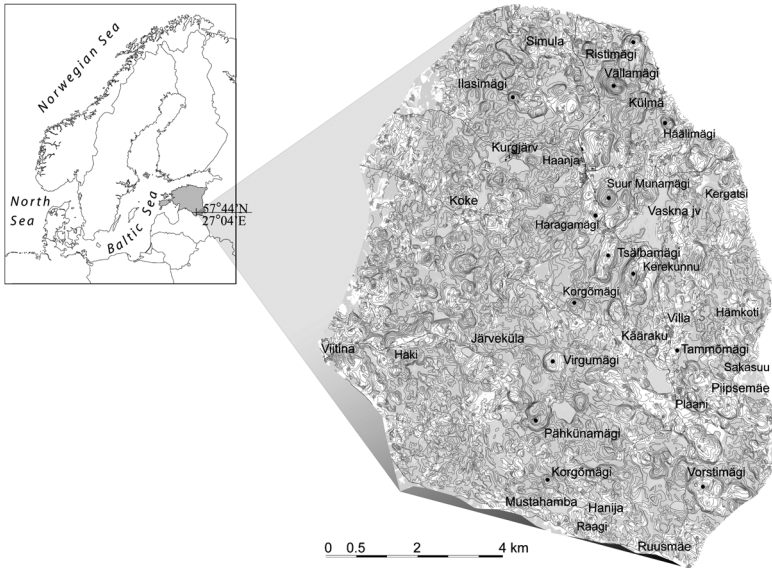
Figure 1:   Location of the study area. The detailed study area covers
             orographically varied terrain in the central part of the Haanja
             Upland.

The Haanja Upland region is a hilly/hummocky landscape that can be characterised as a large underlying moraine hill that is itself covered with a variety of different sized moraine hills, glacio-lacustrine and glacio-fluvial kames, eskers and sandy plains (around the fringes of the upland). The upland area is intersected with deep (up to 200 m) primaeval or sub-glacial valleys, mostly filled with glacio-fluvial gravels and sands. This geological structure makes the topography extremely complex: relative heights reach a difference of 50–60 m, and the steepness of slopes can be 30–35°.

This very diverse relief also determines the high degree of patchiness of soil distribution and vegetation cover. The vegetation cover of the present-day patchy cultural landscape consists of an intricate mixture of forests, fields and settlement. Forests cover 62% of the total area [7]. Since the study area is located at the southern limit of the boreo-nemoral forest zone, two deciduous tree genera (*Alnus* spp. and *Betula* spp.) and two coniferous species (*Picea abies* and *Pinus sylvestris*) are the major constituents in these woodlands. Of the non-forest land, arable fields cover 7% and grasslands 29% of the area. In the valleys and depressions there are over 1000 small peatlands and 170 small lakes, which cover about 1% of the area. Only 1% of the entire Haanja Upland area can be classified as settled area [7]. However, as is typical of Estonian rural settlements, the farmsteads (about 500) are dispersed over the area. As a result, the highly natural appearance, landscape diversity and local cultural heritage of the Haanja region make it attractive for tourism in both summer and winter.

2.2 Methodology used

The study involved comparing the perceived restorative value of the same landscapes in two seasons and was conducted in two phases – the winter set was done in April 2005 and the summer set in April 2007. A self-rating method developed by Han [5] – the "short-version revised restoration scale" (SRRS) was used to evaluate the restoration potential of natural environments in terms of the different vegetation types found in the study area. The subjects were shown winter or summer landscape photographs respectively and asked to rate specific aspects of their reaction towards those images using a number of differently worded questions on a nine-point Likert scale.

SRRS has a broad perspective integrating both the Kaplan and Kaplan [8] and Ulrich [9] theories of restorative environments. While similar to Hartig et al's [10] revised perceived restorativeness scale RPRS, it also measures the restoration potential of a given environment but focuses on recovery from stress from a broader perspective, not only on the recovery from mental fatigue. It has a small number of items (two questions per dimension of restoration – emotional, physiological, cognitive and behavioural reactions), while still maintaining its validity and reliability [5].

Respondents were undergraduates of geography and biology of the University of Tartu and landscape architecture and environmental protection students from the Estonian University of Life Sciences. The winter set used 86 respondents (25 male, 61 female), whose average age was 21.4 years. Slides were viewed in groups of 7 to 20 people, in two distinctive arrangements (A and B respectively). In total, 48 persons viewed the slides in order A and 38 in order B. The summer set used 79 respondents (18 male, 59 female, 2 unspecified gender), and their average age was 20.8 years. Slides were viewed in groups of 9 to 25 people, in two distinctive arrangements of slides (C and D respectively). In total, 42 persons viewed slides in order C and 37 in order D.

2.3 Selection of visual stimuli

The photographs used for the vegetation type restoration potential test were chosen according to vegetation site types characteristic to the Haanja Upland. Vegetation site types were first selected following the national habitat classification system [11], and the selection was later clarified through on-site observations and finally consolidated into 17 distinct "vegetation classes" – groups of visually similar vegetation types. Man-made types – fields and grasslands – were also included in the selection, as these determine the visually open scenes and are usually perceived as natural in character [12].

All pictures were taken at eye level in the same weather conditions throughout the summer and winter and set with the same camera lens setting and orientation towards the horizon. Flat topography in the scene was preferred, because an undulating sightline may increase the degree of aesthetic preference by conveying a sense of mystery [12, 13], and so introduce bias into the results. However, in the case of some scenes it was impossible to eliminate topographic variations completely, due to the particular topography of the test area. The

presence of obvious man-made structures in the photos was avoided, as it is known from other studies to reduce the attractiveness of a scene, often dramatically [12], leading people to rate the semiotic signs in the landscape given by the structure rather than the vegetation itself. In terms of composition, we chose pictures where there were uniform depictions of the vegetation class without dominant objects or prominent groups of objects created by Gestalt principles [14, 15]. Objects occurring in groups tend to be seen as single landscape elements, and this helps towards interpretation of the view and is one of the key factors determining the preference of views [13, 15]. Thus, making "dull and uniform" pictures enabled the measurement of reactions towards a vegetation type rather than the overall composition of the scene.

It was assumed from earlier studies [6] that the restoration potential of a vegetation class would be influenced by the viewer's position in relation to it, especially when visually enclosing vegetation (i.e. various forest stand types) is situated next to visually open vegetation such as grassland or arable fields. In addition to the uniform view from within the vegetation type, two more views were taken when possible – the view from the visually open landscape towards the vegetation and the view from within the vegetation type outwards to the visually open area. It was impossible to obtain all three view-types with each vegetation class, as 1) some visually enclosed types were seldom located next to a visually open landscape and 2) some types composed of dense vegetation at eye level were visually impervious. The above-mentioned views were grouped into the following classes: views towards the vegetation, views within and views outwards from the vegetation. A total of 35 winter and a corresponding 35 summer slides were used for this study.

The sequence of slides in all four sets was random and followed two rules – neither two similar vegetation classes nor two similar view-types should be next to each other in the sequence [16].

2.4 Questionnaire and statistical analysis

The SRRS questionnaire consists of eight questions, two for each dimension of restoration (emotional, physiological, cognitive and behavioural reaction). The questions are set up to be bipolar, enabling the use of a Likert scale from 1 (lowest preference) to 9 (highest preference) to record the response. The questions on physiological response in the SRRS are set up to measure physiological arousal, the opposite of restoration, so resulting value scores must be reversed before further calculations can be carried out (see Han [5] for details).

The restorativeness measure of each slide is used to evaluate the restorativeness of vegetation classes amongst each other, and different view types within each vegetation class. It is calculated as an arithmetic average of the four composite scores of emotional, reversed value of physiological, cognitive and behavioural dimensions. The four composite scores are in turn calculated as an arithmetic average of the two appropriate mean question scores within each dimension. Lastly, the eight mean question scores are found by averaging eight sets of numerical responses to the questions in the questionnaire.

Personal restorativeness scores for each slide are used to test the reliability of the respondents and for ANOVA tests aimed at detecting similarity or dissimilarity amongst summer and winter datasets and view-type datasets. The personal restorativeness score is calculated as an arithmetical average of personal responses to two questions per emotional, cognitive, behavioural and the reversed value of physiological dimensions.

Two different reliability tests were carried out on the data. Firstly, Cronbach's alpha test, which calculated the lower limit for the true reliability of the survey (a function of the number of test items and the average inter-correlation among the items, SPSS Inc. [17]) was carried out to ensure that the restorativeness scale itself was reliable. It was used to examine the relationship of the eight mean question scores within the construct of restorativeness and each of the two appropriate mean question scores within the constructs of emotion, physiology, cognition and behaviour. The second reliability test examined the intra-class correlation calculated for each respondent's personal restoration potential scores for all slides, to determine whether the respondents' rating pattern was consistent [17, 18].

In order to compare the restorativeness results of vegetation classes in summer and winter and also to compare the restorativeness results of view-types within vegetation classes, the ANOVA Two-Factor with Replication test was carried out. For that purpose, personal restorativeness scores from both seasons and for all view-types were combined in a single table for every vegetation class. For views with only one view-type, the ANOVA Single Factor analysis was used to compare seasonal effects.

The separate scores for restoration potential calculated for each slide were consolidated in a table organised by vegetation class and three view types. The vegetation classes were sorted by values for the restorative potential of the view within the vegetation class in descending order and ranked, in order to illustrate seasonal differences even further. Finally, tables for summer and winter were combined.

3 Results and discussion

3.1 Reliability tests

The statistical analysis supported the reliability of the data. The reliability measure (Cronbach's alpha) across all eight variables was 0.945 in winter and 0.932 for summer data. The reliability across four factors of emotion, physiology, cognition and behaviour (two questions per factor) were 0.965; 0.946; 0.991 and 0.997 in the winter test and 0.939; 0.864; 0.985 and 0.992 respectively in the summer test. According to the standards of the Cronbach's alpha test, values over 0.9 are extremely reliable. This permitted the conclusion that the variation in the data originated from the individuality of respondents and the nature of the slides shown, rather than any lack of clarity in the wording of the questionnaire [17]. Furthermore, the intra-class correlation of 0.919 for winter data and 0.955 for summer data showed that despite their individuality, the respondents were rated according to a very similar pattern [17, 18].

3.2 Assessment of restorativeness of vegetation types

The analysis of the test of restoration potential shows that vegetation types do provide different degrees of restoration potential in landscapes, as hypothesized (Table 1). For example, in winter the restoration potential of mature thinned deciduous stands reached 7.24 for views within the stand, while the internal view of willow scrub showed the lowest restoration potential at 3.88. The summer data shows somewhat smaller differences, as pine forest with spruce understorey reached 6.55 for views towards the stand and internal view of the alder thicket showed the lowest restoration potential, at 4.50.

3.3 Seasonal comparison

It is necessary to point out some obvious visual differences in the winter and summer scenes used in this study. Winter scenes showed vegetation classes under snow cover that covered uneven ground surface, fallen trunks etc. Lack of foliage and visible ground cover vegetation also enabled one to see further through the vegetation, while various bushes in the understorey were less noticeable. In the summer scenes, the massive foliage reduced visibility and rendered the understorey and silhouettes of the plants very prominent.

The results of the ANOVA test (Table 1) show that roughly half of the vegetation classes did elicit different restorativeness scores in different seasons, because the corresponding F statistic was greater than the critical F needed to reject the null hypothesis. The mature deciduous stand placed first in both winter and summer, but winter scores were significantly higher than personal restorativeness scores in summer. Similarly, the pure pine forest, reed-beds on lake shores, pine forest on wet boggy sites and young spruce plantation with a view towards the stand were cases where a winter scene placed significantly better than the summer view in the ranking order, and that difference was confirmed by the ANOVA test.

This tendency may be explained by seasonal differences in ground cover. The smoothness of the ground and perceived ease of movement through the scene are believed to be key factors in determining people's preference for landscapes [12]. In summer photos, high ground cover vegetation can be observed, while winter scenes show smooth ground surface under thick snow cover. Snow also covers up fallen trunks and other "bumpy" surface features. Ice covering the lake surface also renders it easy to walk on.

Contrary to previous examples, there were vegetation classes where summer scenes had significantly better scores. Open field with protruding grassy remains, younger thinned deciduous forest and pine forest with spruce understorey placed considerably better in summer rankings, and the seasonal difference was confirmed by the ANOVA test. Willow scrub also showed a significant seasonal difference, although placement in the ranking order was less dramatic.

The high score of restoration potential given to the mature thinned deciduous stand and pure pine forest in both seasons is consistent with a general notion expressed by Ulrich [12] and Parsons and Daniel [3] on the extensive body of

Table 1: Restoration potential (scale 1 to 9) of the vegetation classes, by different view types and their ranking order in summer (s) and winter (w), ANOVA F statistic and critical F value of the seasonal difference test and view-type difference test.

Vegetation class		Restorativeness score			Ranking order		Seasonal difference		View-type difference	
Summer (s) / Winter (w)		Towards the type	Within the type	Away from the type	Summer	Winter	F	F-crit	F	F-crit
Mature thinned deciduous stand	s		6.50		1		17.67	3.90		
	w		7.24			1	confirmed			
Raised bog with scattered small pines (Pinus sylvestris)	s		6.38		2		0.23	3.90		
	w		6.30			4	not confirmed			
Open field with protruding grassy remains	s		6.28		3		48.40	3.90		
	w		5.03			13	confirmed			
Open field with smooth surface	s		6.26		4		3.24	3.90		
	w		5.90			8	not confirmed			
Younger thinned deciduous forest	s	6.53	6.20		5		55.40	3.87	9.70	3.87
	w	5.61	5.15			12	confirmed		confirmed	
Pine forest with spruce (Picea abies) understorey	s	6.55	6.17		6		124.00	3.87	5.48	3.87
	w	4.89	4.64			14	confirmed		confirmed	
Pure pine forest	s	6.03	6.04	6.53	7		7.77	3.86	6.05	3.02
	w	6.52	6.25	6.76		5	confirmed		confirmed	
Reed beds on lake shores	s	6.14	5.83		8		5.46	3.87	0.06	3.87
	w	6.17	6.37			3	confirmed		not confirmed	
Pine forests on wet boggy sites	s		5.62		9		31.28	3.90		
	w		6.69			2	confirmed			
Young spruce plantation	s	5.60			10		12.30	3.90		
	w	6.23				6	confirmed			
Spruce plantation thicket	s	5.48	5.60		11		2.07	3.87	0.00	3.87
	w	5.79	5.68			9	not confirmed		not confirmed	
Spruce forest with sparse understorey	s	6.45	5.59	5.92	12		1.90	3.86	9.58	3.02
	w	6.29	5.96	5.97		7	not confirmed		confirmed	
Spruce forest with dense understorey	s	6.17	5.05	5.12	13		1.08	3.86	10.35	3.02
	w	5.57	5.47	5.65		10	not confirmed		confirmed	
Deciduous forest with dense understorey	s	5.92	4.91	5.52	14		1.22	3.86	9.94	3.02
	w	5.63	5.38	5.60		11	not confirmed		confirmed	
Willow (Salix sp) scrub	s	6.14	4.84	5.34	15		77.60	3.86	17.75	3.02
	w	4.27	3.88	4.72		17	confirmed		confirmed	
Birch (Betula pendula) scrub	s	5.29	4.76	4.88	16		1.61	3.86	8.49	3.02
	w	5.16	4.52	4.73		16	not confirmed		confirmed	
Alder (Alnus incana) thicket	s	5.16	4.50	5.11	17		0.59	3.86	8.84	3.02
	w	5.07	4.63	5.25		15	not confirmed		confirmed	

research concerning aesthetic preferences for natural vegetation, where park-like or savannah-like structures tend to produce the highest preference scores. Another notion expressed by Ulrich [12] is that people tend to prefer land cover types with a smooth surface, which favours movement across them. This would also suggest that scrub would be viewed unfavourably, as it hinders walking through it. Whether the perceived ability to walk across or through vegetation can be associated with restoration potential is another matter, however, this corresponds to the high restorative potential of mature thinned deciduous stands, scattered pine forest on wet boggy sites in winter, raised bog with scattered small pines and pure pine forest and the low restoration potential of scattered pine forest on wet boggy sites in summer, alder thicket, birch and willow scrub. In addition, the higher scores of spruce forest with sparse understorey compared to the same stand with dense understorey also seem to confirm this notion.

The scenes of pine forest with a spruce understorey showed fallen tree trunks in the winter photo, as the snow was not thick enough to cover them up. Meanwhile, the summer scene did not show fallen trunks on the ground. As such, the results for the pine forest with spruce understorey are in line with the general findings concerning the smoothness and navigability of the ground surface. The better results of the willow scrub in summer are perhaps explainable by foliage bringing out the round silhouettes of the bushes that gave the scene better legibility / distinctiveness, which in turn increased preference [13]. The great seasonal difference of the open field with protruding grassy remains may be due to the content of the scene. The winter photo showed a strip of an even width of forest in the background, but the summer photo unfortunately had forests broken up in separate distinguishable clumps. This may have increased the complexity of the scene, which is known to influence landscape preference [13]. The remaining case of younger thinned deciduous forest seems to be an anomaly that the authors are unable to explain. Perhaps the white birch trunks were less prominent on the background of the white snow while green vegetation in the summer made the trunks more prominent and dramatic.

According to the ANOVA test, it was not possible to reject the hypothesis that summer and winter scores are similar in the case of nearly half of the vegetation classes. In addition, the ranking order placed some of those classes, namely raised bog with scattered small pines, spruce plantation thicket, birch scrub and alder thicket, quite close to each other. In contrast, open field with smooth surface, spruce forest with sparse understorey, spruce forest with dense understorey, and deciduous forest with dense understorey all had a noticeable difference in restorativeness scores and ranking order placements, but the ANOVA test was unable to confirm that difference. These results allow one to conclude that in general, the smoothness of the ground and perceived ease of movement through the scene may have determined the results. Vegetation classes that had a thick understorey or were dense by themselves showed low restorativeness scores regardless of the season.

3.4 The "edge effect"

The hypothesis that views towards, away from and within the same vegetation type can elicit different degrees of restoration potential was supported by the data. The ANOVA test conducted separately for each vegetation class consistently showed that the restorativeness scores of different view-types of a vegetation class differed significantly. The only two exceptions to the rule where it was not possible to confirm difference in datasets were reed-beds on lakeshores and spruce plantation thickets. Moreover, a distinct pattern could be observed where views towards and away from the vegetation generally produced a higher score for restoration potential than views within the vegetation type (Table 1). This may be explained by the higher visual complexity of the scene [13], which leads to increased aesthetic preference.

In terms of a practical landscape design application, we can conclude that the ideal recreational route should contain a combination of views towards and away from certain vegetation types. From the ecological point of view, when planning the management of woodland edges it is important to consider the fact that south- and west-facing edges usually develop higher species richness and structural diversity than north- and east-facing edges [6]. On the contrast, north- and east-facing edges provide cool shade in the hot summer and have favourable conditions for long-lasting and thick snow cover in winter. This difference in the suitability of forest edges for recreation and ecological conservation could provide planners with an application enabling them to reduce conflicts between those two interest groups.

3.5 General discussion

The recreational trails might be targeted more specifically to suit the most desirable season (be it cross-country skiing in winter or cycling in summer), but in order to maximize the restorative value in both seasons, they should provide views in towards and away from certain vegetation types on the north- and east-facing edges of the forests in the landscape with smooth ground cover. Long sections of tracks within forests with a dense understorey should be avoided, although the need for variation should receive equal consideration. Recommendations on the design of recreational areas and routes suggest that variety in the experience is desirable [19, 20]. Thus the recreational route should also be located so the viewer could experience different vegetation types over time, passing through open areas with views of sufficient scale to enable the view to be enjoyed.

Many forest types in the study area are naturally dense or develop a dense understorey, especially on the woodland's edge. Due to their linear character, the recreational tracks create additional strands of woodland edge with better light conditions for a newly propagating dense understorey. Also, abandoned fields that have begun to grow into birch and alder scrub occupy a considerable proportion of the study area. All of this poses a challenge for landscape maintenance and design.

The study subjects were all young adults, mostly female, who had an interest in landscape and nature. They were able to distinguish between vegetation types because they have been educated to do so. This may have biased the results compared with a more demographically representative sample. It would be valuable to carry out further exploration of the preferences and perceptions of different user-groups such as sportsmen or children, and other user needs such as solitude or physical challenge.

4 Conclusions

The study involved comparing the perceived restorative value of the same vegetation types in winter and summer. We found that vegetation classes do have different levels of restorative value. In agreement with the extensive body of knowledge on the topic, the park-like and savannah-like vegetation types resulted in higher restorativeness scores. The smoothness of the ground and perceived ease of movement through the landscape seemed to positively affect the restorative value of the vegetation class. Seasonal variability has an influence on the restorative value of some vegetation types. This can be explained by apparent changes in the visibility and smoothness of the ground. Views towards and away from the vegetation type tend to elicit higher scores for restoration potential than views within the type.

It is possible to reduce conflicts between recreational and ecological interests in woodlands by having recreation tracks on north- and east-facing edges where species richness and structural diversity are lower, while the shade provides shelter from the hot summer sun and creates better snow conditions in winter.

Recreational trails might be targeted more specifically to suit the most desirable season, but in order to maximize the restorative value and provide opportunities in both seasons, they should provide views towards and away from certain vegetation types on the north- and east-facing edges of the forests in landscape with smooth ground cover. Long sections of tracks within forests with a dense understorey should be avoided, although the need for variation should receive equal consideration.

Many forest types in the study area are naturally dense or develop a dense understorey, especially on the edge of the woodland. Also, due to their linear character, recreational tracks create long strands of woodland edge with better light conditions for a newly propagating dense understorey. This poses a challenge for landscape maintenance and landscape design.

References

[1] Krakover, S., 2000. Partitioning seasonal employment in the hospitality industry. Tourism Manage. 21, 5, 461-471.
[2] Baum, T. and Hagen, L., 1999. Responses to seasonality: the experiences of peripheral destinations, Int. J. Tourism Res. 1, 299-312.
[3] Parsons, R., Daniel, T.C., 2002. Good looking: in defense of scenic landscape aesthetics. Landscape Urban Plan. 60, 43–56.

[4]   Tahvanainen, L., Tyrväinen, L., Ihalainen, M., Vuorela, N., Kolehmainen, O, 2001. Forest management and public perceptions — visual versus verbal information. Landscape Urban Plan. 53, 53–70.

[5]   Han, K.-T., 2003. A reliable and valid self-rating measure of the restorative quality of natural environments. Landscape Urban Plan. 64, 209–232.

[6]   Fry, G., Sarlöv-Herlin, I., 1997. The ecological and amenity functions of woodland edges in the agricultural landscape; a basis for design and management. Landscape Urban Plan. 37, 45–55.

[7]   Arold, I., 2005. Estonian landscapes. Tartu Ülikooli Kirjastus. Tartu. (In Estonian).

[8]   Kaplan, R., Kaplan, S., 1989. The Experience of Nature: A Psychological Perspective. Cambridge University Press, New York.

[9]   Ulrich, R.S., 1983. Aesthetic and affective response to natural environment. In: Altman, I., Wohlwill, J.F. (Eds.), Behavior and Natural Environments. Plenum Press, New York.

[10]   Hartig, T.A., Korpela, K., Evans, G.W., Garling, T., 1997. A measure of restorative quality in environments. Scand. Hous. Plann. Res. 14, 175–194.

[11]   Paal, J., 1997. Classification of Estonian vegetation site types. Keskkonnaministeeriumi Info- ja Tehnokeskus, Tallinn. (In Estonian).

[12]   Ulrich, R.S., 1986. Human Responses to Vegetation And Landscapes. Landscape Urban Plan. 13, 29–40.

[13]   Kaplan, S., 1982. Cognition and Environment: Functioning in an Uncertain World. Praeger Publishers, New York.

[14]   Bell, S., 1999 Landscape: pattern, perception and process. E&FN Spon, London.

[15]   Bell, S., 2004. Elements of visual design in the landscape. Second edition. E. &F.N. Spon, London.

[16]   Herzog, T.R., Black, A.M., Fountaine, K.A., Knotts, D.J., 1997. Reflection and attentional recovery as distinctive benefits of restorative environments. J. Environ. Psychol. 17, 165–170.

[17]   SPSS Inc., 2004. SPSS Base 13.0 Case studies tutorial. SPSS Inc., Chicago.

[18]   Palmer, J.F., Hoffman, R.E., 2001. Rating reliability and representation validity in scenic landscape assessments. Landscape Urban Plan. 54, 149–161.

[19]   Bell, S., 1997. Design for outdoor recreation. E&FN Spon, London

[20]   Kaplan, R., Kaplan S., Ryan, R., 1998 With people in mind. Island Press, Washington DC.