



A GIS model for mapping spatial patterns and distribution of wild land in Scotland

Steve Carver^{a,*}, Alexis Comber^b, Rob McMorran^c, Steve Nutter^a

^a School of Geography, University of Leeds, LS2 9JT, UK

^b Department of Geography, University of Leicester, LE1 7RH, UK

^c Centre for Mountain Studies, Perth College UHI, PH1 2NX, UK

ARTICLE INFO

Article history:

Received 27 May 2011

Received in revised form

18 November 2011

Accepted 22 November 2011

Available online 17 December 2011

Keywords:

Geographical Information Systems (GIS)

Wildness

Protected areas

Landscape character

Scotland

ABSTRACT

This paper presents a robust and repeatable method for mapping wildness in support of decisions about planning, policy and management in protected landscapes. This is based around the application of high resolution data and GIS models to map four attributes of wildness: perceived naturalness of land cover, absence of modern human artefacts in the landscape, rugged and challenging nature of the terrain, and remoteness from mechanised access. These are combined using multi-criteria evaluation and fuzzy methods to determine spatial patterns and variability in wild land quality. The approach is demonstrated and tested for the two national parks in Scotland: the Cairngorms National Park and the Loch Lomond and The Trossachs National Park. This is presented within a wider debate on the ability of such models to accurately depict and spatially define the concept of wildness within both the Scottish setting and the wider global context. Conclusions are drawn as to scalability and transferability, together with potential future applications including local and national level mapping, and support for landscape character assessment, planning policy and development control. Maps of the wild land core, buffer and periphery areas of the two parks are presented.

© 2011 Elsevier B.V. All rights reserved.

1. Introduction

Mountains, lochs and rugged coastlines are valued hallmarks of Scotland's landscape, providing a major focus for outdoor recreation and wildlife conservation. These distinctive qualities of the Scottish landscape are strongly expressed in areas dominated by natural vegetation, lack of human intrusion from built structures and the rugged and remote nature of the terrain. They are not wilderness in the true sense, but they do possess certain attributes of wildness and so are widely referred to as 'wild land' (Aitken, Watson, & Greene, 1992; Scottish Natural Heritage, 2002). These iconic landscapes are closely linked to Scotland's national identity and represent a key draw for visitors. However, despite recognition of their value, Scotland's wild land areas face a growing array of threats including renewable energy, overgrazing and bulldozed hill tracks (McMorran, Price, & Warren, 2008). Previous studies have shown these factors can impact significantly on an area's wildness and result in a gradual attrition of the wild land resource (Carver & Wrightham, 2003).

The importance and value of wild land is increasingly reflected in planning policy in Scotland. National Planning Policy Guideline

(NPPG) 14 states that local authority development plans should identify and protect wild land (Scottish Office, 1998). In order to support this initiative, Scottish Natural Heritage (SNH) produced a Policy Statement on *Wildness in Scotland's Countryside* (Scottish Natural Heritage, 2002). NPPG 14 was superseded by the Scottish Planning Policy document, wherein the need to safeguard areas of wild land character from development is highlighted: "Areas of wild land character in some of Scotland's remoter upland, mountain and coastal areas are very sensitive to any form of development or intrusive human activity and planning authorities should safeguard the character of these areas in the development plan" (Scottish Government, 2010, p. 26). This has been given extra credence by the Scottish Government with the commissioning of a report on "A Review of the Status and Conservation of Wild Land in Europe" (Fisher et al., 2010) which itself arises out of recommendations from the European Parliament's resolution on wilderness calling for:

1. better definition of wilderness including ecosystem services and conservation value;
2. a programme of mapping aimed at identifying Europe's last wilderness areas, the current distribution, level of biodiversity and existent of untouched areas where human activities are minimal; and
3. greater attention to providing effective protection from threats to wilderness areas (European Parliament, 2009).

In 2007, SNH and the Cairngorms National Park Authority (CNPA) commissioned research that linked three pieces of work:

* Corresponding author. Tel.: +44 0113 3433318; fax: +44 0113 3433308.
E-mail addresses: s.j.carver@leeds.ac.uk (S. Carver), ajc36@leicester.ac.uk (A. Comber), robert.mcmorran@perth.uhi.ac.uk (R. McMorran), ste.nutter@gmail.com (S. Nutter).

Table 1
Policy and other definitions of Scottish wildness.

Organisation	Definition
National Planning Policy Guideline (Scottish Office Development Department, 1999)	“uninhabited and often relatively inaccessible countryside where the influence of human activity on the character and quality of the environment has been minimal”
Scottish Natural Heritage (2002) – Wildness in Scotland’s countryside	“The term ‘wild land’ is . . . best reserved for those limited core areas of mountain and moorland and remote coast, which mostly lie beyond contemporary human artefacts such as roads or other development”
National Trust for Scotland – Wild Land Policy (2002)	‘Wild land in Scotland is relatively remote and inaccessible, not noticeably affected by contemporary human activity, and offers high quality opportunities to escape from the pressures of everyday living and to find physical and spiritual refreshment.’
John Muir Trust – Wild land Policy (2004)	‘Uninhabited land containing minimal evidence of human activity’

1. a perception survey of wildness in Scotland;
2. development of a Geographic Information System (GIS) based analysis of wildness; and
3. its application to identify the geographical extent and intensity of wildness across the Cairngorms National Park.

Wild land is a qualitative concept and numerous definitions exist within the Scottish context (National Trust for Scotland, 2002; Scottish Natural Heritage, 2002) (see Table 1). To support management and planning policy, methods for mapping wildness in a robust and repeatable manner need to be developed. The aims of this paper are to: (1) describe work carried out by the authors on behalf of Scotland’s national park authorities and SNH to map and model wildness in both the Cairngorms National Park and the Loch Lomond and The Trossachs National Park, and (2) explore the utility of the resulting maps for further developing wild land policy and support of landscape character assessments.

2. Defining and mapping wilderness: scalability and relativity

Geographically speaking, wilderness is a term that is more commonly associated with other parts of the world and is not readily applied to Scotland. At a global scale, the distribution of wilderness areas is relatively well mapped based on the impact of human activity (e.g. Sanderson et al., 2002). GIS approaches for mapping wilderness have been developed (e.g. Aplet, Thomson, & Wilbert, 2000; Carver, Evans, & Fritz, 2002; Kliskey & Kearsley, 1993; Lesslie & Taylor, 1985) which adopt a spatial definition of wilderness based on the continuum concept outlined by Nash (1993) whereby wilderness is regarded as one extreme on a scale of environmental modification from the “paved to the primeval” (Fig. 1). Various methods and criteria have been used to describe this continuum, but these invariably focus on mapping and classifying landscapes

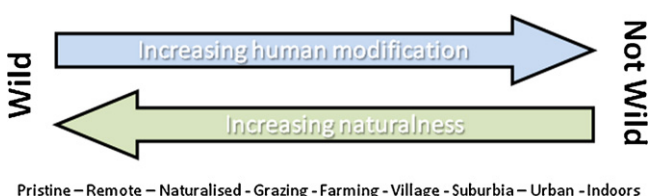


Fig. 1. The wilderness continuum.

according to measures of remoteness and naturalness, with landscapes exhibiting a greater tendency towards a wilderness condition if they are both remote from human influence and more natural in terms of their ecosystem form and function.

The continuum concept gives rise to an interesting philosophical debate in our deliberation about the point along the continuum at which wilderness can be said to exist (Carver, 1996; Dawson & Hendee, 2009; Lesslie & Taylor, 1985; Nash, 1993). Nash (1993, p. 1) maintains that “one man’s wilderness is another’s roadside picnic ground” indicating that individual experience and background is important in what might be considered wild and what is not. Nash neatly side-steps the need for a formal definition by suggesting that “wilderness is what men think it is” and that wilderness should be self-defining (Nash, 1993, p. 1). The imprecise definitions of wildness point to fuzzy approaches for spatially delimiting wildness for policy and management purposes since application of the continuum concept demonstrates that wildness is both relative and scalable and can be defined using continuous geographical variables to identify both the wildest and least wild locations and all points in between (e.g. Carver, 1996; Lesslie & Taylor, 1985). Researchers have selected and/or weighted different criteria to explore how individual perceptions shape spatial patterns of wilderness quality (Carver et al., 2002), attempting to address Nash’s original and careful ambiguity by generating fuzzy membership sets for ‘wildness’ (Carver et al., 2002; Comber et al., 2010; Fritz, See, & Carver, 2000) and thereby demonstrating the scalability and relativity of the wilderness concept. This approach has been used to map relative wildness across a range of spatial scales and regions from continental to local scales (e.g. Aplet et al., 2000; Carver, 2010; Carver & Wrightham, 2003).

The definition of wild land from SNH provides some basis for the geographical analysis of wild land in Scotland. It characterises wild land by a lack of human habitation and influence, remoteness and inaccessibility, size, ruggedness, challenge and opportunity for physical recreation. These characteristics of wildness can be mapped, either directly or using proxy indicators. SNH identify four basic attributes of wildness; naturalness, human impact, ruggedness and remoteness as shown in Table 2 with associated criteria. These provide the basis for the data inputs described in Section 4.

3. Study area

This work models wildness in two national park areas in the Cairngorm and Trossach mountains in Scotland, an autonomous region within the UK. The Cairngorm National Park (CNP) in the North East of Scotland has an area of 4528 km² making it Britain’s largest national park and is centred on an area of high mountain plateau deeply dissected by glaciers. It contains 5 of the country’s 6 highest mountains and the largest area of the UK above the 4000 foot contour. It includes the largest area of arctic montane habitat in the British Isles and has a unique collection of habitats and wildlife including 25% of threatened and significant remnants of ancient Caledonian pine forest. The park has a population of 17,000 people mainly engaged in tourism, agriculture and forestry. Around 30% of the local economy is based on tourism with over 1 million visitors to the park every year (Cairngorms National Park Authority, 2006). The Loch Lomond and The Trossachs National Park (LLTNP) in the West of Scotland is much smaller with an area of 1865 km² and encompasses a varied landscape of high mountains, lochs, rivers, forests, woodlands and lowlands. It contains 20 mountains above 3000 feet and 22 large lochs including Loch Lomond, the largest freshwater body in Britain. The park is home to a rich collection of wildlife including otter, capercaillie and osprey. Over 15,000 people live within the park, but more significantly around 50% of Scotland’s population live with only an hour’s drive of the park, making it very

Download English Version:

<https://daneshyari.com/en/article/1049665>

Download Persian Version:

<https://daneshyari.com/article/1049665>

[Daneshyari.com](https://daneshyari.com)