8.2 The environment of the Applecross Peninsula coastal fringe, present and past | Robert Shiel with Andrew Stewart & Angi Silver

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8.2.1 Introduction

The Applecross peninsula was visited on a number of occasions during the course of the project in order to record present vegetation and soil conditions in the hope that these might throw light on the environmental history of the area. Settlement along the peninsula appears to have been restricted through time to a narrow elevational band, which the topography has confined to within about a kilometre of the modern shoreline. Exploitation of the inland areas is likely to have been limited to seasonal grazing and hunting. This Section therefore concentrates on the coastal fringe. The climate, geology, soils and vegetation of the present day are all examined and the final discussion looks at the changes within these over the Holocene.

8.2.2 Climate

There is no meteorological station on the westward facing side of the Applecross Peninsula and therefore data has been taken for Kinlochewe at 25 metres above sea-level (masl) (see Table 184, below).

Table 184

Month	Max Temp (°C)	Min Temp (°C)	Days of Air Frost	Hours of Sunshine	mm of Rainfall	Rainfall **days ≥1mm**
Jan	6.7	0.6	12.0	18.0	283.5	21.0
Feb	7.2	0.7	10.5	46.0	212.8	17.4
Mar	8.9	2.0	8.2	64.2	226.8	20.5
Apr	11.3	3.1	5.7	101.1	114.9	16.0
May	14.9	5.5	2.3	147.3	94.0	13.7
Jun	16.6	8.2	0.1	124.5	103.8	14.4
Jul	18.3	10.4	0.0	112.8	98.9	15.6
Aug	18.1	10.1	0.0	108.8	128.5	16.3
Sep	15.4	8.0	0.3	81.6	205.4	18.8
Oct	12.4	5.6	2.2	52.4	234.7	21.1
Nov	8.9	2.7	7.5	23.7	287.5	21.4

Dec	7.4	1.4	10.8	14.0	287.1	21.7
Year	12.2	4.9	59.6	894.3	2277.8	217.9

Table 184: Climate averages for Kinlochewe (25 masl) 1971–2000

Because of the proximity to the sea, winter minimum temperatures at Applecross are probably higher and frost less frequent than those recorded in Table 184 (above), but maximum temperatures will be lower. Tiree has higher minimum and lower maximum temperatures with fewer days of frost and rain, but it is not backed by the large massif of Beinn Bhan (896m). The growing season in Applecross is long, but there are few really hot days and many rain days, even in summer. The soil remains wet for most of the year. The whole of the peninsula is exposed to the prevailing wind. This area is not well suited to ripening seed, but it is suited to the production of green vegetables. For humans the major concerns are to keep warm and dry. The availability of drinking water is unlikely to have been a problem even in the driest years. Outside the Applecross Glen the land grades steeply uphill with a resultant decrease in temperature and increase in rainfall away from the coast. The Applecross Glen, and the narrow areas of raised beach to the north and south of it, are the only substantial areas of land with a less extreme climate and thus are likely to have been attractive for settlement throughout the Holocene. Within the Glen frost may be problem throughout the year.

8.2.3 Geology

The Applecross peninsula consists of a massive exposure of Torridonian Sandstone, which extends to both the north and south towards Gairloch and Skye respectively, but is cut off from them by the sea lochs: Loch Torridon and Loch Carron. These sandstones were laid down about 770 millennia ago as erosion occurred from a large landmass in the position of modern northern Skye and Lewis and Harris (Johnstone & Mykura 1989). The rock is an arkose and was laid down under fluvial conditions. It shows strong current bedding and a great deal of local variation. From Applecross southwards it is known as the Altbea formation, while to the north it is the Applecross formation. Both are described as fine to medium grained pale red sandstones (Phemister 1960). The cementing agents and mineral composition of these particular rocks have not been well studied, though examination of local caves suggests that calcium carbonate may be present in some of the deposits as it was observed on cave walls as flowstone. Phemister (1960) does recognise the presence of calcareous material in the Altbea formation. Around Applecross village and in the Applecross Glen there are small outcrops of Triassic and Jurassic rocks. These include limestones and further reddened sandstones. None of these rocks have been subject to major earthmoving forces and consequently retain their original near-level stratification.

The whole area has been exposed to glacial processes, which have deposited a thin and patchy till; this outcrops mostly to the north of Applecross (Geological Survey 1954). Over much of the rest of the area there is either sandstone exposed at the surface or a covering of moraine. The moraine fields vary greatly in stoniness and have a very uneven surface of small rounded knolls. A considerable area is covered in postglacial peat, but this is thin away from the depressions and at lower elevations it would mostly class as a humose layer. The massif to the east prevented movement of ice from other regions across the peninsula so that most of the till and moraines are of local origin from the Torridonian series. One glacier did come down the Applecross Glen, and this may have spread some of the carbonate-rich sediments across the land between Applecross and Sand. The main glacial flow, however, was from south west to north east (Anderson & Dunham 1966). There is a considerable area of alluvium surrounding the Applecross River and this overlies part of the extensive raised beach. Raised beach formations are also extensive from Cuaig to Sand, but they are patchy elsewhere. Glacial and postglacial deposits cover much of the flatter, low-lying land.

8.2.4 Soils (*with Andrew Stewart*)

The typical soil that would be expected on sandstone is a podsol, though in such a wet

climate (see Table 184, above) humic stagnogleys might be expected on slopes with peat in depressions such as Applecross, or by the main road past Sand (Glentworth & Dion 1950). However, it has already been noted that many of the sandstones here appear to be fine textured and there is a thin cover of boulder clay (till) over part of the area, hence a wider suite of soils typical of upland conditions (Askew *et al* 1985) might be expected. On flat areas, blanket peat would form and in depressions, a basin peat. In areas of pan formation, humic stagnopodsols would also be found. The limestone area will have more eutrophic soils, which may range from rendzinas on the slopes through brown earths to, on flatter areas or where there is a thicker cover of till, stagnogleys. The soils of the area have been mapped at 1:250 000 scale (Bibby *et al* 1982) but this only provides a low resolution.

It was not possible to make a comprehensive survey, but the soils were examined at various points along the western edge of the Applecross Peninsula from Cuaig in the north to Uags in the south (below). In addition, land use and modern vegetation were described for each location. As the survey was not comprehensive, no map has been created of the soils (but see Ordnance Survey Landranger map number 24 for the general locations). As the general description of vegetation took place it became clear that the range of species was, in many cases, typical of relict woodland and so a more detailed survey was carried out in various sectors, predominantly in the numerous remaining areas of unplanted deciduous woodland (see below).

8.2.4.1 Cuaig to Sand

Between these two villages the rock is all Applecross formation of the Torridonian sandstone and it has been patchily covered by various glacial and postglacial deposits including raised beach, till, moraine, alluvium, blown sand and peat.

8.2.4.1.1 Cuaig (NGR: NG 705 577)

The settlement lies within the moraine deposit area but the large stream, Abhainn Chuaig, that drains from Croic Bheinn to the south-east has deposited much terrace alluvium and this is described separately. North east of Cuaig in the stream zone, (NGR: NG 706 578), a peat bog is present, thicker than 1m in places with humic sands on the slopes rising away from the flatter stream area. In the area north of Cuaig, west of the chapel ruin, a basin holds humic sands and on the terrace rising immediately to the north-west, a soil (NGR: NG 706 577) shows properties of being buried. This is possibly a buried podsol consisting of a layer of bleached sand underneath 70mm of humus. The soil above the humus is modern cover sand. Much of the vegetation is heather or rough grazing. At NGR: NG 702 576 south-west of Cuaig, still within the moraine landscape, there is some evidence of stone clearance in the form of a low stone wall. This site is almost level, approximately 30m wide with a stream running through the centre. The upper horizon, 200mm deep, was a humic sandy loam overlying a sandy silt loam.

8.2.4.1.2 Abhainn Chuaig (NGR: NG 705 585 to 716 567)

This stream flows north-east into Cuaig Bay (Ob Chuaig), running through a moraine field and undifferentiated drift. Sand accumulation was observed in the form of alluviation and it is possible that this area has experienced both washout and accumulation of sand due to climatic and seasonal changes since the last glaciation; this could have resulted in the buried soil described above. Another buried soil was found on the floodplain area. 200mm of sand lay over 200mm fibrous peat, possibly phragmites, which in turn covered about 400mm of amorphous ‘black’ peat. This build-up is likely to have occurred in relatively recent times given the depth and freshness of the material. Deep peat areas (greater than 1m deep) were common in hollows and depressions. Deep sands,

Illus 557: Sands deposited by the Abhainn Cuaig

several meters deep, are found on the edge of the steep scarp edge (see Illustration 557, right). This sand lies within the undifferentiated drift geology which forms the basis for the surrounding soils. The only other area where deep sand occurred was in the moraine area to the east of the stream and floodplain. Grassland, rather than moorland, is present on the 'in-by' land including the current alluvial terrace around Cuaig, to the south of the stream. This grassland has been improved through grazing and shallow ploughing. The soil was found to have an Ah horizon on sand. The adjacent areas were covered by blanket peat and peat bogs, depending on the local relief and wetness, and the peat was commonly 0.5 to greater than 1m in depth. The woodland areas near to where the stream enters Ob Chuaig were found to contain shallow sands under peaty topsoil.

8.2.4.1.3 Cuaig to Callakile (NGR: NG 695 566)

West from the main road the landform comprises a steep slope that drops to a walled, moderate to gently sloping area and finally meets a steeper sloped shoreline. This plateau is probably the raised beach shown on the geological map. Inland, the boulder clay is largely covered by peat with some evidence for stone clearance. Much of the walled area is covered by 400mm peat which overlies coarse sand. Shallower peat exists on the gentle slopes, but, in localised depressions, coarser peat was found to a depth of 1m. A small area of grassland with Juncus, approximately 10m wide, was found 30m inland from the sea on a gentle slope.

8.2.4.1.4 Lonbain (NGR: NG 688 531)

Illus 12: General view of Lonbain. Back to Section 8.2.6.4.1

This site is adjacent to a previously crofted area. It consists of sandstone outcrops on the steeper slopes and boulder clay over much of the level areas but with alluvium along the stream that flows parallel to the coast. Along the coast the raised beach, described earlier, continues (see Illustration 12, right). Inland, 150m east on steeply sloping ground (NGR: NG 688 532) 300mm of sandy amorphous peat was recorded, overlying sandy loam to clay loam which in turn overlies weathered sand at 500mm. Areas which are level to slightly sloping range from humose sands to peat down to a depth of 300mm, with an underlying thin layer of sand on sandstone. Peat bog areas can be found in slight depressions. The adjacent old crofted area (NGR: NG 688 531) is of a similar geography with locally variable soils ranging from peat or humose sands over sand or sandy loam. Strip cultivation scars are evident and it is possible that some of the variability in soils is due to effects of past cultivation on drainage patterns.

8.2.4.1.5 Salacher (NGR: NG 687 511)

This area is situated where the parent material changes from a thin cover of boulder clay, to the north and east, to sandstone, running along the coastline to the west and

south. Depressions are filled with peat. At NGR: NG 686 511, there is a depression adjacent to the main road holding a peat bog with over 900mm of peat overlying sandy loam. The surrounding area to the west and south was found to be solid sandstone, with boulder clay to the east. Indications of land management exist in the form of a wooden fence that cuts through this site, and joins with the wall that surrounds the woodland at NGR: NG 684 511. This point is on a steep slope of the first ridge to the west which runs parallel to the road and faces east. Small pockets of gleyed soil can be found here, with gleying at approximately 100mm deep. At NGR: NG 663 508, coniferous trees are growing and the soil was found to be a peaty ranker. Since gleying was found adjacent here, it is possible that the trees have influenced the formation of the ranker through processes such as increasing transpiration and improved ground drainage. This suggests that there could be similar soils in other locations where trees have been growing until relatively recent times.

The depression south and west of the trees (NGR: NG 684 507) holds a peat bog greater than 1m deep. The surrounding area running parallel to the coastline consists mainly of blanket peat with small pockets of peat bogs in hollows. The lower lying relief contained the deeper peat, and to the west and south west the peat became deeper, exceeding 1.6m. The ruins of two buildings near to the main road indicate past settlement. Towards the shoreline there is a low walled enclosure of beach pebbles and boulders, within which lies a shallow peat. Beach pebbles underlie this peat, which could indicate a past shoreline. On the 4° slope at NGR: NG 685 507 the soil comprises 300mm of humose bleached sand which overlies a coarse sandy loam, rising to the main road 30m south-east of the trees. This small area has a low wall, and stone clearance piles are present. The vegetation is moss and tussock grass with some Juncus and occasional heather. A few large stones are present on the ground surface. This area also slopes north towards a depression with similar vegetation and soils.

8.2.4.1.6 Sand (NGR: NG 682 506)

Sand comprises a substantial depression sheltered behind a low sandstone ridge to the west that is broken at this point. The depression is partly in-filled with blown beach sand but there are also raised beach deposits, sandstone outcrops and peat in the wetter areas. Thirty metres to the south of the archaeological investigation site, in a slight depression (NGR: NG 682 492), is a peat bog greater than 350mm depth. To the west and south, extending to the military base, blanket bog covers the raised areas while the depressions consist of peat bogs up to 550mm depth. Evidence of past peat cutting was found 50m from the base. Twenty metres south of the road linked to the military base, on the edge of a sandstone-sand ridge (NGR: NG 682 490), humose sand over sand can be found to a depth of 1m or greater. The vegetation here is bracken and grass; Oxalis is also present. South of the ridge, 150m north-west of the settlement remains (NGR: NG 682 489), Juncus and grass persist on 300mm of peaty sand overlying sand. This site slopes gently south-east and is noticeably wetter than could be caused by a spring line. To the east at NGR: NG 683 480, on gently sloping (~2°), south-east facing land, 50mm peat overlies humose sand and has a poor quality grassland vegetation. This area may be affected by increasing salt levels from the sea. There are settlement remains 50m south (NGR: NG 682 488) and here the vegetation is bracken with some grass and sporadic Juncus. This site lies on a slight ridge and the soil is again humose sand. Blown sand underlies a significant area of the archaeological excavation site at Sand. Visually the physical boundaries of this sand can be plotted approximately in line with the change in vegetation from heather to bracken and grassland. Oxalis was noted particularly to the east side of the blown sand area. Blanket peat and peat bogs cover the adjacent areas located on sandstone. Blown sand is now being deposited on the south side of Sand bay, indicating a change in the factors that have influenced the deposition patterns during soil formation at this site. When the site was revisited in 2003 this sand had largely disappeared, demonstrating its dynamic nature.

8.2.4.2 Applecross to Uags

This area is more complex geologically than that to the north. Around Applecross itself there are Mesozoic outcrops including limestones. Along the coast to the South of this is

the Altbea formation of the Torridonian while further inland the Applecross formation continues. The whole area is variously covered by a range of superficial deposits similar to those to the north. Applecross bay contains a substantial undifferentiated terrace with large areas of alluvium overlying the Liassic limestone. There is boulder clay fringing the valley edge above the terrace and together with the Mesozoic sediments south to Camusteel this forms the largest low-lying area south of Cuaig.

8.2.4.2.1 Applecross (NGR: NG 713 442)

There was no sampling on the Mesozoic red clays, sandstones and conglomerates. The area examined was on the Lias limestone (NGR: NG 713 443). This site has a variable cover of moraine. The location is gently sloping and the soil comprises 500mm sandy loam over sandy clay loam. The vegetation is clover grassland, grazed by sheep and cattle. The surrounding landscape has varying slopes from gentle to steeply sloping to the east and south east. It was noted in conversation with the farmer that there are locations on this land where, during heavy rainfall, water disappears from the surface in to natural drainage voids. The farmer also said that the soils on the limestone did not suffer from traffic-ability problems even with seasonal wetness. At NGR: NG 713 442, adjacent to a dried up streambed, the soil is sandy loam to 300mm or greater, and there is evidence of iron movement with oxidised red iron mottles. This indicates that water movement has occurred down the profile causing iron movement with subsequent oxidation after water dispersal. Large trees run along the field boundaries, maple, silver birch and possibly hazel, with a plantation of coniferous woodland to the north east. This was the only substantial farm seen with good quality, well-managed, cultivated land. In the mature beech woodland at NGR: NG 719 455, near the bottom of the slopes of the limestone, is an acid brown earth of sandy clay loam which sits on top of colluvial coarse material. The woodland is undoubtedly planted and the understorey species – including bluebell and primrose – are typical of an amenity area.

8.2.4.2.2 Applecross Glen

The Applecross River enters the Inner Sound at Applecross Bay, north of the settlement of Applecross. The vegetation here ranges from rough grazing to mature mixed deciduous woodland and spruce plantations (see Illustration 558, right). The majority of the higher quality, but still coarse, grazing pasture lies on the flood plain area to the south and south-west of Hartfield. Remnants of cotton grass heads, small areas of Juncus and lady's smock (Cuckoo flower) were observed in this pasture. In the mature mixed woodland between the bay and Applecross house, wood anemone and bluebell were observed in abundance in a deer-fenced exclusion zone. The land surrounding the river comprises a number of soil patterns. Soils covering the immediate floodplain are generally sand to sandy loam. Blanket peat (200–400mm deep), and deep peats (up to and greater than 1m deep), cover much of the land rising away from the floodplain. Evidence of old drainage ditches and the presence of plantations indicate past land management which will have influenced the build up of peat within the river valley. Some of the shallower peats were observed to be sitting on sand or sandy loam soils within 200mm depth. Sands and gravels were observed in natural profiles in a number of places within about 70m of the river, particularly in the mid lower area east of Hartfield and in mid upper areas. The profiles generally have 200mm peat. No buried soils were found. Soil animal activity in the molehills indicates the presence of earthworms, though these were not widespread. Soil wetness is indicated by several molehills in the Beech woodland within 50m of the river, and in the grassland within 20m of the river south of Hartfield, as well as to the east of Hartfield under rough grazing Juncus vegetation. The latter area, a sandy clay loam, may be influenced by the glacial till.

Illus 558: Mixed woodland along the Applecross River.
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8.2.4.2.3 Camusteel (NGR: NG 705 422) and Camasterach (NGR: NG 710 416)

The settlement of Camusteel lies on Applecross formation sandstone but a large area between the coastal ridge and An Glas-tulach is covered with moraine. At NGR: NG 705 426, on sandstone, blanket bog covers the area along the coastline to the west of the road. To the east of the road, the landscape changes to moraine with coarse sandy peat overlying coarse sandy loam on the slope, about 3°, facing east. On the opposing steeper slope, about 6°, facing west, the soil is sandy loam to the surface, with humose sandy loams on even steeper slopes. The ground was very stony, large to medium stones, but there were also molehills present indicating the presence of earthworms and the lighter soils are not particularly acid. This area is densely populated, much of the land is used for crofting and stone clearance cairns are common.

8.2.4.2.4 Ard-dubh (NGR: NG 706 408)

Ard-dubh lies on Aultbea formation sandstone which gives a rougher landscape. It is adjacent to a stone pebble beach and the surrounding land is covered by blanket peat, 300–700mm deep.

8.2.4.2.5 Culduie (NGR: NG 715 403)

The fields in front of this row of croft houses are gentle to moderately sloping on moraine and undifferentiated glacial deposits. The vegetation is essentially grassland which is heavily grazed by sheep. The soils are deep (700mm), humose sands.

8.2.4.2.6 Ardban (NGR: NG 700 397)

Illus 559: Birchwood at Culduie

An area of blown sand surrounded by Aultbea formation sandstone but with peat in the hollows. The inlet on the east side of the Ardban peninsula (NGR: NG 703 392) forms a depression through the landscape. This is only about 15m wide but it holds a soil with humose sandy loams. The vegetation is moss and Juncus with celandine nearby and pockets of woodland grow along the coastline with silver birch, oak and possibly rowan (see Illustration 559, right). The majority of the soils at NGR: NG 701 396 have formed on blown white sand formed from calcium carbonate-rich shells ($CaCO_3$). This has resulted in the formation of an alkaline soil, as indicated by the pH results (see Table 2, below), with 200mm humic sand over white (machair) sand. The vegetation is grassland and it is heavily grazed by sheep. White sand and shells are present in the small bay to the south of the Ardban settlement from which the soils extend. Away from the coastline, this area of sandy soil is surrounded on all sides by blanket bog and occasional peat bogs. Peat cutting was being carried out during the site visit.

Table 2

Location	Number of caves / rockshelters	Lithic scatters	Find spots	Shovel pitted raised beaches	Open Midden
Loch Torridon	12	3	2	4	
Loch Carron	17	3		3	
North Applecross	13		2		
Mid	17		1	3	3

Applecross					
South Applecross	25			1	1
Islands	53	11			
Trotternish	3	11	1		1
South Skye		2	1		4
Totals	140	30	7	11	9

Table 2: Survey sites by type and area (repeated from Section 2.1)

8.2.4.2.7 Toscaig (NGR: NG 713 385)

Illus 560: Birchwood near Toscaig

Much of this area is located on Aultbea formation sandstone with Toscaig itself located on the edge of a low raised beach. There is also an area of alluvium brought down by the River Toscaig from Coire Dubh. The land rises steeply to the west and east of Toscaig. Most of the area surveyed is covered by blanket peat and heather moorland, with small (~0.5m) silver birch saplings and bog myrtle (*Myrica gale*) found locally. Silver birch is found most commonly near rocks and rocky outcrops where peaty or organic layers were thinner (less than 0.4m), and in rock fissures. Parts of the Toscaig peninsula have been fenced off to reduce deer damage and help regenerate woodland (see Illustration 560, left). Anecdotal evidence from a local resident suggests that, although the regeneration scheme has only been going for five to six years, there is a distinct increase in the number of trees. This would tie in with the significant number of small silver birch saplings found at all elevations.

Illus 561: Reddened mineral soil at Toscaig with Birchwood in background

Localised small (<100m²) peat bogs are commonly found in depressions and where drainage lines are interrupted by gentler relief over the whole area. Depths are often between 0.5–0.9m, but occasionally greater than 1.6m. Larger areas of peat are also found, together with a significant area of raised bog. These deeper peats are commonly covered by sphagnum moss, some cotton grass, bog myrtle and lousewort. They are often surrounded by blanket bog, as at the edge of the short valley (NGR: NG 707 376) and organic soils, generally peaty loams, continue up the steep sides, particularly on the south-east facing slope where silver birch and oak woodland grows. Though most of the soils over the Toscaig area are generally peaty or humified, at least at the surface, mineral topsoils of particular interest are found near NGR: NG 710 383 (see Illustration 561, right). These are sandy loam to sandy clay loam soils set in colluvial material on exposed south to south east facing slopes. However, these soils are not found on or near other ridges and rocky outcrops on the same geology. This suggests that the geology at this location is an anomaly, and likely to be of localised influence. This ridge and its associated soils may be more base and mineral rich than the rest of Toscaig. Indications of these qualities include the presence of earthworms, a leatherjacket, a diversity of woodland plants and a patch of nettles (indicating soil fertility), which was found on the lower south facing slope. Earthworm activity indicates free drainage and a pH that is likely to be less acid. Previous pH analysis of soils from this site (see Table 185, below) confirms this with a pH of no less than five.

Table 185

Location	Depth (cm)	pH

Cuaig	0–20	4.6
Cuaig	20–30	4.6
Lonbain	0–20	5.1
Applecross	0–20	6.0
Applecross	0–20	5.7
Ardban	0–20	7.2
Ardban	20–30	7.4
Toscaig	0–10	5.0
Beach sand	0–20	8.2
Sand roadside	0–15	4.1
Sand roadside	15–25	4.3
Sand roadside	25–35	4.5

Table 185: pH of samples from Applecross peninsula; Back to Section 8.2.6.4.1

Given these seemingly more biologically active soils, in terms of meso-fauna, and potentially more fertile soils, it is likely that the soils and plant life further down slope are influenced by the quality of through-flowing water, thus increasing biological activity lower in the catchment area. Mid and lower moderate to steep slopes to the east and south-east of NGR: NG 710 383 tended to vary in wetness, and consequently ground flora changes occur, with flag iris in the wettest area of the woodland. Stone clearance indicates some form of past land management. At NGR: NG 709 381, 50m north west of the harbour in a north-west to south-east trending valley, the vegetation is moss, tussock grass and deciduous woodland, mainly mature silver birch. A peat bog, 500–700mm deep, is located here overlying 100–200mm of humose sand on sandstone. Lonicera and bilberry were found growing on the rising ground to the north-west, as was Oxalis, grading in to heather and bracken on the steeper ground rising north out of the valley. In a flat L-shaped basin (NGR: NG 709 383) is a peat bog to a depth of greater than 1m with a small lake to the north west. The ground rises to NGR: NG 709 385 where there is a moderately sloping (10°) south to south-west facing gully and the vegetation consists of a number of flowering plants including Oxalis, dog violet, celandine, primroses and grasses. Bracken is also common. The soil is a dark reddish brown sandy loam to sandy clay loam, 200mm thick, overlying coarse sandy loam.

Deciduous woodland is situated on most of the surrounding slopes and even on some of the more exposed sites (see Illustration 21, right). The steeply rising ground to the north and north-west has sandy loam soil approximately 300mm deep. On the hill top overlooking NGR: NG 709 385, the site is very exposed, with blanket peat dominating. However, a number of young silver birch grow here, approximately 0.5m in height. This area has a recently erected deer exclusion zone and it may be that the control of deer is aiding the regeneration of woodland.

Illus 21:General view of Toscaig

In a gully cutting through the Shalach peninsula at NGR: NG 685 377, from south east to north west between Loch Toscaig and the west coast is a raised peat bog greater than 1m deep. There is an inlet from the Loch to the south-east, which is rocky. In the transition zone between the peat bog and the rocky shore line the vegetation includes primrose, bracken, reeds and celandine. Silver birch and oak trees are present on slopes on the north side and on some of the east-facing coastline, with young silver birch growing sporadically over most hills. The majority of this very hilly landscape is covered by blanket bog to a depth of 200mm or more, with small peat bogs in depressions. There is evidence of old peat cuttings on the top of the hills to the south of this gully.

8.2.4.2.8 Uags (NGR: NG 724 350)

The site was visited briefly but, as the season was late, flowering was over and plant recognition difficult (see Illustration 562, right). The location is at the far south tip of the Applecross peninsula and is on the Torridonian Sandstone, which at this point dips more strongly. There is no substantial till or moraine in the area. As elsewhere, the soil consisted of thin podzolic soils over the sandstone whilst in hollows and on level sites thin peaty soils form.

Illus 562: Oakwood at Uags

8.2.4.3 Synthesis of soil examination

The soils are dominantly humose gleys with peat in hollows and on flatter areas. This accords well with Bibby *et al*'s (1982) examination which places the soils dominantly in the peaty gley (humic stagnogley) and peaty podzol with iron pan (humic stagnopodsol) groups. In agreement with these authors the soils on Mesozoic rocks are brown forest soils. Cultivation of the soils has disturbed the peaty top at many locations and this is now seen as a humose rich topsoil. On the areas where moraine is the parent material the soils are stonier, where till is present there is more peat, and the peaty horizons tend to be thicker on the gleys. The only deep peats found were in hollows and it appears that these have been wet centres from which the peat has spread out across land which originally had mineral soils. This process of engulfment of mineral soils is common and can easily lead to the view that the soils were formerly wetter than in fact they were. Without detailed radiocarbon dating within the peaty hollows, it is impossible to date the spread of peat and the associated wettening of the environment. Nevertheless, one can be certain that in the early postglacial the soils here were dominantly mineral to the surface and only after woodland clearance did the spread of peat became more widespread.

8.2.4.4 Soil pH Measurements

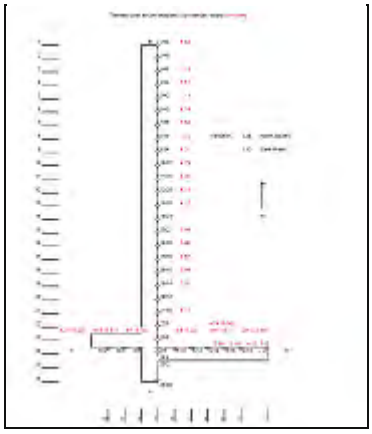
Samples were taken at a range of depths from the soils described above at Cuaig, Lonbain, Applecross, Ardban, Toscaig and Sand. In addition a sample of beach sand was taken from the foreshore at Sand. The soil samples for Sand are from a roadside profile on the uphill side of the Applecross to Cuaig public road 400m north of the road junction at Sand (NGR: NG 685 495). Samples were collected, and analysed, separately along transects A—B and C—D of the dig at Sand.

The samples were dried, the soil within them was mixed thoroughly and a sub-sample of 10g was mixed with 40ml distilled water, allowed to equilibrate for ten minutes and the pH measured with a glass electrode.

The pHs (see Table 185, above) are remarkably high considering the high rainfall (see Table 184, above), nutrient poor parent material of sandstone, and the presence of surface organic matter accumulations. It may be that some of the Torridonian sandstone has carbonate present as a cementing agent, as described above, but this remains to be confirmed. The lowest pH was on the roadside near Sand and though the pH was low throughout the profile here it did increase with depth, as expected. The increase in pH with depth would ensure that plant roots could easily reach soil of a more moderate pH. In addition, the rapid increase in pH with depth indicates that in the past the pH throughout the profile would have been considerably higher and would have supported a more eutrophic vegetation than that of today. Where there is any soil disturbance, as has occurred along the roadside due to the construction of the road, soil with a pH high enough for a wider range of species has been exposed and remnant woodland understorey species such as foxglove are commonly seen in these situations.

The beach sand has the expected high pH. The very obvious movement of this sand, noted in the bay at Sand, and blowing of it and sea water onto the area close to the shore has helped to

maintain a higher pH environment than would be expected further inland. It is common to find that the plants along the shoreline are not only tolerant of some degree of salt spray, but also prefer a higher soil pH. There was no good evidence that this sand has affected the pH of soil other than on the foreshore. However alkaline spray drift from the sea is likely to have had an impact over the relatively narrow range from which samples were taken. None of the samples were from the deeper organic soil, in which low pH would be expected.



Illus 563: Sand – transect plan for pH analysis (soil sample locations, pH in red)

The samples taken from the dig site transects (see Appendix 32 & Illustration 563, archive version of the chart on p11 of report) varied in pH from 3.67 to 7.59. Twenty-five of the samples had a pH below 5.5, at which bone would disappear rapidly, and of these 12 had a pH below 4. There were also ten samples with a pH above 6; at this pH bone would be preserved well over a long period. The variation in pH within the dig site is due to the presence of acidic peat associated with some of the samples, the formation of this probably started soon after the site was occupied. In addition, the large amounts of crustacea and shells in parts of the midden have helped to maintain a higher pH. It does not seem that the mobile sand of high pH, seen in 2001 at the south end of Sand bay, has ever moved substantially to the north across the excavated area. In 2003 this sand blow had vanished.

The figure at the bottom of the Illustration shows the pH variation along the transect; all of the higher pHs are found close to the intersection of the two transects, at the point where the shell midden was deepest.

8.2.5 Vegetation (*with Angi Silver*)

The vegetation descriptions above indicate a wide diversity of flora, some of which suggests that there are relict native woodlands (see Illustration 564, right). As a result, a more detailed botanical survey was carried out, predominantly in areas of existing deciduous, apparently natural, woodland and also at Sand, where there was great interest in the possible presence of former woodland.

Illus 564: Mature birch

The woodlands are mainly linear in shape. Originally, it was intended to survey ten metre-wide transects of each woodland, but this was not always practical due to the steepness of the terrain and existence of narrow shelves or ledges of rock. The area was thus traversed wherever the terrain permitted. Most of the plants were identified to species level and the rest to genus. Obviously, a survey of this type is limited to the plants that are in evidence at the time of year (May in this case). As these are deciduous woodlands, however, most of the flora is spring flowering. The frequency of each species of tree is reported as a percentage of the total number of trees and the same for the understorey plants.

8.2.5.1 Locations

Surveys were carried out at the following locations:

8.2.5.1.1 Sgeir Shalach. NGR: NG 704 366

20–30m asl. A narrow inland gully about 800m long running approximately north to south. There was a rock face to the west with the flora on the eastern slope.

8.2.5.1.2 Toscaig 1. NGR: NG 707 370

20–40m asl. A strip of woodland about 800m long, running north to south, parallel to the coast south of Toscaig. Facing east. It was generally quite wet with a central boggy area of grass and sphagnum mosses.

8.2.5.1.3 Toscaig 2. NGR: NG 705 377

20–30m asl. On the north-east hillside of a wide valley about 1600m long running north west-south east inland, perpendicular to the Toscaig coast. This area was dry and very rocky and steep. Most of the flowering plants were on the lower part of the slope where more soil was present. Higher up there were mainly trees, mosses and lichens. There was no sphagnum present.

8.2.5.1.4 Toscaig 3. NGR: NG 707 377

30m asl. Woodland adjoining Toscaig 2, running north to south for about 800m, parallel to, but away from, the Toscaig coast. This was dry at the southern end becoming wetter towards the north. It was on several levels of rock ledges facing east. Species-poor compared to the other sites.

8.2.5.1.5 Toscaig 4. NGR: NG 708 377

20m asl. This wood is parallel to the previous one and adjoins Toscaig 2 at the southern end. It runs parallel to, but does not face the coast. About 800m long on rock ledges facing west.

8.2.5.1.6 Ardban. NGR: NG 704 395

0–20m asl. Running roughly north to south for about 800m. A steep rocky slope with a rock face at the top and the sea at the bottom. Mainly dry with almost no sphagnum.

8.2.5.1.7 Coillegillie. NGR: NG 702 387

20–50m asl. A T-shaped area of woodland. The north to south part, which was about 1600m long, was surveyed and was fairly flat with a stream and open grassy strips. The northern part was fairly dry but it got wetter to the south.

8.2.5.1.8 Toscaig 5. NGR: NG 709 382

10–50m asl. About 1600m long running SSW-NNE parallel to the road from Toscaig to the pier. There were some fairly large oaks here and some big hazels which looked as if they had been coppiced some time ago. There was also an old tumbled down stone wall. The whole place felt very ancient. There was lichen on everything. The southern end of the wood was quite open and flattish with a stream and boggy area with sphagnum, then going down a steep gully towards the north to a more species-rich boggy area at the bottom.

8.2.5.1.9 Sand area.

Plants were identified but no percentages were estimated.

Sand 1 By the road to the south of the car park NGR: NG 683 491 0–10m asl
Sand 2 Boggy coastal meadow NGR: NG 683 490 0–10m asl
Sand 3 Bank near car park, below rockshelter NGR: NG 683 492 0–20m asl
Sand 4 Outside rockshelter NGR: NG 683 492 10–20m asl
Sand 5 Near ruined house NGR: NG 682 489 0–10m asl

8.2.5.1.10 Cuaig NGR: NG 703 585

0–20m asl. A brief survey of a small strip of woodland north of Cuaig, opposite Reaulay. A steep slope parallel to and going down to the sea.

8.2.5.2 Species found

The number of species found and most common species is shown in Table 186, below. Birch is by far the most common arboreal species (see Table 187, below). Only at Uags (surveyed separately in October) and in the planted woodlands around Applecross are other tree species common or dominant. Birch is clearly able to regenerate freely when grazing is suppressed.

Table 186	
Toscaig 1	17 species; birch, bracken, bilberry
Toscaig 2	22 species; birch, bracken, bilberry, wood sorrel
Toscaig 3	14 species; birch, bracken, northern bilberry
Toscaig 4	16 species; birch, bracken, northern bilberry
Toscaig 5	29 species; birch, bracken, tormentil, bluebell
Sgeir Shalach	12 species; birch, bracken, wood sorrel, sweet vernal grass
Ardban	23 species; birch, bracken, wood sorrel
Coillegillie	16 species; birch, bracken, wood sorrel, bilberry

Table 186: Applecross peninsula vegetation survey, number of species found and most common species

Table 187	
Tree species	%
Alnus glutinosa	1
Betula pubescens	92
Corylus avellana	1
Quercus petraea	2
Sorbus aucuparia	4

Table 187: Proportion of tree species averaged across all woodlands

A wide range of herbaceous species was recorded, of which bracken was the most common overall, but with considerable amounts of *Vaccinium* and *Oxalis* (see Table 188, below). Excluding grasses and mosses a total of 66 species was identified.

Table 188	
Species	%
Hyacinthoides non-scripta	3
Oxalis acetosella	10
Potentilla erecta	6
Primula vulgaris	2
Pteridium aquilinum	21
Vaccinium myrtillus	10
Vaccinium uliginosum	2

Viola riviniana	3

Table 188: Most common herb species averaged over all woodlands

8.2.5.3 Comparison with previous documentation on Scottish woodlands

According to McVean and Ratcliffe (1962), most highland birchwoods fall into one of two categories: *Betuletum* Oxaleto-Vaccinetum (bilberry-rich birchwood) or *Betula*-herb nodum (Herb-rich birchwood). Bilberry and wood sorrel are two of the main indicators of the Betuletum Oxaleto-Vaccinetum type of woodland along with rowan, bracken, hard fern, tormentil and so on, all of which were found by the survey. McVean and Ratcliffe also include *Galium hercynicum*, (now called *Galium saxatile*) or heath bedstraw as a constant, and this was not found, perhaps because it does not usually appear until later in the season. The Betula-herb nodum differs in the virtual absence of *Vaccinium* species and the appearance of *Anemone nemorosa* (wood anemone) and *Conopodium majus* (pignut) which were not recorded by the survey. Wood anemone is a spring flowering plant, and should have been visible had it been present. It is thus possible to conclude that the woodlands surveyed were of the Betuletum Oxaleto-Vaccinetum variety.

A noticeable feature of the woodlands recorded was the lack of age structure. There were many mature trees, including some quite large and old specimens, as well as a lot of small seedlings in some areas, but almost no saplings or young trees. This could be due to past grazing by deer, in some places now prevented by fencing as described earlier. There were also many trees with multiple trunks, probably created by previous coppicing (see Illustration 565, right). There was no sign of recent management of any of the areas surveyed.

Illus 565: Pollarded birch

Illus 566: Woodland plants, including bluebells, at Sand

At Sand, which is without trees, several species were recorded which are normally associated with woodlands, such as bluebells, wood sorrel, dog violet, lesser celandine and primrose (see Illustration 566, left). This could mean that woodland was once present. It is possible that there has been woodland all along the coast from Cuaig to Toscaig at some time in the past.

The oak-rich woodland near Uags, was subsequently examined in the autumn (see Illustration 567, below right). It appears much larger on the 1899 Ordnance Survey map used as the base for the geological map (Geological Survey 1954) than on the modern map. Today, oak woodland (estimated 10–13m tall) grows from the coastal edge, up the stream gullies, adjacent to and rooted into sandstone rock. Very occasional silver birch and rowan are also found. The ground vegetation is generally moss, bracken and sedges rising to heather on the crags. Occasional wild mint, bramble, fern, common blueberry and primrose were also recorded. This site was formerly inhabited so that care must be taken in drawing conclusions as to the origins of the woodland. Nevertheless, it is clear that oak can flourish in the area, in this case below about 50m OD. Oak was noted in the other woodlands examined but it was uncommon (see Table 187, above). As Uags is exposed to uncontrolled sheep grazing it is not possible to assess the potential of the oak trees to regenerate from seed.

An examination was also made of the woodlands on the limestone near Applecross. An area of sycamore and oaks included tormentil, wood sorrel, wood anemone, celandine, bluebell, primrose and nettles. Buttercups, foxglove, bracken, bramble, moss, grass, violet and Juncus were found in an area of mature beech trees. Adjacent to this was an area dominated by silver birch and rowan on

Illus 567: Oak-rich woodland at Uags

moister more humose top soils, with Juncus, moss and grass vegetation. Heading down slope towards Applecross House, younger woodland occurred with beech, silver birch and chestnut, and ground flora including bluebell, primrose, and dandelion. On a lower managed area near the house one *Araucaria* (monkey puzzle), horse chestnut, holly, sycamore, beech, bluebell, fern spp, oxalis, and rhododendron occurred. In woodland to the south of Applecross house on gently sloping land (~2°), silver birch, rowan, larch, beech, rhododendron, foxglove, bramble, bluebell and holly occurred.

8.2.6 Discussion

The whole area is striking for a general lack of peat and the presence both of rock and soil close to or at the surface. In addition, there is a flora which is typical of soils that are drier and less acid than might otherwise be expected. This is not to say that peat does not occur, most of the hollows and flat areas are filled with peat to one metre or more depth, but in many places mineral material is found usually within about 500mm. This indicates that, in the past, the environment was able to support a wide flora and fauna, and would have been relatively productive, given the long growing season at low elevations. In the following discussion, the acidity, wetness, soil development, flora and the environment are considered both with relation to human occupation through time and to the preservation of archaeological artefacts. Although described separately, it is obvious that these factors are strongly interlinked and that they have a considerable cumulative effect.

8.2.6.1 Soil Acidity

As it is near to the coast the area already receives two main inputs of base-rich material: sea spray and shell fragments. Strong and frequent winds mean that there is a considerable carry of sodium, potassium, magnesium and calcium inland. These conditions would commonly maintain the flora associated with a eutrophic environment, as elsewhere on the coast, but here the extent of this aeolian effect may be more pronounced. There is also considerable exposure of shell sand in the bays. The sand is less mobile than the spray but it has certainly had an impact on low-lying areas around the inlets perhaps over as much as 50m. In addition to these sources, parts of the sandstone contain an unusually large amount of bases, so that these three factors combined may be responsible for maintaining the pHs noted in Table 185 (above) and Illustration 12, (above). An active vegetation which transpires large amounts of water and takes up base nutrients from depth has also helped to develop this environment. The vegetation discussed below certainly suggests that until relatively recently a rather better suite of soils than now visible has been preserved; even today the soils are relatively good for the location.

8.2.6.2 Wetness

The immediate post-glacial rainfall is usually considered to have been somewhat lower than that today, though from the beginning of the Atlantic period, about 5,300 BC, rainfall increased to at least as much as present. The lower rainfall coupled with the suggested deciduous woodland vegetation discussed below would have provided a much drier environment; even today the planting of coniferous vegetation leads to substantial drying of the soil. For as long as the deciduous woodland persisted, the soils and environment would therefore have been drier, and there would also have been collateral benefits from better shelter and fuelwood supply. Before peat development, the mineral soils would have tended to shed water rapidly, also leading to a drier environment which

warmed up quickly in the spring. As peat spread the water held in the organic matter would make the whole area cooler and damper.

8.2.6.3 Soil development

The lack of widespread podsolisation of soils developed from sandstone under high rainfall was initially surprising, but in view of the higher pH and presence of deciduous trees even today on areas where grazing animals are restricted, it seems that for much of the postglacial period past soils have comprised acid brown earth on slopes. In flat areas and hollows, gleys and peats began to develop from an early date, though much of the gleying could post-date woodland clearance. As acid brown earths, probably with some gleying, there would have been a thick humus mat under woodland conditions, once the woodland was cleared this would rapidly transform into the incipient humose horizon or thin peat as seen today. The localised peat deposits with thin organic tops on other soils, represent the end point of soil evolution and the organic matter would have been less extensive in the past. Care in generalising this argument is, however, essential as, from the clearance of the woodland, peat cutting must have limited the extent of the peat deposits today. The anthropogenic effects need careful interpretation, but the properties of most soils today are a function of human interference.

8.2.6.4 Vegetation (*with Angi Silver*)

It is debatable whether oak woodland was ever extensive in the area, though a wide range of tree species can clearly tolerate the present conditions on the more eutrophic soils – and these were more widespread in the past (see Illustration 558, above). Even today some of the species can propagate freely when grazing livestock are excluded. The widespread presence of understorey species away from human habitation and modern woodland indicates that woodland was formerly much more extensive at low altitudes. It must be concluded, therefore, that all of the area under consideration had deciduous woodland cover at some time during the Holocene. This is supported by other specialist studies (see Sections 3.15 & 8.1) and it has major implications for the archaeological interpretation of the environmental conditions and resources in the area.

Files cited in the text

All files start from ads.ahds.ac.uk/catalogue/resources.html?sfs_ba_2007 > Downloads > …

… > Documents > Final Reports > Shiel,_Environment_and_soils_of_Applecross_Penninsula.pdf