8 Camping, Wild Camping, Snow Holing, and Bothies

Chapter Summary
This chapter first defines camping and presents a camping spectrum which ranges from survival camping to trailer tents, caravans, and motorhomes. It then discusses snow caves, quinzhees and igloos, and finally bothies before examining participation numbers. The final part of the chapter focuses on specific environmental impacts: damage to soil and vegetation, impacts on water, and the impacts on wildlife. The final section considers the management of these activities such as trail design and the development of hardened campsites as in the Overland Track in Tasmania. There is discussion on some attempts to manage the impact of human faeces on water resources, with examples from the Cairngorms, UK. Finally, examples of how the impact of camping on wildlife has been managed are presented.

8.1 Definitions

8.1.1 Camping

Camping is an outdoor activity which involves at least one overnight stay away from home in a shelter, such as a tent. Generally participants leave developed areas to spend time outdoors in more natural ones in pursuit of activities which give enjoyment, rejuvenation, and/or recreation. Some research has even indicated that people who camp are happier (Camping and Caravanning Club 2011) and that camping has benefits to families in terms of personal and social development (Jirásek et al. 2017). By our definition "camping" should include a minimum of one night spent outdoors, which distinguishes it from day-tripping, picnicking, and other similarly short-term recreational activities. Camping can be enjoyed through all four seasons. Luxury may be an element, such as in early twentieth-century African safaris or some of the early mountain tours in the Alps before hut accommodation was available (see Chap. 6), but including accommodation in fixed or permanent structures, be they wooden cabins such as may be found in summer camps or sports camps under the banner of "camping" is probably a step too far.

Camping as a recreational activity became popular among the elite middle and upper classes in the early twentieth century. Over time it has become popular with all demographic and economic classes. Modern campers visit publicly owned natural resources such as national and state parks, wilderness areas, Areas of Outstanding Natural Beauty, and commercial campgrounds. Camping is an important ingredient in the programmes of many youth organisations around the world, such as scouting, which is used to teach both self-reliance and teamwork.

Camping encompasses a range of activities and approaches to outdoor accommodation. Table 8.1 shows a spectrum of camping options.

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Table 8.1 A proposed camping spectrum

Survival/very close to nature			Luxury camping or "glamping"	
Less insulated from nature			Very insulated from nature	
Survival camping	Wild camping/ expedition camping	Campsite/valley camping	Family/fixed tent camping with electricity	Trailer tent/caravan/ motorhome (recreation vehicle, RV)
Use of a "bivvy" (bivouac) bag or home-made/natural shelter, tarp, or basher (cape used by military personnel). Maybe an emergency shelter or may be a pre-planned camp but emphasis and priority on lightweight and survival *not* comfort	Use of a lightweight backpacking tent which has been carried into a wild area where there are no facilities, perhaps camping by a mountain tarn, remote but some attempt to be comfortable (e.g. sleeping mat)	Any portable tent pitched on a commercial site (farm or holiday park) where basic facilities like toilets, washing-up or shower facilities provided on-site. Usually the camping equipment is carried to the site in a car or van	Usually a large tent, often with two-thirds compartments which may be pre-pitched (e.g. Eurocamp), may have proper beds, raised wooden floor, and some luxury facilities (stove/ fire, electricity) but still canvas roof walls, so insulated from nature to some extent, but not totally	The main difference between this and tent camping is the mobility, raised off the ground. Many caravans or motorhomes have central heating, running water (from an onboard tank), cooker/ oven, permanent beds with comfortable mattress, shower and toilet, and so on. Capability to close blinds, turn on lights, and become largely *isolated from nature*

Survivalist campers (extreme left in Table 8.1) set off with as little as possible to get by and may rely on a waterproof bivouac (bivvy) bag (Fig. 8.1A) or simple tarpaulin (Fig. 8.1B, C) for protection from the weather, or they may use a hammock (Fig. 8.1D). Camping may be combined with hiking, called "backpacking," in which case lightweight backpacking tents such as that in Fig. 8.1E are used and, when pitched in remote regions (as in Fig. 8.1E), is termed "wild camping." However, camping is often enjoyed in conjunction with other outdoor activities such as canoeing, climbing, fishing, hunting, and cycling.

In the middle of the camping spectrum (Table 8.1) is campsite/valley camping where individuals, groups, or families pay a fee (usually per person/tent per night) to pitch on a well-maintained field, next to which there will be, as a minimum, toilets, but often other facilities like showers, washing-up sinks, hot water, and maybe a small shop selling basic provisions like bread and milk. In family/fixed tent camping with electricity (Fig. 8.1 F, G), the campers bring large family tents which sleep up to six or eight people and usually pitch up for a week or more. There will be folding chairs, tables, cookers, and even fridges or TVs when hooked up to electricity points which may be provided on the site (at extra cost).

At the other end of the spectrum (to the right in Table 8.1), trailer tents, touring caravans (Fig. 8.2A, C), motorhomes, and recreational vehicle (RV) travellers arrive equipped with their own electricity, heat, and patio furniture. At this more luxurious end of the spectrum, the term "glamping" is now used, a blend of "glamorous" and "camping" which has evolved from African safaris where demanding European and American travellers slept in luxurious canvas tents, supported by chefs, guides, porters, and butlers.

Fig. 8.1 (A) A hooped bivouac bag used for lightweight survival camping. Photo by Tim Stott. (B) Using a tarpaulin (also called an Army "basher") to create an overnight shelter in Yorkshire, UK. Photo by Tim Stott. (C) A tarpaulin used as a lightweight overnight shelter in a woodland. The campers sleep on the ground. Photo by Tim Stott. (D) A hammock with tarpaulin used as a lightweight overnight shelter in a woodland. The camper sleeps off the ground. Photo by Tim Stott. (E) A mountain tent used for a camp at 2000 m by Castle Creek Glacier in the Cariboo Mountains, British Columbia. Photo by Tim Stott. (F) Typical family camping tent on a campsite in Anglesey, Wales. Photo by Tim Stott. (G) A campsite in Switzerland in summer showing a range of typical tent designs. Photo by Tim Stott

There is no universally held definition of what is and what is not camping. Fundamentally, it reflects a combination of the intent to stay out overnight and the nature of the activities involved. A children's summer camp with dining hall, catered meals, and bunkhouse accommodation may have "camp" in its name but perhaps fails to reflect the spirit and form of "camping" as it is broadly understood. Similarly, a homeless person's lifestyle may involve many common camping activities, such as sleeping out and preparing meals over a fire, but fails to reflect the elective nature and pursuit of spirit rejuvenation that are an integral aspect of camping. Likewise, cultures with itinerant lifestyles or lack of permanent dwellings such as the

Fig. 8.1 (continued)

Bedouin who inhabit desert regions in North Africa cannot truly be said to be "camping", as it is just their way of life. With this in mind, Fig. 8.2C shows typical static caravan park in North Wales. Although technically mobile (with wheels), such mobile homes are raised on blocks and may not be moved for many years. They have full services (water, electricity, gas) and owners typically pay an annual fee for ground rent and services and visit (usually by car) at weekends, for longer periods or even live permanently in them. These are not included in our definition of camping, though perhaps could be in some cases?

8.1.2 Snow Caves, Quinzhees, and Igloos

Snow holing is a general term for the activity of digging or making a shelter in snow as overnight accommodation. A snow cave is a shelter constructed in snow by certain animals (e.g. polar bear) and humans, in particular mountaineers, ski tourers, and anyone who enjoys the challenge of surviving outdoors in winter. Snow caves have thermal properties similar to igloos, both of which are particularly effective at providing protection from wind as well as low temperatures. A well-constructed snow cave can be 0 °C (32 °F) or warmer inside, even when outside temperatures are −40 °C (−40 °F).

Before a snow cave can be constructed, considerable care must be taken to find a suitable location. A bank of deep stable snow is required, preferably with a steep face into which the entrance can be excavated (Fig. 8.3A). The snow cave is then constructed by excavating snow so that the tunnel entrance is below the main space to retain warm air (Fig. 8.3B). By building it on a steep slope and digging slightly upwards and horizontally into the slope, the task is made

Fig. 8.2 (A) A 5-berth UK touring caravan on a campsite in Wales. Note the electricity hook-up point to the right of the picture. Photo by Tim Stott. (B) A typical touring caravan park at Strathyre in central Scotland. Note the spacing between caravans (for fire safety) and communal building which may provide services like washing machines, dryers, and sinks. Photo by Tim Stott. (C) A typical static caravan park in North Wales. Although technically mobile (with wheels), such vans are raised on blocks and may not be moved for many years. They have full services (water, electricity, gas) and owners typically pay an annual fee for ground rent and services, and visit (usually by car) at weekends and for longer periods. Photo by Tim Stott

easier. The roof is domed (Fig. 8.3C) to prevent dripping on the occupants. Adequate snow depth, free of rocks and ice, is needed with a depth of at least 1.5 m (4–5 ft) is required. Normally some kinds of markers (e.g. wands, flags, ski sticks, or avalanche probes, as seen in Fig. 8.3A) are placed around the perimeter to warn other walkers or skiers that the cave is there in case they walk on and collapse the roof. In windy conditions the entrance may be blocked from inside by the occupants using snow blocks or a rucksack to prevent spindrift entering the cave. In such circumstances the occupants need to be sure to maintain airflow in the cave. Where more than one cave is constructed, a climbing rope may be used to connect the occupants of each cave in case a cave collapsed. The rope would make it easier for rescuers to locate and dig out the occupants.

Regardless of construction type, the snow must be consolidated so that it retains its structure. A small pit is often dug deeper into one part of the cave floor (Fig. 8.3D) to provide a place for the coldest air to gather, away from the occupant(s). It is possible to sleep several consecutive nights in a snow cave, but care must be taken since a slight ice surface may develop on the inside of the cave from moisture in the exhaled air of the inhabitants. This is thought to result in reduced air ventilation through the snow cave walls and roof and thus increase risk of suffocation. As a precaution it is common to scrape

Fig. 8.3 (A) Excavating snow caves at Garbh Uist Beag, Cairngorms, Scotland. Photo by Tim Stott. (B) A snow cave is constructed by excavating snow so that the tunnel entrance is below the main space to retain warm air. Photo by Tim Stott. (C) Inside a snow cave in the Cairngorms, Scotland. Photo by Tim Stott. (D) Cooking equipment inside a snow cave. Photo by Tim Stott

off a thin layer from the inside of the cave ceiling each day spent in the cave.

The narrow entrance tunnel, which is just a little wider than the occupants of the cave, leads into a main chamber which consists of a flat area, perhaps with elevated sleeping platform(s), also excavated from snow (Fig. 8.3C). The use of tools such as a shovel and ice axe is vital; digging by hand is for emergencies only. Digging a snow cave can be very physically demanding. In perfect conditions with good snow, digging a snow cave for two or three persons can take three to four hours to complete. Therefore it is usual for a team of four to undertake the task. Two entrances are excavated (approximately 2–3 m apart) with a pair working on each entrance. Each person works in five-minute intervals digging, while the others help remove excess snow outside the cave and prepare food and warm liquids for the group. The aim is for the two tunnels to meet up and at that point the main chamber is excavated.

Another kind of snow cave is the quinzhee (or quinzee) which is a snow shelter that is made from a large pile of loose snow which is shaped then hollowed (Fig. 8.4A). This is in contrast to an igloo, which is built up from blocks of hard snow (Fig. 8.4B–D), and a snow cave (Fig. 8.3A–D), constructed by digging into the snow. The word

Fig. 8.4 (A) A quinzhee (or quinzee) is a snow shelter that is made from a large pile of loose snow which is shaped then hollowed. Photo by Tim Stott. (B) Cutting blocks to make the base of an igloo, Cairngorms, Scotland. Photo by Tim Stott. (C) Construction of an igloo nearing completion. Photo by Tim Stott. (D) A finished igloo. The person standing on top is demonstrating the structural strength of the igloo. Photo by Tim Stott

is of Athabaskan origin. The snow for a quinzhee need not be of the same quality as required for an igloo. Quinzhees are not usually made for permanent shelter, whereas igloos and can be used for seasonal habitation. Quinzhee can be made for winter camping and survival purposes or for fun. The construction of a quinzhee is much easier than the construction of an igloo, although they are somewhat less sturdy and more prone to collapsing in harsh weather conditions. Quinzhees are normally constructed in times of necessity, usually as an instrument of survival, so aesthetic and long-term dwelling considerations are normally exchanged for economy of time and materials. One simple construction technique is to pile up several rucksacks, shovel loose snow on top until it is around 0.5 m (2 ft) thick, then slowly remove the rucksacks from inside. This leaves an inside height after excavation which allows for sitting or crouching but not standing.

An igloo (the name coming from the Inuit language: iglu), also known as a snow house or snow hut, is a type of shelter built of snow, typically built when the snow can be easily compacted. Although igloos are normally associated with all Eskimo peoples, they were traditionally associated with people of Canada's Central Arctic and Greenland's Thule area. Snow is used because

Fig. 8.5 Ryvoan bothy in the Spey Valley, Scotland. Photo by Tim Stott

the air pockets trapped in it makes it an insulator. On the outside, temperatures may be as low as −45 °C (−49 °F), but on the inside the temperature may range from −7 °C (19 °F) to 16 °C (61 °F) when warmed by body heat alone. The snow used to build an igloo must have enough structural strength to be cut and stacked appropriately (Fig. 8.4B). The best snow to use for this purpose is snow which has been blown by wind, which can serve to compact and interlock the ice crystals. The hole left in the snow where the blocks are cut is usually used as the lower half of the shelter. Sometimes, a short tunnel is constructed at the entrance (Fig. 8.4D) to reduce wind and heat loss when the door is opened. Snow's effective insulating properties enable the inside of the igloo to remain relatively warm.

8.1.3 Bothies

A bothy is a basic shelter, usually left unlocked and available for anyone to use free of charge (Fig. 8.5). They are usually remote, with no road access, and may be ruined estate workers' or shepherds' cottages which have been renovated. They may or may not have glass in the windows, but normally the roof will have been maintained to provide a dry shelter. Some have an open fireplace, but visitors need to bring their own fuel and supplies. Most bothies are near a natural source of water. There are usually no toilets but a spade may be provided to bury excrement. Most bothies have designated sleeping areas, which commonly are either an upstairs room or a raised platform, thus allowing visitors to keep clear of cold air and draughts at floor height. No bedding, mattresses, or blankets are provided. Public access to bothies is either on foot, by bicycle, or by boat.

The term bothy was also used for basic accommodation, usually for gardeners or other workers on an estate. Bothies are to be found in remote mountainous areas of Scotland, Northern England, Ireland, and Wales. They are particularly common in the Scottish Highlands, but related buildings can be found around the world (e.g. in the Nordic countries there are wilderness huts).

The aim of the UK's Mountain Bothies Association (MBA) is to maintain simple shelters in remote country for the use and benefit of all who love wild and lonely places (www.mountainbothies.org.uk). It received the Queen's Award for Voluntary Service and celebrated 50 years of its existence in 2015, and its volunteers maintain over 100 bothies.

8.2 Participation Numbers

Estimating the number or people who camp is a difficult task, particularly as camping is so often combined with other activities. In his

Table 8.2 Trends in number of people of ages 16 and older participating in recreation activities by historic period in the USA, 1982–2001 (Source: Cordell 2012, p. 33)

	Total participants			Change
Activity	1982–1983	1994–1995	1999–2001	1982–1983 to 1999–2001
Walk for pleasure	91.9	138.5	175.6	83.7
View/photograph birds	20.8	54.3	68.5	47.7
Day hiking	24.3	53.6	69.1	44.8
Picnicking	83.3	112.2	118.3	35.0
Visit outdoor nature centre/zoo	86.7	110.9	121.0	34.3
Swimming in lakes/streams etc.	55.5	87.4	85.5	30.0
Sightseeing	79.8	117.5	109.0	29.2
Boating	48.6	76.2	75.0	26.4
Bicycling	55.5	77.8	81.9	26.4
Developed camping	**29.5**	**46.5**	**55.3**	**25.8**
Driving for pleasure	83.3	–	107.9	24.6
Motorboating	33.0	59.5	50.7	17.7
Off-highway vehicle driving	19.1	35.9	36.0	16.9
Primitive camping	**17.3**	**31.4**	**33.1**	**15.8**
Sledding	17.3	27.7	30.8	13.5
Backpacking	8.7	17.0	21.5	12.8
Fishing	59.0	70.4	71.6	12.6
Swimming in outdoor pool	74.6	99.1	85.0	10.4
Canoeing or kayaking	13.9	19.2	23.0	9.1
Downhill skiing	10.4	22.8	17.4	7.0
Snowmobiling	5.2	9.6	11.3	6.1
Horseback riding	15.6	20.7	19.8	4.2
Ice skating outdoors	10.4	14.2	13.6	3.2
Hunting	20.8	25.3	23.6	2.8
Cross-country skiing	5.2	8.8	7.8	2.6
Waterskiing	15.6	22.7	16.0	0.4
Sailing	10.4	12.1	10.4	0.0

Missing data are denoted with "–" and indicate that participation data for that activity were not collected during that time period
Source: NRS 1982–1983 (n = 5757), USDA Forest Service (1995) (n = 17,217), and USDA Forest Service (2001) (n = 52,607)
Note: The numbers in this table are *annual* participant estimates on data collected during the three time periods
1982–1983 participants based on 173.5 million people ages 16+ (U.S. Department of the Interior 1986)
1994–1995 participants based on 201.3 million people ages 16+ (Woods & Poole Economics, Inc. 2007)
1999–2001 participants based on 214.0 million people ages 16+ (U.S. Department of Commerce 2000)

survey of trends in number of people ages 16 and older participating in recreation activities by historic period in the USA, 1982 to 2001, Cordell (2012) estimated that there were 25.9 million people taking part in developed camping in 1982–1983, increasing to 55.3 million in 1999–2001, showing an increase of 25.8 million over the two decades (Table 8.3). For what Cordell termed primitive camping, he estimated that there were 17.3 million people taking part in 1982–1983, increasing to 33.1 million in 1999–2001, showing an increase of 15.8 million over the two decades (Table 8.3). In Cordell's table (Table 8.3), he has ranked 27 recreational activities and developed camping is ranked 10th in terms of the 1982–1983 to 1999–2001 increase, and primitive camping was 14th (Table 8.2).

In his more updated survey (Cordell 2012) of trends in number of people ages 16 and older participating in recreation activities in the USA, 1999–2001 and 2005–2009 for activities with between 25 and 49 million participants from 2005 through 2009, he found 34.2 million

Table 8.3 Trends in number of people of ages 16 and older participating in recreation activities in the USA, 1999–2001 and 2005–2009 for activities with between 25 and 49 million participants from 2005 through 2009 (Source: Cordell 2012, p. 37)

	Total participants (*millions*)			Percent participating	Percent change
	1994–1995	1999–2001	2005–2009	2005–2009	1999–2001 to 2005–2009
Visit archaeological sites	36.1	44.0	48.8	20.8	11.1
Off-highway vehicle driving	35.9	36.0	48.4	20.6	34.5
Boat tours or excursions	–	40.8	46.1	19.6	13.1
Bicycling on mountain/hybrid bike	–	44.0	42.7	18.1	−3.0
Primitive camping	**31.4**	**33.1**	**34.2**	**14.5**	**3.2**
Sledding	27.7	30.8	32.0	13.6	3.9
Coldwater fishing	25.1	28.4	30.9	13.1	8.7
Saltwater fishing	22.9	21.4	25.1	10.7	17.2

Missing data are denoted with "–" and indicate that participation data for that activity were not collected during that time period. Percent change was calculated before rounding
Source: USDA Forest Service (1995) (n = 17,217), USDA Forest Service (2001) (n = 52,607), and USDA Forest Service (2009) (n = 30,398)
Note: The numbers in this table are *annual* participant estimates on data collected during the three time periods
1994–1995 participants based on 201.3 million people ages 16+ (Woods & Poole Economics, Inc. 2007)
1999–2001 participants based on 214.0 million people ages 16+ (U.S. Department of Commerce 2000)
2005–2009 participants based on 235.3 million people ages 16+ (U.S. Department of Commerce 2008)

participating in primitive camping in the 2005 to 2009 period (Table 8.3).

In the USA, during the 2016 calendar year, a total of 24,134 online interviews were carried out with a nationwide sample of individuals and households from the US Online Panel of over one million people operated by Synovate/IPSOS (Outdoor Foundation 2017). A total of 11,453 individual and 12,681 household surveys were completed. The total panel is maintained to be representative of the US population for people ages six and older. Over sampling of ethnic groups took place to boost response from typically under responding groups. The 2016 participation survey sample size of 24,134 completed interviews provides a high degree of statistical accuracy.

In this most up-to-date survey that we can find (The Outdoor Foundation 2017), camping (RV) had 15.8 million participants in 2016 (with an 8.9% increase in the previous three years) while camping within one-fourth mile of vehicle/home had 25.5 million participants in 2016 (with an −9.6% decrease in the previous three years)—see Table 8.4.

Although not as up-to-date at the Outdoor Foundation survey, Cordell's (2012) report lumped together car, backyard, and RV camping showed that the number of participants exceeded hiking, cycling, and running, with only fishing having higher numbers participating (Fig. 8.6).

Unfortunately, such comprehensive surveys as those by the Outdoor Foundation and Cordell have not yet been undertaken in other parts of the world. However, Brooker and Joppe (2013) stated that in Europe, one in six of all overnight stays were spent in a campground (Eurostat 2012). The most avid campers are found in Australia and New Zealand where 86% of Australians (Alliance Strategic Research 2011) and 80% of New Zealanders (DOC 2006) have visited a caravan or holiday park at least once in their lifetime.

Whether the numbers for snow holing are included in primitive camping in Cordell's (2012) survey or not is unclear. Obtaining data on the number of snow hole and bothy users is difficult, but in comparison to camping they are likely to be very small, though perhaps comparable in some areas with bothy visits and snow holing.

Table 8.4 Outdoor participation by activity (ages 6+) in the USA, 2006–2016 (The Outdoor Foundation 2017, p. 8)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	3-year change (%)
Adventure racing	725	698	920	1089	1339	1065	2170	2213	2368	2864	2999	35.5
Backpacking overnight >¼ mile from vehicle/home	7076	6637	7867	7647	8349	7095	8771	9069	10,101	10,100	10,151	11.9
Bicycling (BMX)	1655	1887	1904	1811	2369	1547	2175	2168	2350	2690	3104	43.2
Bicycling (mountain/non-paved surface)	6751	6892	7592	7142	7161	6816	7714	8542	8044	8316	8615	0.9
Bicycling (roads/paved surface)	38,457	38,940	38,114	40,140	39,320	40,349	39,232	40,888	39,725	38,280	38,365	−6.2
Birdwatching (more and ¼ mile from home/vehicle)	11,070	13,476	14,399	13,294	13,339	12,794	14,275	14,152	13,179	13,093	11,589	−18.1
Boardsailing/windsurfing	938	1118	1307	1128	1617	1151	1593	1324	1562	1766	1737	31.2
Camping (RV)	**16,946**	**16,168**	**16,517**	**17,436**	**15,865**	**16,698**	**15,108**	**14,556**	**14,663**	**14,699**	**15,855**	**8.9**
Camping (with ¼ mile of home/vehicle)	**35,618**	**31,375**	**33,686**	**34,338**	**30,996**	**32,925**	**29,982**	**29,269**	**28,660**	**27,742**	**26,467**	**−9.6**
Canoeing	9154	9797	9935	10,058	10,553	9787	9839	10,153	10,044	10,236	10,046	−1.1
Climbing (sports/indoor/boulder)	4728	4514	4769	4313	4770	4119	4592	4745	4536	4684	4905	3.4
Climbing (traditional/ice/mountaineering)	1586	2062	2288	1835	2198	1609	2189	2319	2457	2571	2790	20.3
Fishing (fly)	6071	5756	5941	5568	5478	5683	6012	5878	5842	6089	6456	9.8
Fishing (freshwater/other)	43,100	43,859	40,331	40,961	38,860	38,868	39,135	37,796	37,821	37,682	38,121	0.9
Fishing (saltwater)	12,466	14,437	13,804	12,303	11,809	11,983	12,017	11,790	11,817	11,975	12,266	4.0
Hiking (day)	29,863	29,965	32,511	32,572	32,496	34,491	34,545	34,378	36,222	37,232	42,128	22.5
Hunting (bow)	3875	3818	3722	4226	3908	4633	4075	4079	4411	4564	4427	8.5
Hunting (handgun)	2525	2595	2873	2276	2709	2671	3553	3198	3091	3400	3512	9.8
Hunting (rifle)	11,242	10,635	10,344	11,114	10,150	10,807	10,164	9792	10,081	10,778	10,797	10.3
Hunting (shotgun)	8987	8545	8731	8490	8062	8678	8174	7894	8220	8438	8271	4.8
Kayak fishing	n/a	n/a	n/a	n/a	1044	1201	1409	1798	2074	2265	2371	31.8
Kayaking (recreational)	4134	5070	6240	6212	6465	8229	8144	8716	8855	9499	10,017	14.9
Kayaking (sea/touring)	1136	1485	1780	1771	2144	2029	2446	2694	2912	3079	3124	16.0
Kayaking (white water)	828	1207	1242	1369	1842	1546	1878	2146	2351	2518	2552	18.9
Rafting	3609	3786	4226	4342	3869	3725	3958	3915	3924	4099	4095	−10.6
Running/jogging	38,559	41,064	41,130	43,892	49,408	50,713	52,187	54,188	51,127	48,496	47,384	−12.6
Sailing	3390	3786	4226	4342	3869	3725	3958	3915	3924	4099	4095	4.6
Scuba diving	2965	2965	3216	2723	3153	2579	2982	3174	3145	3274	3111	−2.0
Skateboarding	10,130	8429	7807	7352	6808	5827	6627	6350	6582	6436	6442	1.5
Skiing (alpine/downhill)	n/a	10,362	10,346	10,919	11,504	10,201	8243	8044	8649	9378	9267	12.4
Skiing (cross-country)	n/a	3530	3848	4157	4530	3641	3307	3377	3820	4146	4640	40.3
Skiing (freestyle)	n/a	2817	2711	2950	3647	4318	5357	4007	4564	4465	4640	2.7
Snorkelling	8395	9294	10,296	9358	9305	9318	8011	8700	8752	8874	8717	0.2
Snowboarding	n/a	6841	7159	7421	8196	7579	7351	6418	6785	7676	7602	3.4
Snowshoeing	n/a	2400	2922	3431	3823	4111	4029	3012	3501	3885	3533	−12.3
Stand up paddling	n/a	n/a	n/a	n/a	1050	1242	1542	1993	2751	3020	3220	61.6
Surfing	2170	2206	2607	2403	2767	2195	2895	2658	2721	2701	2793	3.0
Telemarking (downhill)	n/a	1173	1435	1482	1821	2099	2766	1732	2188	2569	2848	3.0
Trail running	4558	4216	4857	4833	5136	5610	6003	6792	7531	8139	8582	26.4

Note: All participation numbers are in thousands (000)

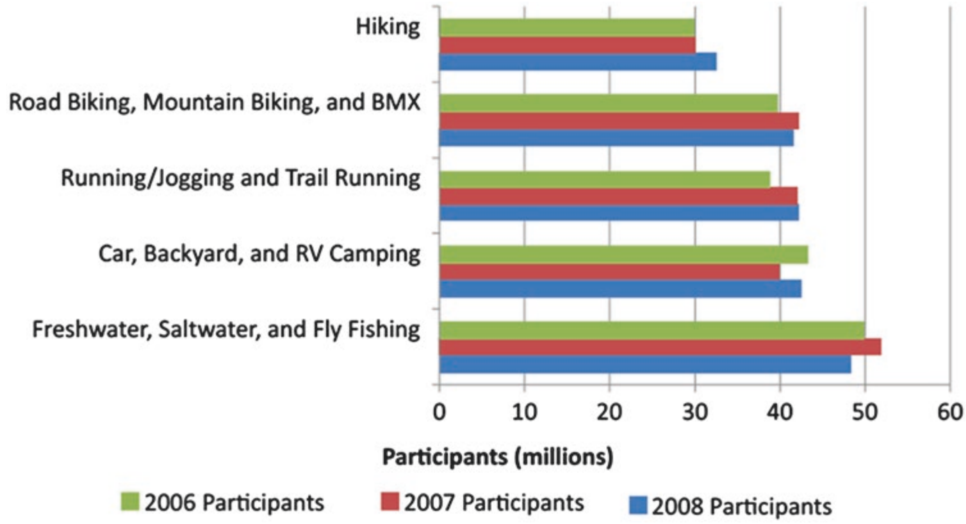

Fig. 8.6 Participation in gateway outdoor activities. Source: Cordell (2012, p. 27)

8.3 Environmental Impact

> Humans have walked and camped for as long as they have existed. Only in recent centuries, particularly in developed countries, has there been little need for large portions of the population to walk from place to place. In the past half century, this trend has reversed. As the proportion of people with substantial leisure time has increased, people are turning to hiking and camping as recreational activities.
>
> (Cole 2004, p. 2)

Inevitably camping, snow holing, and staying at mountain bothies come with some impact on the environment. This chapter does not seek to comment on off-site or indirect impacts such as travel to/from campsites, snow-hole venues, or bothies. Instead it will focus on the more direct/on-site impacts. These fall into three main categories: damage to soil and vegetation, impacts on water resources, and impacts on wildlife.

Sid Frissell conducted the first study of campsites that received differing levels of use (Frissell and Duncan 1965). His research showed that impact occurs wherever use occurs, leading him to suggest that the decision facing recreation managers is how much impact is acceptable, not whether or not to allow impact. This provided the conceptual foundation for planning processes which followed, such as the Limits of Acceptable Change (LAC) (Stankey et al. 1985). Frissell's data illustrated the curvilinear nature of the relationship between amount of use and amount of impact, although it was another 15 years before this finding and its significance to recreation management was articulated (Cole 1981).

8.3.1 Damage to Soil and Vegetation

Trumbull et al. (1994) compared the woody vegetation and soils on 20–40-year-old military campsites with undisturbed but otherwise similar areas in south-central Missouri. Military camping caused a reduction in the density and species richness of canopy and understory plants. Ground cover on the campsites was found to have less litter and more bare ground, but canopy cover on the campsites was indistinguishable from the control sites. Radial growth of the canopy was unaffected by 40 years of military camping. Soils on the campsite had higher bulk density, less total organic carbon, and a trend towards lower infiltration rates. The percentage rock volume on the surface of the campsites suggests that between 28 and 61 cm of soil has been lost.

Cole and Monz (2003) carried out experiments with controlled levels of recreational camping and compared them with previously undisturbed sites in two different plant communities in the subalpine zone of the Wind River Mountains, Wyoming, USA. The plant communities were coniferous forest with understory dominated by the low shrub *Vaccinium scoparium* and a riparian meadow of intermixed grasses and forbs, of which *Deschampsia cespitosa* was most abundant. Sites were camped on at intensities of either one or four nights per year, for either one (acute disturbance) or three consecutive years (chronic disturbance). Recovery was followed for three years on sites camped on for one year and for one year on sites camped on for three years. Reductions in vegetation cover and vegetation height were much more pronounced on sites in the forest than on sites in the meadow. In both plant communities, increases in vegetation impact were not proportional to increases in either years of camping or nights per year of camping. Close to the centre of campsites, near-maximum levels of impact occurred after the first year of camping on forested sites and after the second year on meadow sites. Meadow sites recovered completely within a year, at the camping intensities employed in the experiments. Forest sites, even those camped on for just one night, did not recover completely within three years. Differences between acute and chronic disturbance were not pronounced.

Pickering and Hill (2007) identified four key effects of camping on soil and vegetation. These were:

1. *Addition of nutrients*: the disposal of human waste (such as urine and faeces) has direct effects such as removal of vegetation in order to dig a hole but also has indirect effects through the addition of nutrients which can result in a change to species composition due to competitive displacement. This can create feedbacks for continuing change and also benefit weed species, leading to changes in vegetation communities. Research in Tasmania found a beneficial effect of low levels of nutrient addition (artificial urine) on vegetation, with increased growth of many taxa, with the only obvious negative effects on moss at one site (Bridle and Kirkpatrick 2003).
2. *Impacts of weeds*: another indirect and potentially self-sustaining impact of camping is the accidental introduction of weed propagules on visitors' shoes, clothing, and equipment. The risk associated with even low numbers of campers visiting remote areas was highlighted by Whinam et al. (2005) who found 981 propagules on the clothing and equipment of just 64 people visiting a remote subantarctic island. High-risk items were equipment cases, daypacks, and the cuffs and Velcro closures on outer clothing. As a result there have been policy changes regarding clothing for people visiting subantarctic islands as part of expeditions from Australia.

   Another important issue is the potential for exotics to spread from areas disturbed by tourism infrastructure into natural vegetation. In protected areas in Australia, for example, the verges of tracks and trails are often characterised by high diversity and cover of exotics, but not all these species spread into undisturbed native vegetation and become important environmental weeds (Godfree et al. 2004; Johnston 2005).
3. *Impact of pathogens*: another important example of an indirect and self-sustaining impact of tourism is the spread of exotic soil-borne pathogen *P. cinnamomi* (Buckley et al. 2004) in protected areas in Australia. This root rot fungus is a threat to vegetation including many plants that are already classified as rare and threatened. This threat has been recognised nationally within Australia, and it is listed as a key threatening process by the Australian Government (Environment Australia 2001) and by the NSW government in the Threatened Species Conservation Act 1995. Tourism contributes to the spread of *P. cinnamomi* by transportation of spores in mud on footwear, tent pegs, trowels, bike tyres, and other types of vehicles.

Marion and Farrell (2002) assessed campsite conditions and the effectiveness of campsite

Fig. 8.7 (A) Damage to grass by trampling around the entrance to a family tent on a commercial campsite in Switzerland. Photo by Tim Stott. (B) Damage to natural vegetation by trampling around tents at a mountain training camp in SW Greenland. Photo by Tim Stott. (C) Building open fires for cooking is a common activity when camping. Photo by Tim Stott

impact management strategies at Isle Royale National Park, USA. Vegetation and soil conditions were assessed at 156 campsites and 88 shelters within 36 backcountry campgrounds. The average site was 68 m^2 and 83% of sites lost vegetation over areas less than 47 m^2. Figure 8.7A, B shows examples of where damage has been caused to vegetation around tent sites on both commercial campsite (Fig. 8.7A) and in wilderness areas (Fig. 8.7B).

Building open fires for cooking is a common activity when camping (Fig. 8.7C). Unless carefully managed, this can result in dead wood being collected from the area around the fire. Dead wood provides a habitat for a variety of species, and this habitat is lost when the wood is removed and burned. The wood naturally decomposes over a number of years, returning nutrients to the soil. When wood is burned, this process is interrupted as a large proportion of the nutrients (e.g. carbon) are lost to the atmosphere, though some may be returned to the soil through the burnt wood ash.

Marion and Cole (1996) studied the impacts of camping on soil and vegetation at Delaware Water Gap National Recreation Area. They assessed the magnitude of impact on campsites that varied in amount of use and in topographic position and also evaluated change over a five-year period on long-established, recently opened, and recently closed campsites, as well as on plots subjected to experimental trampling. Campsite impacts were intense and spatially variable. Amount of use and topographic position explained some of this variation. Soil and vegetation conditions changed rapidly when campsites were initially opened to use and when they were closed to use. Changes were less pronounced on the long-established campsites that remained open to use. In the trampling experiments, impact varied greatly with trampling intensity and between vegetation types. An open-canopy grassland vegetation type was much more resistant to trampling than a forb-dominated forest vegetation type. Campsite impacts increased rapidly with initial disturbance, stabilised with ongoing disturbance, and—in contrast to what has been found in most other studies—decreased rapidly once disturbance was terminated. In Table 8.5 (adapted from Marion and Cole's 1996 paper), of all the variables they measured, only soil moisture did not show a statistically significant difference between the campsites and the control.

Provided there is full snow cover, building and staying overnight in snow caves, quinzhees, and igloos are unlikely to have any impact on vegetation and soils. However, the effects around bothies are likely to be similar, if not more intense, than around tents. This is because bothies are permanent structures with fixed entrances which visitors must use each time they enter and exit the bothy. The extent of soil compaction and vegetation damage will be proportional to the intensity of use and other factors like weather/climate, season, soil type/geology, and slope angle.

8.3.2 Impacts of Camping, Snow Holing, and Bothying on Water Resources

Cole and Landres (1996) argued that the effects of recreation on aquatic systems is often more spatially extensive than the effects on soil and vegetation, concluding that most recreational research focused on terrestrial environments. They identified the need for more research into the effects of human activity on individual watercourses. Pringle (1996) reported levels of increased coliform bacteria, up to ten times the normal background levels, at Ryvoan Bothy (Fig. 8.5B) on Mar Lodge Estate in Cairngorm National Park, Scotland, highlighting the correlation between raised coliform levels and areas of human activity.

Table 8.5 Vegetation and soil conditions on 29 campsites and undisturbed control sites at Delaware Water Gap National Recreation Area, 1986

	Campsite		Control		
Impact parameter	Mean	Range	Mean	Range	*P*
Ground vegetation cover (%)	15	0–63	72	1–95	0.001
Floristic dissimilarity (%)	75	23–100	n/a	n/a	
Graminoid cover (%)	58	0–100	26	0–92	0.023
Forb cover (%)	23	0–78	59	5–100	0.001
Mineral soil cover (%)	61	21–94	1	0–15	0.001
Organic horizon thickness (cm)	0.5	0–1.4	1.5	0.2–3.1	0.002
Soil bulk density (g cm^{-3})	1.26	1.0–1.4	1.06	0.7–1.4	0.001
Soil penetration resistance (kPa)[a]	275	137–382	49	0–226	0.001
Soil moisture (g cm^{-3})	18	8–32	17	8–31	0.710
Felled trees (%)	19	0–53	n/a	n/a	
Damaged trees (%)	77	25–100	n/a	n/a	
Tree reproduction (stems ha^{-1})	936	0–6275	10,090	0–56,400	0.001
Non-vegetated area (m^2)	181	0–696	0	0–15	0.001
Campsite area (m^2)	269	51–731	n/a	n/a	
Shoreline disturbance (m)	9	0–20	n/a	n/a	

Source: Marion and Cole (1996, p. 523)
[a]1 kPa = the pressure corresponding to 1.01971×10^{-2} kg cm^{-2}

Later in the same area, Bryan (2002) reported increased levels of coliform bacteria, up to ten times that of the accepted background levels, around the same bothy though he did not quantify the faecal coliform levels. Although not conclusive evidence of human-derived contamination, these findings highlight a tenuous link between areas of human activity and the potential for raised coliform levels in mountain streams.

In the UK organisations such as the MBA and the Mountaineering Council of Scotland (MCofS) advise recreation seekers to bury their organic waste. Liddle and Scorgie (1980) and Temple et al. (1982) identified the potential persistence and associated effects of the burial of human faeces. The disposal of human waste is a recurring concern among wilderness managers with visitation trends having a potential impact on faecal coliform levels (Cilimburg et al. 2000). The impact of wild camping has been a focus of attention for the various recreational governing bodies, such as the MCofS, MBA, and British Mountaineering Council (BMC). During the winter months concerns generally relate to the activity of snowholing and bothies, since tented camps are less popular in the harsh winter conditions. Anecdotal evidence (Cairngorm Ranger, pers. comm. 16.4.09) suggested that during the 2008/2009 winter season, in the region of 400 snowholing parties had accessed Ciste Mhearad, one of the closest snowholing sites to the Coire Cas ski area in the Cairngorms. Forrester and Stott (2016) investigated the spatial distribution of stream water faecal coliform concentrations in specific winter recreation areas in the northern Corries of the Cairngorm Mountains, Scotland. During two winter seasons, 2007–2008 and 2008–2009, 207 samples were collected from ten sites and analysed for the presence of faecal coliforms, specifically *Escherichia coli* (*E.coli*). E.coli was not detected at the seven above 635 m, but three sites below 635 m (the altitude of the ski area buildings and car park) had positive detection rates for *E.coli*, these being 32%, 35%, and 31% respectively, suggesting that snow holing was not associated with elevated faecal coliform levels (their site 1 was right next to the popular snowholing sites in Ciste Mhearad), but that the ski infrastructure was.

Carter et al. (2015) examined the impact of beach camping on beach freshwater on Fraser Island, a popular tourist destination off the east coast of Australia. Prior to their study the assumption was that the natural assimilative capacity of the fore dune ecosystem was sufficient to dissipate any negative environmental impact. Their study of nutrients, faecal coliforms, and faecal sterols in the water table and beach flows associated with camping and non-camping zones revealed concerning differences between sample sites. The study suggested that nutrient levels in the water table were enriched in camping zones and that, in some areas, faecal coliforms persisted in beach flows. The link to a human cause was supported by the presence of strong faecal sterol signals in soil samples from the water table interface. The risk implications for human health were thought to be significant.

Waters derived from remote "wilderness" locations in the Scottish mountains, unused for agriculture, had long been assumed to be largely free of bacterial contamination. However, McDonald et al. (2008) challenged this assumption after carrying out their bacterial survey of the waters draining several stream catchments on the south side of the Cairngorms (on the Mar Lodge Estate). Over 480 spot samples taken from 59 sites revealed that over 75% of samples tested positive for *Escherichia coli* (*E. coli*) and 85% for total coliforms. Largest values occurred over the summer months and particularly at weekends at sites frequented by visitors, either for "wild" camping or day visits or where water was drawn from the river for drinking. Overall the spatial and temporal variations in bacterial concentrations suggested a relationship with visitor numbers and in particular wild camping.

8.3.3 Impacts of Camping, Snow Holing, and Bothying on Wildlife

Blakesley and Reese (1988) compared use of riparian habitat by 14 bird species during the breeding season on campground (n = 31) and non-campground ($n = 80$) sites in northern Utah. Multivariate analysis showed that seven bird species were closely associated with campgrounds, whereas six of seven species associated with non-campgrounds were ground- or shrub-nesting, or ground-foraging. These avian responses may be explained by differences in shrub and sapling density, litter depth, and amount of dead woody vegetation between the campground and non-campground.

Farooquee et al. (2008) studied the environmental and socio-cultural impacts of river rafting and camping on the Ganga in the Uttarakhand Himalaya. They reported that displacement of wildlife had occurred in the region due to bright colours of tents, toilet tents, rafts, and loud music and lights in and around campsites. According to a survey conducted among the rural population of this area, prior to the camping and rafting activities, animals were frequently spotted on river side while drinking water and resting on the sand beach; now they are not visible in the area for months, especially during the camping and rafting season (Table 8.6).

Clevenger (1977) reported on some of the effects of campgrounds on small mammal populations in Canyonlands and Arches National Parks, Utah. Data collection consisted of live-trapping from April to November, 1975 (12,337 trap-nights). The populations of Ordls kangaroo rat (*Dipodomys ordii*), antelope ground squirrels (*Ammospermophilus leucurus*), deer mice (*Peromyscus spp*.), woodrats (*Neotoma spp*.), Colorado chipmunks (*Eutamias guadrivittatus*), and desert cottontails (*Sylvilagus audubonii*) inhabiting campgrounds were compared with non-campground control areas. Clevenger found that Squaw Flat campground in Canyonlands National Park contained significantly higher populations of woodrats and Colorado chipmunks than the control. Devil's Garden campground in Arches National Park exhibited significantly higher populations of deer mice, but a lower population of woodrats than the control. No significant difference was found between campgrounds and control areas for all other species. Occurrence of species in the campground and control areas was identical.

It seems likely that wherever there are concentrations of visitors staying overnight bringing food with them, they are likely to invoke interest from certain groups of animals. One species which receives some attention in the literature is the black bear (*Ursus americanus*). Ayres et al. (1986) working in Sequoia National Park noted that in places where black bears have become pests (in campgrounds and other developments), their visits are frequently at night. However, this is not the case elsewhere and they suggest that human activity, when imposed on black bear habitat, disrupts bear activity patterns. In national parks where hunting is not permitted, the two principal factors affecting the population ecology and behaviour of black bears are the availability of human food and the management practices designed to remove bears from sites with human activity such as campgrounds.

McCutchen (1990) on the other hand, while agreeing that black bears in many US and Canadian national parks become habituated to humans (they are often bold, frequent human use areas, and are generally a nuisance), his study at Rocky Mountain National Park, Colorado found the antithesis of this behaviour. His four-year study of black bears using radio-telemetry and observation indicated that although many bears have home ranges in high human use areas, they are secretive and avoid humans and developed areas.

8.4 Management and Education

8.4.1 Managing the Impacts of Camping, Snow Holing, and Bothying on Vegetation and Soils

Turton (2005) examined environmental impacts of tourism and recreation activities in the world heritage listed rainforests of northeast Australia Visitor use in the World Heritage Area was mostly associated with walking tracks, camping areas, day-use areas, and off-road vehicle use of old forestry roads and tracks. Adverse environmental impacts range from vegetation trampling, soil

Table 8.6 Spotting of animals by villagers of the surrounding areas before and after the start of camping/rafting

Animal	Activity/time/place when spotted	Month spotted											
		J	F	M	A	M	J	J	A	S	O	N	D
Barking deer	Grazing, drinking	−+	−	−	−	−+	−+	−+	−	−	−	−	−
Sambar	Grazing, drinking		−	−	−	−+	−+	−+		−	−		
Rabbit	Evening, forest		−	−	−	−+	+		−+	−	−	−	
Monkey	Daytime	−+	−+	+	+	+	+			+	−+	−+	−+
Wild boar	Morning and evening	+	+	−+	−+	−+	+			−+	−+	−+	+
Langur	Forest, drinking	−+	−+	−			−	−				−+	−+
Fox	Morning and evening	−	−	−		−+	−+		−	−	−		−
Jackal	Barking in evening	−+	−+	−	−	−	−	−	−	−	−	−	−
Leopard	Night	−+	−	−	−						−	−	−
Black bear	Late evening					−	−	−+					
Goral	Grazing, drinking	−	−	−	−	−	−+	−+	−+	−	−	−	−
Mongoose	Forest, daytime	−+	−	−			−+	−+		−	−	−+	−
Wild cat	Evening and night	−+	−	−	−	−	−+	−+	−+	−	−	−+	−
Porcupine	Late evening	−+	−	−		−	−	−		−+	−+	−	−+
Common otter	Late evening	−+	−+	−			−	−				−+	−+

Source: Farooquee et al. (2008, p. 592)
Note: −, spotting before start of caming/rafting; +, spotting after the start of camping/rafting

compaction, water contamination, and soil erosion at the local scale through to spread of weeds, feral animals, and soil pathogens along extensive networks of old forestry roads and tracks at the regional scale.

In terms of managing these impacts, he concluded that concentration of visitor use is the most desirable management strategy for controlling adverse impacts at most World Heritage Area visitor nodes and sites. This included methods such as site hardening and shielding to contain impacts. For dispersed visitor activities, such as off-road vehicle driving and long-distance walking, the preferred management strategies included procedures like removal of mud and soils from vehicle tyres and hiking boots before entering pathogen-free catchments, seasonal closure of roads and tracks, the retention of canopy cover at camping areas and day-use areas, and along walking tracks and forestry roads. These were simple, yet effective, management strategies for reducing a range of adverse impacts, including dispersal of weeds and feral animals, edge effects, soil erosion and nutrient loss, road kill and linear barrier effects on rainforest fauna.

In order to control invasive species (such as *P. cinnamomiis* as discussed earlier), Pickering and Hill (2007) suggested that quarantine and hygiene were the main strategies that have been implemented by protected area managers to combat this threat. Some parks have permanent or seasonal closures of specific tracks, or sections within a park, or in a few cases whole parks are closed particularly in severely affected areas of Western Australia and South Australia (Newsome 2003; Buckley et al. 2004). Hygiene procedures to minimise the spread of spores were implemented through education programs (signs, leaflets, etc.) which encourage/require visitors to wash down vehicles, boots, tent pegs, and so on when entering and leaving sites and in some cases to visit uninfected sites before infected sites (Buckley et al. 2004). Figure 8.8 shows some examples of management strategies for aquatic invasive species spread by fishing and boat users.

Marion and Farrell (2002) assessed campsite conditions and the effectiveness of campsite impact management strategies at Isle Royale National Park, USA. Vegetation and soil conditions were assessed 156 campsites and 88 shelters within 36 backcountry campgrounds. The average site was 68 m^2 and 83% of sites lost vegetation over areas less than 47 m^2. They concluded that management actions implemented to spatially concentrate camping activities and reduce camping disturbance had been highly successful. Comparisons of disturbed area/overnight stay among other protected areas reinforces this assertion. These reductions in area of camping disturbance are attributed to a designated site camping policy, limitation on site numbers, construction of sites in sloping terrain, use of facilities, and an ongoing programme of campsite maintenance. Such actions are most appropriate in higher use backcountry and wilderness settings.

Dixon (2017) studied the 79 km Overland Track which is Tasmania's premier overnight walking track (trail) and one of Australia's best known and most popular backcountry hikes. Trampling impacts (poor track condition) were recognised in the 1970s and degraded campsites were a concern by the 1980s. Despite three decades of intermittent works, many sections of track remained in poor condition in the early 2000s (Fig. 8.8A), but targeted works since 2006 has addressed many problem areas (Fig. 8.8B). Hardening of campsites at selected overnight nodes (Fig. 8.8C, D) commenced in 2000 and a reduction in overall camping impacts followed, presumed due to a greater concentration of camping use at the hardened sites despite unrestricted camping still being permitted (Fig. 8.9).

Longitudinal monitoring of both track (eight years) and campsite (16–25 years) conditions by Dixon (2017) has successfully described the scale and constrained the location of changes in condition and has provided a useful planning tool for management. In particular, it has contributed to documenting a contemporaneous improvement in track and campsite conditions partly associated with a booking system to regulate walker use of the Overland Track, introduced in 2005. Booking fees have contributed to management successes by providing adequate and consistent resourcing for

Fig. 8.8 (A) Example of a visitor sign used by Maine Lakes Environmental Association, USA, to control the spread of invasive aquatic species. Source: http://www.mainelakes.org/, accessed 10/3/18. (B) Visitor sign in the Eastern USA alerting water users to the spread of the invasive species, Eurasian Watermilfoil. Source: https://amateuranglers.wordpress.com/2016/09/12/the-war-on-milfoil-and-how-it-affects-fish/, accessed 10/3/18

the repair and maintenance of walking track surface infrastructure.

Management implications from Dixon's (2017) study included the following:

- Extensive hardening is an effective way to sustainably manage a moderate to high use of walking track that has not been initially well-designed.
- Adequate and consistent resourcing for the repair and maintenance of walking track surface and infrastructure is necessary to sustainably manage such tracks.
- The provision of inviting facilities, including camping platforms, at selected overnight nodes has resulted in a concentration of visitor camping use on a smaller number of campsites, hence reducing the overall impact of camping along the Overland Track.

8.4.2 Managing the Impacts of Camping, Snow Holing, and Bothying on Water Resources

When heading off to the hills for overnight expeditions (and sometimes on day trips if you get your timings wrong) going to the toilet, where there are none, can result in unsightly and unpleasant piles of human faeces near campsites, bothies or paths. Worse still, if they are near watercourses they can be washed in and cause faecal coliforms in streams to rise, and thereby contaminate the water (Fewtrell 1991: McDonald et al. 2008; Forrester and Stott 2016). It is a matter organisations such as Scottish Natural Heritage (SNH) and the MCofS have tackled. They warn that public and animal health is threatened by irresponsible toileting because the waste could contaminate drinking water which, further downstream, could be someone else's drinking water. People can be put at risk to a cocktail of nasty pathogens, such as *Cryptosporidium*, *Campylobacter*, *Aeromonas*, *E. coli* O157, and giardia. The SNH recommends that if you need to urinate, do so at least 30 m from open water or rivers and streams, and if you need to defecate, do so as far away as possible from buildings, from open water or rivers and streams, and from any farm animals and bury faeces in a shallow hole and replace the turf.

The MCofS offers guidance in its leaflet "Where to 'Go' in the Great Outdoors" (Fig. 8.10). It recommends taking home toilet paper in containers and cleaning hands using

Fig. 8.9 (A) A degraded section of the Tasmanian Overland Track (2005). Photo by Tim Stott. (B) A renovated section of the Tasmanian Overland Track (2005). Photo by Tim Stott. (C) Hardening of campsites at selected overnight nodes (foreground) on the Tasmanian Overland Track commenced in 2000 and a reduction in overall camping impacts followed, presumed due to a greater concentration of camping use at these hardened sites. Photo by Tim Stott, 2005. (D) Camping platform near a overnight stay cabin on the Tasmanian Overland Track. Photo by Tim Stott, 2005

gels. The council asks that people should not “go” near paths, huts, and bothies and never in caves. It suggests carrying a small trowel to make the task of digging a hole to bury waste easier. The leaflet specifies that: “When digging a hole is absolutely impossible and you are in a very remote place, spread excrement thinly or arrange rocks such that air can circulate. Avoid just putting a rock on top as it slows decomposition.”

In winter it is a different matter. To be able to dig out enough snow to get to the ground below and then dig a hole may take some serious excavations. If excrement is simply buried in the snow then this is only delaying the time when, after the snow has melted, it appears on the ground surface. Once the temperature rises enough, the various bacteria, microbes, and insects will get to work to break it down. All this takes time and can be very unpleasant in popular spots, specifically around snow holes and bothies.

In order to try to reduce the effect of people staying overnight in snow holes on the Cairngorm plateau, the Cairngorm National Park Ranger Service set up the Snow White facility (formerly known as the Poo Project) to encourage people to bring back all human waste and dispose of it in the disposal facilities at Cairngorm Mountain. This facility is unique in Scotland (Fig. 8.11).

Where to "Go" in the Great Outdoors

Keeping Water "Fresh"

- Burns, rivers and lochs may be the water supply for a remote house or tent; "go" at least 30 metres from any water.
- Ideally use antiseptic handwash gel but otherwise cleansing wipes or if using soap ensure it is biodegradable; even then do not use it directly in the river or loch.
- Always take drinking water from above a camp, and walk downhill and away from water to go to the toilet.
- Always check for contamination at least 30 metres above the point of extraction.

Toilet Paper and Sanitary Items

Both should be carried out as they can take a long time to breakdown, and animals may dig them up. This can be done hygienically and without smell using re-sealable bags or containers.

Toilet Facilities

Never miss an opportunity to use a proper toilet, and if a dry or composting toilet, it only functions if everyone follows the instructions.

General Hygiene

It is essential to clean your hands after going to the toilet, particularly before handling food. The best option is handwash gel that does not require water.

Talk About It

Discussing outdoor sanitation will increase awareness, and raise standards. The MCofS will update changes to this advice on our website and magazine, The Scottish Mountaineer.

KNOW THE CODE BEFORE YOU GO

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SEPA

Join the MCofS and support our work – see www.mcofs.org.uk for current membership offers.

This information was published by the MCofS with support from the Scottish Environment Protection Agency (SEPA). Copies of the leaflet are available on our website or from the MCofS Office.

The Mountaineering Council of Scotland

Dealing with the sanitation in an hygienic and environmentally-sensitive way is a vital outdoor skill. This leaflet has been compiled in consultation with health and environmental professionals.

The Main Issues Are:

1. Human Health
Cryptosporidium, Campylobacter, Aeromonas, E. coli O157 and Giardia are all gut pathogens that can be caught from drinking infected water. The number of cases is low, but carelessness could result in one of these potentially serious conditions. Giardia cases are increasing. You may still be infectious if you have just returned from a developing country with an upset stomach. Take extreme care if you go into the mountains.

2. Environment
Some sites are particularly sensitive due to the ecological importance and/or numbers of people leading to cumulative impact.

3. Visual Pollution and Smell
Carrying out solids is best. Burying is next best but needs to be done sensitively. Urine is less harmful than excrement, but it is safest to follow the same practices as for solids, except obviously carrying out.

What to do with "it"

Carry Out Techniques

Some countries require visitors to "carry out" in wilderness areas. Specialist facilities are available for use at Cairngorm car park – see the Cairngorm Ranger Service. Otherwise, one option is to defecate on toilet paper, then use a biodegradable (cornstarch-based is good) bag to pick it up, then carry out in a plastic sealable container (labelled and kept only for that purpose). The human waste can then be flushed down a toilet as usual, and the bag thrown in the rubbish. The canister should be disinfected.

On-Site Disposal Techniques

In some areas burying it is not advised, such as on high plateaux and other particularly ecologically sensitive areas, or popular wild camping spots. In these places extra effort must be made to carry out.

- Avoid toileting within 50 metres of paths or 200 metres of huts, bothies and crags, and never in caves.
- Dig a 15 cm (6") hole in the soil and bury your excrement. A trowel makes this much easier.
- Dig down into the soil through any snow. Burying excrement in the snow does not work when the snow melts!
- When digging a hole is absolutely impossible and you are in a very remote place, spread excrement thinly or arrange rocks such that air can circulate. Avoid just putting a rock on top as it slows decomposition.

The Mountaineering Council of Scotland www.mcofs.org.uk

Fig. 8.10 "Where to Go in the Great Outdoors". Mountaineering Council of Scotland Advisory Leaflet. Source: https://www.mountaineering.scot/assets/contentfiles/pdf/where-to-go-leaflet.pdf, accessed 10/3/18

Fig. 8.11 The Cairngorm Poo Project provides visitors with these bottles to bring back their human waste in winter. This one was used by a Winter Mountain Leader Training group. Source: https://www.walkhighlands.co.uk/Forum/viewtopic.php?f=9&t=4082, accessed 10/3/18

Forrester and Stott (2016) attempted to evaluate the success of the Cairngorm Snow White project but, as mentioned earlier, found no evidence of faecal coliform contamination in the stream at their Ciste Mhearad snow-holing site. This, of course, does not confirm that the project works, and they discuss a range of possible reasons as to why they may not have detected faecal coliform contamination.

Due to their permanent nature, perhaps the greatest issues with human excrement arise around bothies and permanent camps which do not have toilet facilities. A number of authors (and the MBA itself) have drawn attention to this problem in Scotland (e.g. Hillbrant 1992; Bryan 2002; McDonald et al. 2008). Bothy users have been encouraged to "do their business" in as considerate and environmentally friendly a way as possible, away from the bothy. This means taking a trowel to a quiet spot well away from streams and paths and digging a little hole in the ground for excrement and the accompanying toilet roll (better still use moss). Most bothies are equipped with a spade for this purpose. Unfortunately some people don't bother to think of others, and when it's cold, wet, and windy, people will often take the easy option of squatting down against the back wall of the bothy, rather than venturing a little further afield. At Corrour bothy at the south end of the Lairig Ghru, Cairngorms, you can see the damage this does—little piles of human waste and toilet paper scattered over the hillside. As well as being unsightly, this presents a very real health problem to walkers and animals and also upsets landowners. The MBA has developed the Bothy Code (Fig. 8.12), and in locations where building and maintaining permanent toilet facilities is not possible, we have to reply on educating walkers and campers through such leaflets, signs, and the internet. Mountain training courses such as those run by the Mountain Training UK (http://www.mountain-training.org/) include environmental responsibility in their syllabi.

Other issues at bothies include the collection of firewood from the surrounding area which can destroy habitats, leaving of rubbish which attracts animals which in turn can end up ingesting or getting tangled in plastic. The Bothy Code attempts to educate visitors against creating these problems.

8.4.3 Managing the Impacts of Camping, Snow Holing, and Bothying on Wildlife

Rogers (2011) studied the effects of what has been termed "diversionary feeding" of black bears (*Ursus americanus*) around campgrounds and residential areas in an attempt to divert nui-

Who Cares About Bothies?
Many bothies in Scotland, Wales and Northern England are maintained as open shelters and may be used at no charge. They are used by walkers, climbers and cyclists, and also by shepherds, stalkers and other estate workers. In severe weather or after an accident, bothies have frequently saved lives, by providing shelter to those who need it.

What Facilities do they Offer?
Many bothies have open fires or stoves, although there may not be fuel available. Some will have a wooden sleeping platform and tables to cook on. Very few offer more than these basics.

What is the Attraction of Bothies?
Going to a bothy offers the chance of meeting other people who are passionate about the outdoors. You will find that the art of good conversation is alive and well around the bothy fire. A bothy is also a link with the past. Most have a history going back a century or more, to a time when the countryside was home to many more folk and the way of life was very different.

How Are Bothies Maintained?
Often landowners maintain the bothies on their estates, but many are maintained by enthusiasts. There are several volunteer groups, some long established, that look after specific bothies. The oldest is the Mountain Bothies Association, a charity registered in Scotland, that currently cares for around a hundred bothies in Scotland, England and Wales.

How Do I find Out More About Bothies?
The easiest introduction to bothies is to visit the Mountain Bothies Association website.

www.mountainbothies.org.uk

The Bothy Code

The Bothies maintained by the MBA are available by courtesy of the owners. Please respect this privilege. Please record your visit in the Bothy Log-Book.

Respect for Other Users
Please leave the bothy clean and tidy with dry kindling for the next visitors. Make other visitors welcome. Set a good example.

Respect for the Bothy
Tell us about any accidental damage. Don't leave graffiti or vandalise the bothy. Please take out all rubbish which you can't burn. Avoid burying rubbish; this pollutes the environment. Please don't leave perishable food as this attracts vermin. Guard against fire risk and ensure the fire is out when you leave. Make sure the doors and windows are properly closed when you leave.

Respect for the Surroundings
If there is no toilet at the bothy please bury human waste well away from the bothy. Use the spade provided, keep well away from the water supply and never use the vicinity of the bothy as a toilet. Never cut live wood or damage estate property. Use fuel sparingly.

Respect the Agreement with the Estate
Please observe any restrictions on use of the bothy, for example during stag stalking or at lambing time. Please remember bothies are available for short stays only.

Respect the Restriction On Numbers
Because of over crowding and lack of facilities, large groups (6 or more) should not use a bothy nor camp near a bothy without first seeking permission from the owner. Bothies are not available for commercial groups.

Bothies Are Used Entirely At Your Own Risk

Published by the
Mountain Bothies Association

Bothies

Responsible access

In 2005, new legislation came into force in Scotland, which enshrined in law rights of access to the countryside. Many of these rights are based on traditions of tolerance, mutual respect and personal responsibility. In England and Wales, meantime, legislation to open upland areas to greater public access is putting more emphasis than ever before on mutual understanding between visitors and those who live and work there.

Bothies have for generations been freely available for the public to use. This tradition began with empty buildings in remote locations being left open in case anyone needed shelter. In time wayfarers came to rely on such shelters and some set up voluntary organisations to help maintain them. However, few bothies could survive were it not for the active co-operation of both the landowners and all the people who use these shelters.

Just as a landowner may provide a stile across a fence and expect it to be used and not broken down, so too is the bothy available on the understanding that those who use it will respect the building and its contents. Many are still used on a regular basis by the landowner and estate folk. All of them offer shelter when lives may be in peril. **Each bothy is a fragile resource**, which if abused will be lost. This leaflet explains some of the ways in which we can all help our system of unlocked shelters to survive.

The new legislation does not directly affect the use of bothies, but it does emphasise lessons that regular bothy users learned many years ago. When we go into the countryside we expect our presence to be tolerated and our rights to be respected. We know that this only happens if in return we can be counted on to exercise personal responsibility.

A positive attitude begins at the roadside. Parking vehicles safely can be a challenge on narrow roads in remote places. Gateways may appear inviting, but should never be blocked. Farming, forestry and deer management doesn't only happen during the week and access to a track, a field or woodland may be required at any time. Please show consideration for others from the moment you stop your vehicle.

Minimise disturbance If there are farm or estate activities in progress near or across your route try to cooperate with any reasonable requests about your choice of route. Many people legitimately earn their living from the land. If we can show that we recognise this, it is more likely that our right to be in the countryside will in turn be respected.

Tread lightly both on the way to and when you are at the bothy. This doesn't only help preserve the bothy, it is also good for the environment and helps ensure the enjoyment of future visitors.

Care about the bothy. Almost all maintenance work on bothies is done by volunteer organisations, such as the Mountain Bothies Association. Most of the materials are paid for with donations and subscriptions. Vandalism squanders the labour and the money that is given freely by many for the benefit of all who use bothies.

We are fortunate to have open mountain shelters that are free to use. Please help preserve this priceless asset by behaving responsibly when going to or from a bothy and when you are there. Without your continuing co-operation, bothying could well become no more than a fading memory.

Care for the environment

Care for the bothy

Fig. 8.12 The Mountain Bothies Association's Bothy Code. Source: https://www.mountainbothies.org.uk/wp-content/uploads/2017/07/Responsible-access.pdf, accessed 10/3/18 sance bears away from the public and thereby increase public safety. Rogers studied diversionary feeding, habituation, and food conditioning at a US Forest Service campground and residential complex near Ely, Minnesota. From 1981 to 1983, six bears (two/year) had been removed from this area as nuisances; but during eight years of diversionary feeding (1984–1991), the only removals were two bears that had newly immigrated to the periphery of the study area and had not yet found the diversionary feeding site. The reduction in nuisance activity was significant, despite continued availability of garbage and the fact that the study bears were habituated and food-conditioned. No bear that visited the diversionary-feeding site became a nuisance or jeopardised public safety, even in 1985, the year with the lowest bear food index and the highest number of nuisance complaints ever recorded throughout Minnesota. Diversionary feeding led to greater tolerance of bears by residents.

Hammitt et al. (2015) suggest that bear problems are aggravated by concentrating use on a few sites rather than using the dispersal management technique of spreading visitors over a larger number of campsites. However, small mammals are more likely to be adversely affected by the creation on many moderately impacted sites rather than a few highly impacted sites.

Martin et al. (1989) investigated human-induced impacts from recreational use of wilderness which threaten the integrity of the wilderness resource and the quality of visitor experiences. They noted that campsite impacts are of particular concern to managers. One approach to this problem is the LAC planning system, which focuses attention on the question, “How much change in wilderness conditions is acceptable?” Their study compares and contrasts wilderness manager and visitor perceptions of the acceptability of different levels of campsite impacts, amount of impact, and perceptual zoning of wilderness. The results reinforce previous findings regarding differences between managers and visitors.

Gore et al. (2007) studied negative human-black bear interactions in New York’s Adirondack Park campgrounds which pose risk management challenges. They highlighted that communication is one tool available to modify human behaviour and reduce associated risks, but knowledge of constructs influencing risk perception among key stakeholder groups was needed to design effective risk communication approaches. They interviewed managers (n = 14) and users (n = 40) at seven Adirondack Park campgrounds to characterise risk perceptions between groups and identified eight constructs influencing risk perceived by users and/or managers with three constructs on which both groups agreed and five on which they did not agree. They concluded that shared understanding across groups, and explicit recognition by risk communicators of differences between groups, may offer opportunities to maximise successes of risk communication efforts in campgrounds.

Crowe and Reid (1998) examined the future management of mountain bothies in the Scottish Highlands. Their research was undertaken in the context of major changes in the planning and management of countryside recreation opportunities in the UK; not least the increasing pressures to manage such facilities on a more commercial basis. Commercialisation can bring distinct advantages in the management and improvement of facilities, including the manipulation of users and, of course, revenue generation. However, there may be disadvantages in terms of accessibility. Mountain bothies are currently managed by volunteers in the MBA and other organisations and are free of charge to users. However, there are increasing concerns about overuse, vandalism, and pollution, particularly in areas of outstanding wildlife and landscape importance. Crowe and Reid claimed that the system of management must adapt if it is to respond to these growing pressures. In order to propose a way forward, alternative remote accommodation systems in Norway and New Zealand were examined. These systems appear more effective and generally include an element of charging for accommodation. It is suggested that the MBA will need to consider some degree of commercialisation in order to ensure the future protection of the bothy system in Scotland.

Conclusions

1. Camping is an outdoor activity which involves at least one overnight stay away from home in a shelter, such as a tent. The spectrum of types of camping ranges from survival camping (with emphasis and priority on lightweight and survival *not* comfort) through to wild camping using a tent, to camping on a valley campsite/family camping, to camping with electricity and using trailer tents, caravans, and motorhomes (glamping).
2. Snow caves, quinzhees, and igloos are used at alternatives in winter and/or snowy regions.
3. A bothy is a basic shelter, usually left unlocked and available for anyone to use free of charge. They are usually remote, with no road access, and may be ruined estate workers' or shepherds' cottages which have been renovated. The aim of the UK's MBA is to maintain simple shelters in remote country for the use and benefit of all who love wild and lonely places.
4. Cordell's (2012) survey of trends in number of people ages 16 and older participating in recreation activities in the USA, 1999–2001 and 2005–2009 for activities with between 25 and 49 million participants from 2005 through 2009, showed that 34.2 million were participating in primitive camping in the 2005 to 2009 period. The Outdoor Foundation, (2017) reported camping (RV) had 15.8 million participants in 2016 (with an 8.9% increase in the previous three years) while camping within one fourth mile of vehicle/home had 25.5 million participants in 2016 (with an −9.6% decrease in the previous three years). Cordell's (2012) report lumped together car, backyard, and RV camping and showed that the number of participants exceeded hiking, cycling, and running, with only fishing having higher numbers participating.
5. Early research showed that impact occurs wherever use occurs, leading to the suggestion that the decision facing recreation managers is how much impact is acceptable, not whether or not to allow impact. This provided the conceptual foundation for planning processes known as the LAC.
6. Numerous studies have shown that camping impacts soils, vegetation, water resources, and wildlife in a range of environments and over different time scales. Camping effects on soils can result in addition of nutrients, the accidental introduction of weed propagules, the potential for exotics to spread from areas disturbed by tourism infrastructure into natural vegetation, spread of exotic soil-borne pathogens.
7. The effects of recreation on aquatic systems are often more spatially extensive than the effects on soil and vegetation. Camping, bothy use, and snow holing all have the potential to introduce pathogens, such as *Cryptosporidium*, *Campylobacter*, *Aeromonas*, *E. coli* O157 and giardia into watercourses. A range of advice from organisations like the MCofS and MBA is available to backcountry users about how to manage this issue in both summer and winter.
8. The impacts of camping, snow holing, and bothying on wildlife are also well researched, and certain groups of animals such as black bears emerge as nuisances, and a range of measures have been adopted to deal with this problem in certain areas.
9. The management of the impacts of camping, snow holing, and bothying on the environment comes back to the question "How much change in wilderness conditions is acceptable?" or the LAC planning system.

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