Applecross Peninsula Soil Survey 2002
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Introduction:

A soil survey was conducted over a 3.5 day period over to further the understanding of the current and past environment and formation of soils in the area. The study used information from a preliminary study made in 2000 as guidance to look for soil variation and patterns throughout four main areas:- Cuaig, Sand, Applecross and Toscaig.

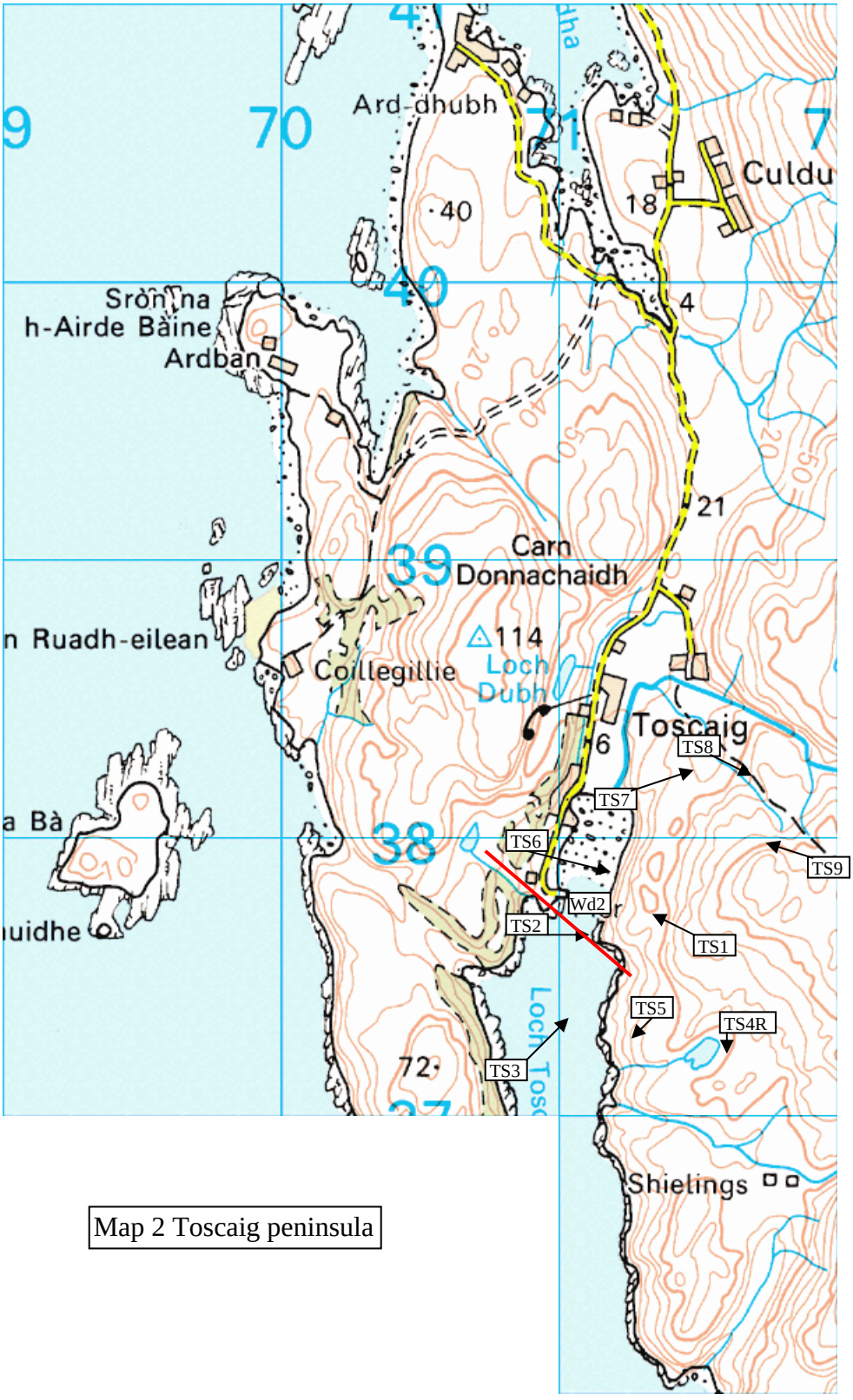
Map 1 Survey location

Source: http://www.streetmap.co.uk/streetmap.dll?G2M?X=161520&Y=841360&A=Y&Z=5

The climate is likely to have had a marked influence on soil formation and vegetation throughout this area, however given the field observations, I would suggest that geology, relief and subsequent drainage are also of particular importance in the ability of this land to be productive and to be used locally as a resource and “home”.

Day 1 was spent studying Toscaig, day 2 centred on Chuaig stream and Applecross river, day 3 was spent surveying peat distribution in the Sand vicinity and additional time was used to check over some of the soils on the limestone area particularly in the Beech woodland adjacent to the roadside and Applecross bay.

Day 1. Sunday 12th May. **Toscaig peninsula**



Map 2 Toscaig peninsula

Most of the area surveyed is covered by blanket peat and heather moorland, with small (approx. 0.5m) silver birch saplings and Bog Myrtle (*Myrica gale*) found locally common. Silver birch was found most common 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 to help regenerate woodland over the area. Anecdotal evidence from a local resident suggested that although the regeneration scheme had only been going for 5 to 6 years, a distinct increase in the number of trees growing over the area had been observed. This would tie in with the significant number of small Silver Birch saplings found at all elevations studied.

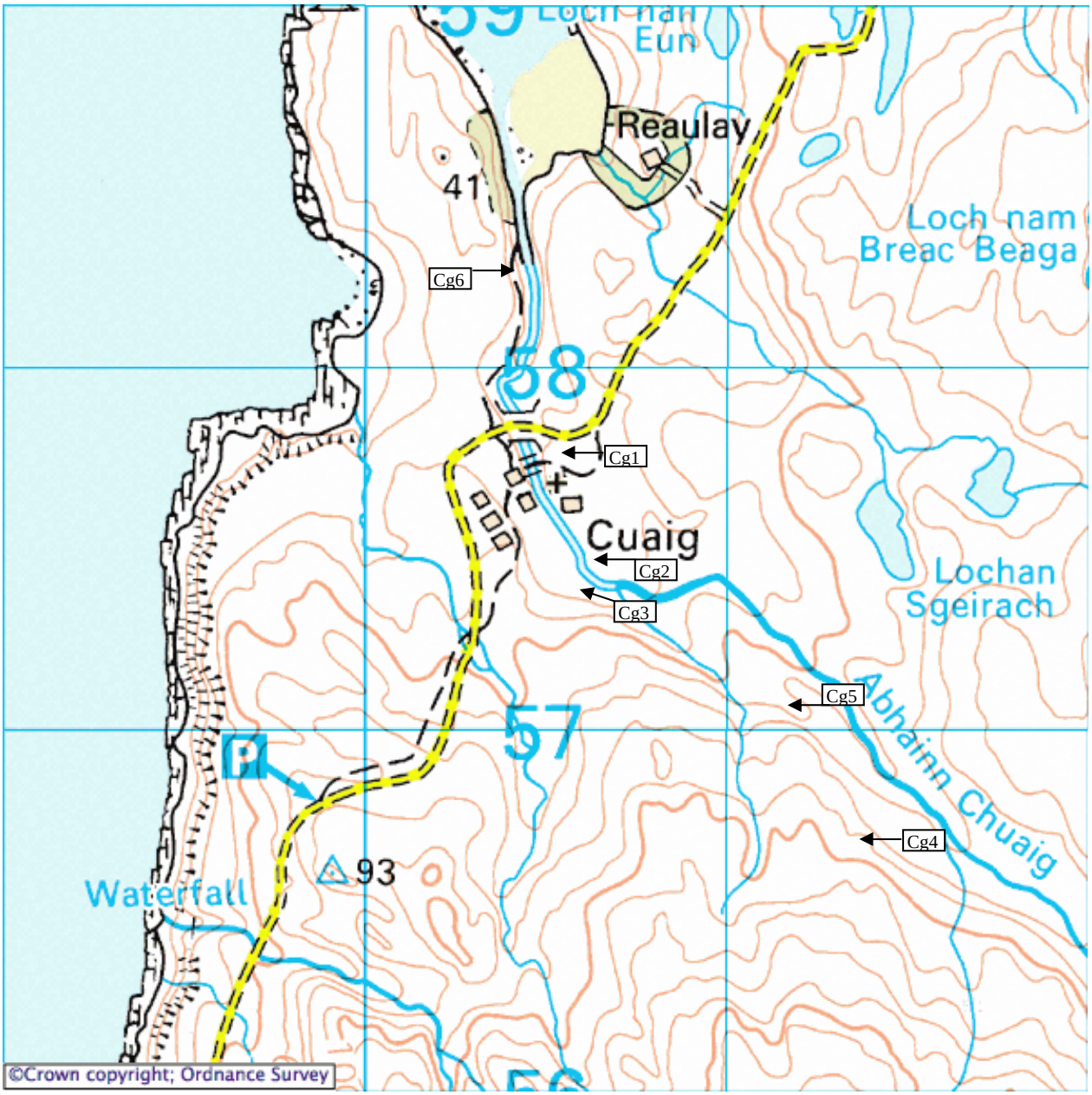
Localized small (<100m^2) peat bogs were commonly found in depressions and where drainage liners were interrupted by gentler sloping relief over the whole area. Depths were often between 0.5 – 0.9m and were occasionally measured at greater than 1.6m. larger areas were also found such as at reference points TS1 and TS3, and a significant area of raised bog was located at TS2 (Map2). These deeper peats are commonly covered by sphagnum moss, some cotton grass, Bog myrtle and lousewort.
TS2 is surrounded by blanket bog at the edge of the short valley (transect line cutting through TS2) and organic soils, generally peaty loams, continue up the steep sides, particularly on the South East facing slope where silver birch and Sessile Oak woodland were growing (Wd2).

Though most of the soils over the Toscaig area were generally peaty or humified at least at the surface, mineral top soils of particular interest were found down slope from a specific ridge between TS7 and TS8. Sample TS8 (see Appendix) is representative, though slightly deeper, of the physical properties observed in these soils in the field. These hand textured sandy loam to sandy clay loam soils were set in colluvial material on exposed S-SE facing slopes, originating from the Torridon Group geological formation. However these soils were 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 localized influence.

This ridge and associated soils may be more base and mineral rich than the rest of Toscaig. Indications of these qualities include the presence of earthworms, a leather Jacket, a diversity of woodland plants (see Appendix) and a patch of nettles (indicating soil fertility) which was found on the lower S facing slope, adjacent to sample point TS8. Earthworm activity indicates free drainage and a pH which is likely to be less acid. Previous pH analysis of soils from this site (sample T3, SFS 2000, Data structure report) confirm this with a pH of no less than 5. Given these seemingly more biologically active soils, in terms of mesofauna, and potentially more fertile soils, it is likely that the soils and plant life further down-slope will be influenced by the quality of the through-flowing water, increasing biological activity lower in this catchment area.
Mid and lower moderate to steep slopes to the E and SE of TS8 tended to vary in wetness, and consequently ground flora changes occurred, with Flag Iris found in the wettest area of the woodland. Some form of land management has occurred in the past where stone clearance had occurred at TS9 (see Appendix).

Day 2. Monday 13th May. **Cuaig stream (Abhainn Chuaig) and River Applecross**
Both Cuaig stream and the river Applecross were surveyed from mouth up to about the 80m contour inland. The purpose of exploring these watercourses. The purpose was to look for old terraces, buried soils and soil patterns.

Cuaig stream (Abhainn Chuaig)



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source: http://www.streetmap.co.uk/streetmap.dll?G2M?X=170369&Y=857669&A=Y&Z=3

Abhainn Chuaig
This stream runs through a Moraine field and undifferentiated drift, flowing north east into Cuaig bay (Ob Chuaig). Cg2 (see Appendix) is an example of the soil developing within lower lying moraine deposits. Sand accumulation was observed in the form of alluviation and it is possible that this area has experienced both washout and accumulation of sand during climatic and seasonal change since the last glaciation. This could have resulted in buried soil. However the only buried soil material was found near Cg1, on the floodplain area. 20cm of sand lay over 20cmfibrous peat, possibly phragmites,

which in turn covered about 40cm of amorphous “black” peat. This burial is likely to have occurred in relatively recent times given the depth and freshness of material.
Cg3 is a typical example of the Cuaig stream flood plain with 20-40cm blanket peat over coarse dark brown sand. Deep peat areas (greater than 1m depth) were common in hollows and depressions between Cg4 and Cg5 and further upstream.
Deep sands, several meters depth, are found at Cg6 on the edge of the steep scarp edge. 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 probably been improved through grazing and shallow ploughing which was observed. The soil was found to be similar to Cg2 with an Ah layer 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 than1 meter in depth. The woodland area near where the stream enters Ob Chuaig were found to contain shallow sands under peaty topsoil.

River Applecross. This map includes mapping data licensed from Ordnance Survey
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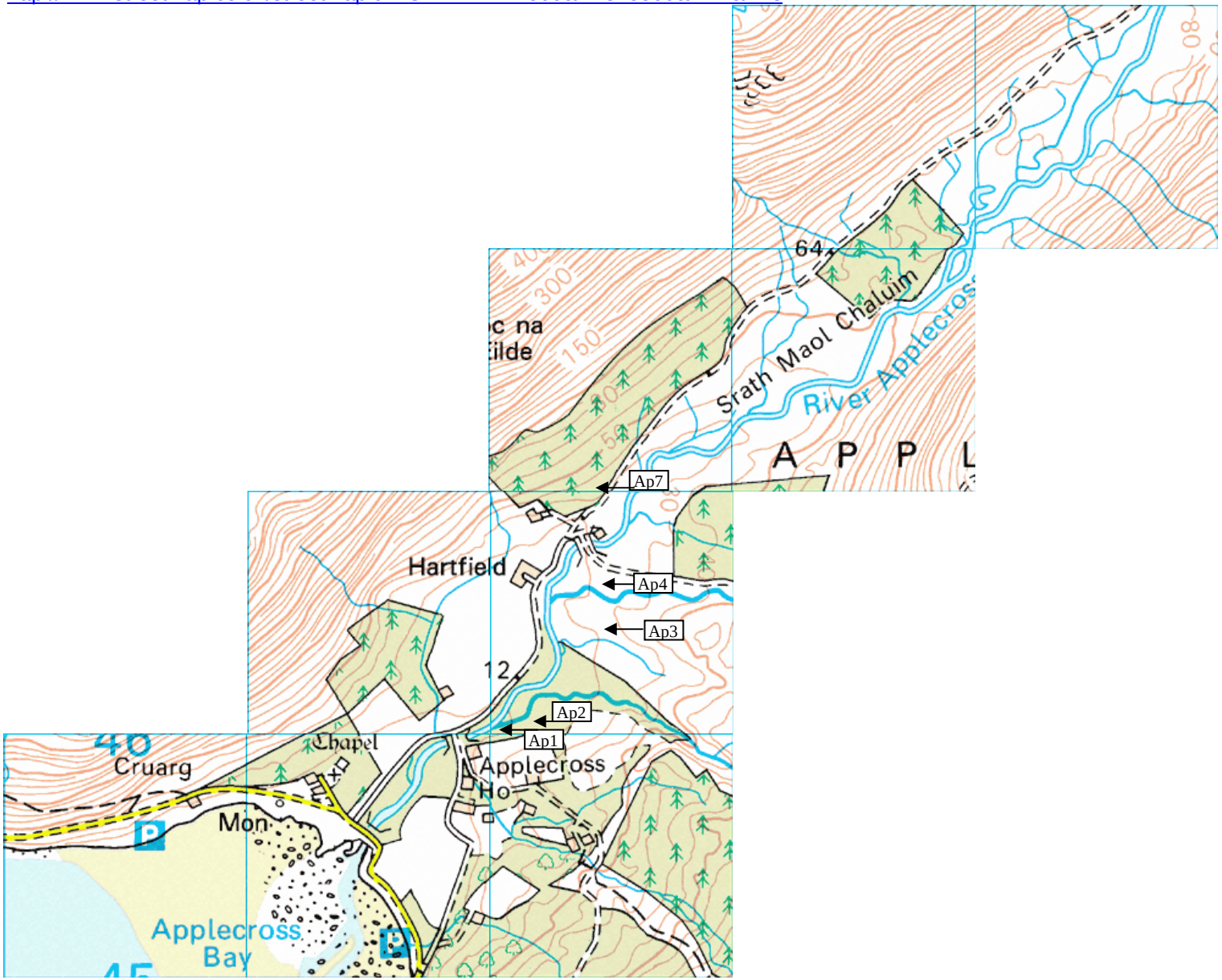


The Applecross River enters the Inner Sound at Applecross Bay, north of the settlement of Applecross. The vegetation in this area ranges from rough grazing to mature mixed deciduous woodland and spruce plantations. The majority of the higher quality, but still coarse grazing pasture lies on the flood 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, in an area deer fenced, possibly for regeneration, Wood Anenome and Bluebell were observed in abundance.

The land surrounding the river comprised a number of soil patterns. Soils covering the immediate floodplain generally hand textured as sand to sandy loam. Blanket peat 20-40cm depth and deep peats (up to and greater than 1m depth) cover much of the land rising away from the floodplain. Evidence of old drainage ditches and the presence of plantations indicate that some form of past land management has occurred which will have influenced the build up of peat within this river valley. Some of the shallower peats were observed to be sitting on sand or sandy loam soils within 20cm depth. Sands and gravels were observed in natural profiles in a number of places along the river, within about 70m radius, particularly in the mid lower area east of Hartfield and in mid upper areas. The profiles generally contained 20cm depth peat on the top. No buried soils were found.

Soil animal activity was found in the form of molehills, indicating the presence of earthworms, although these were not widespread. Several molehills were found in the Beech woodland near Ap1, within 50m of the river, and within 20m of the river south of Hartfield in the grassland and east of Hartfield under rough grazing-Juncus vegetation indicating soil wetness. This latter area, which hand textured as sandy clay loam, may be affected by the glacial till found at the profile Ap7 (see Appendix). Since moles are evident, earthworms will also be present and this would indicate that the soils are above a pH of 4.

Day 3 Tuesday 14th May. Sand.

A survey was carried out in the vicinity of Sand to determine peat distribution and soil development. An example of soil formation is described from North of Sand at Sd1 (see Appendix), and depths of peat were measured using a graduated wooden rod of length 1.6m. The area surveyed was from the stream to the north (adjacent to Sd1), and west of the coast main road.

The basic pattern was that the lower lying relief contained the deeper peat, and the further west and south west you travel the deeper the peat, up to depths greater than 1.6m.

Ruins of 2 buildings were found near to the main road down on the level relief indicating a past settlement. An area close to this towards the shoreline had a low wall enclosure, of beach pebbles and boulders, within which a shallow peat occurred. Plants on this included Oxalis, rough grazing and moss. Beach pebbles were found underlying this peat which could indicate a past shoreline.

Sand. This map includes mapping data licensed from Ordnance Survey
Source: http://www.streetmap.co.uk/streetmap.dll?G2M?X=167500&Y=848500&A=Y&Z=3

Day 4. Wednesday 15th May. Applecross vicinity – limestone soil investigation.

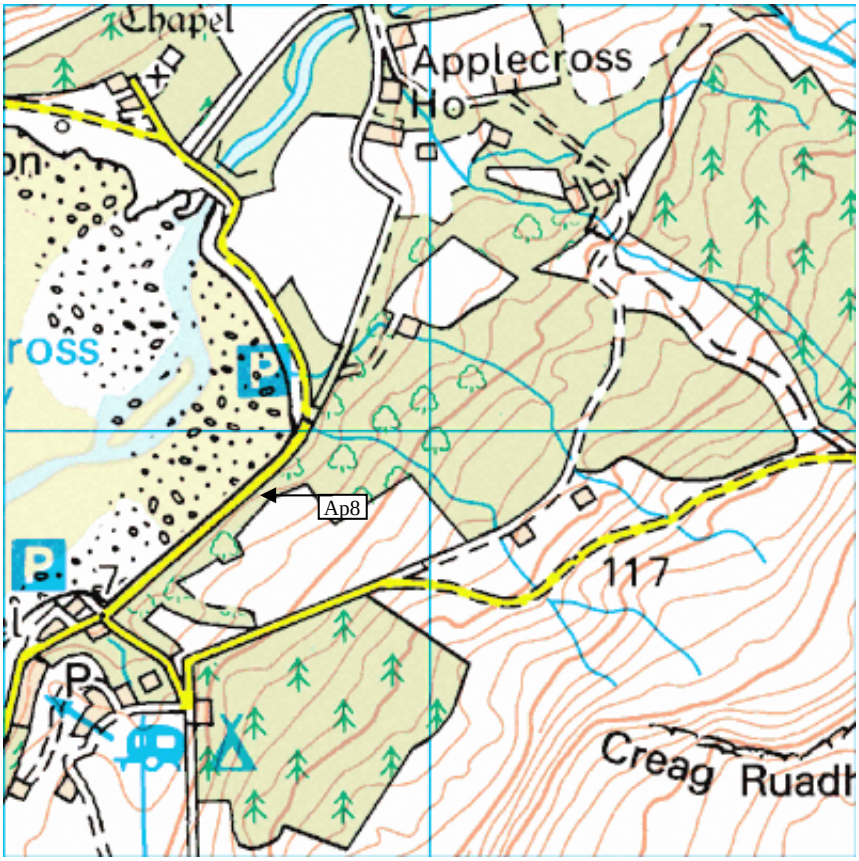
Given the short time available, only a brief investigation occurred in to the Limestone soils in this area. The purpose was to collect information for comparison with those soils found on the Torridonian Sandstone. The investigation centred within the mature Beech woodland at Ap8. A soil profile (Ap8) illustrating the type of soil that can be found near the bottom of the slopes of the limestone area is described in the Appendix. Basically this soil is a sandy clay loam sitting on top of colluvial coarse material. A brief investigation was also carried out on the slopes in the mixed woodland area, below the 50m contour line to the south and east of Applecross house.

Ground flora found in an area of Sycamore and Oaks included Tormentil, Wood Sorrel, Wood Anenome, Celendine, Bluebell, primrose and nettles in places. 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 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 Monkey Puzzle tree, Horse Chestnut, Holly, Sycamore, Beech, Bluebell, Fern spp. Oxalis, and Rhododendron occurred.

Moles were active in woodland to the south of Applecross house on sloping land, approx 2^0 in humose sandy soil. Silver Birch, Rowan, Larch, Beech, Rododendron, Foxglove, Bramble, Bluebell and Holley occurred close to the mole hills.

Applecross - Woodland vicinity.



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Appendix

Toscaig, day 1

TS1
Slight incline (approx 2^{o}), running parallel N-S to loch Toscaig. Variable peat depth 0.1m at the edge of the peat bog hollow to 1.2m in the center.

TS2
Narrow, shallow valley. Deep peat (0.7 - 1.7m or greater) over the majority of the area merging in to blanket peat at the edges of this raised peat bog.

TS3
Blanket peat bog greater than 1.6m depth.
Vegetation: Sphagnum moss, heather (*Caluna*), Bog Myrtle (*Myrica gale*), Lousewort (*Pedicularis*), Heath Milkwort (*Polygala serpyllifolia*), Cotton-Grass Hair's Tail (*Eriophorum vaginatum)* and sporadic Silver Birch (*Betula pendula*) particularly adjacent to rock outcrops.

TS5 Woodland area, predominantly Silver Birch, on steep E facing slopes. Local variability of soils on short steep slopes and hollows. Organic layers developed on rocky slopes and shallow (approx. 10cm) peaty layers over peaty sands developing adjacent to rocky outcrops peaty layers in hollows.

0-10cm	Peaty layer
10- ≤ 50cm	Peaty sand – peaty sandy loam (dark brown 7.5YR 3/2 when moist).

TS6 Gentle slope approx 1^{o} SW-NE draining towards a small lake.
Vegetation: Sphagnum moss, Bog Myrtle (*Myrica gale*), Lousewort (*Pedicularis*), Cotton-Grass Hair's Tail (*Eriophorum vaginatum).*
Typically 0.9 - ≥ 1.65m peat

TS7 Vegetation: Lesser Celandine (*Ranunculus ficaria*), Lesser Stitchwort (*Stellaria graminea*), violet (*Viola*) probably Common Dog-violet (*Viola riviniana*), Wood Sorrel (*Oxalis acetosella*), Bracken (*Pteridium aquilinum*)

0-10cm	Loamy sand 10YR 3/3 dark brown moist. Moderately plastic. Earthworm found during auguring.
10cm+	Sandy loam 7.5YR 3/4 dark brown moist.

TS8 Vegetation: Rough grazing, coarse grasses, Wood Sorrel (*Oxalis acetosella*), Bracken, moss, Calluna, small (0.5m) Silver Birch, and very common Lesser Stitchwort (*Stellaria graminea*) on the adjoining S-facing slope. Animal life: earthworms, Leather Jacket

Soil profile: Situated in colluvial material.

Cm	
0-17	A1. Clay loam – sandy clay loam 5YR3/3 dark reddish brown moist. Moderate – very plastic, slightly sticky. Loose, slightly stony, very small – small platy – sub-angular blocky. Many very fine roots, common medium – coarse roots.

TS9 Slight – moderately sloping. Woodland mainly Oak and Silver Birch. Rough grazing clearing (about 20m x 30m) containing some sphagnum moss, lump grass and bramble, braken on the edge of the clearing. Stone clearance had occurred resulting in the formation of a low wall.

0-10cm depth Amorphous peat / humified layer over structureless loamy sand.

Cuaig, (Abhainn Chuaig) day 2.

Cg1 Floodplain area north of stream, 5-10 meters lower than the land on the south side of the stream. Boulders are common over the blanket peat area on the north side.

cm
0-15 Blanket peat
15-50 Coarse – medium sand – sandy loam. 10YR 3/3 to 10YR 4/6 – 5/3 moist

Cg2 South facing natural profile edge of the stream and moraine hillock, slope approx. 2^{o} S. Heather and rough grazing.

Cm
0-12 Oh. Moderate to very stony, very small to small stones. Loose coarse sand grains incorporated throughout. Abundant very fine to fine roots. Clear boundary

12-28 B1. Coarse blocky to sub-angular blocky, 10YR 2/2 moist sand – humose sand. Slight to moderately stony. Non-sticky. Slightly stony, very small stones sub-rounded angular to platy. Weak to moderate structure. Clear boundary.

28+ B2. Friable to firm, non sticky sand. 10YR 2/2. Few very fine fibrous roots.

Cg3 Floodplain. Heather moorland, Bog myrtle, cotton grass.

cm
0-20/40 Blanket peat

20/40+ Coarse sand, dark brown, 10YR 3/3 moist.

Applecross River, day 2.

Ap1 Adjacent to river on floodplain.
cm
20+ Sand

Ap2 Beech and mixed (managed) woodland
Sandy loam to sandy clay loam.

Ap3 Rough grazing, moss, coarse grasses, heather, milkwort.
cm
0-20 Fibrous peat.

20+ sandy clay loam to silty clay loam. Slightly sticky, over sands / gravels.

Ap4 Rough grazing, juncos, moss.
cm
0-10/15 Fibrous peat

10/15+ Sand to sandy loam. 10YR 3/4 moist, dark yellowish brown.

Ap7 (Profile) Spruce plantation. Profile taken at the edge of a past site of excavation. 2-3^{o} south facing slope, with the profile facing east. Ground flora included Oxalis, common violet, grasses and moss.

Soil profile:
cm
0-9 L. small twigs, moss and needles.

9-30 Ah. Sandy loam, very slightly sticky. 10YR 4/3 moist dark brown to brown. Many very fine to fine fibrous roots, few medium fibrous roots. Moderately stony, very small to small stones.

30-80 B1. Sand. 7.5YR 4/6 moist, strong brown. Very stony, small to mediumstones. Few very fine to fine fleshy roots.

80-140 B2. Sandy clay loam. 10YR 4/4 moist, dark yellowish brown moist. Moderately sticky and plastic. Very few very fine fleshy roots. Moderately stony very small to small stones.

140+ C. Till. Moderately sticky, very plastic. 10YR 5/3 moist, brown.

Sand, day 3.
Sd1. Slope 2^{0} West facing towards sea. Profile 1-2^{0} South facing. Vegetation: *Caluna* and patches of *Juncus*, coarse grassland and moss.

Soil description.
cm
0-1 L. Moss and *Caluna* spp.

1-9 Ah. Sand to Loamy sand. 10YR 2/1 – 2/2 moist, black to very dark brown. Friable when moist, soft when dry. Many very fine to fine roots. Slightly stony, very small to small stones. Weak to moderate structure, medium to coarse sub-angular blocky.

9-19 A2. Sand. 7.5YR 5/4 brown, dry, 7.5YR 4/4 dark brown, moist. Loose when moist and dry. Structureless to weak fine sub-angular blocky. Moderately to very stony, very small stones. Slight to moderately stony, medium to large stones. Many very fine to fine fibrous roots. Abrupt boundary.

19-37 Bh. Sand, 10YR 2/2, very dark brown moist. Weak structure, fine to coarse sub-angular blocky. Non sticky, non plastic, friable when moist. Stones rotting in situ. Abrupt boundary, extremely stony very small to large stones. Few very fine to fine roots.

37-70+ C. Extremely to very stony. Few boulders. Few very fine to fine fibrous roots.

Applecross, day 4.

Ap8 (Profile). Mature Beech woodland. 100m west of mixed Silver Birch / conifer / cherry woodland. Ground flora includes moss, wood sorrel, bluebell, violet, primrose and grass spp. Evidence of the past presence of sheep in the form of wool and droppings. Evidence of soil erosion with exposed tree roots on parts of the steep slope. Small to very large rounded and platy / angular stones on surface. Slope generally approx. 5^0 North facing towards the bay.

Soil profile: (natural – on 3to5^0 North facing slope).

cm

0-4 L. Moss, leaves, grass, twigs

4-14 Ah. Sandy clay loam, 10YR 2/2 very dark brown, moist. Fine to medium sub-angular blocky, moderate structure. Friable to firm when moist. Slightly sticky, moderate to very plastic. Few fine to medium woody roots. Slight to moderately stony, very small to small sub-angular to sub-rounded stones. Clear boundary.

14-33/38
A2. Partially decomposed and cemented. 2.5YR 2.5 /4 dark reddish brown moist, and 2.5YR 4/6 red moist. Sand – sand and gravel. Extremely stony, very small to medium rounded to sub-rounded stones. Many very fine fibrous roots, few very fine to fine woody roots.

38+ Extremely stony, small to large sub-angular to sub-rounded stones. Sand and gravel, more strongly cemented than above. Few very fine to fine fibrous roots.

Rock and soil sample list

Toscaig soil:	TS8 (A1, A2). Rock: T S4R
Cuaig soils:	Cg2 (Oh, B1, B2)
	Cg6 (Deep sand)
Applecross soils:	Ap7 (Ah, A2, Bh)
	Ap8 (Ah, A2, C)