Countryside Recreational Access in West Europe and Anglo-America: a Comparison of Supply

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This comparative study analyzes the provision of public recreational access in representative districts within West Europe and Anglo-America. The data record whether or not lands and routes are open to access, and at what levels of physical rigour. Access levels are strongly related to both topography and land cover in both continental settings, but it is argued that the key determinant of access provision is the intensity of land use, as indicated by all-season road density. At given road density levels, West European districts (excepting Great Britain) have both more footpaths and less land closed to the public. These contrasts relate to the vintage, scale, and pattern of original agricultural landholdings, and also to contrasts in communal versus individual farming. The paper concludes with a discussion of the behavioural and policy implications of differences in access provision.

Keywords: Recreation, access, countryside, West Europe, Anglo-America.

Public access to routes and lands within the countryside is a topic of increasing significance in all developed economies, owing to increased demand (more leisure time and more income – see Cushman et al., 1996), increased mobility, and decreases in the compatibility of recreational activity with both conservation and land exploitation. While countryside access may be viewed as one of the main objectives of rural planning (Dower, 1964; Gilg, 1991, 1996), it resolves into two sets of issues. One set addresses access to the countryside (Coppock and Duffield, 1975; Greer and Wall, 1979; Patmore, 1983; Pigram, 1983; Glyptis, 1991), which is of concern in terms of equity, but also in terms of the expansion of day-trip and weekend-trip recreational zones around large cities. A second set concerns the divergent and often confrontational interests of recreationists and land managers (Dower, 1973; Mattingly, 1982; Pigram, 1987; Wilson, 1989; Bromley, 1990, 1991; Statham, 1993). Of particular concern to recreationists are legal or customary rights of access (e.g., Bryant, 1972; Lambden, 1976; Countryside Commission, 1992; Riddell and Trevelyan, 1992; Curry, 1994; Watkins, 1996), and the issue of 'access apartheid' (e.g., Shoard, 1980, 1987, 1996; Norton-Taylor, 1982; Allison, 1986; Stephenson, 1989; Godwin, 1990). From the landowner's perspective, there are concerns over property damage and owner liability for injury, leading to negative attitudes regarding access to private lands (e.g., Conservation Council of Ontario, 1976; Gramann et al., 1985; Kaiser and Wright, 1985; Wright et al., 1988; Wright and Fesenmaier, 1990; Wright et al., 1990; Cox et al., 1996).

Most of the literature on recreational access concerns a single country or region, and there has been very little cross-cultural or international comparison of the demand for, supply of, or use of access routes and zones in the countryside (though see Lambden, 1976; Pigram, 1987). In particular, until recently, there have been no empirical studies which allow a comparison of the supply or availability of countryside access.

In 1991, I published a conceptual framework for analysis of recreational access centred on the concept of physical rigour. Though related to levels of difficulty specified in the recreational opportunity spectrum (Clark and Stankey, 1979; Lichtkoppler and Clonts, 1990; Daniels and Krannich, 1990), levels of rigour in my scheme are applicable to both routes and off-trail areas, in a broad range of environmental and cultural settings, and are explicitly related to a range of recreational pursuits, from passive through to active, and novice through to expert (Millward, 1991). Levels of rigour may be operationalized from topographic maps with relatively little field verification, and the scheme has been utilized to survey and categorize the supply of recreational access in Canada, West Europe, and the United States (Millward, 1992, 1993 and 1996, respectively). In this capstone paper, results from these previous studies will be compared and contrasted. The key questions to be addressed empirically are: what are the effects on access availability of topography, land cover, and intensity of land use; and why do these causal variables vary in their effects between and within continental and national settings? The analysis

is also intended to shed light on a more fundamental question: how do the historical and cultural bases of current rural landscapes, including patterns of land-ownership, affect variations in access? Answers to these questions have important implications for the planning and management of countryside recreation.

Conceptual Framework and Study Areas

Access Rigour

Two key conceptual issues relating to public recreational access are the distinction between lands open and closed to the public, and the categorization of recreational activities, trips, and routes/zones on a scale of increasing rigour, from passive through to arduous. These issues are discussed and illustrated fully in Millward (1991), and are only briefly summarized here.

Access within the countryside is afforded either by routes (roads, tracks, paths, and waterways) or across country through access zones (in public parks, natural areas, or areas of exploitation for forestry, pasture, or even crops). The two categories overlap, in that access zones may be criss-crossed with pathways, while linear features such as rivers, beaches, and lakes may be viewed as either routes or zones, depending on scale.

Routes and zones may be viewed as open to the public when they may be freely used for recreational movement, *de jure* or *de facto*. Closed lands and routes, which are typically private property, have legal, physical, monetary, or psychological barriers to access. Lands with high economic value for production, privacy, or game are more likely to be in private ownership, and more likely to be guarded from public use by means of fencing, posting, and threats of prosecution or even physical harm (Bromley, 1991, 141-7). By contrast, lands with low economic value are less likely to be guarded or protected; hence uninvited users may acquire customary or even legal rights of access. Recreational movement may be categorized according to the level of dedication and/or physical rigour involved, and routes/zones open to the public may be categorized according to the types of movement they allow. The following five categories represent a scale of increasing rigour.

Passive access. This easiest level or mode of access is employed by the largest proportion of recreationists, and in the greatest proportion of recreational trips. Movement is restricted to routes accessible year-round by automobiles, or to areas of easy going within 100 m of such routes. Activities which are car-restricted include sightseeing, automobile touring, and picnicking.

Casual access. In this mode, recreationists move more than 100m from the road, making short excursions on tracks and footpaths to a distance limit of three km from the road. Strolling, rambling, and Nordic skiing are typical activities.

Vigorous access. Recreationists at this level move between three and 20 km from the road (that is, up to a day's round-trip), yet remain on tracks, paths, or areas of easy going. Typical activities are hiking, running, Nordic skiing, mountain-biking, and the use of all-terrain vehicles.

Rugged access. This level involves cross-country movement in areas of hard going, yet still within 20 route-kms of an all-season road and three km of a track or path. Activities are similar to those for vigorous access; however, the rugged zone includes navigable rivers, most lakes, and sheltered coastal waters, and thus applies also to canoeing, kayaking, sailing, and motor-boating.

Arduous access. This most rigorous access mode involves cross-country travel more than 20 km from a road and more than three km from a track or path. It also includes movement over ill-favoured terrain within those distance cut-offs, such as marsh, swamp, ice, mountains, or badlands. Typical activities employing this mode are wilderness trekking, mountaineering, and guided hunting and fishing trips.

The Study Areas: Selection and Appraisal

No official counts or censuses on recreational supply exist at regional or national levels (and if they did, they would employ different definitions and criteria). The only feasible way of acquiring internationally comparative data on the supply of access routes and zones is therefore through the analysis of topographic maps for representative study areas, combined with field verification. Since the great bulk of recreational activity takes place in the settled or semi-settled countryside, our interest focuses on these areas. More specifically, the study areas selected are in regions having continuous blocks of ecumene (rural densities over two people per km^2), indicative of agricultural settlement. A few non-ecumene or wilderness areas – specifically, national parks fitting the restrictive WCU (World Conservation Union, formerly, the International Union for the Conservation of Nature) definition (IUCN, 1986) – were also selected. Since these uninhabited areas have experienced little human modification, they serve as control areas against which settled areas may be compared. They are also important recreational magnets in their own right, even

when remote from settled regions.

To permit meaningful comparisons, study areas were grouped by national and regional settings. Though none of these settings is homogenous physically or culturally, they provide convenient units within which factors influencing countryside access are more likely to be constant. These factors are climate, natural vegetation, the legal and historical bases of land-ownership and property rights, overall levels of population pressure, and the nature and extent of countryside planning. In Western Europe, the national settings used are Great Britain, France, West Germany, and Benelux. In Anglo-America, owing to the scale of the two national units, a further division into regional settings was considered desirable: five in the United States (Northeast, Midwest, South, Great Plains, and California) and three in Canada (Maritimes, Heartland, and Prairies).

Within each national or regional setting, three or four representative agriculturally-settled districts, and where possible one non-settled national park, were selected for study. Except for parks, the study areas are of the same size (40 by 25 km, or 1,000 km^2), and reflect the physical and human diversity of the regions within which they are set. For detailed selection criteria, locations of the study areas, and their salient characteristics, see Millward (1992, 1993, 1996). Certain generalizations can be made regarding the study areas in each national and regional setting. Regarding topography, there is greater variation of relief in non-settled parks than in settled districts, and in the settled areas of West Europe than in those of Anglo-America (Table 1). Among settled areas, Great Britain shows greatest relief, while the Canadian Prairies and Heartland, USA South, and Benelux are most noticeably flat. The natural vegetation in most study areas is woodland, but higher parts of the national parks are alpine (reflected in their high values for open land-cover in Table 1), while most study areas in the Great Plains, Prairies, and California are natural grasslands. Dates of initial agricultural settlement are generally prior to 1,000 C.E. in West Europe, though late medieval in polderized portions of Benelux and north Germany. By contrast, agricultural clearance in the Anglo-America districts was minimal prior to European settlement, and dates from the early 1600s (southern New England) to as late as the 1880s in parts of the Great Plains and California.

In settled areas, current land cover (Table 1) primarily reflects the extent of agricultural exploitation, but also partially relates to natural vegetation. Of the naturally-wooded regions, Great Britain is most open (i.e., farmed) followed by the USA Midwest (parts of which are natural grassland), France, and the Canadian Heartland. Naturally-wooded areas which remain highly wooded are the Canadian Maritimes and the USA Northeast.

In the preliminary stage of the survey, 1:50,000 topographic maps (1:24,000 in the USA) were used to identify all routeways open to the public, according to their level of access rigour. While exact guidelines varied by country and region, all-weather roads were generally classed as passive, while unimproved dirt roads, tracks, and paths deemed open to the public (usually in less intensively-utilized areas) were classed as casual or vigorous depending on distance from an improved road. To identify off-route zones open to the public (and thus generally rugged or arduous), information on *de facto* access was gathered from literature review, government documents and pamphlets, and field-verification in selected areas. For each national or regional setting, detailed guidelines were prepared for estimating access from map evidence: to generalize, most lands in well-settled lowlands were deemed to be closed, with the exception of certain government recreation and forest lands. In more lightly-settled or heavily-wooded areas, most unenclosed or non-agricultural land was deemed open to the public.

Access patterns in selected portions (10 km^2) of five study areas are mapped in Figure 1. Given their differences in physical setting and cultural characteristics, these areas illustrate many of the ways in which public access is provided or denied. In the long-settled and intensely-cultivated area near Mainz (West Germany), a dense network of exploitation tracks exists to service small and scattered landholdings (a legacy of divided inheritance) and intense cultivation (arable and vines). Owing to early communal farming, these tracks were originally public rights-of-way, and remain so in large part because land consolidation occurred only recently, and was accompanied by very little land enclosure. The dense network continues as a public resource, and is available for passive and casual recreation. Because of the prevalence of farmland in the Mainz area, however, all off-route lands are closed to the public.

Red Lion (Northeast USA) is also well-settled and fully farmed, and has a similarly high level of passive (automobile) access via its network of paved roads. But farm exploitation lanes are privately owned and gated, since this area has always had non-communal farming on large consolidated farms. As a consequence, there is almost no casual access.

Table 1 Mean Quadrat Values, by Country and Region

Country	*Region*	*No. of Quadrats*	*Easiest Access Mode (percent of Counters)*						*Weighted Index of Access Availability*	*Amplitude of Relief (m)*	*Percent Land Cover*		
			Passive	Casual	Vigorous	Rugged	Arduous	Closed			Wooded	Open	Built
Great Britain		175	50	18	1	7	0	24	60	227	6	91	3
France (settled)		120	71	22	0	0	0	7	82	152	19	79	2
West Germany		155	71	26	0	1	0	1	84	139	30	64	5
Benelux		120	59	25	0	6	0	11	72	61	20	76	3
W. Europe (settled)		570	62	22	0	4	0	12	73	152	18	78	3
W. Europe (non-settled)	La Vanoise N.P.	36	2	16	5	9	67	0	13	1547	9	91	0
W. Europe (all)		606	59	22	1	4	4	11	71	235	18	79	3
United States	Northeast	118	60	12	0	7	1	20	67	162	50	47	3
	Midwest	120	55	3	0	3	1	38	57	77	16	82	2
	South	120	45	12	0	6	1	35	52	54	24	75	1
	Gt. Plains	120	34	13	0	5	0	48	41	72	7	93	0
	California	120	36	19	1	6	0	39	46	109	6	93	1
USA (settled)		598	46	12	0	6	0	36	53	96	20	78	1
USA (non-settled)	National Parks	302	7	12	8	60	13	0	21	765	59	41	0
USA (all)		900	33	12	3	24	5	24	42	320	33	66	1
Canada	Maritimes	116	32	12	1	30	1	23	41	70	65	33	2
	Heartland	120	45	5	0	10	1	40	49	54	17	79	4
	Prairies	120	26	15	1	5	1	51	34	74	12	88	0
Canada (settled)		356	35	10	1	15	1	38	42	66	31	67	2
Canada (non-settled)	National Parks	198	6	4	5	52	33	0	15	564	81	19	0
Canada(all)		554	24	8	2	28	12	25	32	244	49	50	1
ALL(settled)		1524	49	15	0	7	0	27	57	109	22	76	2
ALL (non-settled)		536	7	9	7	53	24	0	19	743	64	36	0
ALL (all)		2060	38	14	2	19	7	20	48	274	33	65	2

A dammed stretch of the Susquehanna River provides rugged access for boaters, but otherwise there is no off-route access. Yellow Grass (Canadian Prairies) provides a simpler and more regular version of the Red Lion picture. Like most trans-Appalachian areas of Anglo-America, its sectional survey system provides adequate (though hardly interesting) passive and casual access along the often unpaved roadways, but cultivated farmlands are closed for much of the year (though off-road travel across unfenced fields is possible during the winter freeze).

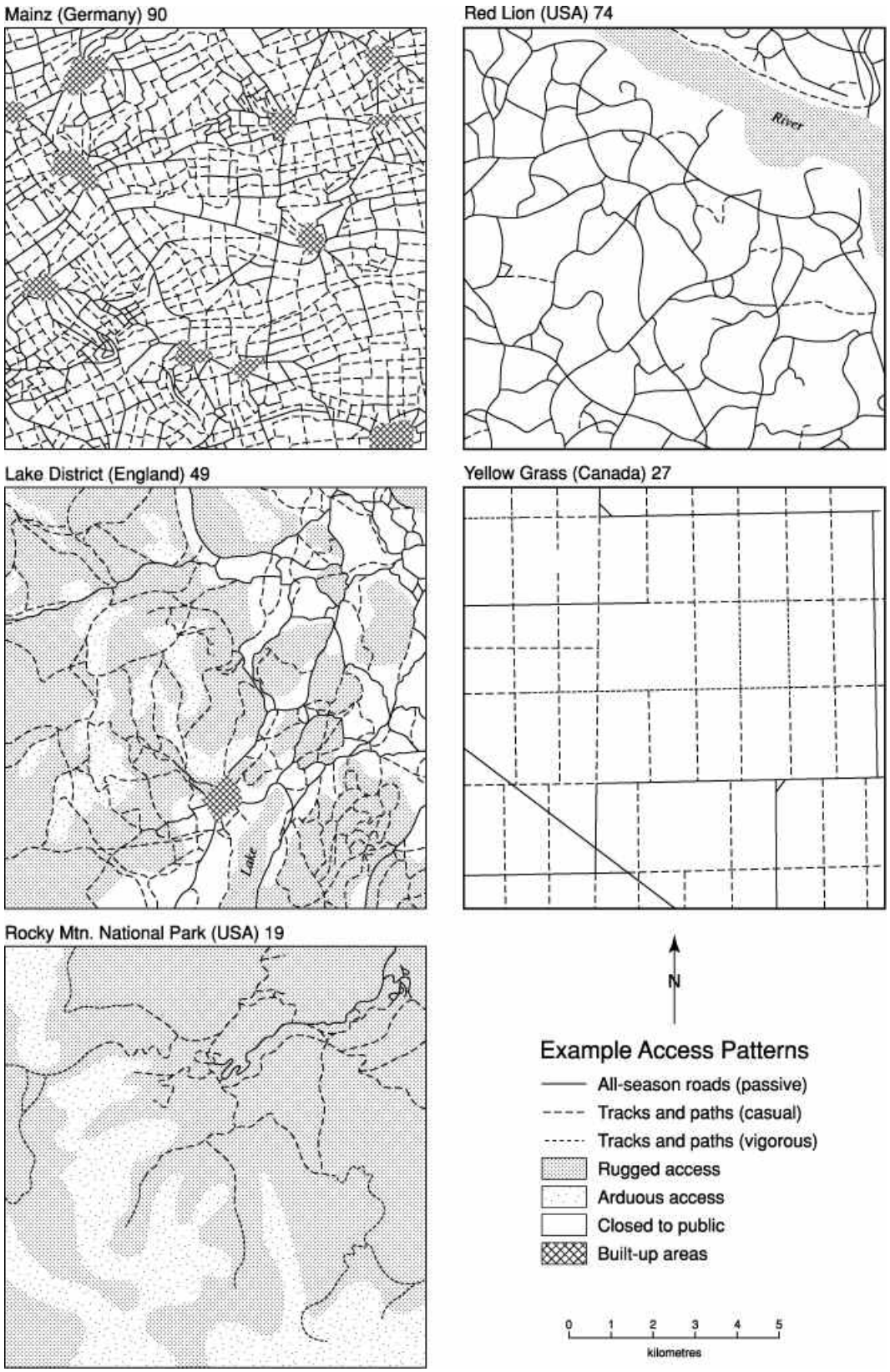

Figure 1: Access routes and zones in portions of five selected study areas. Numbers following area names are weighted indexes of accessibility.

The Lake District (England) segment presents a more complicated and interesting mix of access routes and zones. Although this area lies within a non-WCU national park, it is well-settled and almost all land is privately owned. There is, however, much cross-country access, largely due to the hilly topography, which restricts arable or enclosed pasture to the valleys, and leaves the hills and plateaus open for rugged and arduous access. In addition, the National Trust–the world's largest private land trust–owns much of this highly scenic area, and allows public access to most of its holdings. A network of footpaths also crosses the uplands, providing a great deal of access in the casual category.

Rocky Mountain national park, in the western USA, represents access conditions in a non-settled WCU park. Like most such parks, its publicly-owned mountainous terrain has a meager provision of paved roads along main valleys, with casual (day-use) trails stemming from them. A few vigorous (overnight) trails climb towards the glaciers and peaks. All off-trail land is open to the public, and is mostly in the rugged category, with steeper slopes classed as arduous.

Comparative Measures of Access

Figure 1 presents only a small fraction of the study areas (500 km^2 of the 51,500 km^2 total). In order to objectively compare and analyze access availability in all study areas, the previously-defined access types were applied to quadrats aligned to the map grid. A nested scheme was employed to aggregate from smaller counter units (each 500 m squared) to larger quadrats of 5 km squared (see Millward, 1991, 244-6).

Access was determined for each counter on a nominal basis of presence or absence, beginning with the easiest mode (passive), and then testing for increasingly rigorous modes. In the case of route access, a counter must simply contain a section of the appropriate type of route, while for zonal access (rugged and arduous) a majority of the counter must be open to the public. Each counter was classed according to the easiest available rigour category, and if none were available, it was classed as *closed access*. For each quadrat the percentage of counters (and hence of area) in each rigour category was then calculated.

Access Profiles

Access measures for all six country settings, and also for regional settings in the USA and Canada, are summarized in Table 1. The non-settled national parks have been extracted from the regional and country figures, and are aggregated separately for the USA (five parks), Canada (four), and France (one). The table contains mean quadrat percentages for five levels of access (passive through to arduous), and for areas closed to the public. The access profile for a region, district, or group of parks is provided by the percentage distribution of counters within this descending sequence of access modes.

For the full set of 2,060 quadrats (bottom line), four modes of access are well represented (passive, closed, rugged, and casual, with 38, 20, 19, and 14 percent respectively), and two are much less common (arduous and vigorous, with seven and two percent). However, these aggregate figures are not representative, and mask great contrasts between settled and non-settled areas, and between settled areas in Anglo-America and West Europe.

In non-settled parks only seven percent of area, on average, is accessible by car (passive), versus 49 percent in settled districts. However, the non-settled parks are almost entirely open to cross-country travel (77 percent rugged or arduous, versus only seven percent in settled districts). By definition, they are rugged wilderness areas, and display similar access profiles regardless of national setting. The main difference to be noted in Table 1 is the split between rugged and arduous access, which is controlled by the roughness of topography. For example, La Vanoise National Park is more mountainous than the average Canadian or US park, and hence off-route access is largely arduous. Though the same is true of alpine parks in Anglo-America (Rocky Mountain, Sequoia, and Yoho), parks with more gentle terrain (e.g., La Mauricie in Canada, or Shenandoah in the USA) can be as little as one percent arduous.

The settled districts of West Europe show markedly different access profiles from their counterparts in Anglo-America. Furthermore, Great Britain's access profile is intermediate between those of its West European neighbours and that of the USA, while the USA's profile is intermediate between those of Britain and Canada. The extremes are occupied by West Germany (which has very high passive access, low rugged access, and very little closed land) and Canada (with very low passive access, high rugged access, and much closed land).

The West European countries, though Britain less so, are well provided with access by car (passive), as are the USA Northeast and Midwest. They also have high levels of casual access, averaging 22 percent in West Europe versus only 11 percent in Anglo-America. All of the settled regions lack vigorous access, however,

since by definition this access category is restricted to paths far from roadheads. Cross-country access of the rugged type is also generally low in all well-settled areas. It averages 4 percent in West Europe and 6 percent in the United States, but rises to 15 percent in Canada. Rugged access is notably high in the Canadian Maritime Provinces, which, even in the settled districts studied, are only lightly populated and highly wooded.

Settled portions of West Europe differ greatly from those of Anglo-America because they have relatively little area closed to the public (12 percent, versus 36 percent in the USA and 38 percent in Canada). The proportion closed is particularly low in West Germany, which is the country best provided with public roads, tracks, and paths (and thus with the highest levels of passive and casual access). Conversely, since Britain's enclosure movement erased or privatized many public rights-of-way, it has West Europe's lowest levels of passive and casual access, and the highest proportion of land closed to the public. In Anglo-America, the two regions with the largest proportion closed (the Canadian Prairies and the USA Great Plains) both have natural grasslands. This is important, since it means that even though they are lightly settled, with large farms and a coarse-grained cadastre, the land is easily and almost fully exploited for agriculture, thus typically excluding public recreational access.

Weighted Index of Access Availability

Not all modes of recreational access are of equal importance to the public. Whereas almost all recreationists use vehicles as their sole or major means of access, very few are able or willing to venture far from the road or path. In this sense, the more rigorous modes of access are less available to the general public than easier or more leisurely modes. To weight access supply by potential demand, the percentage of counters at each level of access rigour was multiplied by an estimate of the proportion of recreationists willing to participate at that level. Based on conceptual considerations (Millward, 1991, 243-4) and empirical evidence (e.g., Simmons, 1975, 26-9; Glyptis, 1991, 106-21; Gilg, 1996, 222), these weights were set at 1.0 (passive), 0.5 (casual), 0.25 (vigorous), 0.1 (rugged), and 0.02 (arduous). Closed lands were weighted at zero, though we recognize that trespass does indeed occur. By summing for each quadrat the weighted percentages in each mode, we arrive at an index of access availability which ranges from zero to 100. To appraise the utility of this index, return to the panels in Figure 1. These are arranged in order of their weighted index values, which range from 90 for Mainz down to only 19 in Rocky Mountain national park.

Weighted availability indices averaged for each country or region appear in Table 1, and confirm many points already noted. First, non-settled parks have much lower scores than settled areas, whether they are in West Europe or Anglo-America. Largely owing to their topography, they provide meager access for the general public (who restrict themselves to peripheral and often rationed "honeypot" areas) while reserving the great bulk of their area for a small minority of specialized or expert recreationists.

Secondly, West Europe scores much more highly than Anglo-America, with the exception of one notable overlap: Great Britain scores lower than the USA Northeast, reflecting the inclusion of several semi-wild and hence poorly-roaded landscapes in the British study areas, but also reflecting 18th Century enclosures in some eastern British districts, which reduced the public road network. Lower access availability in Anglo-America may be partly due to cultural and economic factors (lack of early communal farming, private land ethic, larger farms, coarser cadastre), but would also appear to be partly environmental. Particularly low index scores are recorded in regions with marginal farming environments, where landholdings are large and the road network is sparse (Great Plains, Maritimes, and Prairies).

Statistical Analysis of Access Determinants

Quadrat scores for each access mode were taken as dependent variables, and related to the independent variables of topography, land cover, and land-use intensity. These variables were analyzed statistically because they can be measured simply and objectively from topography maps. They cannot be viewed as the only determinants, but they often reflect or operate through more subtle or complex historical, economic, cultural, and legal factors. Various forms of regression analysis were performed, but owing to the non-linear nature of most relationships, multiple regression proved to be inappropriate. Fourth-order polynomial regressions were found to provide well-fitting trend curves, and these serve as the focus of the following discussion.

Topography

Topography affects access via the amplitude or degree of local relief. Amplitude was measured from the range of contours in each quadrat, and converted to metres. Table 2 presents product-moment correlations between

amplitude and the various access modes. Significance levels are not provided, since the variables are not normally distributed, but with the sample sizes employed (which range from 536 to 1524) correlations exceeding plus or minus 0.1 are likely to be highly significant. As a comparison of the linear and 4th-order regression coefficients shows, only the rugged mode exhibits a fairly linear relationship with topography in both Anglo-America and West Europe, while the closed mode has a linear relationship in Anglo-America.

Table 2 Linear and Polynomial Correlations between Access Scores (Y) and Topography (X = Amplitude of Relief, in m)

Regression (no. of quadrats)	Linear r	Fourth-order R
Y = % Passive:		
all settled (1524)	+0.02	0.38
Anglo-America settled (954)	+0.10	0.31
West Europe settled (570)	-0.39	0.55
Non-settled national parks (536)	-0.18	0.24
Y = % Casual:		
all settled	+0.21	0.29
Anglo-America settled	+0.03	0.26
West Europe settled	+0.16	0.32
Non-settled national parks	+0.06	0.37
Y = % Vigorous:		
all settled	+0.16	0.51
Y = % Rugged:		
all settled	+0.17	0.23
Anglo-America settled	+0.18	0.22
West Europe settled	+0.44	0.51
Non-settled national parks	-0.57	0.58
Y = % Arduous:		
all settled	0.00	0.22
Y = % Closed:		
all settled	-0.28	0.32
Anglo-America settled	-0.24	0.29
West Europe settled	-0.04	0.20

Figure 2 illustrates the form of the relationships between topography and passive access. With the exception of the non-settled parks, where topography has little effect, passive access is high on gentle terrain (though reduced on excessively flat land), and falls with increasing relief. The curves for Anglo-America and West Europe are very similar, but West Europe has higher levels of passive access on low and moderate terrain, and a stronger relationship overall (R=0.55, versus only 0.31 in Anglo-America). This is understandable, since European rural settlement is denser and more closely related to environmental limits.

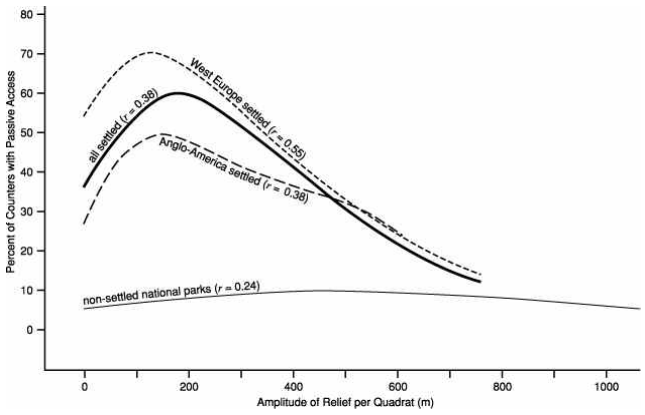

Figure 2: Relationships between amplitude of relief and the percentage of counters with passive access (4th-order polynomial regressions).

In both Anglo-America and West Europe, the peak of the regression curve is found at higher amplitudes of relief as we progress to harder modes of access, though interestingly in both cases the peak for vigorous access is to the right of that for rugged access. Also, the peaks for all except passive access lie at higher amplitudes than those normally found in settled districts. Casual access shows an extra feature in both Anglo-America and West Europe: it is slightly more prevalent on very flat lands than on gently rolling terrain.

In Anglo-America, levels of rugged access are near 10 percent even on gentle terrain, whereas in West Europe they remain below five percent until amplitude reaches 250m. This may reflect denser settlement and more intense land usage in West Europe, which preclude off-trail movement. While levels of rugged access are higher at all amplitudes in Anglo-America, the strength of the relationship with amplitude is considerably higher in West Europe (0.51 versus 0.22).

The amount of land closed to the public is highest on flat terrain and falls to zero on mountainous terrain in both Anglo-America and West Europe. The levels are generally much higher in Anglo-America (a peak of 50 percent, versus only 15 percent in West Europe), but begin to fall off rapidly at a lower amplitude (300 m versus 425 m), presumably because environmentally marginal hill-country is relatively less viable economically in Anglo-America, and thus merits less protection from public use.

Land Cover

Topographic maps were used to measure the percentage of each quadrat in the three main categories of land cover (woodland, open country, and built-up areas). While the woodland and built-up categories are homogenous, the open or clear category presents some interpretation problems. It normally indicates farmland, but may also include moorland, natural grassland, and even alpine meadow. Since the wooded and open categories are inversely related (Table 1), our analysis of land cover centres on the presence or absence of woodland. West Europe is slightly less wooded (18 percent) than settled districts of the USA (20 percent), and much less so than those of Canada (31 percent). However, there is great variation within West Europe (contrast West Germany with Great Britain) and within Anglo-America (contrast the Maritimes with the Great Plains, California, and the Prairies – the latter being natural grasslands).

Table 3 presents correlations between percentage wood cover and scores for the various access modes. In general, wood cover indicates land considered less worthwhile for farming and settlement, and therefore less likely to be serviced with paved roads (passive access). Conversely, because of their lower exploitation value than farmland, and their higher compatibility with recreation (Green, 1977; Cloke and Park, 1985, ch. 12; Statham, 1993), well-wooded areas should have higher levels of trail and cross-country access (casual, vigorous, and rugged), and less closed land. Inspection of scattergrams for each polynomial regression in Table 3 confirmed these expectations, but revealed marked differences between West Europe and Anglo-America. Passive access actually declined at very low levels of wood cover in Anglo-America, reflecting the fact that natural grasslands are only lightly settled. Passive access also dropped off sharply above 80 percent woodland, but in West Europe there was no such drop-off, and the entire relationship was very weak.

Casual access is moderately correlated with wood cover in both groups of countries, and in both it peaks at high levels of wood cover (90 percent in Anglo-America and 80 percent in West Europe). However, casual access is in greater supply in West Europe at all levels of wood cover, which partly reflects more intensive silviculture and hence greater provision of forest tracks

There is a strong relationship in Anglo-America between wood cover and rugged access (R = 0.65), with the latter increasing rapidly beyond 75 percent wood cover (Figure 3). The same relationship is both much weaker (R = 0.10) and flatter in West Europe, with

Table 3 Linear and Polynomial Correlations between Access Scores (Y) and Percentage Wood Cover (X)

Regression (no. of quadrats)	Linear r	Fourth-order R
Y = % Passive:		
all settled (1524)	-0.04	0.26
Anglo-America settled (954)	-0.02	0.30
West Europe settled (570)	+0.08	0.08
Non-settled national parks (536)	+0.19	0.23
Y = % Casual:		
all settled	+0.13	0.14
Anglo-America settled	+0.16	0.26
West Europe settled	+0.26	0.30
Non-settled national parks	+0.19	0.24
Y = % Vigorous:		
all settled	+0.04	0.18
Y = % Rugged:		
all settled	+0.49	0.54
Anglo-America settled	+0.62	0.65
West Europe settled	-0.05	0.10
Non-settled national parks	+0.15	0.27
Y = % Arduous:		
all settled	+0.16	0.19
Y = % Closed:		
all settled	-0.38	0.40
Anglo-America settled	-0.63	0.64
West Europe settled	-0.34	0.35

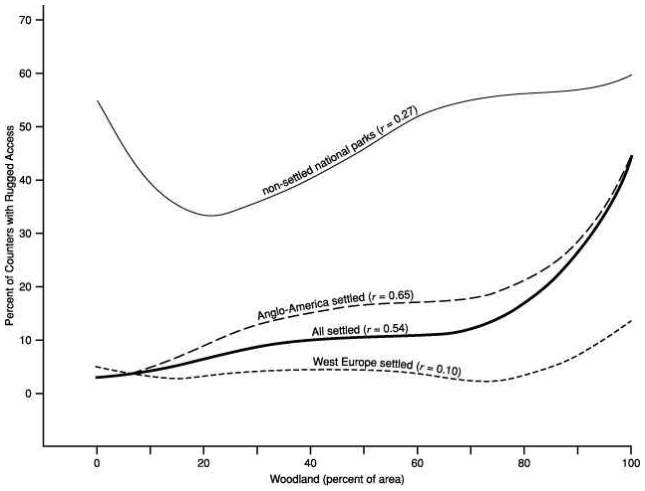

Figure 3: Relationships between woodland cover and the percentage of counters with rugged access (4th-order polynomial regressions).

levels of rugged access being lower at all levels of wood cover. Again, this simply reflects higher levels of provision of easier access modes (roads and paths) due to more intensive forest exploitation, and does not necessarily indicate that cross-country access is less available. The relationship between closed access and wood cover (not illustrated) tends to confirm this interpretation. While both Anglo-America and West Europe show monotonically decreasing levels of closed land as wood cover increases (with correlations of 0.64 and 0.40 respectively), levels of closure are consistently higher in Anglo-America. At 20 percent woodland, they are 35 percent versus 10 percent, and at 80 percent wooded they are 17 percent versus two percent.

Road Density (Intensity of Land Use)

While access profiles in both Anglo-America and West Europe are clearly related to both topography and land cover, the analysis so far suggests that the underlying mechanism concerns the intensity of land use. As argued earlier, the degree to which land is productively utilized affects its economic valuation, and hence the degree of access owners or managers are willing to allow the public. Intense land use requires a dense network of well-maintained exploitation roads, while marginal lands with little use warrant little investment in road access.

The index of passive access is a direct measure of road density (it shows the percentage of counters containing a section of all-season road), and thus is an excellent surrogate measure of the intensity of land use. When viewed in this light, it may be regarded as an independent variable affecting other modes of countryside access. At very low intensity levels (below 10 percent roaded), the landscape is an unsettled wilderness, with high levels of rugged and arduous access, while at the other end of the intensity scale almost all counters are traversed by paved roads, and thus regarded as passively accessible.

Table 4 presents linear and 4th-order polynomial correlations between road density and the percentage of area in each non-road access mode. The relationships are also graphed for the more commonly occurring types of access–casual, rugged, and closed (Figures 4, 5, and 6). A comparison of the linear and polynomial coefficients reveals that most relationships are non-linear, which is confirmed by the graphs. In both Anglo-America and West Europe, the more rigorous types of access increase monotonically as road density declines, as illustrated by the trend-lines for rugged access (Figure 4). Here, West Europe shows a steeper

Table 4 Linear and Polynomial Correlations between Access Scores (Y) and All-Season Road Density (X)

Regression (no. of quadrats)	Linear r	Fourth-order R
Y = % Casual:		
all settled (1524)	-0.20	0.27
Anglo-America settled (954)	-0.47	0.49
West Europe settled (570)	-0.50	0.52
Non-settled national parks (536)	+0.24	0.29
Y = % Vigorous:		
all settled	-0.28	0.59
Anglo-America settled	-0.36	0.66
West Europe settled	-0.23	0.62
Non-settled national parks	-0.32	0.36
Y = % Rugged:		
all settled	-0.44	0.46
Anglo-America settled	-0.36	0.37
West Europe settled	-0.55	0.69
Non-settled national parks	-0.02	0.16
Y = % Arduous:		
all settled	-0.19	0.24
Anglo-America settled	-0.12	0.17
West Europe settled	-0.32	0.58
Non-settled national parks	-0.35	0.38
Y = % Closed:		
all settled	-0.54	0.58
Anglo-America settled	-0.35	0.39
West Europe settled	-0.39	0.48

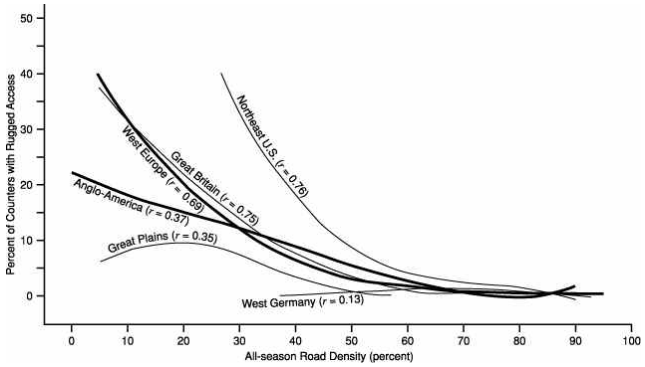

Figure 4: Selected relationships between all-season road density and the percentage of counters with rugged access, for settled districts only (4th-order polynomial regressions). Figures in parentheses are correlation coefficients.

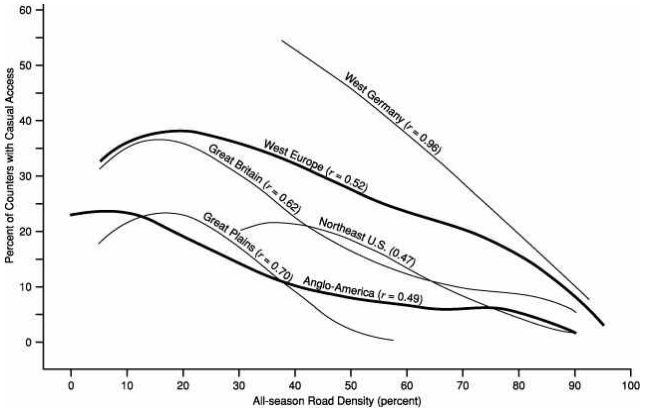

Figure 5: Selected relationships between all-season road density and the percentage of counters with casual access, for settled districts only (4th-order polynomial regressions). Figures in parentheses are correlation coefficients.

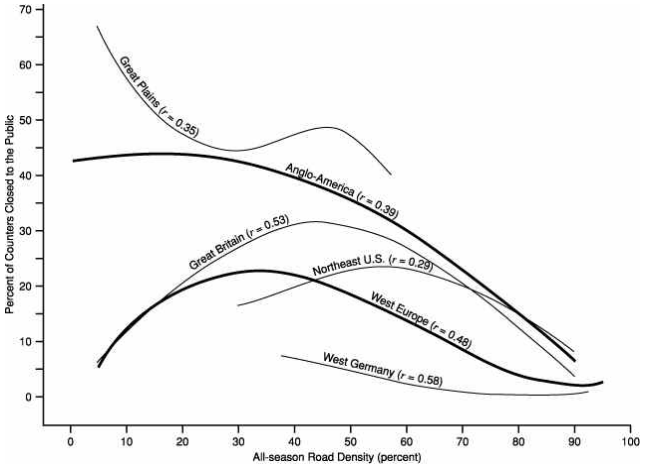

Figure 6: Selected relationships between all-season road density and the percentage of counters closed to the public, for settled districts only (4th-order polynomial regressions). Figures in parentheses are correlation coefficients.

trend and also a stronger correlation than Anglo-America (R = 0.69, versus 0.37). From this it may be inferred that, at low levels of land-use intensity, European landowners are more likely to allow public access to their properties; that is, they appear to be either more responsive to economic valuations of their land, or more public-spirited. However, the composite curves, and the broad generalization made, should be treated with caution, as there are great variations from country to country and region to region. Note that in Figure 4, West Germany shows a very low correlation compared with Great Britain (though because its study areas are all well roaded, we lack information on rugged access at low road densities). Also note that in the Northeast USA rugged access is *more* available, at all road densities, than in either West Europe or Anglo-America as a whole, while on the Great Plains it is much less available. The interpretation here should not be that landowners in the Northeast are more altruistic, or have a less well-developed sense of private property. The reasons are partly environmental, since natural grasslands are more easily maintained as fully arable even when lightly settled. They are also partly cultural/historical: the earlier settled Northeast had an initial cadastre of small properties served by a dense public road system. Even though much early farmland has reverted to forest, the road network remains, reflecting former rather than current land valuations.

Casual access (i.e., access along tracks and paths) is positively correlated with all-season road density in national parks (Table 4), but in settled areas the relationship is inverse. It is also largely linear, as a comparison of linear and 4th-order correlations shows. Note in Figure 5, however, that in West Europe levels of casual access are higher than in Anglo-America for any given level of road density, which may be attributed to (a) a higher density of dry-weather farm exploitation tracks, owing to small-scale and fragmented land parcels, and (b) public rights-of-way as the legacy of 1,000 years of communal farming. Both of these explanations are highly applicable to West Germany, but much less so to Great Britain, where earlier (often 18th Century) re-apportionment and enclosure produced a landscape of large farms, and privatized many rights-of-way. For this reason, at most road density levels Great Britain exhibits levels of casual access very similar to those in the Northeast USA

Within Anglo-America, longer-settled and/or less marginal regions tend to show higher levels of casual access, at any given road density. This, again, is related to initial farm sizes and the density of the initial road network, for in Anglo-America casual access is typically afforded by unpaved public roadways rather than by footpaths or trails. Particularly in those extensive regions settled through the sectional survey, such as the Great Plains, public footpaths off the road grid are virtually non-existent.

Relationships between closed land and all-season road density (Figure 6) should be interpreted with the discussions on casual and rugged access firmly in mind. Recall that counters are assigned only to their easiest access mode, so that access percentages shown in Figures 4, 5, and 6 are cumulative and cannot exceed 100 percent. For this reason, at 60 percent road density, the *maximum* percentage of closed land is (the remaining) 40 percent. Figure 6 shows that at higher

road densities Anglo-America and also Great Britain have near-maximum levels of closed land; that is, almost all counters not containing a paved road are closed to the public. By contrast, in the rest of West Europe, and especially in West Germany, counters not containing a paved road are likely to contain an unpaved public track, and are classed as having casual access (even though off-route lands are equally likely to be closed).

Table 5 Average Access Scores at Key Levels of All-Season Road Density (Passive Access), for Settled Districts of Anglo-America and West Europe

All-Season Road Density (% of counters)	Implied land-use Intensity	Region[a]	Easiest Access Mode (% of counters)				
			Casual	Vigorous	Rugged	Arduous	Closed
25	Low	Anglo-America	17	0	14	1	43
		West Europe	37	0	16	1	21
50	Moderate	Anglo-America	7	0	6	1	36
		West Europe	28	0	4	0	18
75	High	Anglo-America	6	0	0	0	19
		West Europe	18	0	1	0	6

[a] n equals number of quadrats in sample: 954 for Anglo-America and 570 for West Europe

Source: all values derived from 4th-order polynomial regressions

To summarize the effects of land-use intensity, as reflected through all-season road density, we may record the characteristic mix of access modes at key density levels (Table 5). At 25 percent road density (sparsely settled and low land-use intensity), West Europe averages much higher levels of casual access than Anglo-America (36 percent versus 17 percent), and also has much less land closed to the public (21 percent versus 43 percent), while both regions record similar levels of rugged access (16 percent and 14 percent respectively). West Europe's countryside is also more accessible to recreationists at the higher density levels, and indeed in proportional terms even more so: at 50 percent road density (moderate land-use intensity) West Europe offers four times as much casual access as Anglo-America (28 percent versus seven percent), while at 75 percent road density (thickly-settled and high land-use intensity) it has only one third as much land closed to the public (six percent versus 19 percent). Table 5 also confirms that both vigorous and arduous access are of negligible importance in settled areas of both Anglo-America and West Europe.

Summary

This comparative survey of countryside recreational access has revealed many attributes and relationships common to both Anglo-America and West Europe, but also some considerable differences which have important behavioural and policy implications.

In general, wilderness parks in both continental settings are similar, providing little passive (car-borne) or casual (trail-oriented) access, but relatively high levels of more rigorous access types. Settled areas differ markedly, however, being much more generously provided with passive and casual access in West Europe, and conversely having much more land closed to the public in Anglo-America

In both continental settings relationships between access availability and topography show similar forms, but the correlations are stronger in West Europe. This is interpreted as a reflection of Europe's longer-standing and denser rural settlement, which presses more closely against environmental limits, thus resulting in a closer match between topography and route densities (hence passive and casual access), and between topography and land enclosure (hence rugged access).

The strong relationship between woodland cover and rugged access evident in Anglo-America is not present in West Europe. Again, this seems to relate to more intense land exploitation and higher land values in the latter. Managed woodlands are well provided with passive and casual routes, and hence rugged access is seldom the easiest available access mode.

In both continental settings there is evidence that the most important determinant of access provision, and one which incorporates or subsumes the relationships with topography and land cover, is the intensity of land use, as indicated by all-season road density. In economically valuable and hence intensely utilized areas, road access is plentiful, but there are few trails and almost no zonal or cross-country access.

Conversely, economically marginal lands, with the important exception of grasslands used for grain production, are often left open to public access by the rugged or arduous modes.

West Europe differs considerably from Anglo-America in having, at all road density levels, both much more casual access and much less land closed to the public. These differences result from (a) a denser network of dry-weather farm exploitation tracks existing as public roads, owing to small-scale and fragmented land parcels, and (b) non-road public rights-of-way as a legacy of 1,000 years of communal farming. This interpretation is buttressed by the fact that the West European country experiencing the earliest land enclosures and subsequently the greatest degree of farm enlargement (Great Britain) has levels of both casual and closed access most similar to those in Anglo-America.

There are both behavioural and policy implications from these findings, which need to be addressed in further research. It is clear that West Europeans are better provided with the more frequently demanded types of recreational access (passive and casual) and find the countryside more easily available to them. They are typically provided with a denser network of roads, tracks, and paths, and at low road densities they are also more able than Anglo-Americans to enjoy movement across country (rugged access). Given the lack of space in their towns and cities, their recreational pressure on the countryside, and the prohibitive cost of purchasing private recreational retreats, these higher levels of access are both fortunate and necessary. But there is considerable variation *within* West Europe in terms of the amount and quality of access provision, and clear mismatches between the supply of and demand for access. European policy-makers and planners should aim to identify best access practices within each national or environmental setting, and extend these practices to all jurisdictions.

In Anglo-America, lack of cross-country access in settled areas has been partially overcome, by a substantial minority of the population, through the purchase of estate homes in the exurbs, through acquisition of private recreational retreats (cottages, cabins), or through membership in private fishing and game clubs and syndicates (Wolf, 1981, ch. 13). In this way, the private land ethic (Wright and Fesenmaier, 1990), which is partially responsible for lower access levels, is reinforced. As both recreational demand and land prices rise, however, the social inequity of these market responses to scarce access can increasingly be called into question, and the goal of wider public access should be pursued. One strategy is to promote and encourage semi-public land trusts (Wright, 1993; Dwyer and Hodge, 1996), and a neglected alternative is to negotiate access agreements, modelled on British practice (Beard, 1994; Curry, 1994).

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