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Effect of the season and forest management on the visual quality of the nature-based tourism environment: a case from Finnish Lapland

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ABSTRACT

The growth of nature-based tourism has raised the need to better understand tourists' expectations towards outdoor recreation environments. There is little knowledge, however, of international tourists' attitudes towards forest management practises or of their effect during winter. This study investigated how commercial forests correspond to the environmental expectations of international nature-based tourists and how the season affects tourists' landscape preferences. Altogether 750 foreign visitors to Finnish Lapland responded to a survey and evaluated photographs presenting various types of forest landscapes in summer and winter. Beautiful scenery was the most important motive for the choice of travel destination and for participating in outdoor recreation. The results highlight the strong impact of seasons on the perceived quality of the landscape in commercial forests. Seasonal differences are largest in regeneration areas as snow cover mitigates the effects of forestry operations. Even-aged, middle-aged and mature forest stands were considered to be suitable for tourism in both summer and winter. There is a demand for adapted management regimes in commercial forests targeting year-round nature-based tourism. In conclusion, forestry and tourism can coexist in the same area with good planning and with management actions that take visual quality and recreational values of the environment into account.

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Forest management; nature-based tourism; landscape research; landscape preferences; outdoor recreation

Introduction

The demand for nature-based tourism has steadily grown and is a rapidly expanding sector within tourism in the Nordic countries and across Europe (Bell et al. 2008; Fredman & Tyrväinen 2010). This demand has created opportunities for nature-based tourism to develop as an economic diversification tool within regions rich in natural amenities, such as northern Europe. In fact, in Nordic countries, with their abundant natural assets, the role of nature-based tourism is substantial (Fredman & Tyrväinen 2010). In Finland, targets set for tourism growth rely strongly on nature-based tourism and increasing the number of foreign visitors (Roadmap of tourism 2015). It is estimated that one-third of all foreign tourists participate in nature activities (MEK 2009).

In Finnish Lapland, tourism is the most important sector in terms of employment, with an employment effect of 5000 labour-years/year (Regional Council of Lapland 2011a). In Lapland, the growth of the tourism sector has been stronger than in other parts of Finland. In 2011, the direct income effect within Lapland's communities was 600 million euros, and in many communities tourism is economically the most important livelihood – especially during winter and spring. Significant efforts are made to develop international and year-round tourism. The key aim of Lapland's Tourism Strategy is to become a leading destination for sustainable nature-based and experience tourism in Europe by 2020 (Regional Council of Lapland 2011b).

With the growth of nature-based tourism, outdoor recreation tourist activities have expanded from taking place mostly in protected areas increasingly into commercial forests. This increased use of commercial forests is mainly because protected areas are not suitable for all types of outdoor activities that tourists engage in; moreover, the location of commercial forests is sometimes more suitable for entrepreneurs. Finland and other Nordic countries have adopted a broad definition of nature-based tourism, which includes motorised and non-motorised activities (Fredman & Tyrväinen 2010). However, as a rule, activities, such as snowmobile or all-terrain vehicle (ATV) tours, are not allowed in protected areas based on laws (Cross-country Traffic Law 1995; Nature Conservation Law 1996). This increased tourism use of commercial forests has, correspondingly, fortified the demand to modify forest management regimes, to minimise the negative effects of harvesting trees on the visual quality of landscape and to sustain the recreational value of the environment that are the main pull factors of nature-based tourism (e.g. Tyrväinen et al. 2008; Ahtikoski et al. 2011; Tyrväinen et al. 2014). Furthermore, in some areas, such as in Levi and Ruka tourism resorts located in northern Finland, tourism operators are dependent on using surrounding private forests that aim mainly at timber production for their outdoor recreation services.

The total land area in Finnish Lapland is 9.1 million hectares of which about 43% is in forestry use. The total growth

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of forests is annually 11.4 million cubic meters, and the volume of the cuttings is about 5.6 million cubic meters. About one-third of the productive forest land (growing at minimum 1.0 cubic meters per hectare annually) is protected. Forestry and the forest industry employs 3200 persons in the region (Keskimölö & Väisänen 2012). Even-aged forestry methods are typically used in private and state-owned commercial forests. Approximately half of reforestation occurs by artificial methods (planting and sowing) and the other half by natural regeneration (Keskimölö & Väisänen 2012).

The link between forest management and the quality of the recreation environment is demonstrated in forest landscape preferences studies. The landscape's characteristics and scenic beauty are affected by the seasonal appearance of vegetation and the amount of snow and therefore, the environment may change considerably with the season (van Mansvelt & Pedroli 2003; Ahas et al. 2005). Most of Finland is located between the latitudes of 60 and 70 degrees north where all four seasons (summer, autumn, winter and spring) are clearly distinguishable.

Thus, it may seem surprising that only a few earlier studies have considered forest management in different seasons (see Ribe 1989; Gundersen & Frivold 2008). Gramann and Rudis' (1994) study in Arkansas, USA, showed that the season had a greater effect than forest management on scenic beauty. Summer views were preferred to winter views (no snow cover) due to the overall colour of the forest, which is at its greenest in the summer. Moreover, Dhami and Deng (2010) modelled scenic beauty using far-views of forests in early and late autumn. In their study, late autumn views were appreciated more than early views due to full leaf colours. Sonntag-Öström et al. (2015) found that forests in springtime have more positive effects on people's feelings than in autumn, probably due to less light and colours in the late autumn.

Forest preference studies conclude that people appreciate mature forests with good visibility, some undergrowth and a green field layer with no signs of soil preparation (e.g. Lindhagen & Hörsten 2000; Silvennoinen et al. 2001; Ribe 2009). Forests that are thought to be in their natural state, or that look natural and bear no visible traces of human activity, are usually preferred. Correspondingly, the view after clear-felling is the least preferred environment (e.g. Silvennoinen et al. 2002; Gundersen & Frivold 2008; Ribe 2009; Kearney & Bradley 2011). In particular, the large size of the regeneration area and direct traces of cutting, such as signs of soil preparation and logging residues, have a negative impact (e.g. Silvennoinen et al. 2002; Karjalainen 2006). Furthermore, on average, people do not prefer dead or fallen trees (e.g. Tyrväinen et al. 2003; Gundersen & Frivold 2011). Forest landscape quality can also be analysed by using the nine visual concepts introduced by Tveit et al. (2006), these are stewardship, coherence, disturbance, historicity, visual scale, imageability, complexity, naturalness and ephemera.

In the case of near-views of the landscape, forest management generally lowers the quality of the landscape, at least for a certain time period. For instance, thinnings first decrease scenic value, but as soon as the traces of cutting such as the logging residues and signs of soil preparation are hidden by vegetation, the scenic value of the forest is restored (e.g. Silvennoinen et al. 2002). Furthermore, forest regeneration methods leaving more retention trees, shelter trees or seed trees are preferred to open regeneration areas (e.g. Silvennoinen et al. 2002; Tönnes et al. 2004). Ultimately, preferences towards forest management depend on personal characteristics and previous forest experiences (e.g. Tyrväinen et al. 2001; Kearney & Beadley 2011) along with the outdoor activities performed, thus, it is important to investigate landscape preferences of the actual users (e.g. Gundersen et al. 2015).

Tourists' observations of the environment are often directed towards aesthetic factors and scenic beauty (Schroeder 2002; Tyrväinen et al. 2008; Barroso et al. 2012). It is probably for this reason that the landscape is a key attraction factor in nature-based tourism (e.g. Tyrväinen et al. 2001; 2008; Brown & Raymond 2007). The desire to visit an area correlates with its beauty and the quality of its views (Sevenant & Antrop 2009). Tourists in Finland usually appreciate natural looking environments, abundant vegetation and wooded views (e.g. Tyrväinen et al. 2001). Moreover, the wilderness character of nature is an appreciated feature for a large share of Finns. Characteristic nature features of Finnish wilderness include old, mostly coniferous forests, large open mires, and small watersheds. Open large fell areas are also appreciated as wilderness areas. The wilderness character has been studied by Hallikainen (1998) using survey data, photo evaluations and field visits.

Previous Nordic landscape studies of visual forest structures (Gundersen et al. 2015) have mainly focused on the preferences of local residents or citizens of the country, not on those of international tourists. Landscape studies targeted at tourists have usually examined their attitudes towards large-scale cultural and natural landscapes (e.g. Fyhri et al. 2009). At present, we have little knowledge of which types of forest environments are adequate for providing international tourists with nature experiences. More knowledge is needed about how forest management regimes affect non-market forest ecosystem services, such as recreation and aesthetics (e.g. Filyushkina et al. 2016).

This study examined the landscape preferences of international tourists in Northern Finland. The aim was to study how different forest management regimes on average affect the suitability of forests for outdoor recreation activities. The research questions of the study are as follows:

(1) How do commercial forests correspond to the wishes and expectations of international nature-based tourists?
(2) How does the season affect tourists' forest landscape preferences?
(3) Is it possible to group forest vistas into forest vista types on the basis of their suitability for tourism?

Materials and methods

The data were collected as an on-site guided survey by interviewing foreign tourists who visited Finnish Lapland in 2008 and 2009. They were contacted by several interviewers at airports, hotels and other suitable places within tourist resorts in

different parts of Lapland. The questionnaire was available for respondents in English, German, French and Russian. It had two parts: firstly, tourists were asked about their travel motives, demand for qualities and services in nature-based tourism destinations and background information; secondly, the respondents were asked to look at photographs and evaluate the suitability of a range of forest environments for recreation and tourism. The total number of responses was 750. Almost all approached tourists accepted to fill in the questionnaire, with a less than 20% refusal rate. The data were collected in periods when there were peaks in the number of foreign visitors, that is, during late summer (August–September), turn of the year (December–January) and late winter (March–April).

The respondents did not evaluate all of the images, whether summer or winter, in order to reduce the probability of survey fatigue. Summer images were assessed by those who travelled in summer (71 tourists) or early winter (380), while winter images were evaluated by those who travelled in late winter (299). As there are clearly fewer international tourists visiting Lapland in summer, winter tourists were asked to also evaluate summer landscapes to guarantee an adequate number of responses.

To evaluate the quality and suitability of the forest environment for nature-based recreation, respondents were asked to look at a photograph and assign a number to it according to a scale from zero (*not at all*) to 10 (*perfectly*) in response to the question: "How well do these landscapes and environments fit your outdoor recreation needs and expectations in Lapland in summer/in winter?".

The main aim was to present the respondents a selection of typical forest scenes that they might see and experience during their outdoor recreation visit in Lapland. A large majority of the scenes represented landscapes produced by even-aged forestry methods that are typically used in Lapland and in other parts of Finland, too. The photographic material was composed of 26 summer and winter views that were comparable to each other. In addition to 26 photograph pairs, two summer and three winter images were included for factor analysis in order to have a larger dataset for grouping the scenes into forest vista types. The images represented typical forest stands found in commercial forests in Northern Finland, but they also included two summer and two winter images (P2 and P24) taken in national parks in Lapland. Managed forest stands included regeneration areas (seed or shelter tree and clear-felling), mature stands resembling stands close to their natural state, young stands and sapling stands (Table 1). A large number of regeneration alternatives compared to other management options were included in the study because their impact on landscape quality has previously been found to be the strongest. In practice, regeneration methods and their scale also vary greatly (Silvennoinen et al. 2002; Gundersen & Frivold 2008; Ribe 2009; Kearney & Bradley 2011).

Table 1. Grouping of images according to type of forest management.

Description of the images	Number of pictures		
	Summer–winter pairs	Winter no pairs	Summer no pairs
Clear-felling	8, 9, 12, 15, 16, 22, 28	21	
Seed or shelter trees	1, 5, 10, 11, 14, 18, 25	4, 29	4, 21
Sapling stands	3, 19, 20, 26		
Young stands	6, 13		
Mature stands	7, 17, 23, 27		
Protected areas	2, 24		

The same forest stands and the same views were photographed in both summer and winter. However, some pairs of photos were not taken precisely in the same place, because they were difficult to find in winter with the help of a map and a photograph taken in summer. Moreover, some locations (seven places) were remote and difficult to reach in wintertime due to heavy snow conditions and lack of time resources. These were replaced with photos as similar as possible. The final photographic material included 26 summer–winter image pairs: winter image P1 and summer image P1 form a pair and so on. In addition, the data included three separate winter (P4, P21 and P29) and two separate summer images (P4 and P21) that were suggested to be included in the study by Metsähallitus' foresters responsible for the management of state-owned commercial forests.

A separate factor analysis was conducted for summer and winter images (using principal axis factor and promax rotation). Factor analysis was used to search for latent variables hidden behind individual forest vistas, that is, common factors relating to the structure of the vistas. The promax rotation was used because the factors correlated considerably with each other (Brown 2009). The correlations are theoretically justifiable because the single vistas as well as the vista types can be considered as a continuum. The consistency of the factor items (vistas) in each of the factors was checked using Cronbach's alphas.

Based on the factor analysis results, new sum variables were computed by summing the key variables (i.e. variables that had a factor loading >0.5 with a particular factor). The new sum variables could be placed on the same scale as the original variables. The statistical significance of the seasonal differences between the images and sum variables was tested using the *t*-test.

Results

Respondents

The respondents represented 5 continents (no respondents from South-America) and 36 nationalities. Most respondents came from Europe (Table 2). British tourists accounted for the largest proportion (28.8% of all respondents), followed by Russian (15.1%), Dutch (10.1%), French (9.3%), Swiss (5.5%), German (3.9%), Italian (3.9%) and Spanish (3.9%) tourists. The share of male and female respondents was approximately equal; likewise, about half of the respondents were between 30 and 50 years. The respondents were relatively highly educated and two-thirds of them lived in cities with more than 50,000 inhabitants. The majority (68.6%) were visiting Finnish Lapland for the first time. Tourists with different backgrounds may, however, evaluate the scenes somewhat

Table 2. Characteristics of the respondents. The numbers in the table illustrate percentages.

Sex (n = 749)	*Male*	*Female*			
	50.6	49.4			
Age (n = 743)	*<30*	*30–49*	*≥50*		
	26.0	48.2	25.8		
Base education (*n* = 694)	*Primary school*	*Secondary school*	*High school*		
	7.6	29.3	63.1		
Professional education (*n* = 682)	*None*	*Vocational*	*University*		
	12.2	32.0	55.9		
Residential environment (*n* = 747)	*City (>500 000 inhabitants)*	*City (50 000–500 000 inhabitants)*	*Small town or countryside*		
	32.4	31.4	36.1		
Region where a tourist comes from (*n* = 710)	*Atlantic Europe*	*Southern Europe*	*Central Europe*	*Eastern Europe*	*Outside Europe*
	30.4	8.7	34.1	19.7	6.8

differently, but this analysis is beyond the scope of this article.

Attractive scenery was regarded as the most important characteristic of the tourist area, with a value of 4.4 on a scale where 1 is not important and 5 is very important. In winter, the respondents were most interested in snowmobiling (63.2%), husky safaris (60.0%), reindeer safaris (46.5%), downhill skiing (42.6%), cross-country skiing (35.6%) and snowshoe trekking (28.7%). During summer and autumn, the most preferred activities were hiking (38.6%), walking (37.1%) and observing nature (35.7%). The respondents were asked what motivated them to exercise outdoors in a natural setting. The most important motivator to participate in outdoor recreation was to view beautiful scenery (with a value of 4.5 on a scale of 1 = not important … 5 = very important).

Evaluations of summer images

Only approximately half of the summer forest vistas were rated as good or moderately good by the evaluators (Figure 1). Rather, large differences were found between the preferences since some summer images were rated as very poor. In the case of summer images, closed views of well-stocked or selectively logged semi-open forests were the most appreciated. The age of the stands varied; the most highly valued sceneries were mature forests, but two young stands were also rather well ranked (P13 and P6). However, open regeneration areas representing even-aged clear-cutting regime were the least appreciated among all images. The larger the size of the regeneration area and the more intensive the soil preparation treatment, the lower the rating of the area. Spruce and mixed stands were appreciated slightly more than pure pine stands. Forests in their natural state, with visible fallen and dead trees among old trees (P2 and P24), were slightly less preferable on average than mature and managed forest stands. Sites with saplings and/or an abundance of bushes were more preferable on average than natural regeneration areas. Of the natural regeneration sites, spruce shelter or seed-tree stands were appreciated more than pine seed-tree stands. Of the pine seed-tree stands, sites with intensive soil preparation were the least appreciated. According to the statistical tests, preferences for summer images were similar between the summer tourists and the early winter tourists, who both evaluated summer photographs.

Evaluations of winter images

In the evaluation of winter images, almost all landscapes were deemed moderately suitable for nature-based recreation and tourism (Figure 2). The differences between the images with the highest and lowest ratings were clearly smaller than in the case of summer images. Of the images, far-views of spacious and sparsely stocked forests where white snow cover formed an essential part of the view were the most appreciated. In fact, an open, extensive regeneration area or sapling stand did not greatly affect landscape appreciation in winter if the management operation had open far-views outside the treatment area. Closed views of well-stocked forests, especially if they were spruce stands, received high ratings. On average, winter images of natural regeneration areas were given higher ratings than corresponding mature forest stands that had been established through artificial regeneration (planting or sowing). The lowest ratings were given to open regeneration areas where signs of a clear cut such as dead or broken trees or geometric delineation of the cut block were apparent.

Comparison of summer–winter image pairs

The image pair comparisons showed that the season has a clear impact on the suitability of forest environments for recreational use (Figure 3). There were only two image pairs (P6 and P19) where the difference between the seasons was not statistically significant ($p \leq .05$). Winter images were generally more appreciated than the corresponding summer images. Only in five pairs were summer images rated more highly than winter images. These were images of relatively dense forest stands.

The preference for winter forest vistas was emphasised the most in the case of regeneration areas that had no or only a few trees (Figures 3 and 4). In such cases, there were great differences between image pairs: the summer image was perceived to be very poor, while the corresponding winter image was rated as good or very good.

Grouping of images into forest vista types

A separate factor analysis was conducted for summer and winter images. The final factor analysis performed on summer images produced a four-factor solution (Table 3). The first factor (*F1. Open view, regeneration area*) received

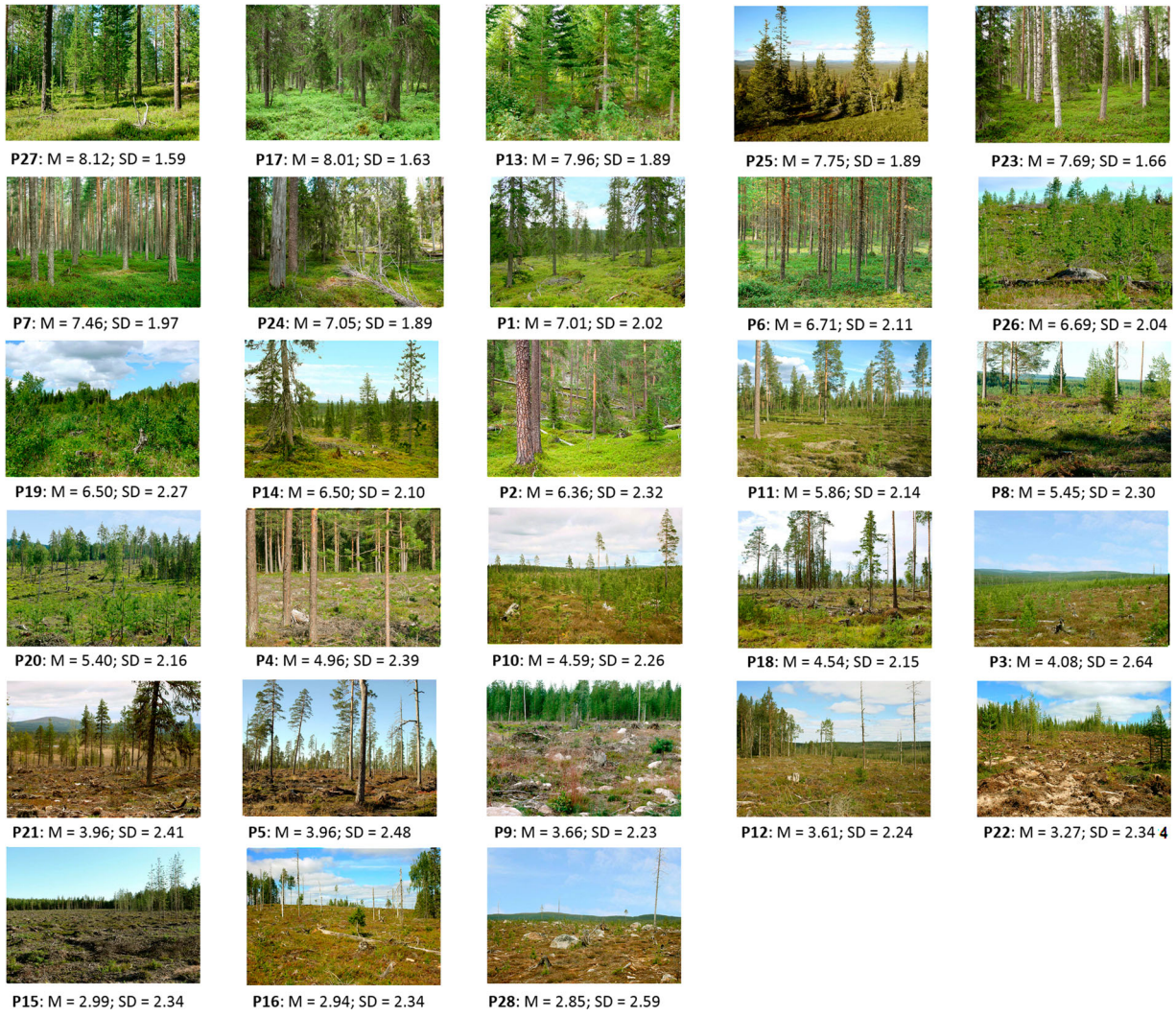

Figure 1. Summer image evaluations in order of preference on a suitability scale of 0 = Not at all … 10 = Perfectly. P = Number of the picture; M = Mean value; SD = Standard deviation.

high loadings in the case of images of open or almost open views. Many of these sites also had visible clear signs of forest management (soil preparation, logging residues and stumps). The weightings on the second factor (*F2. Closed view, dense forest*) were mainly associated with images representing closed views of well-stocked forests. The third factor (*F3. Semi open view, sparse trees*) was represented by seed trees or small clearings. The fourth factor (*F4. Spacious view, old trees*) was represented by two images in which the old trees were in a spacious area.

The factor analysis performed on winter images also produced a four-factor solution (Table 4). The first factor (*F1. Closed view, dense forest*) had high loadings in relation to images of closed views of well-stocked forests. The loadings on the second factor (*F2. Open view, regeneration area*) were mainly associated with images representing open treeless views. The third factor (*F3. Semi open view, sparse trees)* was represented by a very sparse stand structure (seed or shelter trees) or small clearings. The fourth factor (*F4. Spacious view, varying trees*) represented almost open views with trees of variable ages.

Ranked most highly of all factor solutions were winter images of the "spacious view, varying trees" type (Figure 5). The groupings of summer and winter images produced three forest vista types corresponding to each other: "closed view, dense forest"; "semi open view, sparse trees"; and "open view, regeneration area". Of these, "closed view, dense forest" was evaluated as meeting expectations and wishes at least moderately well, in both summer and winter. Ranked as highly were winter images of the "semi open view, sparse trees" type. Their summer counterparts were ranked clearly lower, even lower than winter images of the "open view, regeneration area" type, which received the lowest rating among winter images. The lowest ratings were given to summer images of the "open view, regeneration area" type. The difference between them and their wintery counterparts was very clear. Moreover, the groupings of summer images produced the "spacious view, old trees" type, which was ranked as second highest of all summer views.

Discussion

This study highlights the strong impact of seasons on the quality of the landscape in commercial forest environments.

Figure 2. Winter image evaluations in order of preference on a suitability scale of 0 = Not at all … 10 = Perfectly. P = Number of the picture; M = Mean value; SD = Standard deviation.

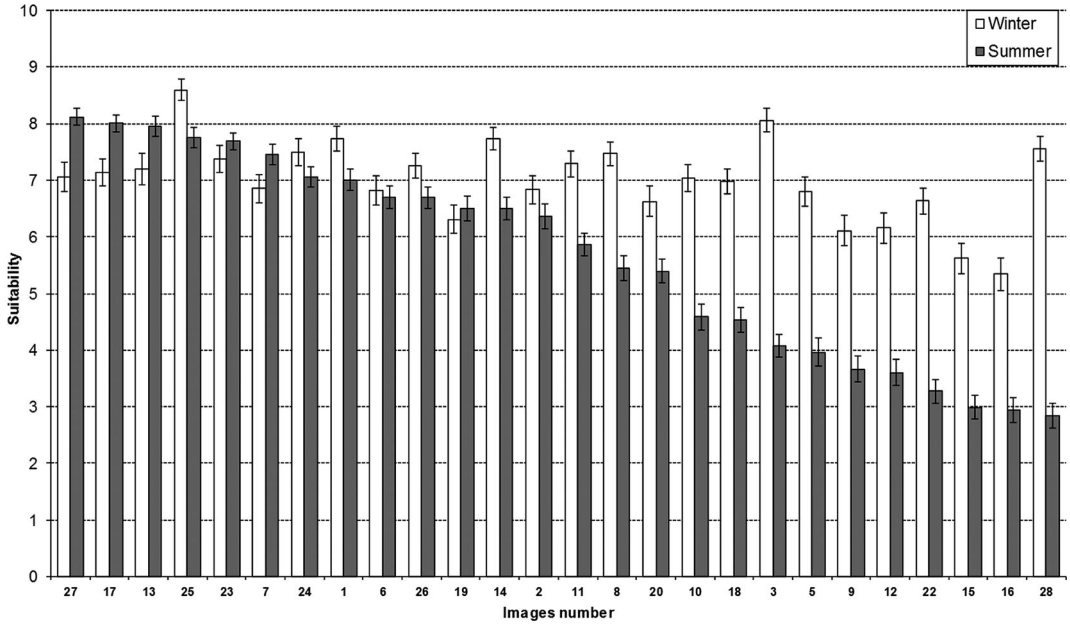

Figure 3. Image pairs in order of preference based on summer images. Mean value and error bars (95% CI). Scale: 0 = Not at all … 10 = Perfectly. The effect of the season is statistical significant (*t*-test; $p \leq 0.05$) in all pairs except images 6 and 19.

Figure 4. Image pairs, where the differences in preferences were greatest (the more preferable views are in the top row).

Earlier forest preference studies analysing seasonal differences have not examined the effect of snow on landscapes (Gramann & Rudis 1994; Dhami & Deng 2010) or they have only used verbal stimuli (Gundersen et al. 2015). This study shows that a specific stand in a commercial forest may be suitable for outdoor recreation in winter but less so in summer. Seasonal differences are particularly large in clear-cut areas.

Beautiful scenery was the most important motive for choice of destination and for participation in outdoor recreation. Therefore, it is important to understand how forest management affect the quality of visual quality of forest-based tourism landscapes. The greatest conflict between tourism and forestry arises when a forest is regenerated. In particular, sites regenerated through artificial regeneration (planting or sowing) are problematic, especially in summer. Open felling sites with visible signs of forest management, such as stumps, logging residues and signs of soil preparation, do not fulfil international tourists' expectations of an attractive recreation forest in summer. Dead retention trees or snags left in the regeneration area for biodiversity enhancement do not improve the situation. These results are in line with earlier studies carried out in various countries (e.g. Silvennoinen et al. 2002; Gundersen & Frivold 2008, 2011; Ribe 2009; Gundersen et al. 2015).

According to the results, relatively many sites in commercial forests would be suitable for nature-based tourism, especially in winter season. Even young commercial stands were moderately suitable nature-based tourism sites for international tourists, although many Finnish landscape preference studies have found dense young stands to be visually undesirable (e.g. Silvennoinen et al. 2001, 2002). These results may reflect different forest-use cultures in different countries. More than half of Finnish recreationists, for example, pick berries or mushrooms and move outside trails and paths based on Finnish everyman's rights (Sievänen & Neuvonen 2011). The accessibility of unthinned and dense forests is limited, which may affect the forest preferences of Finns. In Southern and Central Europe, for example, the use of forests is usually more restricted. People usually move along trails and paths (e.g. Bell et al. 2008) as the most preferred outdoor activities in this study also suggest and, therefore, dense forests, as such, do not hinder activities. This study had, however, only two winter and summer images representing young forest stands and therefore, only preliminary conclusions can be drawn.

Views of forests in their natural state were slightly less appreciated than mature commercial forests, but got quite high preference score values compared to photos depicting clear-cuttings. The Nordic studies show that on average recreationists appreciate lightly managed forests, with no direct signs of forest management (e.g. Karjalainen 2006; Gundersen & Frivold 2008). In fact, decaying and dead trees may be viewed as a safety risk (e.g. Tyrväinen et al. 2003) or ecologically valuable areas containing visible dead or downed wood are not necessarily perceived as the most aesthetic (e.g. Sheppard et al. 2001; Gobster et al. 2007; Gundersen & Frivold 2011) although naturalness of the forest is usually a desired feature (Sevenant & Antrop 2009; Edwards et al. 2012). Presumably, the respondents would have assigned higher values to sceneries with visible standing and lying dead wood within forest stands (P2 and P24) if they knew their ecological value (e.g. Gundersen & Frivold 2011; Gundersen et al. 2015) or that they were presenting scenes from National Parks.

This study also demonstrated that it is possible to group forest vistas into forest vista types on the basis of their suitability for tourism. The groups were relatively clear and differed from each other in terms of their appearance, which makes them easily identifiable. There were only four groups or forest vista types per season. With the exception of one group, the groups formed for summer and winter vistas corresponded to each other. This too indicates that the groups are relevant and genuinely reflect tourists' preferences for various forest environments. The system is primarily based on the number of trees and the openness of the view, not tree species or the size of trees, for example.

In the summer, tourists prefer mature, well-stocked stands and in the winter, far-views of sparsely stocked forests. An open view with no or only a few trees is the least suitable for tourism, both in summer and winter. This kind of open view, as well as semi-open view, were valued higher as winter scenery than as summer scenery. The reasons behind this are probably similar to the single pair image evaluations: in winter, the intact snow covers disturbances so that even a fresh cutting looks natural and coherent. This kind of snow scenery may respond quite well to tourists' expectations of Lapland in winter. Kearney and Bradley (2011) have also grouped forest environments on the basis of landscape preferences using factor analysis. Their groupings are quite similar to the groupings obtained in this

Table 3. Factor matrix (factor loadings) for summer image evaluations.

	Factors:				
Variables:	F1. Open view, regeneration area	F2. Closed view, dense forest	F3. Semi open view, sparse trees	F4. Spacious view, old trees	Communality
Picture 21	.859	.256	.422	.225	.747
Picture 22	.857	.229	.414	.200	.742
Picture 16	.845	.152	.538	.179	.742
Picture 15	.836	.170	.460	.181	.706
Picture 18	.806	.396	.512	.259	.679
Picture 12	.791	.298	.683	.279	.714
Picture 28	.767	.190	.484	.132	.602
Picture 20	.702	.473	.466	.243	.572
Picture 9	.666	.248	.664	.300	.579
Picture 27	.170	.780	.372	.267	.617
Picture 23	.151	.777	.327	.270	.613
Picture 17	.094	.770	.273	.459	.652
Picture 13	.111	.729	.333	.443	.571
Picture 7	.131	.706	.564	.465	.629
Picture 6	.216	.651	.616	.536	.605
Picture 24	.363	.651	.340	.316	.464
Picture 26	.493	.628	.509	.251	.512
Picture 25	.345	.627	.456	.159	.462
Picture 14	.485	.612	.504	.339	.486
Picture 19	.487	.558	.428	.329	.430
Picture 10	.674	.435	.794	.245	.727
Picture 11	.503	.572	.725	.203	.641
Picture 4	.541	.406	.723	.541	.614
Picture 8	.600	.416	.700	.313	.560
Picture 3	.610	.250	.689	.380	.574
Picture 5	.659	.256	.682	.425	.619
Picture 2	.281	.381	.376	.753	.583
Picture 1	.244	.501	.437	.653	.574
Initial eigenvalues	11.85	4.13	1.42	1.11	
% of Variance	40.93	13.43	3.58	2.54	Total: 60.5
Cronbach's alpha	.939	.902	.887	.762	

Table 4. Factor matrix (factor loadings) for winter image evaluations.

	Factors:				
Variables:	F1. Closed view, dense forest	F2. Open view, regeneration area	F3. Semi open view, sparse trees	F4. Spacious view, varying trees	Communality
Picture23	.918	.446	.476	.460	849
Picture24	.891	.395	.481	.472	814
Picture27	.884	.447	.375	.543	819
Picture17	.876	.487	.527	.357	776
Picture20	.822	.603	.453	.582	738
Picture6	.822	.417	.551	.236	721
Picture13	.803	.371	.444	.453	663
Picture29	.778	.458	.431	.647	700
Picture7	.730	.482	.579	.180	620
Picture19	.720	.708	.433	.674	734
Picture2	.682	.433	.629	.138	596
Picture1	.658	.442	.649	.337	548
Picture15	.418	.856	.381	.481	764
Picture12	.310	.802	.546	.231	705
Picture22	.407	.795	.490	.442	640
Picture16	.381	.790	.401	.346	639
Picture9	.416	.751	.533	.415	579
Picture18	.670	.716	.564	.581	656
Picture21	.607	.681	.475	.545	566
Picture8	.463	.642	.624	.366	505
Picture28	.366	.615	.397	.599	504
Picture5	.597	.683	.756	.278	673
Picture3	.529	.443	.748	.409	635
Picture10	.587	.721	.737	.447	682
Picture14	.664	.587	.719	.444	637
Picture4	.398	.569	.695	.424	577
Picture11	.637	.676	.678	.418	617
Picture26	.577	.697	.438	.779	739
Picture25	.454	.465	.503	.713	637
Initial eigenvalues	14.91	3.08	1.41	1.24	
% of Variance	50.30	9.59	3.70	3.07	Total: 66.7
Cronbach's alpha	.954	.915	.902	.764	

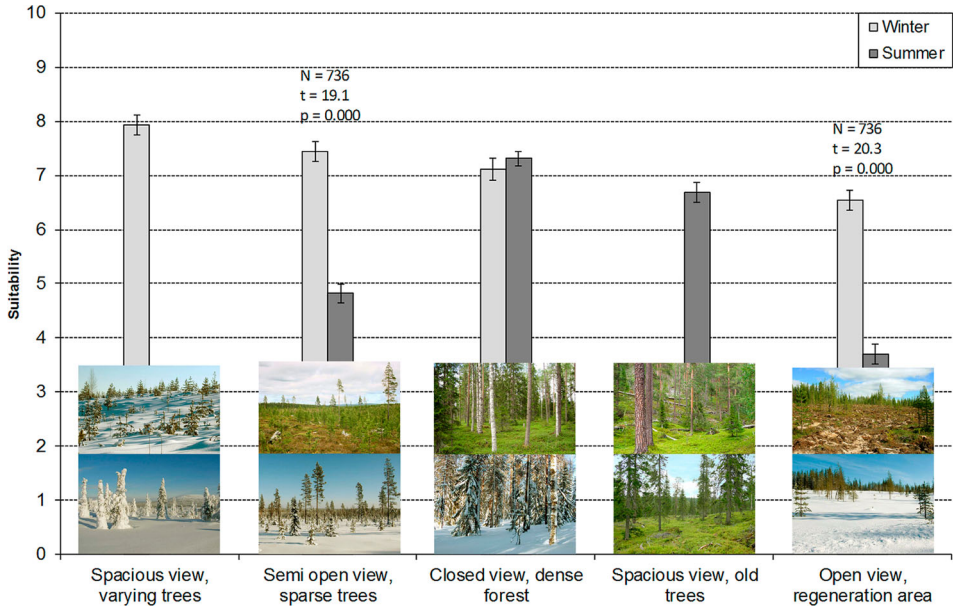

Figure 5. Forest vista types created on the basis of the factor analysis performed on summer and winter images. Mean value, error bars (95% CI) and statistically significant (*t*-test; $p \leq 0.05$). Scale: 0 = Not at all … 10 = Perfectly.

study. Furthermore, also Karjalainen (2006) and Gundersern and Frivold (2008) have found that Nordic and North American landscape preference studies have produced largely similar results.

Tveit et al. (2006) introduced visual concepts that help in understanding seasonal differences in people's preferences, in particular linked to regeneration areas. In winter, the sceneries seem to be more *natural and intact*, because snow hides signs of forest management, such as logging residue and stumps. The season also affects the *visual scale and openness* of landscapes: in winter, large-scale landscapes are more important because of limited light and sight. At northern latitudes, the importance of light is emphasised in winter. Areas with the highest amount of light are those with no or only a few trees, such as clear-cut areas. Moreover, it is easier to perceive the environment in clear-cut areas as they have the best visibility and may provide interesting long-distance views (e.g. Li et al. 2004).

Snow cover also has an effect on the *complexity* and *coherence* of the landscape (Tveit et al. 2006). Visually rather complex forest scenes in regeneration areas in summer are hidden by snow and the coherence of the landscape is improved as snow on the ground and on the trees make landscapes visibly more harmonious. In summer, intensive forestry changes and causes *disturbance* on the landscape, and the signs of management are most visible. This may imply to viewers that the environment is not taken care of and is lacking *stewardship and upkeep* (Tveit et al. 2006; Ode & Tveit 2013). Moreover, tourism marketing of Lapland has mainly concentrated on winter tourism (*imageability*), which may affect the higher scores of winter sceneries.

To address the challenge of collecting a representative tourist sample in a large tourism area, a relatively large dataset was gathered to represent different groups of tourists and nationalities visiting the area. It is notable that the time of the data collection did not have an effect on landscape preferences. Likewise, evaluations of summer images were similar between summer tourists and early winter tourists, who both evaluated summer photographs. This suggests that the environmental preferences for outdoor recreation environments in summer are on average relatively stable and do not depend on the time (season) of evaluation.

A possible weakness in the data was that some pairs of photos did not represent exactly the same views. The groupings of images based on factor analysis did, however, consolidate the results of individual image evaluations and image pair comparisons. Although the results do not reveal, for example, what outdoor activities respondents connected to the sceneries, their travel and outdoor motives stress the importance of the visual quality of the forest landscapes.

The main outcomes of the study show that forestry and tourism can be practised in the same areas, but the parties must adapt their operations to each other's needs. Problems relating to the reconciliation of tourism and forestry are clearly emphasised in summer and during the period when the ground has no snow cover. This finding is important, as the development of year-round tourism in Finnish Lapland is one of the main objectives of the tourism industry. If summer and winter tourism need to operate in different areas, the total amount of trails and paths and other infrastructure will substantially increase, and thus a higher amount of commercial forests would be under restricted forestry use.

The results suggest a clear demand for adapted management within even-aged forest management regime in areas used for nature-based tourism. From this point of view, intensive forest regeneration should be avoided in actively used forest areas such as along trails and paths and their immediate vicinity. Correspondingly, to match international tourist's

expectations, entrepreneurs should plan their guiding of visitors to areas where no intensive forest management treatments are visible. Another suggestion is that uneven age forest management might help the integration of forestry with nature-based tourism; this is a topic in need of further research as this study included only two images presenting uneven-aged forestry management practices. Previous research also suggests that gap felling blends in better with the landscape than conventional forest management treatments (e.g. Kearney & Bradley 2011).

From the point of view of forestry, with good planning and suitable management actions it can be integrated with tourism in the same area, but reducing the intensity of management might cause a loss of timber production values (see Ahtikoski et al. 2011). This calls for compensation mechanisms that would bring economic income from tourism not only to entrepreneurs, but also to landowners (e.g. Tyrväinen et al. 2014). The forest vista types created in the study are recommended as a useful concept for companies in evaluating the suitability of their areas for nature-based tourism.

Reconciliation of tourism and forestry is easier in winter due to snow cover. In the best case, forest regeneration may increase the aesthetic value of wintry nature, as it opens impressive far-views from a closed landscape. A less favourable scenario is that climate change may shorten the period of full snow cover in the not-too-distant future. Nevertheless, a positive finding is that conventional well-stocked commercial forest stands seem to be moderately suitable for tourism, in both summer and winter. This helps the development of year-round tourism in commercial forests and reduces the use pressures associated with the negative ecological impacts of tourism in protected areas with vulnerable natural environments.

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