Mr R.A Allison.

Soil Survey Report

on

Speymouth Forest

1970

(Tiendland + Aultmore joined Speymouth in 1971)

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1. Introduction. The soil survey of Speymouth Forest was carried out as a continuation of the survey of the Moray Forth Old Red Sandstone region.

The primary objects of the survey were to prepare a soil map at a scale of 6"-1 mile and to present to the local field staff detailed information on the soils encountered as a guide to problems in drainage and cultivation.

Field work was carried out by Foresters W. Thomson and J. Davidson from Dec'68-June'69 under the direction of Site Survey Officer D.B. Paterson.

The total acreage surveyed was 12,648 acres, and included the coastal block of Lossie (1909 acres) and recently acquired, unplanted areas. Areas not surveyed were those under permanent agricultural use.

Some correlation was done with Dept. of Soil Survey (Scotland) and the assistance and observations received from R. Grant and A.D. Walker is gratefully acknowledged.

Soil Survey Sheet 95 published at 1" to 1 mile scale was available together with descriptive memoir by R. Grant, this information covering the northern belt of the forest area only.

2. Location and Topography

Speymouth Forest is centred around the small town of Fochabers. The bulk of the Forest area occupies part of Banff-Moray sandstone foothills east of the River Spey and southeast of the Fochabers-Buckie main road (A98). A considerable area also extends into the Moray Lowlands of the Lower Spey as dispersed blocks.

(a) Foothills. The main Fochabers - Aberdeen road (A96) following the Burn of Fochabers divides the hill ground into Whiteash to the north-east and Ordiequish to the south-west.

The Whiteash area is dominated by Whiteash Hill which rises to a height of 866 ft. The terrain falls away by moderate or steep slopes to the Burn of Fochabers in the south-west and similarly in the west to the steep eroded banks of the Aulthrothie burn. The rise to Whiteash Hill from the south Forest boundary is short but gradual; northwards it falls away gradually in a series of gentle slopes to above the A98 road. ~~Northward from the A98 lies flatter gently hillocky lowland terrain stretching to the coastal links between Spey Bay and Port gordon.~~

Prominant features of Whiteash are the eroded gullies cutting the north-west slopes in a north westerly direction leaving a series of small rounded spurs between them. These gullies also occur on the lower south-west slopes leading into Fochabers burn.

South-west of the A96 is Ordiequish Wood which is comprised of a series of smooth generally rounded foothills, heights of which range from 500'-600' in the west rising gradually to 700'-800' in the central areas. Eastward slopes fall away gently to the Gow Moss, a level area of upland unflushed bog in the south-east mainly contained within the 600 contour ±30'. As in Whiteash, steep eroded gullies, sometimes over 100' deep, are a feature on the north and west perimeter leading into the Fochabers Burn and into the Spey. (Delfur and Cairnty Blocks are included with Ordiequish in the above general description).

(b) Moundy terrain. To the east of the River Spey and north of the A98 is the Deer Park and the outliers such as Dryburn, Dallachy, Howcore and others. The small rounded sandstone hill of Ordiga (293') is the highest point in the Deerpark. The terrain then falls away gradually in small hillocky terrain with many intersecting flats. This terrain has been formed largely from terminal moraine, together with extensive fluvioglacial deposits, and altered by resorting and erosion.

(c) River terraces and moundy mixed terrain. Bellie Brae and Gowk tree Wood are part of the upper old Spey terraces whilst the Speyside blocks such as Bellie Wood are characteristic of more recent alluvial terrace deposits of the R. Spey.

The old upper river terraces on the west side of the Spey are represented by the comparatively flatter blocks of Balnacoul, Stynie and Lunan Woods. Westwards in this area the topography becomes more undulating in small rounded fluvioglacial deposits similar to terrain group (b). The block of Castlehill is contained in this latter area and stands out quite prominently from the surrounding flatter areas rising to a height of 240'. It is generally rounded and is composed of mainly fluvioglacial sand with some gravels.

(d) Littoral terrain. A separate terrain category is the littoral block of Lossie which lies between the east bank of the River Lossie and the lower, north facing slopes of Binn Hill; and the Links area north of Dallachy (C 92 & 93 only). The north eastern shoreline at Lossie is comprised of sand dunes but the bulk of the area consists of former storm beaches of shingle which lie roughly parallel to the coastline, producing a corrugated effect repeated at high frequency (refer aerial photographs). Moundy deposits of blown sand occur locally and there are flatter blown sands (links) well inland parallel to Innes Canal.

3. Climate. The upland part of the forest lies within climatic province B 1a of Anderson - Fairbairn classification (1955) with a precipitation of 30-35 ins. (750-900 mm) but the Lowland part experiences an average precipitation of only 25-27 ins. (625-700 mm). The minimum annual precipitation is 20 ins. (500 cm) in Lowlands and 27" (700 mm) in Uplands. (Hirsuta Collina is a good indicator of the low rainfall zone).

Potential water deficit in the growing season averages 2 ins. (500 mm) in the Uplands but rises above 3" (75 mm) in Lossie and the Links.

Total sunshine hours are high, 1250-1350 hrs. and together with the free permeability of many of the soils, low moisture availability is clearly a strong limiting factor to growth when potential water deficit rises to 4" in dry seasons on the Lowlands.

Temperatures are characterised by the low diurnal range which may be a by-product of the westerly "fohn" winds so common in this area.

Storm winds are from west to north-east.

Saline winds cause perimeter damage to littoral forest but the severely damaged belt is relatively narrow.

Climatological Memorandum No. 62 gives further information.

4. Geology and Parent Material

Geology. Sheet 85 of the Geological Survey of Scotland is relevant to Ordiequish and most of Whiteash sections and the new Sheet 95 to the northern areas.

(i) The most widespread geological formation is the Middle Old Red Sandstone. This takes the form of a very stony conglomerate and forms the bulk of Ordiequish and Whiteash Hills occurring again in the vicinity of Orbliston junction. The pebbles in the strong reddish conglomerate vary from fine dark gravel to well-rounded stones of 8-10 cm. diam., mainly quartzite. In the Deer Park, Redmoss and vicinity of Auchenhalrig it loses its conglomerate form and Fish Beds are seen in the Deer Park. A shale bed below the conglomerate may be responsible in part for the heavy textured Sandstone soils in S.E. Whiteash, Braewynner.

(ii) The next most important materials are the Pleistocene fluvioglacial and outwash sands and sandy gravels (Boyndie and Corby associations) overlying M.O.R.S. in varying depths. The Boyndie association refers to fluvioglacial sand, often current bedded with layers of gravel and the Corby association to fluvioglacial mounds or terrace gravel, with beds of sand. The two associations often occur in close conjunction with each other but the main areas of Corby gravels are Balnacoul, Lunan, Stynie, Blackburn, Trochelhill, Dallachy and West compartments of the Deer Park. Castlehill, Poundlers Wood and areas of the Deer Park are more representative of the Boyndie sands. The origin of these deposits is discussed by R. Grant.

It is sufficient to note that the terminal moraine in Deer Park and the extreme outwash activity affecting upper old Spey terraces or drainage channels leads to considerable complexity in the distribution, shape, depth and sand/gravel stratification of deposit and this is further complicated by later peat deposits and alluvium in hollows.

(iii) Alluvial sands and gravels border the Spey in terraces and some alluvium from Whiteash gullies is spread over Deer Park.

(iv). Lossie block consists of recent emergent materials in the form of blown sand and shore shingle deposits.

(v) Along the south-east boundary of Ordiequish and Whiteash sections, the slates and phyllites of the Highland Schists extend just into the blocks of East Braewynner, Drakemyres, Gow Moss and the southern tip of Moss of Cairnty block. Similarly, but to a lesser degree, quartzite bedrock extends into the southern compartments of the Wood of Cairnty. Dalradian rocks have only a diffuse influence on the southern soils probably because of the direction of glacier movement but do coincide with widespread peat.

Exposures of the grological features do not occur very frequently. The major conglomerate bedrock can be readily observed in the recent cuttings of the A96 re-alignment. The Middle O.R.S. lacking the stone content of the conglomerate can best be seen at the western banks of the Spey at Fochabers bridge. Small out-croppings of the Slates and phyllites can only be seen in the bottom of some eroded gullies such as the Burn of Redpath in Aultash Block to Allt Torsie, south of Cairnty Moss.

In the vicinity of Slackbuie (Cairnty Moss) there is an out-cropping of platy, quartzose rock.

Exposures of the fluvioglacial sands and gravels can often be seen in gravel pits or road cuttings below 250'.

B. Parent Materials.

(1) Tynet till. The major parent material in Ordiequish and Whiteash is till and redistributed till derived from the conglomerate of the middle O.R.S. and known as Tynet association. Its main features are its very to extremely high stone content, consisting mainly of quartzite, quartzose schists and some granite stones. The strong red colouration is prominent and its texture is loamy sand to coarse gritty sandy loam. (From the evidence of the eroded gullies it had been thought that till depths were up to 100 ft. However recent exposures on the A96 roadworks show the conglomerate bedrock as being much nearer the surface. Occassional flaggy pieces of the rock, sometimes boulder size, can be seen on or near the surface in the general area but, as the till so closely resembles the parent rock, which is easily erodable it is very difficult to discern where weathering ends and till deposits begin).

The steeper slopes of Whiteash and Ordiequish have been influenced by coarse wash from the till deposits sometimes increasing depth of profile.

There is almost always a compacted/indurated horizon at about 32-45 cm. from ground surface and extending for/up to 30 cm. on the surface of the basal till but because of the very high stone content the material becomes loose and friable when sufficiently disturbed. Silt capping is common on stones in the indurated layer.

(ii) Sandstone till with schists.

In the south-east blocks of Whiteash Hill, the sandstone till is influenced to quite a pronounced degree by rotton schists. The main occurrences of those are to be found in Braewynner, Whiteash Hill and Drakemyres where, although the till retains its normal bright red colour, much rotton mica-schist gives it a much finer texture and a sticky, wet blocky appearance when poorly drained.

(iii) Elgin till

The other, less widespread, till is the Elgin till derived from Upper Old red Sandstone. Its main locations are below 300 feet in the Deer Park, Auchenhalrig, Dryburn and Howcore blocks where it is often capped incompletely by coarse resorted fluvioglacial or resorted till materials. It is pale red in colour with prominent grey cracks throughout which are frequently exploited by roots. Its texture is usually sandy loam and it is frequently found to be compacted or indurated particularly at the surface of the till. The surface material is often intensely water-sorted and thin fluvioglacial materials over Elgin till were regarded as being within this group.

(iv) Gravels and Sands.

These coarse-textured deposits predominate below 250' but are by no means always freely draining.

An important feature of the fluvioglacial sands and gravels is the presence of a strongly cemented humus-iron, deposition in the 'B' horizon, known as the 'Moray Pan'. It can vary in depth from the surface, from less than 30 cm. (12") to over 45 cm. (18") and can cause slight impedence to surface drainage. It is more prevalent nearer the surface in the gravel.

In the Corby gravels too a strong ironpan or ironpans can occur at depths from 45-120 cm. plus but this is usually deep enough to be of little importance in tree root development.

The depth of these deposits often thins out and in these cases the till may cause some impedence to vertical drainage. Other impedence arises within contained hollows. (kettle holes).

(v) Alluvium.

The chief areas of alluvium are (a) Speyside and (b) Deer Park / Lower Whiteash.

The Speyside alluvium is found in the four blocks on the east of the River Spey within the last four miles of that fast flowing river and is mapped in two main forms, the first being the extremely stony gravels with b very little development of surface vegetation and second the adjacent terraces of stone-free sandy loam deposits.

The other type of alluvium spills over the A98 road from the lower Whiteash slopes spreading over the south-east of the Deer Park. This red material, sometimes with much pea-sized gravel, is eroded from Tynet till and conglomerate in the Whiteash gullies and has been deposited as a result of exceptional severe flooding. (One such flood took place in 1829). It often buries former fen peat over ground water gleyed sand.

Other areas of alluvium can be seen along the bottom of the Fochabers Burn glen where it is very stony with limited development of vegetation.

(vi) Shore gravel and blown sand.

The main feature of these strongly acid parent materials is their free to excessive drainage and the extreme stoniness and impoverished status of the shingles.

5. Soils

The classification adopted is that employed by F.C. Site Survey for the Moray Firth Sandstone Region, Speymouth includes approx. 80 acres, which together with Lossie which has been separated, can be regarded as in the Littoral Soils sub-Region to which Tentsmuir belongs. The area of soil types mapped is shown on Table I.

Speymouth shows a close affinity to the convex group of Sandstone forests i.e. Morangie, Easter Ardross and Teindland. Podzolic features tend to be quite pronounced.

The distinctive features of Speymouth soils when related to other forest surveys in this Lithological Region are:-

(a) the larger area of podzols and related soils (22 per cent), often with strongly developed cementation or over indurated horizons.

(b) the high stoniness of the conglomerate-derived soils.

The large area of impoverished shingle soils in the Littoral group is also distinctive and peculiar to this area.

The washed sands and gravels with groundwater gleying in Dallochy and Deer Park and similar blocks corresponding to poorly or very poorly drained series of Boyndie or Corby associations were regarded as similar enough to be amalgamated for soil type number with the groundwater gleyed littoral sands as soil types 15g and 15G.

Soil Type 6 covers both Tynet and Elgin tills or wash over till. As in previous Sandstone surveys, it was not possible to map drainage class differences within soil type 6.

The corresponding soil associations and series mapped by the Department of Soil Survey are believed to be as follows:-

Association	Series	Soil Type No.	Major Occurrences
Corby	Corby	1c, 2	Blocks west of
	Leys	1g	R. Spey
	Mulloch	15g, 7	
	Mundurno	15G, 9	
Boyndie	Boyndie	1, 2, 3	Deer Park
	Anniston	3, 6	
	Dallachy	4, 15g, 15G	
	Ballindary	15G, 9	
Elgin	Elgin	3, 5	Auchenhalrig
	Rosebrae	6	and Deer Park
	Monaughty	6	
	Findrassie	7, 10	
Tynet	Tynet	3, 4, 5	Whiteash and
	Whiteash	6	Ordiequish
?	?	6d	S.E. Whiteash
	?	8	
Alluvium	Gravels	12	Deer Park and
	Sands	12a	Speyside
Mixed bottomland	–	13	
Marine	ZD. LN	15s, 15l, 15d	Lossie and N. Links
Peat	Basin peat	9, 10	Gow Moss

Soil areas and percentages - Speymouth Forest

Number	Soil Type	Acres	Hectares	Percentage
1	Brown earth	59	24.0	.5
1c	Cultivated podzol	198	80.0	2.0
1g	Imperfectly drained cultivated podzol	29	12.0	-
2	Podzolised brown earth	282	114.0	2.5
3	Humus iron podzol	1917	776.0	17.0
4	Weak ironpan soil	702	284.0	7.0
5	Strong ironpan soil	2868	1160.0	27.0
5p	Peaty strong ironpan soil	5	2.0	-
6d	Surface water gley	260	105.0	2.5
6	Fragogley	1849	749.0	17.0
6c/8c	Cultivated fragogley and Cultivated peaty fragogley	244	99.0	2.5
7	Flushed gley	90	36.0	1.0
8	Peaty gley	174	71.0	1.5
9	Flushed basin peat	49	20.0	.5
10	Unflushed bog	783	317.0	7.0
12	Freely drained alluvium	246	100.0	2.5
12a	Imperfectly drained alluvium-fertile	209	84.0	2.0
12g	Poorly drained ground water gleyed alluvium	37	15.0	-
13	Skeletal Soils	255	103.0	2.5
15s	Shingle Soils	92	37.0	1.0
15g	Imperfectly drained G.W.G. sands and gravels	9	4.0	-
15G	Poorly drained G.W.G. sands and gravels	402	162.0	4.0
	TOTAL:-	10,759	4354.0	100%

Soil Type Areas and Percentages - Lossie Block

Number	Soil Type	Acres	Hectares	Percentage
2	Podzolised brown earth	28	11.0	1.5
15d	Sand Dunes	262	106.0	14.0
15l	Links Sand, freely drained	396	160.0	21.0
15s	Shingle soils	1024	414.0	53.5
15g	Imperfectly drained G.W.G. sands and gravels	127	52.0	7.0
15G	Poorly drained G.W.G. sands and gravels	52	21.0	3.0
	TOTAL:-	1889	764.0	100%
	GRAND TOTAL AREA SURVEYED	12,648	5118.0	

The Appendix includes profile descriptions of the major soil types and sub types described below.

Soil Type 1 Brown earth 24 ha. 0.5 per cent.

The incidence of natural brown earths in Speymouth is negligible and areas mapped as equivalent to brown earths appear to have had prolonged or deep agricultural improvement but lack positive features of a former podzol as found in soil type 1c.

Three instances have been mapped - at Coul Brae, Broadley and Deer Park C136, all occurring on well drained fluvioglacial sands.

These are fertile deep rooting sites with fine and soft grasses, bracken, Oxalis and feather mosses, with only weak elements of ericaceous vegetation.

Soil Type 1c Cultivated podzol 80 ha. 2 per cent.

These are found almost entirely on the freely drained fluvioglacial gravels (Corby association) and represent humus iron podzols in which the surface horizons have been altered by agricultural cultivation and husbandry to those more consistent with podzolised brown earth. In Deer Park, depth of cultivation was 25-33 cm.

They have been separated as they support dry grass heath or slightly moist grass heath and do not present ericaceous difficulty with whitewoods.

The principle areas mapped were Dallachy former aerodrome and Deer Park, and there was one local instance at Braewynner on schistose-influenced sandstone till.

Vegetation at Dallachy is whin and broom-invaded grass heath with fine grasses, E. cinerea and Holcus and elsewhere under open canopy is:-

D. flexuosa (d), Soft grasses (f), E. cinerea (a), feather mosses (a), bracken (1a), Blechnum (o), Oxalis, Viola.

Soil Type 1g Imperfectly drained cultivated podzol 12 ha.

This soil type occurs only locally at Dallachy block and is found in slight depressions and hollows. Basically it is the same type as 1c but vertical drainage is impeded, causing moderate but distinct gleying symptoms in the 'B' horizon. The impeding factor is a compacted horizon which, in association with the slightly receiving nature of the site, causes the gleying.

Soil Type 2 Podzolised brown earth 114 ha. 2.5 per cent

Found almost exclusively on the freely drained fluvioglacial sands, Boyndie series, this soil is closely related to the humus iron podzols, the difference being the degree in which surface horizons have been disturbed and mixed in non-woodland periods.

The Bs horizon is always strongly in evidence in both on Boyndie materials. Evidence of cultivation is confirmed as e.g. Castle hill.

The affinity of the two types is well illustrated in the sandy hillocks north and south of Auchenhalrig in the Deer Park where the deposits are very similar but the profiles are soil types 2 and 3 respectively. Other occurrences are Tulloch Banks, Dryburn, Gowktree and Castle hill. It is a deep-rooting and friable soil.

Weed invasion of birch, broom, gorse, raspberry and bramble is common on fine grass heath with few soft grasses.

Soil Type 3 Humus iron podzol 776 ha. 17 per cent

A soil of large scale importance in Speymouth Forest, it can be further sub-divided into the following categories:-

(a) Boyndie series

The principal areas involved are those hillocky deposits of Castle Hill which rise to a height of 230 ft. west of the flatter terrain of the upper Spey Terraces. In the Deer Park the soil type occurs on the hillocky topography south of Auchenhalrig.

They are very sandy in content, freely drained and very friable. The organic horizon is not strongly developed. These are generally the best class of podzols in Speymouth, i.e. the deepest and most friable and least stony. Compacted and cemented horizons are present but are not always readily seen and appear to be associated mainly with flatter terrain.

Vegetation is dry heath with E. cinerea, Calluna, D. flexuosa, feather mosses.

(b) Corby series

The flats of the upper Spey terraces typified by Lunan, Stynie and Balnacoul Woods and the western part of the Deer Park are the main areas of humus iron podzols on Corby gravels; also the more undulating blocks of Blackburn and Trochelhill.

Profiles vary throughout, with some rather indistinct ones with diffuse black humus. However, the most important feature is the presence of a strongly cemented humus-iron 'B' horizon generally found well within 45 cm from the surface. This is particularly noticeable in Lunan and Balnacoul Woods where an example had a cemented horizon of 8 cm (3") starting at about 30 cm (12") from the surface. In seasonally wet months this cementation does have the effect of causing moderate gleying in these upper horizons and is also a decisive impediment to root development. They can be regarded as slightly imperfect soils in drainage and pore space as a result of cementation and would benefit strongly from cultivation. Cladonia becomes quite common in the sparse dry heath vegetation with gorse locally a serious weed.

(c) Podzols on re-distributed materials over compacted/indurated till

The lower moderate slopes of the rounded hills between the gullies in north west Whiteash and similarly on Slorachs, Ordiequish and Cairnty blocks are the sites for this sub-type and also in association with the gullies of Whiteash and Ordiequish.

Generally these soils are stony freely drained, well-developed podzols with a tendency to shallow phase over till. They may be slightly imperfect at the interface with the till and can transition to soil type 4. The underlying till is of the Tynet association (sandstone conglomerate) except for compartments 157 and 168 in the Deer Park where it is Elgin till. The permeable till is usually strongly indurated. Depths from the surface to the compacted till vary up to 60 cm (24") but can be appreciably shallower in the region of 30-38 cm (12"-15") producing a shallow phase active soil and thus restricting the depth and volume of root development.

In the Deer Park the resorted surface material is often found to be fluvioglacial in origin and is very variable in depth. Profiles vary and can have gleying symptoms in the Bs horizon when found adjacent to poorly drained flats and hollows.

Included in the general category of humus iron podzols is a small area of steep gravel deposits between Fochabers Burn and the A.96. Deep E horizons with very indifferent B development are the main features here with veins of ironpan throughout the profile. Distinct gleying was observed at 120 cm (48") as a result of seepage gleying.

Vegetation is dry heath with birch, E. cinerea, C. vulgaris and a deep development of feather mosses.

Soil Type 4 - Weak ironpan soil 284 ha. 7 per cent

The main areas of this variable soil type is on Whiteash Hill particularly the mid slopes. It occurs as a transitional type between the previously described humus iron podzols over indurated till on the lower slopes and the strong ironpan soils of the higher elevations. This is indicated by its distribution and its similarity at first glance to a humus iron podzol. It occurs elsewhere often in small unmappable zones particularly on the Hill of Cairnty. In Drakemyres area it is found on a more schistose-influenced till where the pan is found 15-30 cm (6"-12") from the surface, thereafter followed by a friable Bs on a diggable till.

On the general Whiteash soil type the very compacted, stony till is usually found at a depth of 50 cm (20"). The most important feature of this soil is the weak ironpan and/or a compacted Bh horizon. The felty humus layer is very strongly developed. The weak ironpan may not always be evident but a compacted Bh horizon is. This Bi/Bh horizon varies in thickness from a usual 3cm up to 12cm and is sufficiently developed (weak platy) to cause some moderate seasonal gleying in the E horizon above it and is also a deterrent to free root development. A typical feature of the Bh/Bi horizon is the pronounced undulating habit which in a distance of 1 metre can undulate from within a 15 cm to 60 cm (20") from the surface (the latter resting on the C horizon) and this causes pockets of gleyed material to form locally. Where the Bh/Bi horizon is within 30 cm (12") from the surface it is separated from the C horizon by a friable Bs horizon. Other profiles could be classed as imperfectly drained humus iron podzols. Thus it is a difficult soil for which to quote standard profile characters as it shows surface gleying features with mainly freely drained friable Bs horizons in many transitional forms.

The usual vegetation is rank Calluna, E. cinerea, feather mosses and birch scrub, with occasional Sphagnum in very dense Calluna.

Soil Type 5 - Strong ironpan soil 1,160 ha. 27 per cent.

As can be seen this soil type is of considerable importance in Speymouth. It is almost entirely confined to the convex Whiteash and Ordiequish sections, the underlying till being of the Tynet association, its high stoniness arising from its conglomerate origin. An organic horizon of 5-10 cm is often present, of which 2-5 cm is black mor humus but fire damage may have reduced this horizon.

The strong ironpan is well developed and continuous and is found usually at a depth of 40-45 cm (16-18") from the surface but can occur deeper at approximately 60 cm (24"). The pan is a definite barrier to root penetration and to vertical drainage, and pronounced gleying features such as olive colouration can be readily observed above the pan. Below the pan, the very to extremely stony red till is indurated for approx. 15-30 cm, thereafter gradually becoming less so. Vegetation varies slightly between sites but the more dominant and consistent vegetation is moist poor heath, C. vulgaris, E. tetralix, E. cinerea, feather mosses and Cladonia with occasional Sphagnum.

Four pits were dug and described (see appendix) to illustrate the variants found. These variants are often inter-related but basically they are as follows:-

(a) Whiteash sub-type

This has extremely stony profiles and much small gravelly material. The upper E horizon can often be more typical of a podzol perhaps due to the strongly shedding topography. Pan is strong and metallic. The Cx horizon is indurated for about 25 cm (10") but, because of its extreme stoniness, it becomes loose and friable when disturbed.

(b) Slorachs and Leitches Wood sub-type

This is mainly confined to the shoulder and upper moderately steep slopes of the Fochabers burn and on the lower north west Ordiequish hill. The overlying vegetation is of the dry heathland type, often with a pronounced Of horizon of 15 cm (6"). Because of the steep well drained sites the E horizon is normally well developed and albic at the surface and free from gleying. A humus B deposition is often discernible below the upper E horizon after which the Eg proper is found followed by the continuous strong ironpan. Probably the most important feature of this sub-type is a strongly cemented horizon up to 8 cm (3") below the pan thereafter becoming indurated for approximately 9". Closely associated with this sub type and included with it are soils which lack the ironpan but possess the same characteristics as the above Cx horizon. Above this Cx the material is grey very stony and of a gravelly, nature becoming moister and more gleyed above the Cx, on the surface of which there is often a moist humus deposition.

(c) Standard Ordiequish sub type

This is the most common type and is found over most of the area such as Scotch, Ordiequish, Thiefs and Cairnty Hills. Profile depths to the ironpan are normally 40-45 cm (16"-18") but the general undulating nature of the pan can produce depths of up to 60 cm (24") which is particularly noticeable on Cairnty Hill. The Eg is well gleyed with mottling and olive colouration often present. There is often 5-8 cm (2"-3") of less compacted diggable till immediately below the ironpan followed by the indurated horizon but this should not be confused with the deeper friable B horizon of soil type 4.

Soil Type 5P - Peaty strong ironpan soil

A minor soil type in Speymouth, it is found on the lower gentle slopes of Soundmoor and differs from the standard Ordiequish strong ironpan soil by reason of a 15-35 cm (6"-14") organic layer similar to hill peat.

Soil Type 6d - Surface water gley 105 ha. 2.5 per cent.

In the blocks of Braewynner, Drakenyres and the east and south east slopes of Whiteash Hill there is a strong influence of rotten micaceous schists in the till. This influence is at its greatest in Braewynner and lessens in degree south westwards although it is detectable at the edge of Cow moss and in Sound Moor. When affected by poor surface water drainage this till becomes very sticky and blocky and has a sandy clay texture. It is readily diggable but because of its structure and texture it is largely impervious to water and therefore the Eg horizon is very strongly gleyed, with olive colours and rusty root channels easily recognisable. Profile depths to the Cg are often relatively deep around 50 cm (20") and the type corresponds to a thin peat peaty s.w. gley on fine textured material.

Vegetation is wet heath - Calluna (d), Empetrum (lf), J. squarrosus (o), Cladonia, Sphagnum, Trichophorum, feather mosses.

Soil Type 6 - Fragogley (Surface water gley on induration) 749 ha. 17.0 per cent

This soil differs from the 6d by reason that whereas it was a textural change in the till which caused surface water gleying in the 6d, it is compaction or induration in the till which causes surface water gleying in the Fragogley soil. Ironpan is mainly absent.

It is an important soil in Speymouth and occupies a wide range of sites but the two most important zones are (a) Deer Park section from the Deer Park block north eastwards to Dryburn and Howcore blocks on the Elgin ~~series~~ till; and (b) between Gow Moss and the upland strong ironpan soil of Ordiequish and westwards to the more gentle terrain of Moss of Cairnty and Wood of Cairnty. Elsewhere on Ordiequish it is prominent on the flatter ground adjoining the steep gullies and also on the shelving situations above the burn of Fochabers. On Whiteash it occurs fairly locally, usually associated with flatter more receiving terrain.

The fragogleys of the Deer Park areas are usually compacted or indurated within the upper 30 cm (12") of the till, but (consistent over Speymouth), the till can become more diggable and much more gleyed when it occurs in low-lying areas or receiving hollows. The drainage differences could not be effectively mapped. Because of complexities in parent material and deposition due to ice-sheet melting, fragogleys in the Deer Park consist mainly of resorted tills and fluvioglacial sands and gravels overlying the till to varying depths sometimes only by 25 cm material. One example at Dryburn shows 60 cm (24") sand followed by 15 cm (6") of humus-iron cemented gravels overlying compacted till. Depths of profile to the Cx are not therefore consistent in Deer Park.

Fragogleys of the other major localities are similar to above with the till derived more from the middle old red sandstone conglomerates. Generally the upper 5-8 cm (2"-3") of the till is indurated or very compacted then gradually becoming less so. Depths of profile to the Cx are on average 45 cm (18") from the surface, with deeper pockets. The Eg in most cases is well gleyed and moist.

A further sub type occurs as a result of lateral seepage principally associated with water movement into the steep gullies leading into Fochabers burn. Two good examples are evident adjacent to Elienach Hake and C284 (Aulthash) and also on either side of the A96 main road. This type is usually extremely stony consisting of small gravelly wash material. The Eg horizon usually deep and wet. The principal vegetation of these sites is a giant Woodrush - V. myrtillus, Calluna, feather mosses, birch scrub the first being very indicative of seepage gley conditions.

Vegetation ranges from dry heath Calluna (D), E. cinerea (f), feather mosses (a), Cladonia (f), E. tetralix (o) to moist heath including Sphagnum and J. squarrosus.

The cultivated form, soil type 6c, conforms to that mapped in Culloden, Black Isle and Monaughty i.e. it has been improved to a grassy phase but still has the limitation of induration.

Soil Type 7 - Flushed Gley 36 ha. 1.0 per cent.

A minor mineral gley soil type found locally in small areas as naturally flushed grassy sites. The materials are very variable and should be interpreted as comparable to surrounding soils. It is a fertile soil and worms are often present in the 'A' horizon.

Vegetation is variable with D. caespitosa, Holcus, giant Woodrush, fern, raspberry.

Soil Type 8 - Peaty gley 71 ha. 1.5 per cent

This soil is an intergrade between the unflushed bog peat of Gow and Cairnty mosses and the previously described fragogleys. It has a surface layer of peat of 15-35 cm (6"-14") and the vegetation is very wet Callunetum with Calluna (d), Trichophorum (1a), J. squarrosus (o), E. vaginatum, Polytrichum, Sphagnum.

The organic horizon is about 20 cm on average.

Soil Type 9 - Flushed Peat 20 ha. 0.5 per cent

Gow Moss and the Deer Park are the two main areas of Speymouth where this comparatively minor type can be found. In the Gow Moss it occurs both naturally and also where artificial influences such as drainage and cultivation has produced a peat very similar to flushed peat (improved soil type 10). In the Deer Park and Red Moss it shows as local pockets and strips and seems consistant with drained lochs and old watercourses and is often buried to a variable depth by red alluvium derived from the Whiteash gullies. The peat is well humified and fertile, often with birch and willow remains. Worms can also be present.

Soil Type 10 - Unflushed Bog 317 ha. 7.0 per cent

In Speymouth, Douglasshiel Moss, Gow Moss and Cairnty Moss constitute the two main areas of this peat. It has been much cut over for fuel which gives a variable depth. However, in the Gow Moss, present depths were observed to be in the region of 38-65 cm (15"-26") around the perimeter of the moss to approximately 2 metres in the centre. Old SP stumps have been exposed by peat cutting and lie 45-75 cm (18"-30") beneath the present surface. They appear to have been subjected to fire.

The peat is very fibrous with little decomposition at the surface. The H rating (Von Post) is H2/3 becoming H6/7 at depth. Pronounced gleying features are evident in the underlying mineral soil horizons.
Vegetation is Calluna (d) E. vegnietum (o) Eriophorum (1d) Sphagnum (1a) E. tetralix (o) Cladonia (f) [illegible] (o)

Soil Type 12 - Immature freely drained Alluvium 100 ha. 2.5 per cent.

Two types of this immature soil have been mapped in Speymouth. The first is the extremely stony gravels of the blocks bordering the River Spey where vegetation development is minimal or non-existant. Also included is the flat bottomed valley of Fochabers burn where again sand and gravels are dominant and vegetation is mainly confined to giant Woodrush.

The second type is that deposition of flood alluvium south east of the A98 and originating from the eroded gullies of Whiteash Hill. This sandy loam alluvium is distinctively red in colour and varies from moderate to extreme in stoniness. Some narrow bands of paler sand can sometimes be observed and occasionally finer textured deposits. A rank Calluna vegetation cover with E. cinerea and sparse bracken has developed. Granular mor humus has developed within 2-3 of the surface frequent bleached sand grains are present. Much of this alluvium is thought to have been carried from the gullies in heavy flooding in 1829 but sequential depoeits suggest several depositions.

Soil Type 12a - Imperfectly drained Alluvium - Fertile 84 ha. 2.0 per cent.

Again two types have been mapped resulting from factors previously described i.e. River Spey alluvium and floodwater residue from eroded Whiteash gullies.

In the Speyside blocks, the type is found on the slightly raised terraces and consists of stone free sandy loam overlying the gravels to a depth of up to 20". Some slight to moderate gleying is sometimes present where vertical drainage is impeded by the gravels.

In the Deer Park adjacent to the A98 is found the more fertile belt of the red alluvium. There are less stones in the soil which has a sandy loam texture and there is also a pronounced development towards an A horizon of brown earth type. The vegetation is largely free from heather and the principle vegetative cover consists mainly of soft grasses, bracken, fern and bramble. The deposits thin out gradually often overlying flushed peat and ground water gleyed sand to a depth of only a few inches. Moderate gleying can occur where the underlying peat proves to be a deterrent to adequate vertical drainage.

Soil Type 12g - Poorly drained ground water gleyed Alluvium material 15 ha.

This soil is basically the same as 12a. It is found in natural flushed conditions in association with burns and springs. Gleying is pronounced below the A horizon being usually wet and well mottled. It can be regarded as allied to soil type 7.

Soil Type 13 - Skeletal soils 103 ha. 2,5 per cent.

In Speymouth Forest, skeletal soils are defined as those which have formed on the eroded tills and slopes of the deep gullies. As the process of erosion is continual little development has occurred in the gully sides. Springs and seepages are frequent where giant woodrush has established readily. Shallow layers of flushed peat and flushed gleys occur in the very narrow bottoms of the gullies. Where drainage is free a developing A horizon can some tines be observed on the disturbed material.

Compartment 489 at Moss of Cairnty block is largely composed of steep sided gullies with many smaller ones leading off the main one. Here the red till is less apparent, the material being more of a river bank gravel and soils are more closely related to brown earths and podzolised brown earths with the usual flushes and seepages occurring throughout.

Soil Type 15s - Shingle soil - Speymouth 37 ha. 1.0 per cent
Lossie 414 ha. 53.5 per cent

These excessively drained soils are found in Lossie and Dallachy blocks. They are soils derived from marine origin and whose stone content exceeds 75 per cent of the volume. The stones are the typical flat rounded stones smoothed by sea water action. These shingle soils are found as shingle ridges and old storm beaches running parallel to the shoreline. Frequently they are covered shallowly with blown sand which infills between the ridges and are in ribbon complex with unmappable strips of unflushed bog or soil type 15g.

On Dallachy the overlying vegetation is a grass/whin heath complex and slight podzolisation takes place. In Lossie hirsute Calluna - Cladonia - E. cinerea is the more dominant vegetation with more E. cinerea and Cladonia as stone volume increases.

These are among the poorest soils in Speymouth.

Soil Type 15d - Dunes 106 ha.

These are excessively drained sharply sloped littoral dunes formerly colonised by marram grass. Saline exposure is damaging, particularly on the coastal aspect.

Soil Type 15l - Link sand freely drained 160 ha. 21 per cent (Lossie)

This is as the name applies 18" + of comparatively stone free sand and is confined to Lossie section. Its main concentrations are in the north west part of the section and along the southern boundary. It is sand which has been wind-deposited inshore forming accumulations of flatter configuration of varying depths. The sand has also infilled between shingle ridges often covering the smaller ridges and sometimes reforms as micro-dunes inland.

Drainage is free and incipient podzolisation can be detected.

Vegetation is Holcus/feather mosses/ Carex arenaria

Soil Type 15g - Ground water gleyed sands and gravels - imperfectly drained
4 ha (Speymouth) 52 ha 7 per cent (Lossie)

Lossie section is the main occurrence of this soil type. There is also a small area at Dallachy and again in the Deer Park as washed fluvioglacial sand. The cause of the gleying in the littoral blocks is where drainage has been impeded by the extreme stoniness of the underlying shingle or by the buried O horizons. It is often found between shingle ridges frequently as narrow unmappable strips.

In the pale gleyed sand mottles show up conspicuously, often taking the form of rings. This moderate gleying does not appear to impair root development of the SP crop and is probably beneficial as a 'reserve' in dry seasons.

The small area of 15g in the Deer Park is a flushed ground water gley and occurs in a hollow, probably the site of an old water course.

Soil Type 15G - Ground water gleyed sands and gravels - Poorly drained
162 ha. - 4 per cent (Speymouth); 21 ha. - 3 per cent (Lossie)

The areas on which this type predominate are the fluvioglacial sands and gravels such as Stynie and Balnacoul woods and the Deer Park block. It also occurs to a lesser degree in Lossie. Topography appears to be the factor influencing the gleying i.e. hollows, depressions and receiving sites.

In the Deer Park the main area extends from Auchenhalrig south westwards and would appear to follow the route of old water channels possibly draining the Red Moss area which is believed to have been under water at one stage. The material is mainly wet sand often compacted at depth. Calluna - E. tetralix is the principal vegetation. Oh horizons of 10 cm. (4") developing to bog conditions are found in the worst drained stagnant areas and under this peaty surface the gleyed sand is dark stained by the peaty humus.

A surface vegetation of mosses, birch and willow was observed near the Black Hillock with a matted Of horizon of 10 cm. Elgin till lies under the gleyed sands and gravels and was recorded at 1 metre. The till is usually well gleyed to a depth of sometimes over 0.8 metre with olive colouration predominating. In C156 the very pale, wet gleyed sand is overlain by a shallow deposit of alluvium (this is the point where the red alluvium has thinned out to a maximum cover of 35 cm).

The other instances of this type are found throughout Stynie, East Castlehill, Balnacoul and Trochel hill blocks. Again they occur as pure sands or as gravels. A distinctive feature is the compaction in the upper horizons particularly in the gleyed sands. This is best seen in Castle hill and Stynie blocks. Gleying varies in degree according to the receiving nature of the locality where, in the worst conditions, local shallow peaty deposits can be found. Vegetation is predominantly Calluna but Birch/grass phases can occur and also colonisation by whin.

In Lossie section there are three small areas of soil type 15G, two of which occur in the surrounds of Lochs. The first is very poorly drained sandy loam which is in the vicinity of the Loch of Cotts and the second area is round the fringe of the narrow loch in Cs 40 and 41 which is a poorly drained peaty loam. Technically they are lacustrine soils because of their association with the lochs but because of their infrequency they can readily be classified with 15G. The final area in Lossie is a long narrow hollow just off the eastern shore line; it is very poorly drained sand with a grass/sedge vegetation.

Cultivated Gleys - 6c/8c 99 ha. 2.5 per cent

The suffix 'c' has been used to denote an agricultural history and is worthy of note as surface vegetation and soil horizons have been improved to some degree. Scattered throughout Speymouth Forest are found old cultivated sites, some with a recent agricultural history; others have been abandoned many years ago.

The two main soil types which the agriculturists have improved are the humus iron podzols on fluvioglacial sands and gravels (1c) and the fragogleys (6c). This is well illustrated in the former Gordon Castle policies in the Deer Park. Coarse pasture grasses dominate the vegetation of these ex-cultivated areas along with fern, wood sorrel, violet etc. but Calluna and E. cinerea are often found to be attempting re-colonisation. In the cultivated fragogleys, D. caespitosa and soft rushes can be seen on wetter areas.

Other areas of former cultivation are on the schistose surface water gleys at Braewynnet and the small strip at Starryhaugh. Ap depths were recorded as up to 38 cm. at Starryhaugh and in Braewynner from 15-25 cm.

In the Wood of Cairnty, east of the Cairnty moss and the south boundary of Soundmoor and the more recent acquisitions adjoining Gow moss can be found type 6c of a more recent history with Ap depths averaging 15-25 cm and retaining the grassy phase.

In the wood of Styne there is an example of 15G having been cultivated to a depth of 25 cm producing conditions very similar to flushed gleys.

Table 2. Yield Class Analysis by Soil Type and Species

Soil Type	Remarks	Species	Y.C.(H.ft.)	Top Ht. (ft.)	Age	Compt. Source of data
1c	Deer Park	SP	100	52	48	166a
12a	Tynet alluvium (Deer Park)	"	120	52	39	170a
12a	"	DF	140	75	45	156c
12a	Spey alluvium	SP	100	36	30	103a
2	Sandy deposits	DF	180	28	14	374b
3	Boyndie Series	SP	100	47	39	141a
"	"	"	100	55	49	143a
"	"	SS	200	32	19	34b
"	Birch overstorey	DF	(100) (est)	15	18	32b
"	Boyndie Series	JL	90	63	49	143c
3	Corby Series	SP	80	46	45	135a
	Fluvioglacial	SP	80	25	22	59a
3	Over till	SP	80	38	38	216a
	" "	SP	100	46	39	212b
		SP	80	41	38	231a
4	N. Whiteash (Curling Pav.)	SP	60	50	pre 1900	218d
3/4 Complex		SP	80	20	18	253a
4/5		JL	60	15	15	391a

Soil Type	Remarks	Species	Y.C.(H.ft.)	Top Ht. (ft.)	Age	Compt. Source of data
5		JL	60	18	16	408a
		JL	60	15	15	391a
		JL	60	12	11	244b
		SP	60	35	37	384a
		SP	60		14	394a
	Slorach type	SP	60	13	19	372d
	Leitch's Wood	SP	< 60	24	37	215b
6	Deer Park	SP	80/100	48/52	46	167a
		"	80	12	14	127a
	Deer Park	"	80	42	40	148a
	Gow Moss	"	80	11	12	316a
	Cairnty Wood	"	80	28	24	498a
	Sound Moor	"	60	10	14	464a
	" "	LP	80			474a
		SP	60	38	42	292a/c
		SS	160	60	39	288b/e
6c	-	SP	100	53	45	159a
6/6c	Schistose-type till	LP	100	13	12	272a
15G	Bi overstorey	DF	(100)	13	15	139d
15G/9/12a	-	SS	180	79	45	156e
15G/15Gc	-	SS	140	16	14	28f
15G	Less gleyed Non-ericaceous	SP	100	26	19	27a
15G	-	SP	60	45	53	69a
9	Deer Park	SS	180		48	170b
10	Gow Moss	LP	80	7	8	313b
"	" "	JL	60	12	9	329d
15g	Lossie	SP	80/100			20/21
"	"	SP	60/80			19
15l	"	SP	80			2,6,15,17
15s	" Shingle	SP	60/c			
15d	" Dunes	"	60			37,38
"	" Dunes sheltered	"	80			25,26
"	" Dunes mod. exposed	"	60			"
"	" Dunes very exposed	"	40/c			"

6. Silvicultural Observations.

The wide range of parent materials and soil types on Speymouth - Lossie makes it difficult to summarise or generalise on silvicultural conditions.

A possible grouping is suggested below and silvicultural interpretation is discussed broadly in these groups. Reference has been made to a limited collection of yield class data per soil type from stands older than 15 years (Table 2).

Group	DRAINAGE CLASS	SOIL TYPES	VEGETATION	AREA OF GROUP (ha)
A.	Very freely drained immature soils.	Shingle soils Alluvium-gravels Dunes sand Links sand	Ecinerea heath " Marram. Holcus/sand sedge	817
B.	Well drained soils.	Alluvium - fertile Brown earths Cultivated podzol Podzolised brown earth Humus iron podzols - Boyndie type.	Moist-grass bracken Grass heath " " " " Dry heath Calluna-E.cinerea	353
C.	Slightly imperfectly drained soils.	Imperfectly drained cultivated podzol Humus iron podzol - Corby type Humus iron podzol on till. Weak ironpan soil.	Dry heath with whins " " - Cladonia Dry/damp heath Damp heath	1032
D.	Imperfectly drained soils.	Strong ironpan soils. Fragogley (20% say) with podzolic surface features.	Dry/Moist heath " " "	1312
		Imp. drained g.w.g. sands & gravels.	Moist grass	456
E.	Poorly drained soils.	Fragogleys(80% say) Surfacewater gley	Moist heath Wet heath	942
		Cultivated gleys Flushed gley Skeletal soils, seepage gleys.	Moist pasture " " Moist Wood Rush	
F.	Very poorly drained soils.	Flushed basin peat Poorly drained g.w.g. alluvium. Poorly drained g.w.g. sands & gravels Peaty gley Unflushed bog	Wet Juncus pasture Wet pasture Wet heath. Wet Calluna moor Calluna cotton grass bog.	606
			TOTAL	5118

Group A. Soil types 15s, 12, 15d, and 15l. 817 hectares

This group contains soils with excessive or very free drainage and the first two soils are also extremely stony with very low net soil volume.

They tend to be particularly low in humus and available nitrogen as well as other nutrients and are located in positions where potential water deficit may attain 4" (100 mm) in dry seasons. They are strongly acid soils, tending to podzolise.

The vegetation reflects the drought features by open stocking, predominance of E.cinerea and hirsute Calluna and, on the sands, Carex arenaria.

Tree performance improves with decreasing stoniness but growth on the coastal dunes is strongly affected on the south side by saline blast.

Cultivation is likely to be beneficial on soil type 12 only.

Scots pine is dominant on this group with moderate areas of C.P. and L.P. S. Coastal provenance of LP has done well on the Lossie dunes where used. C.P. has proved a failure on the saline-exposed quarter of dunes and has very sharp taper near the sea but elsewhere bears reasonable comparison with S.P. Scots pine is of very mixed provenance, often coarse, and has nearly failed on the stoniest shingles where the trees indicate extreme NP deficiency. It is very poor in saline exposure.

Some crops on the shingles are so poor that they may be regarded as failed but dramatic responses to probably NP are likely over a large part of the Group. Improved production is possible by top dressing nutrition using NP + N treatments, (refer Culbin - Macaulay Research) by using LP for the zone most subject to saline exposure and by using improved provenance SP, CP or LP in restocking. There is a marginal possibility of using S.S. on soil type 15l provided serious drought is not experienced in the first 5 years from planting.

Imperfectly drained ground water gleyed sand in Lossie soil type 15g is a marginal member of this group and could support S.S. Drainage is difficult to effect because of slumping of sand in this soil.

Group B. Soil type 12a, 1, 1c, 2, 3 (Boyndie) 353 ha.

Although soil type 12a does not quite qualify in drainage class for this group, there are advantages in considering it part of this Group.

The Group consists of freely drained deep soils which support grass heath vegetation or better. Stone volume is smaller than Group C and hence net soil volume is large. They are freely permeable and apart from the alluvium show no signs of mottling of any kind. Only in the sharpest local topography is available water capacity likely to be restricted. Among present crops Scots pine has been an important species, usually having minimum yield class 100, but many other species have been more profitably used - D.F., N.S., S.S. with much greater production, from YC 140-180 and S.S. may be generally favoured in future. Fomes is likely to develop strongly on these soils and will influence choice of species on restocking. Subject to this constraint, W.H. is likely to be a high producer in this group and with early frost protection G.F. should be good on soil type 12a.

Ericaceous species may cause slight checking to D.F., S.S. on Boyndie podzols in establishment and pole crops on this soil may respond in the short-term to N or NP. On the other soils, it is unlikely that any responses will be obtained and they do not require cultivation on restocking.

Limited deep drainage is necessary on soil type 12a in Deer Park usually, as it overlies an organic horizon and groundwater gleyed sand.

Stability in the Group is very high and only the alluvium has a moderate soil susceptibility to windblow but benefits from very low topographic hazard.

Group C. Soil types 1g, 3 (Corby), 3 (till), 4. 1032 ha.

These are a group of stony heathland podzols in which there are restrictions of depth/stoniness/pore space and slight gleying or weak pan in the B horizon. The stoniness reduces net soil volume and the normal presence of indurated or cemented horizons also serves as a moderate or severe restriction to rooting in depth. Some tap roots exploit the grey wedges in the till on soil type 3 over till and soil type 4 but the bulk of fine rooting remains above this level. Slope class is commonly 10-15° and there is often rank Calluna and a strongly developed ff layer.

Run-off and percolation are fast and there is some evidence that limited drought is experienced primarily owing to restrictions in rooting depth and volume of friable soil.

Scots pine is almost the sole species, often without ploughing and screefed into rank Calluna. Establishment and stocking are often irregular but growth rate of dominant S.P. is quite well maintained at YC 80/90 for 40 yrs. after a slow start. There is some evidence that growth may decline later to give a production equivalent to YC 70/80 over a whole rotation. D.F. W.H. and Abies spp. have grown well on lower slopes on soil type 3 on N. Whiteash although suffering from early nitrogen check in Calluna.

On soil type 4 ploughing has partly broken pan where the pan was not too deep but stoniness did prevent uniform cultivation and the plunging or deeper pan with associated gleying has not been disturbed.

All of these soils would benefit from more intensive cultivation. Spaced cultivation at 1.8 metres is the minimum treatment to a minimum effective depth of 40 cm on soil types 3 (Corby), 1g but it would be clearly desirable to cultivate to include indurated till on soil types 3(till) and 4 in order to increase friable soil volume. The latter would involve depths of 50-75 cm and is beyond current standard equipment (prototype deep cultivation equipment is under test).

Since the slightly imperfect drainage is caused by lack of friable consistence and not water table, good cultivation should ensure that no drains are required. However the erosion risk on soil types 3(till) and 4 is often quite high and some contour drains to control run-off into the gullies is essential if large areas are cultivated in one area. Complete cultivation may be generally desirable, especially on soil type 3 (Corby).

Phosphate should be applied early in establishment and for existing SP crops, especially those on soil type 3 with Cladonia present, N or NP and repeated N may give marked responses. A marked accumulation of mor takes place during crop development and short-term stimulus in growth by N or NP is probable in later pole crop conditions. On restocking cultivation would have a similar effect. Speymouth Exps, 7/13 are relevant and the advice of Silv N should be sought before top dressing is done.

The most consistent species is Scots pine and with improved provenance it is likely to remain major species although LP of Skeena or S Inland BC provenances will be a close challenger. Birch is common and this species may be worth preserving in mixture with S.P. for soil improvement and amenity (similarly E.L.). There is also a good prospect for limited use of W.H. using 2,4-D to counteract the N-check which this species experiences in dense Calluna on this site. This species should only be introduced under overhead canopy.

There are good examples on E. Whiteash of SP/SS mixtures on soil type 4 and this is the only soil type on which this mixture has succeeded. The depth of friable ochreous B horizon is probably critical and pure S.S. may be used successfully where friable B horizon exceeds 20 cm below the weak pan. (The diffuse influence of schist may be important). With this exception, S.S. is not generally recommended in Group C unless high intensity cultivation has been employed.

Forbs can be moderately active in this group.

There is a low susceptibility to windthrow at top heights over 20 metres but windthrow is unlikely to be of major significance in view of the generally lower topographic risk of the Group.

Group D. Soil type 5, podzolic soil type 6. 1312 hectares

This very dominant Group has very stony soils with a gleyed horizon resting on a strong metallic ironpan over indurated/compact till. (The more podzolic fragogleys with better drainage near the surface are included - mainly Deer Park.)

Surface conditions may be quite favourable with friable albic E horizon and Bh present but root development is impeded by the gleying in the lower E horizon above the pan and roots cannot breach the pan. Pore space below pan, and sometimes above is too low for normal root development owing to induration with or without additional cementation. This 'cementation' feature is worst on Blorachs Leitches Wood type. Cultivation drawbar pulls may be very high from stoniness alone e.g. Whiteash.

Pan lies at 35-45 cm (undulating on Cairnty to a maximum of 60 cm.) and has hardly ever been disturbed by previous shallow tine ploughing. Consequently present crops of mainly S.P. are restricted to the friable surface of ungleyed or only slightly gleyed material or ploughed spoil. Many crops are establishing poorly and yield class of SP and JL is no better than 60 at 15-30 yrs. Exposure is moderate and early performance of SP may be partly influenced by this.

It must be recognised that inadequate aeration resulting from low rootable soil volume and too shallow ploughing is the principle cause of poor growth in SP on these soils, rather than poor availability of nutrients (although P is low above pan). Consequently somewhat variable results may result from applications of NP in top dressing present crops but this action is recommended if economic responses are obtained from expts.

Complete cultivation to a depth adequate to break pan is essential i.e. an average depth 45 cm, and some consideration should be given to more optimal cultivation in depth including the indurated layer which which would require depths up to 75 cm.

Spaced cultivation at 1.8 metres is not recommended. Where cultivation has to be done with present equipment which is not capable of breaching pan it is recommended that drains to 60 cm. depth at 200 metres per hectare be inserted following complete cultivation. Phosphate should be applied at 400 kg Gafsa per hectare and the levels of P in foliage should be checked at 5 yearly intervals.

These principles of cultivation also apply to much of the area of the fragogleys but owing to their drainage class they have been considered mainly as Group E.

Lodgepole pine is the safe species (Skeena or S.Inland B.C. (Mt. Ida) provenances advised) especially for lower levels of cultivation and should produce YC 100-120 depending upon provenance and scale of cultivation. S.P. should only be used where effective and comprehensive pan breakage has been achieved; good provenances should attain YC 100. Experimental evidence suggests that S.S. may be used in mixture with S.P. where higher levels of cultivation have been used increasing depth of friable profile from the indurated layer. W.H. is an alternative but would require introduction in side shelter in intensively deep-cultivated racks.

Soil susceptibility to windthrow is moderate where gleying above pan is well developed and first cultivation did not disturb pan. Early rocking and windsway was common in the group where planted in the bottom of the furrow. Normally with effective pan breakage and intensive cultivation this would be a stable group.

Group E. Soil types 6d, 6, 6c, 8c, 7. Total 942 ha.

This group of surface water gley soils with generally narrow organic horizons have in common poor drainage class. The bulk are heathland gleys but the cultivated gleys and flushed gley are generally not affected by Calluna at all. Soil type 15 g in the Deer Park can be included here.

Impedence is caused primarily by compact or indurated subsoils but in soil type 6d and 7/15 g impedence is due to fine texture and receiving drainage respectively.

Intensive cultivation together with drains at 300-400 m/ha is the desirable improvement on soil type 6 but in all the other soil types drainage at 400 m. per ha following normal ploughing or restocking should be adequate. Phosphate should always be applied at planting at 400 kg Gafsa per ha on soil types 6d and 6; later in the rotation on the other soils.

S.S. has been used commonly successfully on the cultivated and flushed gleys but has checked severely wherever used pure or in mixture on the heathland soil types 6 and 6d. PK at 560 kg per hectare has been recommended for S.S. checked at 4'-8' on soil type 6d. In row mixtures with SP, SS has again checked severely. L.P. has been used more commonly on heathland gleys at Speymouth than at most Sandstone forests and has been successful. S.P. grows at equivalent to YC 80 down to YC 60 but is bound to decline as it becomes increasingly affected by anaerobic gleying in the profile with rootable depth no more than 20 cm. N P may be beneficial on the poorer SP crops up to 5 metres height on soil types 6 and 6d.

Existing crop drainage is very poor and drainage should be constructed at 300-400 m per ha before advanced thicket stage has passed.

The best overall choice is LP on the heathland gleys and SS on cultivated and flushed gleys. SP should be confined to soil type 6 only where intensive cultivation and drainage has been done.

Windthrow susceptibility is high on soil types 6d, 6c, 8c and 7 but possibly only moderate on soil type 6. Topographic hazard is low in Deer Park, moderate elsewhere. Windthrow can start to become significant after top heights of approximately 16 metres on windward slopes and 20 metres in shelter but top height of present crops and data on windthrow are too scarce to make prediction currently meaningful.

Group F. Soil types 9, 8, 10, 15G, 12g. 606 ha.

This is a group of soils with very poor drainage and, in the case of alluvium and sands-gravels, soils affected seriously by the levels of ground-water tables. It will be extremely difficult to obtain drainage gradients and outfall in soil types 15G and 12 g. There are compacted sand horizons in soil type 15G. The quality of site varies from good in soil types 9 and 12g and restricted parts of soil type 15G to the more normal poor wet ericaceous sites.

Drainage is inadequate in all these soils and programmes are recommended to instal efficient drainage at approx. 500 m per hectare. Timber in the peat is a major defect on bog type 10.

Soil susceptibility to windthrow is generally high and windblow has occurred on soil 15G with alluvium overlay in S.S. at 20 metres in Deer Park while L.P. crops on soil type 8 are very unstable at only 6 metres in moderate exposure. Principles of no thinning appear advisable on soil types 8 and 10.

S.S. is a high producer, YC 180, on soil type 9, 12g and the part of soil type 15G with overlay of red alluvium, with N.S. secondary for the more frosty pockets. There is no clear evidence that P need be used on these sites.

L.P. is the best choice for the poor sands and gravels on wet heathy sites over high ground water table (15G) and for soil types 8 and 10. Phosphate is essential on both and K levels are very low on bog type 10. Present crops on the bog are very K-deficient and top dressing with 560 kg PK per hectare is overdue. Repeated PK or P input will be necessary on bog type 10.

7. References:

Grant, R. Interim Memoir on the Soils of the Country round Elgin (Sheet 95) 1960.

8. Maps.

District Officer	1 coloured set 6"-1 mile soil maps. 1 Blank set
Chief forester	" " " "
Site Survey Officer	1 field set coloured 6"-1" mile soil maps "
Dept of Soil Survey	1Blank set 6"-1 mile soil maps.

Further copies of blank soil maps may be obtained on request from Drawing office E(S) where the permatraces are lodged.

Distribution

Conservator E(S)	1
District Officer, Fochabers	2
Chief Forester	1
Head Forester (Research)	2
Soils Officer (")	1
Silv N.	2
Dr. W.O. Binns.	1
Dept of Soil Survey	2
Site Survey Officer	1
Site Survey foresters	8
Spares	18.

Issued.

January 1970.

Appendix 1 Soil Profiles

CONTENTS

DBP/ST

Appendix I - Soil Profiles

Soil Pits were dug and the profiles described for all the major Soil types and their variations. They are as follows:-

Soil Type 3 - Humus iron podzol Profile no. XVI on fluvioglacial sands and gravels.

Vegetation E. cinerea (d) C. vulgaris (a) Bi regen (o) Fine grasses (f) Luzula pilosa (lf) Bramble (lf) Oxalis (lf) Violet (lf) Feather moss (cod)

Profile

Ol/Of 6cm (2½")	litter
Oh 6-8 cm(2½-3")	Fibrous mor humus.
Ah	Faint and discontinuous.
E 13-16cm (5-6½")	Pinkish grey, mod. stony, very friable sand, very weak structure
Bhs 33 cm (13")	dark reddish brown/dark brown/strong brown, very stony, structureless sand, friable
B/Cx 25 cm (10")	brownish yellow/strong brown, massive structure, extremely firm sand.
C	raw sand and gravel extremely stony.

Occasional live roots into upper C horizon at 1 metre.

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Soil Type 3 - Humus iron podzol Sample of podzols with cemented humus/iron B horizon of upper terrace Corby gravels (Lunan Wood)

Vegetation C. vulgaris (d) Bi scrub (f) E. cinerea (f) Feather mosses (a)

Profile

O horizons	- destroyed by complete ploughing
Ah	- trace only.
E 10 cm (4")	- light brownish grey, very stony loamy sand structureless and very friable, very dry and powdery.
Bh	- diffused through Bs
Bs(g) 13-18 cm (5-7")	- Pale brown, some dark yellowish brown patches, a few distinct ochreous mottles, very stony loamy sand, structureless and very friable
Bx 8 cm (3")	- Strongly cemented with discontinuous ironpan very/extremely stony coarse loamy sand, massive structure : very firm
B/C 30 cm (12")+	- Very/ extremely stony gravel: coarse loamy sand structureless and very friable : moist

Rooting depth 30 cm.

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Soil Type 3 - Humus iron podzol Profile no. I on mixed till and fluvioglacial parent materials.

Vegetation C. vulgaris (coD)E. cinerea (d) fine grasses (f) Feather mosses (d) SS natural regeneration (la) Holly (lf).

Profile

Ol/Of	5 cm.	(2¼")	litter
Oh	2 cm.	(1")	fibrous mor humus with few bleached sand grains
Ah	0.5 cm.	(¼")	discontinuous and weakly developed
E	6-15 cm.	(2½"-6")	light brownish grey/pinkish grey, v. stony, rounded and sub-angular Moine and quartzite, v. friable, structureless loamy sand.
Bh			discontinuous and diffused into Bs
Bs	20-33 cm.	(8"-13")	yellowish red/strong brown, weak sub-angular blocky structure, sandy loam, friable.
Cx_1	13 cm.	(5")	reddish brown/brown, v. stony, platy compacted sandy loam, very firm.
Cx_2	20 cm.+	(8"+)	light reddish brown, extremely stony gritty sand. structureless and friable.

Occassional rooting into upper Cx(1).

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Soil Type 1c - Cultivated Podzol

Vegetation - Fine and soft grasses (d), E. cinerea (a), C. vulgaris (c), mosses (a), bracken (la), fern (lf), wood sorrel, violet and other wild flowers (c).

Profile

Ol			vegetation litter
Of	4 cm.	(1½")	fermenting litter
Ah	2 cm.	(1")	very dark grey with frequent bleached sand grains, weak structure, friable sandy loam.
Ap	31 cm.	(12½")	brown/dark brown, very to extremely stony, quartzite Moine with some granite, structureless, very friable loamy sand.
Bs	25 cm.	(10")	dark reddish brown/yellowish red, extremely stony, structureless, very friable, gritty sandy loam.
C(x)	30 cm.+	(12"+)	reddish brown/light brown, very stony, loamy sand weak, angular blocky structure, friable (Elgin Till).

One boulder in C(x). SP roots penetrating well into C(x).

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Soil Type 4 - Weak ironpan soil

Vegetation - C. vulgaris (d), E. cinerea (f), Bi scrub (c), Bracken (c), fine grasses (lf), Woodrush (lf), Sphagnum (f), Feather mosses (a).

Profile

Ol/Of	10 cm.	(4")	litter
Oh	4 cm.	(1½")	black peat
Ah(g)	5-8 cm.	(2-3")	very dark grey, sandy loam, weak structure, friable.
$E(g)_1$	8-10 cm.	(3-4")	reddish grey, very stony loamy sand, weak structure, friable.
Eg	6 cm.	(1½")	(with deeper pockets) light brownish grey with few small rusty mottles, very stony sandy loam, weak structure friable.
Bh	0.5-2 cm.	(¼"-1")	undulating humus band with distinct iron panning in places.
Bs(g)	15-20 cm.	(6-8")	pinkish grey, very pale brown to yellowish red. Very stony sandy loam, weak structure and friable.
Cx	30 cm.+	(12"+)	red, extremely stony loamy sand, structureless indurated but friable when disturbed.

Occassional rooting down to Cx.

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Soil Type 4 - Weak ironpan soil

Vegetation - C.vulgaris (d), E. cinerea (f), Bi.scrub (lf), Fern (lf), Fine grasses (lf), Feather mosses (a).

Profile

Ol/Of	6 cm.	(2½")	litter
Oh	4 cm.	(1½")	black greasy mor humus tending to peaty
Ah			discontinuous and weakly developed.
E(g)	2-15 cm.	(1-6")	grey, light brownish grey, very stony loamy sand, weak structure and very friable.
Bh	2-13 cm.	(1-5")	Undulating, compacted humus deposition ranging from Cx to within 2" of the surface.
Bs	2-10 cm.	(1-4")	Red with darker humose patches, very stony, loam, weak structure : friable.
Cx			Weak red-red, very stony loamy sand, indurated but weak structure and friable when disturbed.

Flaggy conglomerate boulder in Cx. A few live roots down to Cx.

Soil type 5 - Strong ironpan soil ---------- o ----------

(a) Whiteash Hill Sub-Type

Vegetation - C. vulgaris (d) E. nigrum (lf) Feather mosses (f) Lichen (o)

Profile

Ol/Of	8-9 cm.	(3-3½")	litter.
Oh			narrow and discontinuous horizon, mor humus.
Ah	2 cm.	(1")	black, frequent bleached sand grains, sandy loam, weak structure : friable
$E(g)_1$	10-13 cm.	(4-5")	light brownish grey with darker humose staining, extremely stony loamy sand, structureless and very friable

Eg2	13 cm. (5")	very pale brown/dark reddish brown loamy sand, extremely stony, structureless and very friable.
Bi		strong, slightly undulating ironpan
Cx	60 cm. (24"+)	red, extremely stony gritty loamy sand, indurated, structureless when disturbed, friable when disturbed

One boulder in Cx. Rooting mainly confined to O horizons.

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Soil type 5 Strong ironpan soil

(b) Sycamore and Leitches Wood Type

Vegetation - C. vulgaris (d) E. cinerea (f) V. myrtillus (o) E. nigrum (la) Birch scrub (lf) Feather mosses (a) Sphagnum (o) Lichen (la) Fine grasses (lf)

Profile

Ol	2 cm. (1")	heather and moss litter
Of	15 cm. (6")	very dusky red felted layer of heather and moss remains
Oh	5 cm. (2")	narrow mor humus horizon, tending to peaty.
Ah	2 cm. (1")	weakly developed horizon, loamy sand
E(g)	10 cm. (4")	light brownish grey with humus staining, very stony loamy sand : weak structure : friable.
Bh		narrow irregular horizon diffusing into Eg
Eg	18-24 cm. (7½-9½")	light yellowish brown/yellowish brown, light grey above ironpan, very stony loamy sand : weak structure : friable.
Bi		strong and undulating ironpan
Cx	1, 5-6 cm. (2-2½")	light reddish brown with strong iron colouration of yellowish red, extremely stony loamy sand, massive structure : extremely firm and cemented.
Cx2,	60 cm. (24"+)	red - pale red, extremely stony loamy sand structureless and very friable when disturbed.

Sparse rooting into Eg.

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Soil type 5 Strong ironpan soil

(c) General Ordiequish Sub-Type

Vegetation - C. vulgaris (d) E. tetralix (lf) SP and Bi nat. regen. (o) feather mosses (a) lichen (o) Sphagnum (lf) Carex (lf)

Profile 12

01/0f		litter pH 4.3
Oh 4 cm.	(1½")	Fibrous peat pH 4.2
Ah 6 cm.	(2½")	very dark brown, very stony loamy sand, weak structure : friable pH 4.2
Eg 22 cm.	(9")	pale brown/brown, frequent rusty mottles and root channels, very stony up to 12 cm. gritty sandy loam weak structure : friable pH 4.1.
Bi		strong, continuous and slightly undulating iron pan
Cx		red, very/extremely stony up to 20 cm., sandy loam, weak structure : firm, compact, friable pH 4.3

Some boulders on surrounding surface. Rooting mainly confined to Oh horizon.

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Soil type 5 Strong ironpan soil

(d) General Ordiequish Sub-Type with less indurated upper C horizon

Vegetation - C. vulgaris (d) E. cinerea (f) Rowans (lf) Carex (lf) Feather nosses (a) lichen (o)

Profile

01/0f		vegetation litter
Oh 8-9 cm.	(3-3½")	thin fibrous peat horizon
Ah		no distinct horizon - humus heavily diffused throughout Eg1
Eg1 16 cm.	(6½")	Very dark brown to dark greyish brown, very stony sandy loam : weak structure : friable
Eg2 8-15 cm.	(3-6")	olive, many rusty root channels, very stony sandy loam, strong structure : friable
Bi		strong, slightly undulating ironpan
B/C 1-5cm.	(½-2")	Yellowish red, sandy loam, very variable horizon
Cx 30 cm.	(12")	red, very stony gritty sandy loam; strong platy structure : firm, friable when disturbed

Sparse rooting to Bi horizon.

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Soil type 6d - Surface water gley on schistose-influenced till

Vegetation - C. vulgaris (d) E. nigrum (lf) J. squarrosus (o) Luzula (lf) lichen (f) Feather nosses (a) E. vaginatum (lf)

Profile 12

01/0f		litter pH 4.3
Oh 4 cm.	(1½")	Fibrous peat pH 4.2
Ah 6 cm.	(2½")	very dark brown, very stony loamy sand, weak structure : friable pH 4.2
Eg 22 cm.	(9")	pale brown/brown, frequent rusty mottles and root channels, very stony up to 12 cm. gritty sandy loam weak structure : friable pH 4.1.
Bi		strong, continuous and slightly undulating iron pan
Cx		red, very/extremely stony up to 20 cm., sandy loam, weak structure : firm, compact, friable pH 4.3

Some boulders on surrounding surface. Rooting mainly confined to Oh horizon.

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Soil type 5 Strong ironpan soil

(d) General Ordiequish Sub-Type with less indurated upper C horizon

Vegetation - C. vulgaris (d) E. cinerea (f) Rowans (lf) Carex (lf) Feather mosses (a) lichen (o)

Profile

01/0f		vegetation litter
Oh 8-9 cm.	(3-3½")	thin fibrous peat horizon
Ah		no distinct horizon - humus heavily diffused throughout Eg1
Eg1 16 cm.	(6½")	Very dark brown to dark greyish brown, very stony sandy loam : weak structure : friable
Eg2 8-15 cm.	(3-6")	olive, many rusty root channels, very stony sandy loam, strong structure : friable
Bi		strong, slightly undulating ironpan
B/C 1-5cm.	(½-2")	Yellowish red, sandy loam, very variable horizon
Cx 30 cm.	(12")	red, very stony gritty sandy loam; strong platy structure : firm, friable when disturbed

Sparse rooting to Bi horizon.

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Soil type 6d - Surface water gley on schistose-influenced till

Vegetation - C. vulgaris (d) E. nigrum (lf) J. squarrosus (o) Luzula (lf) lichen (f) Feather mosses (a) E. vaginatum (lf)

Profile

01/0f	3 cm. (1¼")	vegetation litter
0h	8 cm. (3")	black fibrous peat
Ahg	5-10 cm. (2-4")	dark reddish brown mod. stony humose sandy loam, strong fibrous structure : friable pH 3.8
Eg	38 cm. (15")	pale olive with light reddish patches and frequent rusty root channels : very stony loam : strong structure : friable pH4.2
C(g)	60 cm. (24"+)	red with frequent rotten schists and rusty root channels, very stony (sandy) clay, strong structure : friable pH 4.2

Roots penetrating into upper C(g) horizon

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Soil type 6 - Fragogley (a) Deer Park on Elgin till

Vegetation - E. tetralix (f) E. cinerea (o) Fern (lf) fine grasses (lf) C. vulgaris (o) Feather mosses (a)

Profile

01/0f	6 cm. (2½")	litter
Ahg	6-10 cm. (2½-4")	very dark grey, moderately stony sandy loam strong structure due to high humus content : friable
Eg	18-28 cm. (7-11")	light yellowish brown/dark brown, many large rusty mottles in lower horizon : very stony loamy sand, weak to strong structure : friable.
Cxg	20 cm. (8"+)	pale red with frequent mottling and prominent light grey wedges : very stony sandy loam, strong structure : slightly firm.

One granite boulder in Eg horizon. Rooting mainly confined to Ahg, sparse rooting into Eg.

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Soil type 6 - Fragogley (b) Soundmoor

Vegetation - C. vulgaris (d) E. tetralix (o) J. squarrosus (f) Scirpus (la) feather mosses (a) Sphagnum (la) Lichen (f)

Profile

01/0f	4 cm. (1½")	litter
0h	6-9 cm. (2½-3½")	very fibrous peat
Ah	18-25 cm.	narrow and indistinct merging horizon
E(g)	18-25 cm. (7-10")	light brownish grey/very dark greyish brown, very stony sandy loam, weak structure : friable

Eg2	18 cm. (7")	light yellowish brown, distinctly mottled, very stony sandy loam, weak structure : friable
Cx(g)		red with faint rusty mottles, very stony sandy loam : strong structure : upper 5-8cm firm, remainder friable

Very sparse rooting down to Cx(g)

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Soil type 12a - Fertile imperfectly drained alluvium (River Spey alluvium)

Vegetation - Soft grasses (d) Bramble (lf) Fern (la) Raspberry (f) Elder (f) Syc. and Beech regen. (lf) Nettle (la) Foxglove (o) Wood sorrel (la) Mosses (a) herbs (o)

Profile

Ol/Of	4 cm.	(1¾")	litter
Ah	1 cm.	(½")	discontinuous, with many bleached sand grains
'A')	36-41 cm.		greyish brown, no stones, sandy loam : weak
)	(14½-16½")		structure : very friable pH 4.0
'B')			pale brown, no stones, loamy sand : weak structure : very friable pH 4.9
C	30 cm.+	(12"+)	extremely stony, rounded gravel, structureless and very friable

Frequent rooting throughout 'A' and 'B' horizons, negligible rooting into C horizon.

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Soil type 12a/9/15G Tynet alluvium

Showing flushed peat over groundwater gleyed sand with overlay of fine red alluvium (Deer Park)

Vegetation - Soft grasses (d) Bracken (f) Fern (o) Bramble (la) Luzula ~~pilosa~~ sylvatica (la) Oxalis (f) S^S and Holly regen. (lf) Feather mosses (a) Violet and other wild flowers (f) E. cinerea and C. vulgaris (la)

Profile

Ol/Of	4 cm.	(1½")	litter
Ah	5-6 cm.	(2-2½")	dark reddish brown, stone free sandy loam, weak structure : friable
C 1.	15-20 cm.	(6-8")	reddish brown, stone free sandy loam, weak structure : friable
Cg(1)	8-13 cm.	(3-5")	reddish yellow/reddish brown stone free loamy sand, weak structure : very friable
Oh	30-40 cm.	(12-16")	black sedge peat, strong blocky structure : firm
Cg (2)	50 cm.	(20")	pale olive, bleached for 4 cm. below Oh, occasional distinct rusty mottles, wet structureless sand very friable, collapsing; gravel seam at groundwater level

Soil type 15G - Ground water gleyed sands and gravels poorly drained

Poorly drained Corby sands and gravels - Balnacoul Wood

Vegetation - C. vulgaris (d) E. tetralix (f) E. cinerea (1a) Bi scrub (1a) Whin (1f) feather mosses (a) J. squarrosus (1a) Fine grasses (1f) Fern (1f) Lichen (f)

Profile

Ol/Of Oh	(1½")	litter discontinuous horizon up to 5 cm
Ah(g)	4-10cm. (1½-4")	grey/very dark brown, no stones : sandy loam, strong fibrous root-bound structure : friable
Eg	20 cm. (8")	grey/greyish brown frequent rusty root channels moderately stony sandy loam : weak structure : friable
Cg	60 cm.+ (24"+)	bedded sand and gravel of varied colours, extremely stony gritty sand : structureless and very friable collapsing when wet

Sparse Calluna rooting into upper Cg horizon.