Chapter 11
Purism Scale Approach for Wilderness Mapping in Iceland

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Abstract Coincident with increased utilization of the Icelandic highlands, its image as a unique and pristine wilderness is gradually changing. People's perception of wilderness is influenced by a number of factors relating to their culture and socio-economic background. Furthermore, how people value pristine land or define wilderness varies depending on the location and function of the assessment. Therefore, understanding perceived wilderness is likewise of major importance in the planning and long term management of tourism within the Icelandic highlands. This paper attempts to identify and map perceived wilderness areas within the southern Icelandic highlands, using the purism scale approach. The results indicate that constructions related to power plants (i.e. plants, power lines, and dams) are considered undesirable by all four tourism market groups. The results moreover show that non-purists visiting the Icelandic highlands do not favour paved roads. Conversely, mountain huts do not affect the perceived wilderness for any of the purism groups. The perceived wilderness mapping of the southern Icelandic highlands shows that nearly the whole area, or 97.2 %, is perceived as wilderness by the non-purism group, while less than half, or 45.4 %, is perceived as wilderness by the strong purism group. Once a wilderness area becomes known as a tourist destination, maintaining its wilderness condition becomes increasingly difficult. In order to avoid the overuse of wilderness for tourism and other economic sectors, ambitious planning and appropriate management are critical. This includes identifying limits of growth and further development. Without such limitations, the use of wilderness is simply unsustainable.

Keywords Wilderness mapping • Tourist perception • Purism scale • Tourism • Iceland

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11.1 Introduction

> Travelling alone on foot in this vast and threatening landscape was one of the most incredible and spiritual experiences of my life. (Miriam Rose 2006).

Still, the Icelandic wilderness areas provide unique experience for tourists. The Icelandic wilderness resource has however witnessed a rapid expansion of natural resource exploitation that still seems to be progressing. Spectacular nature and vast wilderness have long been the predominant attractions for tourists visiting Iceland. Consequently, they form the backbone of the growing tourism industry that is currently the nation's second largest export sector (Statistics Iceland 2013a). Icelanders numbered 321,857 on the 1st of January 2013 (Statistics Iceland 2013b). This small population shares a landmass of approximately 103,000 km^2 and has throughout the 1100 years of the island's human settlement been distributed mainly along the coastline, leaving the interior highlands a largely uninhabited wilderness (e.g. Ólafsdóttir and Runnström 2011a; Sæþórsdóttir et al. 2011). Previously the Icelandic highlands were used only for summer grazing, but from the early 1970s onwards, gradual changes towards multiple uses have taken place. Thus, vehicles have taken over the role traditionally played by horses in the rounding up of the sheep in autumn, numerous hydro-electric power stations have been constructed and tourism is growing rapidly. This increased use of the highlands and the consequently increased demand for motorized vehicle access into the highlands has led to shrinkage of the country's wilderness area (e.g. Ólafsdóttir and Runnström 2011a; Sæþórsdóttir et al. 2011).

For centuries the Icelandic interior highlands were of little economic significance; they were considered poor pastures and presented a substantial obstacle when travelling between different parts of the country (e.g. Sæþórsdóttir et al. 2011). This, together with the country's sparse population which fluctuated between 30 and 50 thousand until the nineteenth century when the population began a steady increase (e.g. Karlsson 1975; Karlsson and Kjartansson 1994; Júlíusson 1995), preserved the Icelandic highlands from human impact until relatively recently. Until World War II, the only access into the highlands was by foot or horse, but when the British-American occupation forces imported all-wheel-drive army trucks they opened up the vast wilderness of the highlands, as these vehicles were able to traverse the large glacier rivers and drive through rough terrain. Using 4 × 4 vehicles, the classical 'highland safari' was developed which became the first significant form of organized tourism in the Icelandic highlands (Huijbens and Benediktsson 2007; Sæþórsdóttir et al. 2011). In the 1930s, the Iceland Touring Association had begun building mountain huts in the interior highlands for recreational purposes (e.g. Ólafsdóttir and Runnström 2013). At the present time, there are hundreds of mountain huts in the Icelandic highlands, most of them unlicensed (Ministry of the Environment and The National Planning Agency 1999). In the 1970s the development of large-scale power production began in the highlands when the first hydro-electrical power plant was constructed in the southern periphery of the area

(e.g. Pálsdóttir 2005; Sæþórsdóttir 2012a). Over time, additional plants have been constructed and older ones enlarged. Today, seven power plants are located within the highlands, most of them in the southern highlands (Landsvirkjun 2013). The construction of power plants led to improved access into the highlands as roads were constructed and rivers bridged. As the highland road network grew and road conditions improved, day-tripping into the highlands became easier. Yet, to a large extent, the highland roads are rough gravel roads or tracks passable only by 4×4 vehicles. However, concurrent with increased tourism, the Icelandic highlands are growing in popularity with increased demands for improved infrastructure. More than one third (36.3 %) of all foreign summer tourists visit the interior highlands (ITB 2012). Thus, the highlands and their wilderness are a valuable resource to the Icelandic tourism industry, as well as being of symbolic value used in various visual media e.g. used as a major marketing slogan in the symbolic economy.

Recent mapping of Icelandic designated wilderness areas (i.e. Ólafsdóttir and Runnström 2011a, b; Taylor 2011) indicates that the area free from man-made structures currently covers about one third of the total surface area of the country, and that Iceland has lost up to 70 % of its wilderness areas since the 1930s. Likewise, road-less areas have gradually decreased, with a consequent decrease in the quality of the wilderness. The increased number of land use conflicts stemming from the more intense utilization of the highlands (e.g. Thórhallsdóttir 2007; Benediktsson 2008; Sæþórsdóttir 2012a) underline the importance of forming a better knowledge and understanding of Icelandic wilderness resources, in order to implement sustainable management of the country's remaining wilderness areas. This is particularly true in terms of government aims of sustainable development (*cf.* Ministry of the Environment 2010) as well as for the organization of sustainable tourism in the Icelandic highlands. However, despite the rapid increase in human interference and the consequently changed appearance of the Icelandic highlands, research reveals that many travellers still experience the area to be wild and unspoiled nature (Sæþórsdóttir 2010b). Therefore, understanding perceived wilderness is also of major importance for the long term planning and management of tourism within the Icelandic highlands. This paper attempts to identify and map perceived wilderness within the southern Icelandic highlands, using the purism scale approach.

11.2 Previous Mapping of Icelandic Designated Wilderness Areas

The first step towards designating Icelandic wilderness areas was taken in 1997, following a governmental decision concerning a strategy for the preservation of pristine wilderness in Iceland. Subsequently, a work group was appointed by the Icelandic Minister of the Environment which formulated an official definition of Icelandic wilderness. This definition reflects conventional definitions, corresponding

to the original US Wilderness Act of 1964, defining Icelandic wilderness to be an area of land:

- where no trace of human activity is to be found and the natural landscape develops outside of any pressure related to human influence.
- which is situated a minimum distance of 5 km from any human structure or infrastructure, such as roads, houses, power lines, telecommunication masts, dams, etc.
- which is at least 25 km^2 in size, or of such a size that one may enjoy solitude and the natural landscape without disturbance from human structures or traffic from mechanized vehicles.

Icelandic Act no. 44/1999 on Nature Conservation, section 3 (authors' translation)

Recently, a new act on nature conservation, no. 60/2013, has been issued by the Icelandic parliament and is expected to come into effect in 2015. With regard to wilderness, the new act still embraces the same definition as the previous act, no. 44/1999, however, the new act contains additional categories of protection, among which one is aimed at uninhabited wilderness (i: óbyggð víðerni) which will become a legal status of protection. The official mapping of designated wilderness areas in Iceland still only takes into account the criteria of 5 km distances from major roads (Fig. 11.1).

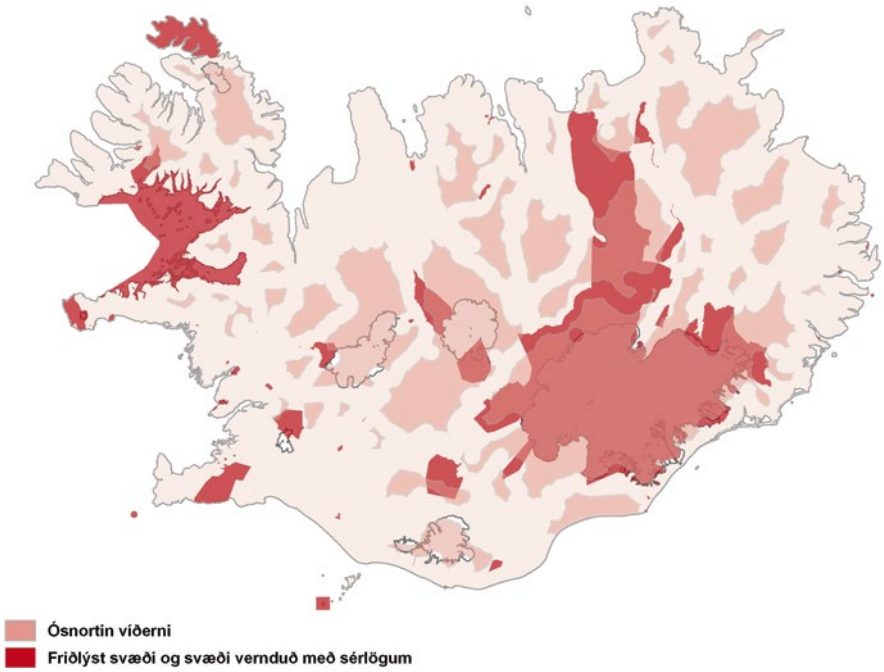

Fig. 11.1 Official mapping of Icelandic wilderness. *Pink* signifies *pristine wilderness* and *red protected areas* (The Environment Agency of Iceland and National Land Survey of Iceland 2009)

The first comprehensive assessment of Icelandic wilderness was carried out by Ólafsdóttir and Runnström (2011a). Their assessment is based on the official definition of the wilderness concept, as stated in the Icelandic act no. 44/1999, applying two different methods; firstly, a proximity analysis, where buffer zones were created and categorized, based on similar criteria as previous studies (e.g. Lesslie and Taylor 1985); and secondly, a viewshed analysis, where what is actually visible in the landscape in relation to topography is taken into account. Both these analyses are based on geographical digital data on a national scale, obtained from the National Land Survey of Iceland.

The proximity analysis mapping is based on three factors: remoteness from mechanized access, remoteness from settlement and apparent naturalness. Each factor was categorized into different attribute variables and appropriate disturbance distances were determined for each variable (*cf.* Ólafsdóttir and Runnström 2011a). Maps of all three factors were combined in a geographical model to obtain a holistic map demonstrating the total disturbance distances from all attribute variables used (Fig. 11.2). According to the proximity analysis results, the area outside the integrated buffer zones makes up 34,695 km^2, or 34 % of the surface of Iceland. Out of these 34 % the country's ice caps cover 26 %. Taylor (2011) added a temporal factor to the proximity analysis by assessing the change in areas free from roads and power lines between 1936 and 2010. Her results indicate that the number of polygons larger than 200 km^2 in size has decreased by over 70 % over the course of those

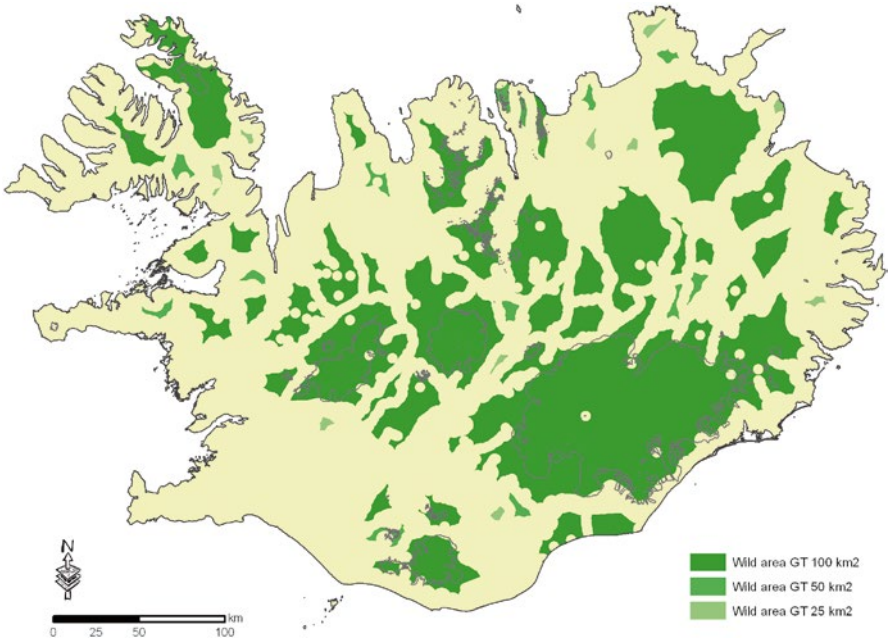

Fig. 11.2 Extent of Icelandic wilderness based on proximity analysis (From Ólafsdóttir and Runnström 2011a)

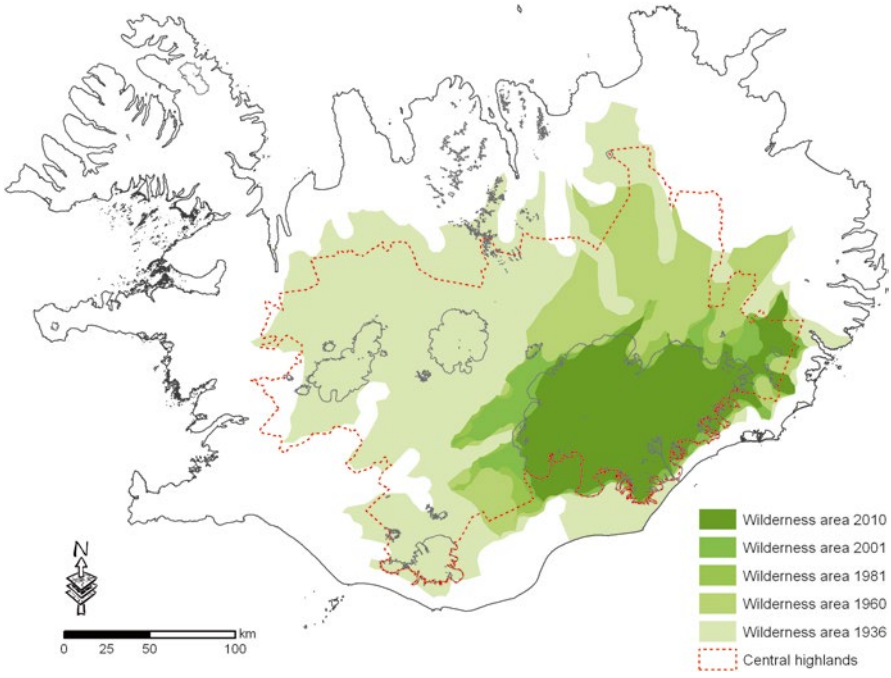

Fig. 11.3 Temporal decrease in the largest area free from roads and power lines within the Icelandic highlands (Modified from Taylor 2011)

75 years. In 1936 the single largest wilderness area within the Icelandic highlands made up nearly 50,000 km^2, or 47 % of the total land area. In 2010 the largest remaining wilderness area made up less than 10,000 km^2, or only 9 % of the total land area, mainly covering the large ice cap of Vatnajökull (Fig. 11.3).

In a landscape like the Icelandic highlands where elevation varies greatly, creating a mountainous and undulating landscape, topography is likely to play a large role in people's experience of wilderness. What is actually visible from different locales may be a more important variable in wilderness assessment than mere proximity to anthropogenic structures, as features may be invisible from certain angles and locations even though the distance is short. Therefore Ólafsdóttir and Runnström (2011a, b) also applied a viewshed analysis to the assessment of the Icelandic wilderness. The algorithm underpinning this analysis calculates the vertical angle for each grid cell in a digital elevation model (DEM) based on the relative difference in elevation between the cell and the cell containing the object and their horizontal distance. After the vertical angle has been calculated for each grid cell, the program compares each cell's vertical angle stepwise in the lines of sight, starting from the cell containing the object. If the vertical angle for a cell is lower than all cells closer to the object in the sight line, the cell is coded visible. However if the vertical angle

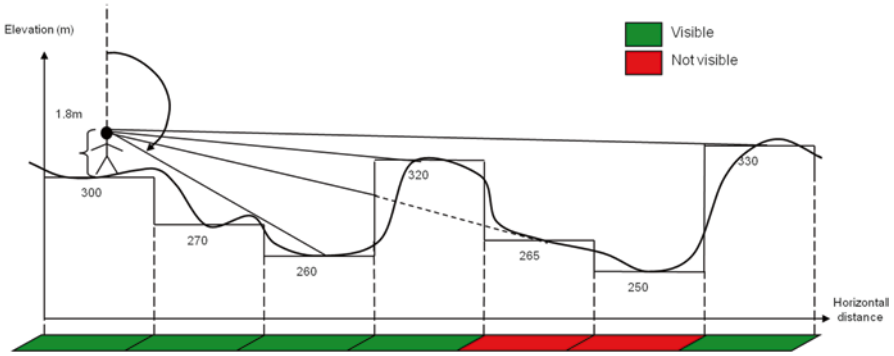

Fig. 11.4 Topographical impact on line of sight. The *numbers* represent elevation value in each grid cell in the DEM (From Ólafsdóttir and Runnström 2011b)

is higher than any one cell closer to the object it is coded as invisible (Fig. 11.4). What is visible is furthermore affected by the maximum sight distance, which is limited by the curvature of the Earth. Ólafsdóttir and Runnström (2011a, b) calculated the maximum sight distance (d) by using Pythagoras' theorem (Eq. 11.1), which shows that a person standing on a level expanse with eyes 1.8 m above the surface level is a 4.8 km distance from the horizon.

$$d = \sqrt{2Rh + h^2} \tag{11.1}$$

where d is the maximum sight distance; R is the Earth's radius (6,371,000 m); and h is the height of the viewer's eyes above ground level. However, if the person stands on a hill, the distance to the horizon is greater. Similarly, if the viewed object is tall, e.g. a power-line tower, it can be seen from further afield. As an example, an object of 2 m height, such as a car, will according to eq. 1 be invisible from about a distance of about 10 km (i.e. ~4.8 km from viewer's eyes to the horizon + ~5.0 km from the horizon to the car's roof). Therefore, as most of the anthropogenic objects in the Icelandic highlands are still rather small in relation to the topography of the landscape and, furthermore, are not striking in colour, a 10 km maximum sight distance was used in the viewshed analysis, at which distance objects were assumed to be too far away for disturbing visualization. The viewshed analysis was run for each of the anthropogenic features used in the proximity analysis model, in order to compare the outcomes of the two methods applied. On a national scale, the map resulting from the viewshed analysis shows a wilderness pattern and areal coverage similar to the one obtained from the proximity analysis (Fig. 11.5). On a local scale, however, a much more dynamic pattern emerges, which is closely interrelated to landscape topography.

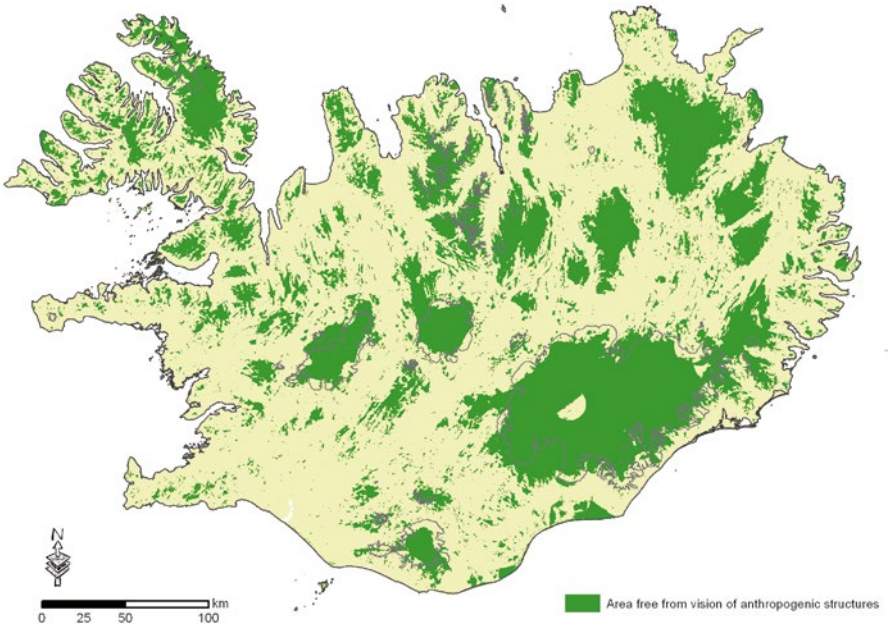

Fig. 11.5 Extent of Icelandic wilderness based on viewshed analysis (From Ólafsdóttir and Runnström 2011a)

11.3 Perceived Wilderness Mapping Based on Purism Scale Approach

11.3.1 Visitors' Perception of Wilderness

The overall perception of the Icelandic environment, with regards to tourism, seems largely based on a romanticized notion of its uniqueness and pristine wilderness (e.g. Ísleifsson 1996, 2009; Gössling and Hultman 2006; Oslund 2011; Sæþórsdóttir et al. 2011), an image which the Icelandic tourist industry is enthusiastic to maintain. However, concurrent with the increased utilization of Icelandic wilderness resources, this image is gradually changing. Hence, Taylor (2011) stresses that if Iceland does not maintain and manage its wilderness, overuse and overcrowding of the most popular areas might lead to dissatisfaction of tourists, decreasing the probability of their returning and adversely affecting the image of Iceland's wilderness as a tourist destination. Importantly, individual wilderness perception may contrast with the official definitions of wilderness. A number of studies have been undertaken to test people's individual perceptions of wilderness and their reasons for visiting such areas (e.g. Kliskey and Kearsley 1993; Higham 1998; Higham et al. 2001; Carver et al. 2002; Sæþórsdóttir 2010a, b; Van den Berg and Koole 2006; Flanagan and Anderson 2008; Lupp et al. 2011). The perception of wilderness by individuals is

influenced by a number of factors relating to their culture and their socio-economic background, including age, gender, and education level (e.g. Sæþórsdóttir and Stefánsson 2009; Lupp et al. 2011). Furthermore, how people value pristine land or define wilderness varies depending on the location and the function of the assessment. According to Stankey and Schreyer (1987), the most common reasons for visiting wilderness areas are to experience solitude and unspoilt nature, as well as to escape from urban lifestyle.

Worldwide wilderness areas seem to be growing in popularity with all types of tourists, including so called "urbanists" who, although they are motivated to experience wildernesses, also require more facilities and services than their purist counterparts who prefer to have few or no facilities and to experience nature in an unspoilt environment (e.g. Sæþórsdóttir 2013; Taylor 2011). Thus, the increasing popularity is often met by expanding infrastructure to meet the increased demands. In this regard Sæþórsdóttir (2008, 2010b, 2013) points out that the increasing popularity and consequently increased crowding of many wilderness areas in the Icelandic highlands negatively impacts the expected wilderness experience, causing areas to become less attractive to the purist tourists, causing displacement of tourism to other, previously undisturbed, isolated areas. Hence, in this sense, the idea of wilderness is socially constructed (e.g. Williams 2002) and ever changing. In this subjective sense, wilderness does not exist without an observer to experience it and is more of an idea than an ontological phenomenon (i.e. Cronon 1998; Tuan 1990; Williams 2002). This is underlined by Van den Berg and Koole (2006), who point out that if people are unaware of previous human interference in an area, this interference does not detract from their wilderness experience. Thus, mapping perceived wilderness is critical for planning and managing wilderness tourism in the Icelandic highlands in a sustainable manner.

11.3.2 The Purism Scale

The purism scale is a continuum that ranks individuals in terms of their level of ideological attachment to purity or primitiveness, in their perception of wilderness (Fig. 11.6). Many variables, such as the level of infrastructure and available services and the density of tourists, influence the individual's perception and experience when visiting wilderness areas, based on his/her background and interests. These

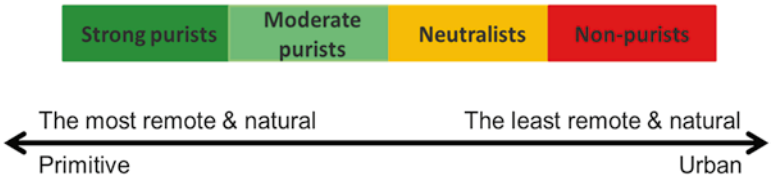

Fig. 11.6 The purism scale

variables reflect different needs, attitudes and expectations as well as the diverse tolerances of different types of individuals towards human impact on the environment. Thus, to distinguish the various types of wilderness perception, individuals with similar responses are grouped together, i.e. in "purism groups" (Hendee et al. 1968; Stankey 1973). In this regard Sæþórsdóttir (2010a) points out that some tourists are not sensitive to human-induced changes, whether they are buildings, roads or information signs. Conversely, such changes can ruin the experience of nature for those who enjoy a natural environment only if it is totally free of human alteration. Therefore, tourists have different opinions about what facilities and services are desirable, and it is obviously not possible to please everyone at a single location. For a natural destination, such as the Icelandic highlands, it is necessary in order to be competitive to distinguish the market segments when developing a natural tourist area, i.e. one has to ask and analyse; what type of tourist does this area attract and who could it potentially attract. The advantage of distinguishing market segments in this way is that neither time nor money is spent trying to attract tourists to a place in which they have no interest, or which they do not appreciate (e.g. Mohsin 2005; Buhalis 2000).

As thoroughly reviewed by Sæþórsdóttir (2010a), Hendee et al. (1968) were the first to analyse the different attitudes held by tourists towards wilderness areas within the USA, and, based on this analysis, suggest how tourism in wilderness areas should be managed. Based on their results, they categorized visitors into five groups on a so called Wildernism-Urbanism Scale, i.e.: *strong wildernists, moderate wildernists, weak wildernists, neutralists and urbanists*. They conclude that wildernists are more sensitive than the other visitor groups in their perception of the wilderness and its qualities, as defined in the US Wilderness Act, such as solitude and primitiveness. In 1973 Stankey carried out similar research, also in the USA. Based on visitors' responses to 14 items, he categorized them into four groups, i.e.: *strong purists, moderate purists, neutralists, and non-purists*, which he located on a so-called Purist Scale. Based on similar criteria, Schreyer (1976) produced another scale, the Wilderness Purism Scale, using 17 items to categorize visitors according to their attitudes. Wallsten (1988) was the first to apply this method in Scandinavia. He uses Stankey's (1973) terminology but his method of categorizing visitors differs from that of Stankey. While Stankey set fixed limits to distinguish between groups, Wallsten uses the Normal distribution. Vistad (1995) and Fredman and Emmelin (2001) use the same approach as Wallsten in assessing wilderness areas within the Scandinavian mountains. Sæþórsdóttir (2010a) points out that the different approaches taken by the Scandinavian and US scientists may have yielded somewhat different results. When fixed limits are used for the different categories, it is possible to compare the composition of visitors in different regions, while the same is not possible when using Normal distribution, as the limits will differ between datasets and research areas. If the datasets are normally distributed, different areas can only be compared by converting all results to the standard normal distribution. The advantage of using the Normal distribution method is that it highlights the differences between visitors at each location. This is useful when looking at certain locations and how to plan them, based on the requirements of dif-

ferent types of tourists. In Iceland Sæþórsdóttir (2010a, b, 2011) carried out a study using fixed limits to divide the different groups, as her main purpose was to compare user groups at different natural destinations in Iceland. Her results show that tourists with puristic attitudes constitute the majority of visitors in the least developed and least accessible tourist destination in the Icelandic highlands. Urbanistic views, on the other hand, are most common among visitors to the national parks and nature destinations in the lowlands. Travellers in the interior highlands generally want less development and fewer services than travellers in the lowlands and they are satisfied with the existing primitive conditions. Their satisfaction does not increase with more infrastructure and services; on the contrary, they prefer to travel in as natural an environment as possible.

Accessibility, physical environment, facilities and services are the critical factors determining which purism group will visit each area and these factors account for the different composition of visitors. Furthermore, the more popular the Icelandic highland areas become, the more likely it is that the composition of travellers will change. Increased numbers of visitors will drive away those who are most sensitive to crowding, and more visitors require more infrastructure. A new market group makes more demands on goods and services as can already be seen in Landmannalaugar, which has become the most visited destination in the Highlands, with over one hundred thousand tourists visiting the area annually. As a result, the character of tourism there has changed and, according to one third of visitors, there are too many tourists in the area (Sæþórsdóttir 2013).

11.3.3 Mapping Perceived Wilderness Using the Purism Scale Approach

In order to map the wilderness perception of tourists in the Icelandic highlands it was decided to use the methodology introduced by Kliskey and Kearsley (1993), Higham et al. 2001, and Flanagan and Anderson (2008) who base their mapping on existing data from questionnaires focusing on visitors' perception of different anthropogenic structures. This research builds on questionnaire surveys gathered among travellers at seven destinations in the southern Icelandic highlands from 2007 to 2011 (Fig. 11.7; Table 11.1). Completed questionnaires were received from 3288 visitors, with a response rate between 70 and 95 % (Sæþórsdóttir 2012b). The data was processed according to the purism scale approach (Fig. 11.8), using the score range from Sæþórsdóttir (2010a) to define each purism group in the Icelandic highlands as follows: strong purists scored >60; moderate purists scored between 50 and 59; neutralists between 40 and 49; and non-purists had scores of <40. The questionnaire was composed of 39 questions, only some of which are considered in this paper. These focus on the respondents' opinions on the desirability of various facilities and structures (e.g. paved roads, accommodation, power plants, etc.) at the location where the questionnaire took place. All questions were presented as a 5-point Likert scale, except three which were statements. To determine from the

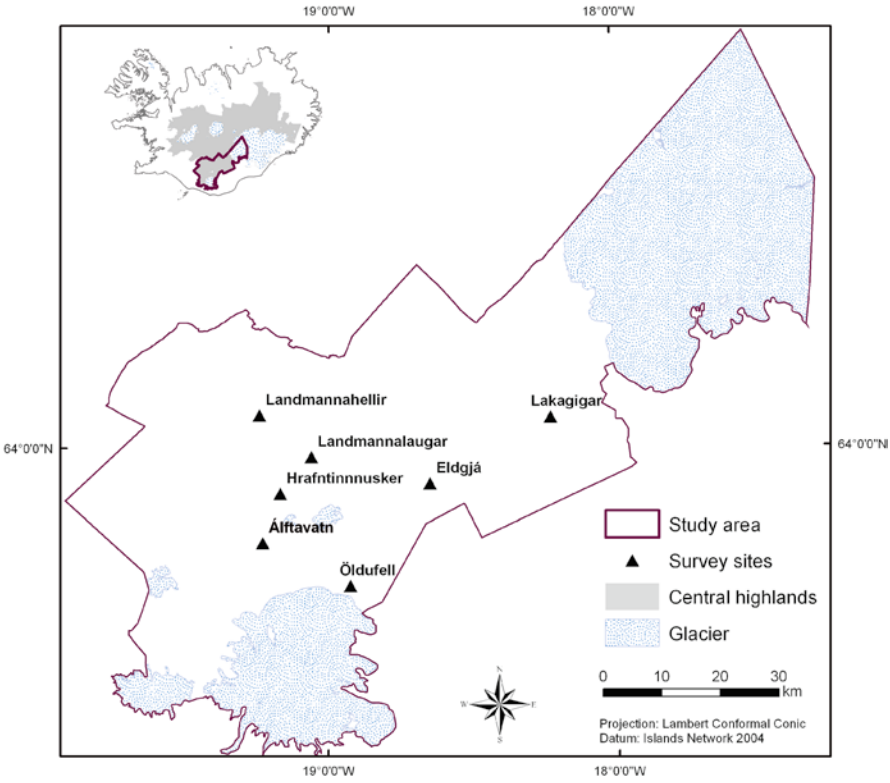

Fig. 11.7 The study area for the perception of wilderness mapping within the Icelandic southern highlands and the location of the seven questionnaire survey collection points

Table 11.1 Data used for the wilderness perception mapping

ID	Tourist destination	Year of survey	Questionnaires (n)	Per cent (%)
1	Landmannahellir	2011	180	5
2	Hrafntinnusker	2011	351	11
3	Álftavatn	2011	219	7
4	Eldgjá	2011	437	13
5	Öldufell	2011	58	2
6	Landmannalaugar	2009	1646	50
7	Lakagigar	2007	397	12
Total			**3288**	**100**

Obtained from Sæþórsdóttir (2012b)

data which features are considered undesirable in the wilderness area, the average score is calculated for each purism group. When the calculated average is below 3, this is mapped as an indication that respondents are against the current facility/structure. Likewise, when the calculated average is above 3, it is assumed that

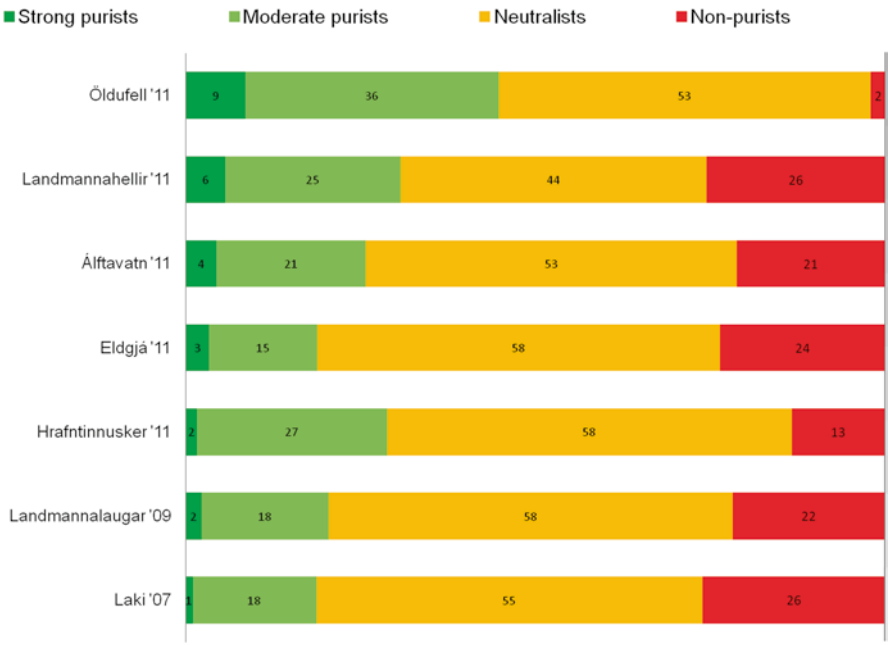

Fig. 11.8 Division of visitors according to the purism scale (Based on data from Sæþórsdóttir 2012b)

respondents are positive towards the facility/construction. The three statements-questions all focus on the visitors' opinions on power lines, dams and reservoirs, e.g. "Power lines may be present in an area which is considered wilderness". If over 50 % of respondents reply yes, this is mapped as if the construction is accepted.

The results from the perception analysis indicate that constructions related to power plants (i.e. plants, power lines, and dams) are considered undesirable by all four purism groups (Table 11.2A). This contradicts the results of Flanagan and Anderson (2008), which indicate that all features are accepted in the wilderness setting by the non-purism group. The results moreover show that non-purists visiting the Icelandic highlands do not favour paved roads. On the other hand, mountain huts do not affect the perceived wilderness by any of the purism groups (*cf.* Table 11.2A). In order to be able to map the different perceptions, an approximated distance of tolerance is required for each purism group (e.g. Higham et al. 2001; Flanagan and Anderson 2008). As such figures can be difficult for a tourist to define, and as such figures were not set forward in the questionnaires used, estimated numbers are given based on Higham et al. (2001)) and Flanagan and Anderson (2008), where the different buffer distances are supposed to reflect the graduated intensity of wilderness feeling by the four purism groups. The buffer distances are increased by one km per purism group (Table 11.2B). Several desirable wilderness features are not taken into account at this stage, due to lack of field data and/or lack of digital data (Table 11.2C).

Table 11.2 Features and structures considered undesirable in the Icelandic wilderness setting divided by purism group, and estimated buffer distances used to exclude areas featuring undesirable structures from extent of perceived wilderness

Feature/construction		Purism group			
		Non-purists	Neutralists	Moderate purists	Strong purists
A: Features/constructions considered undesirable in the Icelandic wilderness setting by purism group					
Hotel/guesthouse		**x**	**x**	**x**	**x**
Visitor centres/museum			**x**	**x**	**x**
Power plants (hydro/geothermal)		**x**	**x**	**x**	**x**
Power lines		**x**	**x**	**x**	**x**
Dams (Reservoirs)*		**x**	**x**	**x**	**x**
Paved roads		**x**	**x**	**x**	**x**
Gravel roads			**x**	**x**	**x**
Mountain huts					
B: Buffer distances (km) used to exclude areas demonstrating undesirable features/ constructions from perceived wilderness according to each purism group					
Hotels/guesthouses		**1**	**2**	**3**	**4**
Visitor centers/museums			**1**	**2**	**3**
Power plants (hydro/geothermal)		**1**	**2**	**3**	**4**
Power lines		**1**	**2**	**3**	**4**
Dams (Reservoirs)[a]		**1**	**2**	**3**	**4**
Paved roads		**1**	**2**	**3**	**4**
Gravel roads			**1**	**2**	**3**
Mountain huts					
Farms					**4**
C: Lack of data					
Evidence of off-road driving	LDD				
Marked hiking routes	LDD				**x**
Designed footpaths	LDD				**x**
Tracks (dirt roads)	LFD				
Signposts/information signs	LFD				
Radio/telephone mast	LFD				
Maintained campsites	LFD				
Toilet facilities	LFD				
Commercial recreation (e.g. guided tours)	LFD				
LDD = Lack of digital data					
LFD = Lack of field data					

[a]In the questionnaires, respondents were only asked about their perception to dams

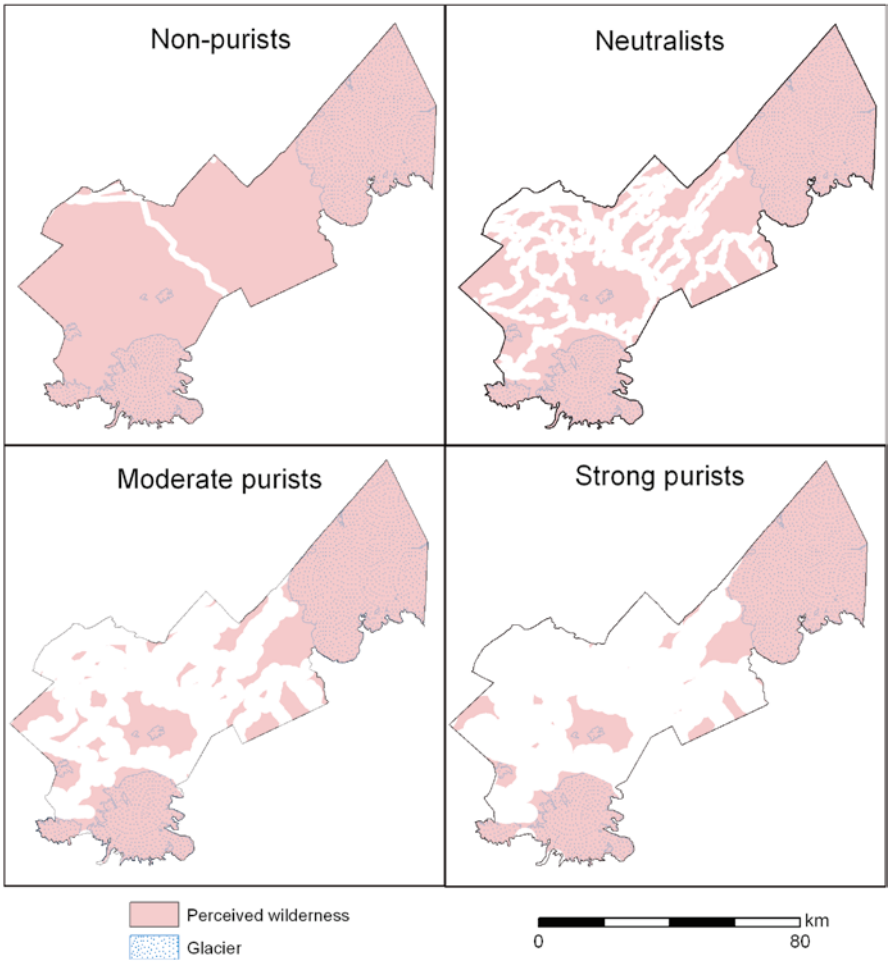

Fig. 11.9 The spatial and areal difference of perceived wilderness in the study area, using the criteria expressed by the four purist groups, i.e. non-purists, neutralists, moderate purists, strong purists

The resulting mapping of the perceived wilderness for the southern Icelandic highlands show that nearly the whole area, or 97.2 %, is perceived as wilderness by the non-purism group, whereas less than half, 45.4 %, is perceived as wilderness by the strong purism group (Fig. 11.9). As a point of comparison, designated wilderness areas (i.e. according to the proximity analysis) make up 49,7 % of the study area (Fig. 11.10).

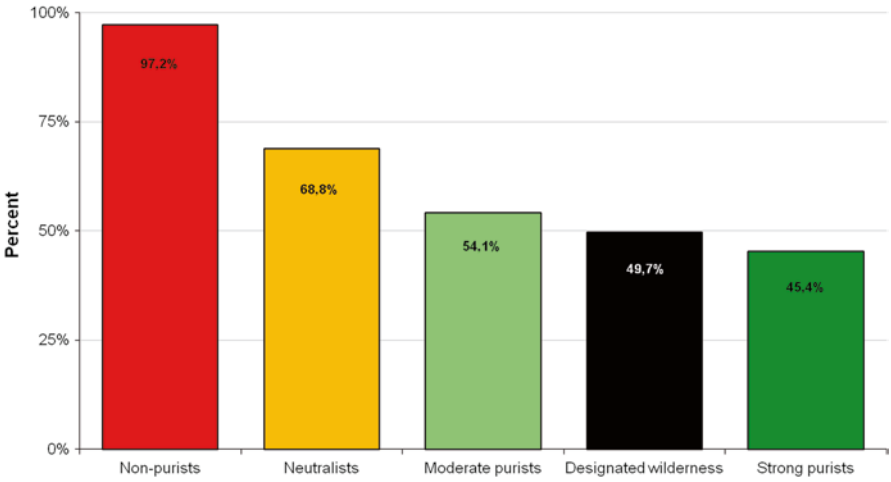

Fig. 11.10 Comparisons of the extent of wilderness as perceived by the four purism groups and as defined by the official designation of Icelandic wilderness (percentage of the study area)

11.4 Discussion and Conclusions

11.4.1 Wilderness Mapping in Iceland

The image of pristine nature has long been employed when marketing Icelandic exports. Likewise, the Icelandic tourism industry has long been using the country's wilderness as their main selling point when attracting tourists (Sæþórsdóttir 2008; Sæþórsdóttir et al. 2011). Thus, the value of the Icelandic wilderness for the tourism industry, as well as for the Icelandic economy, is gradually growing along with increased tourism. During recent decades, however, the Icelandic wilderness has undergone rapid change, greatly affecting the quality of the wilderness (i.e. Ólafsdóttir and Runnström 2011a, b; Taylor 2011). In order to predict how such changes will affect the future of Icelandic tourism and the tourism industry, quantitative as well as qualitative assessment of Icelandic wilderness resources is critical. So far, several attempts have been undertaken to map the Icelandic wilderness resources. The attempts to map existing wilderness based on the definition of designated wilderness areas according to the Icelandic Act no. 44/1999 on Nature Conservation include (i) official mapping using 5 km distance from major roads (i.e. The Environment Agency of Iceland and National Land Survey of Iceland 2009); (ii) an assessment of Iceland's designated statutory wilderness using proximity analysis (i.e. Ólafsdóttir and Runnström 2011a); and (iii) mapping areas outside visibility of anthropogenic structures, using a viewshed analysis (i.e. Ólafsdóttir and Runnström 2011a, b). In the present study an attempt has been made to map perceived wilderness areas by analysing areas that tourists perceive as wilderness, based on questionnaires and interviews with tourists in several tourist

destinations in the southern Icelandic highlands. Efforts have been made to combine the aspects of different tourists with regard to their experience of wilderness by mapping the perception of tourists according to the purism scale and comparing their wilderness perception to the physical features in the area of study, as well as to the extent of the designated wilderness. The results of the mapping of wilderness perception reveal a major difference in opinion between the purism groups with regards to where perceived wilderness exists. Non-purists perceive almost the whole study area as wilderness, while strong purists make notably higher demands of wilderness than the official definition of designated wilderness does. This finding is supported by Higham et al. (2001) and Flanagan and Anderson (2008), indicating similar differences between different purism groups. One noteworthy difference, however, is that all structures related to power plants seem to disrupt the experience of wilderness by all purism groups visiting the Icelandic wilderness, including the non-purism group. This might be due to the barrenness of the Icelandic landscape, making anthropogenic structures particularly striking in the landscape. Another notable difference is that mountain huts do not seem to affect the experience of wilderness in any of the purism groups in the Icelandic wilderness, not even the strong purists. This can be expected to depend on the Icelandic mountain huts still being relatively small and primitive, and being well fitted into the landscape. This situation may change, as many mountain huts have been evolving into larger service centres, in order to meet the increased demands of the rapidly growing tourism in the Icelandic highlands.

11.4.2 Management Implication

The management of the world's wilderness areas is representative of many of the conflicts and challenges faced in natural resource management today. The Icelandic wilderness, whether it is viewed as an ontological reality or as an idea, is an important resource for the Icelandic tourism industry and consequently for the Icelandic economy. A public resource like wilderness can only be protected from overuse and destruction with regulation and supervision, as stated by Hendee et al. (1990). Once a wilderness area becomes known as a tourist destination, maintaining its wilderness condition becomes increasingly difficult. In order to avoid the overuse of wilderness for tourism and by other economic sectors, ambitious planning and appropriate management are critical. This includes identifying limits of growth and further development. Without such limitations, the exploitation of wilderness is unsustainable, which is against the European Parliament declaration on wilderness areas (http://www.wildeurope.org), as well as against the Icelandic government policy on sustainable development (i.e. Ministry of the Environment 2010). Recent studies (i.e. Sæþórsdóttir 2010b, 2013) highlight increased crowding within the Icelandic highlands and an accompanying reduction in the quality of wilderness experience. Given these facts, the results of this study suggest that a redirection of the non-purist group to less pristine areas in the lowlands may preserve the highlands

for the market groups who have higher demands on the quality of wilderness areas. However, in order to maintain the remaining wilderness in the Icelandic highlands, increased research on the wilderness and its quality is vital. Geodiversity and biodiversity are factors likely to play large roles with regards to the quality of the Icelandic wilderness, as well as to the subjective experience of the wildness of the Icelandic highlands.

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