Stidriggs Farm Soil Survey

2024

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Contents

Survey and objectives

The Hutton 25k soil survey layer was used as a backdrop to inform soil investigations and test the accuracy / define shortcomings of this layer. The Hutton's strata were sampled in the field using a combination of soil pits to determine the soil type and auger samples to confirm strata boundaries. Strata boundaries were then redefined using aerial photography and sample point data to produce a more accurate operational map.

Areas which contained peat deposits greater than (or approaching) 50cm were considered "peat risk" and further probed on a 50x50m grid initially then at closer intervals once peat over 50cm was found to produce a dedicated deep peat strata.

Climatic conditions (derived from Ecological Site Classification)

Climatic conditions vary significantly across the site with elevation having the most influence. Generally, the most favourable climatic conditions can be found at lower elevation to the east of the site adjacent the Kinnel water and less hospitable conditions to be found in more elevated ground to the south / West.

The most favourable sites in the east are considered to have a "warm , moderately exposed moist climate" with accumulated temperature value of 123, detailed aspect method scoring (DAMS) value of 14 moisture deficit value of 101.

More elevated and exposed ground are considered to have a "cool, highly exposed and wet climate" with accumulated temperature values of 1174, DAMS scores of 16 and moisture deficit value of 89.

Parent Materials (derived from British Geological survey)

Bedrock for the bulk of the survey area was Selcoth Formation - Sandstone, mudstone and siltstone. Sedimentary bedrock formed between 443.8 and 433.4 million years ago during the Silurian period. Small areas of Queensberry formation material were also present in the northern extent. The parent material for the majority of the site was superficial deposits of till formed between 116 and 11.8 thousand years ago during the Quaternary period with the exception of the main elevated ridgelines which were considered to be weathered from bedrock.

Soils

Brown Earths

Whilst the Hutton layer only specifically maps one distinct section of brown earth in the north of the site adjacent to Stidriggs wood, there are conspicuous areas of brown soils infrequently through all other strata.

These soils are characterized by uniform brown horizons and limited surface organic matter indicative of free drainage and relatively high biological activity. They mainly occurred on steeper slopes on material weathered from coarser grained bedrock rather than fine textured till. Vegetation tended to be acid grassland and or bracken stands. In all circumstances soil moisture regime was "fresh" although it is anticipated that the imperfectly drained variant types (1g) may tend towards "moist" for parts of the year. Soil nutrient regime generally conformed to "poor", occasionally verging into "medium" with the exception of the podzolic type which was poor-very poor.

upland type (1u) exhibiting uniform brown colours but superifical gleying in the A horizon. Typical vegetation of bracken stands / acid grassland

Types identified

1 – typical type

1g – imperfectly drained type - distinguished by slight mottling in the subsoil in this circumstance due to finer texture within lower horizons causing percolating water to slow seasonally.

1u – upland type – distinguished by superficial gley in the topsoil on account of a high rainfall regime / finer texture from high organic content.

1ug – as above with superficial mottling within the subsoil

1z – podzolic type – distinguished by insipient podzolisation visibly displayed via a bleached AE horizon but lacking the distinct deposition of humus or iron associated with the typical podzols.

The primary constraint of these soils in terms of cultivation is the potential weed burden as relative free drainage is already present and fertility adequate for a range or species, so avoiding excessive soil disturbance which may exacerbate the situation i.e., linear strip or complete cultivation should be avoided. If mechanical cultivation is desired, invert mounding would be an ideal if relatively slow and expensive method. Continuous mounding may be preferred from a practical point of view but raised positions will create a higher drought risk in dry spring / summer conditions and depressions left by hinge mounds may affect future operations. If mechanical cultivation is undesirable, chemical, or manual screefing offer a viable although labour intensive alternative.

Gleys

A large proportion of the site is mapped as peaty gleys and mineral gleys within the Hutton 25k. Boundaries of the peaty gley strata were expanded following survey as some peaty podzol areas were found to be peaty gleys. Mineral gleys are also present throughout the peaty gley strata as an unmappable component. Cultivated gleys (7c) made up a large proportion of the improved ground around Stidriggs itself. It's unclear the extent to which tile drains underlaying these areas, in which case the soil moisture regime may be expected to become wetter than current vegetation suggests following removal of agricultural management.

These soils are characterised by varying degrees of waterlogging and thus high soil moisture regimes and poor aeration. They mainly occurred on flatter or water collecting topography or anywhere the parent material limited free vertical drainage as was the case with the finer textured tills. Where chronic waterlogging persists or climatic inputs are extreme, surface organic matter i.e., peat begins to develop faster than it be recycled. Vegetation tended to be marshy grassland or wet heath. Fertility and moisture regimes varied greatly depending on specific soil type. On more favourable types such as flushed surface water gley (7f) and brown gleys (7b) SNR was frequently "medium" and SMR "moist – very moist". On permanently waterlogged and more impoverished versions which were more common such as peaty gleys (6p) typified purple moor grass and cotton grass, SNR varied from "very poor (2) – poor /very poor" and SMR "very moist – wet".

Typical mottling of mineral gleys associated with fine textured material slowing vertical percolation of surface water

Peaty Gley with peat phase (6p) mineral horizon displaying complete reduction of iron due to long term waterlogging

Types identified.

7 – typical surface water gley – distinguished by grey coloured topsoil with rusty streaks and strongly mottled subsoil

7b – brown type – distinished by having a well-drained uniform A horizon as per the brown earths but having finer textured subsoil reducing vertical percolating and giving rise to mottling.

7c – cultivated version of the typical type. Past cultivation and inputs have led to a profile more like 7b where the topsoil has uniform colours but giving rise to mottled subsoil.

7f – flushed type – as per the typical type but flushed with nutrient rich water giving rise to higher nutrient regimes and consequently taller more resplendent vegetation, typically tufted hair grass and soft rush.

7z – podzolic type – essentially has the upper horizons of a podzol and the subsoil of the typical gley and represents something of an intergrade between podzolic soils and gleys.

6 – typical peaty type – impeded soil with peat accumulation of 5-25cm

6p – peat phase – as above but peat depth of 25-50cm

6f – as the mineral version but with peat depth of 5-25cm

6z – as per the mineral version but with peat depth of 5-25cm

For the most challenging sites i.e., the peaty and very poorly aerated mineral gleys, permanent waterlogging needs addressed with drainage and some soil mixing to kickstart mineralization would be advantageous to early growth and survival. Mounding will offer a temporary raised planting position to aide establishment but will require additional surface drainage networks to maintain this effect longer term. Consideration should be given to the inclusion of nurse species to help with poor nutrient regimes on the more impoverished types. On less severely waterlogged gleys, hinge (inc continuous) or invert mouding (with a surface drainage network as required) may provide a sufficiently raised, weed free position to facilitate establishment until crop transpiration can contribute to reducing excess water.

Podzolic soils

Podzolic soils are common on raised topography in the south western section of the site. Despite being classified in the hutton as "peaty podzols" a large proportion of these soils appear to be ironpan soils often the intergrade type (4b) in mosaic with brown soils although areas of peaty ironpans and humus iron podzols are also present.

Podzols are free draining strongly acid soils distinguished by a characteristic bleached Ea horizon which has had iron oxides removed and translocated further down the profile into the B horizon which displays a bright orcherous colour. Raw mor humus is typical at the surface and often humus has leached alongside iron oxide to give a dark Bh horzon. Ironpan soils are a separate group although still considered podzolic soils. They are distinguished by the presence of a Bf horizon composed of accumulated iron oxides which crystalise into a pan which is a barrier to the downward movement of watrer and roots leading to a perched watertable. Vegetation tended to be acid grassland and marshy grassland. SNR was frequently" poor – very poor" and SMR depended greatly on individual type with podzols and intergrade ironpans generally being "moist – very moist" and cultivated ironpans being "very moist – wet".

3 - Humus iron podzol – as described above

3p – peaty type – as above but with peat layer 5-50cm deep

4 – typical ironpan – as described above

4p – as per the typical type but with a peat layer 15-45cm deep

4b – intergrade type – as per the typical type but the ironpan is infrequent or only weakly formed. This is essentially an intergrade between brown earths and typical ironpans

Ironpan soil (4) exhibiting Eg horizon underlain with thin Bf ironpan above ocherous Bs horizon

These soils have the potential for significant improvement through cultivation. The podzols benefit greatly from mixing of the organic and mineral components to restore a texture and structure intermediate of the constituent parts. The ironpans specifically require the fracturing of the Bf layer to solve the perched water table and restore drainage. This can be achieved with various forms of subsoiling, traditionally with the forestry plough. However, due to the frequent occurrence of organic matter deeper than 10cm and slope angles involved this may not be possible under current regulations and as such invert mounding or continuous mounding with ripping may be the most viable options where mechanical cultivation is desired. Manual cultivation using mattock screefing would be possible on the mineral versions but not advisable on peaty variants as the pan will be out of reach.

Rankers

Whilst rankers were not uniquely mapped on the hutton 25k layer they were acknowledged in background data as a minor unmappable component of the various strata, especially brown soils and peaty podzols generally occurring on hilltops where limited weathering of bedrock had occurred.

Rankers are shallow soils of less than 30cm to bedrock. They represent a very small proportion of soil groups on site but are worthy of separate consideration given their unique challenges. Clearly the principal constraint is a lack of any significant depth of soil and potentially the stone content of what little soil there is. Soil nutrient regime was often “poor” but could be “medium” where the parent material was richer. Soil moisture regimes were generally “fresh – slightly dry” although at times of drought these soils have a smaller reserve to call on which may exacerbate drought damage. Cultivation of any depth, such as mounding is unlikely to be successful and may create more of an issue with stone content. A Shallow screef which removes a minimal amount of material, either mechanical, manual, or chemical may be the only viable option.

Peaty ranker – organic surface horizon underlain by very thin gleyed mineral horizon then solid parent material.

Alluvial soils

These soils are associated with more recent alluvial deposits adjacent the Kinnel water. Alluvial soils are not a soil type within the forestry commission soil classification system so largely conform to brown soils where the parent material is coarse sands and gravels and mineral gleys where the parent materal is composed of finer silts and clays. The coarser soils come with heightened drought risk for species with high water demand due to high gravel content and coarse texture.

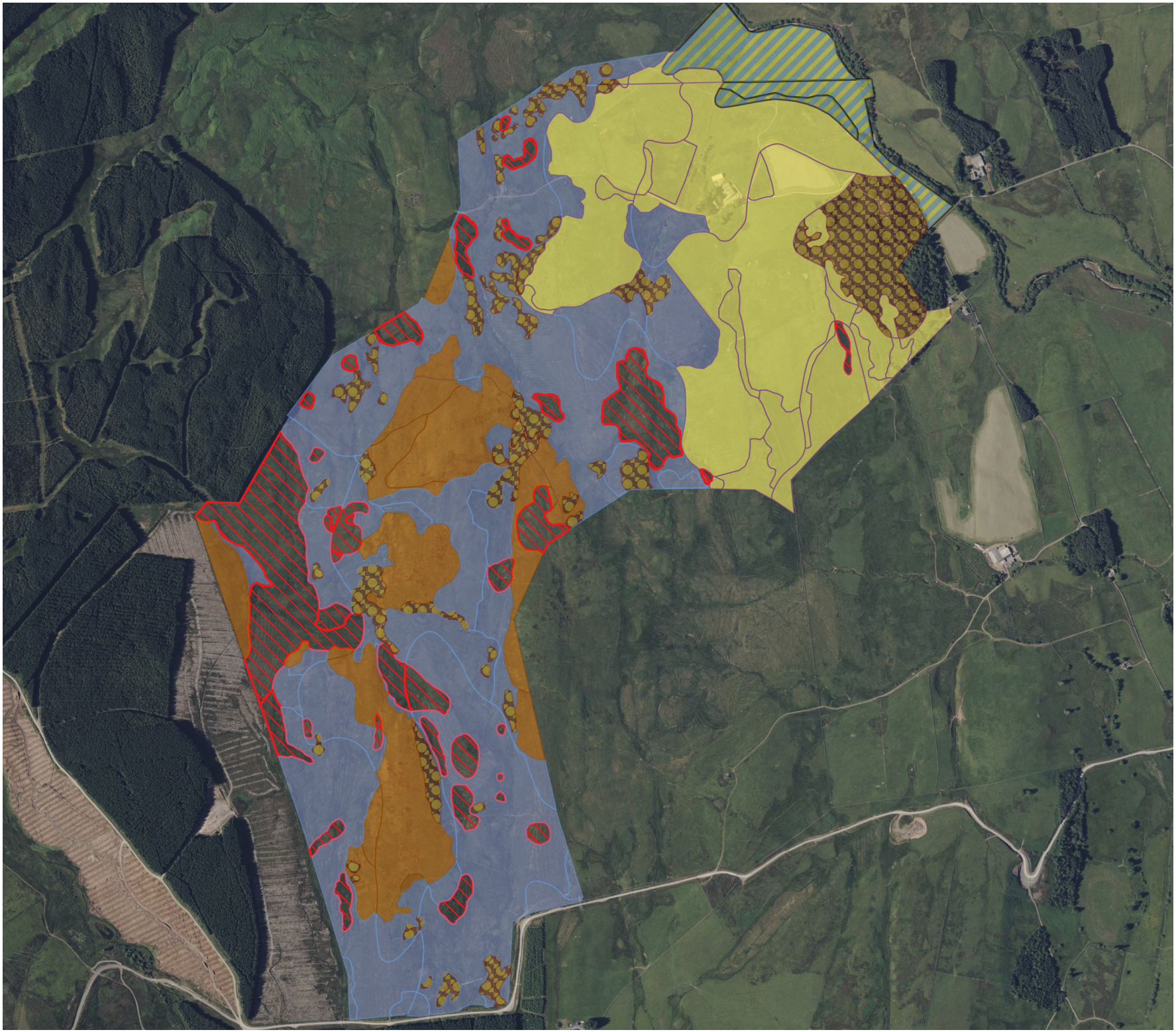
Deep peat

Care has been taken to exclude peat over 50cm but inevitably unmappable micro pockets may be present within other soil strata. Where encountered these should be treated in line with current regulations.

Breakdown of Soils by area

	brown soils	podzolic soils	mineral gleys	peaty gleys	Alluvial soils	deep peat	Total
Area (ha)	23.66	36.58	70.62	112.15	12	31.07	286.1
%	8.27	12.78	24.68	39.2	4.19	10.88	100

Views of the Moffat water valley from Stidriggs


Stidriggs soils
Alluvial soils
Brown soils
Mineral gleys
Peaty gleys
Peaty podzols
Deep peat
0
250
500 m
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