SOIL CLASSIFICATION.

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A SYSTEM OF CLASSIFICATION FOR BRITISH SOILS

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BASIS FOR THE SYSTEM OF SOIL CLASSIFICATION

Systems of classification generally reflect the state of knowledge of the objects classified at a particular time and, especially if the objects are very imperfectly understood, the personal bias of the taxonomists concerned. It is, of course, advantageous to be able to recognise the bias of the taxonomist. If the principles on which a system has been constructed are formally stated, the bias can be more readily ascertained and the quality of the principles evaluated. On the other hand if the taxonomist constructs a system intuitively it usually requires a considerable period of time to elapse before a satisfactory evaluation can be made. In this case the underlying principles, because there will be principles if the system has value, gradually emerge and only then can they be examined critically and the taxonomist's contribution properly appreciated. Since pedology is a comparatively new science most of the systems elaborated so far depend to a large extent on intuition. This is understandable because the theories of soil formation that exist are by no means either comprehensive or thoroughly tested. Nevertheless the principles, such as they are, on which a system of classification is constructed should be stated as clearly and as concisely as possible.

Soil bodies (Muir 1962) are the only real natural objects in pedology and they should be the objects classified by soil taxonomists. The usual way to classify such large and complex objects, in pedology as in other sciences, is to consider only a small part at any one time and construct units that will accommodate these small parts. The traditional fragment studied by soil taxonomists is the soil profile (limiting profile is a more apt description) and it is with this that most systems of soil classification are concerned.

The limiting profile is the "object" classified in the present system and all the units are limiting profile units. The normal way to study a limiting profile is to determine, by field methods, how well it has been differentiated into horizons. The horizons, in turn, are studied by field and laboratory methods to ascertain their properties. Most taxonomists consider all the horizons can be grouped into 4 or 5 master horizons. In the present system all horizons are grouped into 4 master horizons which are defined as follows:-

An A horizon is one formed at the surface of a soil body. It is characterised by a significant content of organic matter formed in situ from the sequence of vegetation growing on the soil body. It can consist almost entirely of organic matter.

An E horizon is one formed below an A horizon. It is characterised by an insignificant content of organic matter formed in situ and a significant loss of other constituents.

A B horizon is one formed below an A horizon. It is characterised by an insignificant content of organic matter formed in situ and a significant gain of other constituents.

A C horizon is relatively unweathered material.

An A horizon can have many diverse properties, provided it has a significant content of organic matter formed more or less in situ from the current sequence of vegetation; the presence of organic matter over-rides all other properties. It can show depletion of constituents as found in an E horizon, augmentation of constituents as in a B horizon or nothing other than an increase in organic matter when it is similar in every other respect to the C horizon.

It is convenient at this point to consider the principles of soil formation on which the present system of classification is based. The first can be termed the Principle of Soil-Body Formation. This principle states that soil processes occur within the soil body as a whole and are not restricted to the dimensions of soil profile pits or similar fragments. This emphasises that soil is three-dimensional, and although it is studied by means of soil profile pits, its true nature must be kept in mind.

The second principle is called The Principle of Developmental Sequences. At a given locus, a soil horizon belonging to one master horizon can be transformed with time into a second horizon belonging either to the same or to a different master horizon. A raw parent material (C horizon) supporting a vegetation for the first time is a simple example of this. If the vegetation persists a visible A horizon will be formed at the surface of the material, thus transforming the C horizon into an A horizon. Similarly an A sub-horizon can be transformed into a different A sub-horizon, or into a B sub-horizon and so on. Obviously, in time, this can lead to the transformation of profiles belonging to one limiting profile unit into profiles belonging to another unit. All this can occur without any change in external conditions.

The examples quoted above are based on morphology and the sequence of development is morphological. This is the usual form of sequence but another is possible, namely, a sequence based on eluviation and illuviation. As yet, no comprehensive eluvial/illuvial sequence has been formulated, although eluviation and illuviation are widely accepted soil processes. Such a sequence is of wider applicability, as a sequence based on morphology is generally restricted to a few closely-related developmental stages and a large number of sequences are required to cover the known limiting soil profiles. The eluvial/illuvial sequence, on the other hand, is something of a balance sheet, not restricted to any one type of morphology but applicable to the whole field of soil profiles. For example, a limiting soil profile which has lost all its alkaline earth carbonate can be termed leached but it can be either a leached gleysol or leached aerasol depending on its morphology. With the group of leached aerasols it could be a brown calcareous soil or a leached chernozem. These considerations have made it possible to construct a system of classification based on eluviation/illuviation in the higher categories and on morphology in the middle categories. The morphological stages can be considered refinements of the eluvial/illuvial classes. The overall effect is to yield classes of approximately major soil group level which differ little in fundamentals from those of earlier systems but which are more tightly defined.

The basis of an eluvial/illuvial sequence is that the loss or gain of constituents is not indiscriminate but follows some sequential pattern, however complex this may be. The main task is to establish the pattern; once it is established a system of priorities for the various characteristics can be set up. An order of priority in keeping with the sequence of events in soil profiles is one which contains a large element of objectivity and consequently one which provides a good basis for a system of classification.

Below is a list, not of constituents, but of groups of constituents considered to be most intimately involved in soil processes.

Table 1. Constituents in Order of Solution.

1. Soluble Salts (γ)
2. Less-Soluble Salts (δ)

Definition

3. Clay (ε)
4. Silica (π) from relatively easily weathered minerals
5. Sesquioxides (θ)

The groups are given in an order which is believed to reflect the most common pattern of loss in a site with excess rainfall. Naturally before a soil could undergo losses in the above order the starting material would have to be a saline, calcareous siallitic material containing clay, and sufficient time would have to elapse to permit the whole sequence of stages to be formed. The following account gives an outline of what would happen at such a site.

When a soil horizon containing soluble salts, less soluble salts, clay and silicate minerals occurs on a site with an excess of annual precipitation, the first constituent to be lost to drainage is the soluble salts. Nevertheless, as long as the horizon contains a minimum of soluble salts it is considered a saline horizon. There are three reasons for this. The first and most important is the profound effect of soluble salts on plant life; the second is the effect of soluble salts on the type of decomposition of silicate minerals within a saline horizon; and the third is the delicacy of soluble salts as an indicator of loss to drainage. When the content of soluble salts is less than the minimum, the horizon ceases to be saline and is regarded as calcareous because it will still contain less soluble salts. Less soluble salts also exert a profound influence on soil processes and plant life as well as acting as an indicator of loss to drainage. The horizon contains clay and other alumino-silicates in addition to less soluble salts but it continues to be termed calcareous until its content of less soluble salts is less than an arbitrary minimum. It then becomes known as a leached horizon, unless it has acquired in the meantime other definite characteristics as, for example, loss of clay. When this occurs the horizon is termed lessivated. The loss of clay is not, in itself, a characteristic of great importance but rather an indicator of a stage of development in the horizon. The lessivated

How obvious!

why calcareous

What woolly writing!

horizon next undergoes a weathering process which results in an increase of free iron oxide accompanied by a loss of silica from the more easily weathered minerals. The horizon is now called desilicated: when it undergoes further decomposition, as indicated by a loss of sesquioxides, it is termed podzolised.

These are the main soil processes and the main order of eluviation in a site with free drainage and an excess of moisture. The order of illuviation in such a site must be similar. Constituents are mobilised in a certain order and at the moment of mobilisation become potential material for illuviation. All the constituents that are eluviated need not be deposited further down in the same limiting profile but those that are will be deposited in accordance with the order of eluviation. The other type of site, the receiving site, will generally behave in the same way. Such a site receives drainage water from other loci and consequently constituents from other loci. The order in which these constituents are deposited also depends on the order in which they are eluviated. The one instance when this is modified is when drainage waters from two or more loci which are out-of-phase intermingle in a receiving site. More than one constituent can then be deposited simultaneously, thus modifying the established order. The deposited constituents, irrespective of the groups to which they belong, have joint sequential priority over all others. Priority for the classification among the deposited constituents can only be decided arbitrarily and if this is necessary the most acceptable order is that already worked out for eluviation and illuviation in sites receiving in-phase drainage waters.

So far sequential eluviation and sequential illuviation have been considered separately. It is quite common, however, for a single horizon to gain as well as lose constituents. The sequential eluviation of a number of constituents is comparatively easy to visualise but it is not so easy to accept sequential eluviation and illuviation. An example of an eluvial sequence is: loss of carbonate, loss of clay, loss of silica and loss of sesquioxides. This is most likely to occur in an upper horizon. An example of an eluvial/illuvial sequence is loss of carbonate, gain of clay (argillic horizon) loss of silica (conversion of an argillic horizon into a desilicated horizon) and loss of sesquioxides. These illustrations emphasise that the real basis of priority in the classification system is the sequence of events, whether eluvial or illuvial, taking place in the soil horizons and in the profile.

Consideration of the sequence of eluviation and illuviation in soil bodies along the lines set out above leads to the following order of priority among constituents for the purpose of classification:

(i) if Soluble Salts are present above a minimum content then the horizon is saline irrespective of its other properties. If the process operating is eluvial then eluviation must be minimal because soluble salts, the most easily eluviated constituents, are present. If the process is illuvial, then conditions for deposition must be extreme because soluble salts are the least easy to deposit. Either way, they are the most delicate indicator of stage of process.

(ii) if Less-soluble Salts are present above a minimum content, and no Soluble Salts are present, then the horizon is calcareous because Less-soluble Salts are the next most easy to eluviate and next most difficult to deposit. - why - $CaCO_3$ may be absent.

(iii) of the other groups of constituents the one which takes precedence is the one most concerned in the current process. Generally speaking it is the one lowest in the following list: clay, silica sesquioxides. This applies to both eluviation and illuviation. What else ?

The final principle, known as the Principle of Depth Priority, does not involve the processes of soil formation so directly. It is concerned with two related questions. The first is which of the master horizons is of greatest importance in a system of classification. The second is which amongst the sub-horizons of a master horizon should take precedence in a system of classification. In a site subject to eluviation, the horizon nearest the soil-body surface would express the greatest loss of constituents, omitting the effects of the organic cycle. In a site subject to deposition, the sub-horizon showing the greatest gain is not always the one nearest the surface. So the yardstick of maximum loss or gain does not give a clear answer. If the problem is viewed from another angle, namely the effect of soils on plant growth, a less ambiguous answer emerges. It is clear that the master horizon with the greatest effect on plant growth, is the one nearest the surface of the soil body. Salinity or acidity, for example, at the surface affects plant growth much more than salinity or acidity at depth. This means that the A horizon is the most important horizon of a soil body. The A horizon, however, is the one most easily changed by cultivation and similar activities. Accordingly a more satisfactory answer to the first question is the master horizon immediately below the A horizon and, to the second question, the sub-horizon which is uppermost in any master horizon.

The general principles which form the basis of the present system have been stated and the outline of the system itself is now discernible. Before specifications for the units can be drawn up, however, a large number of arbitrary decisions must be taken. The reason for this is that soil bodies are large and the limiting profiles of a soil body often change gradually from one locus to another. If any gaps exist in the spectrum of the sum total of limiting profiles then it is highly desirable that they be made the limits of taxonomic units. Few gaps apparently exist, however, and arbitrary decisions as to limits are essential. This in itself need not be harmful because it serves to emphasise the close relationships between groups even at the highest categorical level. Members of one class at the highest level can have properties, even differentiating properties, which differ only in degree from those possessed by members of another class at the same level.

THE SYSTEM OF CLASSIFICATION

DEFINITIONS OF HORIZONS

Definitions of Master Horizons

A - formed at the surface of a soil body. Its over-riding characteristic is the presence of humus formed more or less in situ. It can have many other diverse properties e.g. depleted or augmented with one or more constituents.

E - formed below the A horizon. It has no significant content of humus formed in situ and is depleted of one or more constituents (eluviation).

B - formed below the A horizon. It has no significant content of humus formed in situ and is augmented with one or more constituents (illuviation).

C - is relatively unweathered material which can be the same as the (less-weathered) parent material of the upper horizons.

Definitions of Sub-horizons

A horizons

Organic A ($A\alpha$) - an A horizon showing no significant changes except enrichment with organic matter (content > 2%) formed more or less in situ.

Lixiviated A ($\bar{A}\gamma$) - an A horizon depleted of soluble (S) salts so that it has no longer a conductivity greater than 4 m.mhos. In many cases decomposition of silicates accompanies this change.

Leached A ($\bar{A}\sigma$) - an A horizon depleted of less-soluble (L.S.) salts so that it no longer contains 2% calcium carbonate equivalent.

Lessivated A ($\bar{A}\varepsilon$) - an A horizon depleted of lattice clay so that it has 3% less clay than the argillic B horizon or the ratio of clay in the lessivated A to clay in the argillic B is 0.83 or less.

Desilicated A ($\bar{A}\pi$) - an A horizon depleted of silica from easily weathered silicates so that its chroma is now > 5.0.

Podzolised A ($\bar{A}\theta$) - an A horizon depleted of sesquioxides (eluvial) so that its mineral grains have a low chroma (< 2.0), organic coating lower than the B and/or C horizons.

Salic A ($A\gamma$) - an A horizon containing soluble (S) salts so that its conductivity is greater than 4 m.mhos.

Calcic A ($A\delta$) - an A horizon containing less-soluble salts equivalent to 2% calcium carbonate.

Argillic A ($A\epsilon$) - an A horizon enriched with illuvial lattice clay so that its content of clay has increased by 3% relative to its original content or the ratio of clay in the A to clay in the C is $\frac{1}{1.2}$ (or 0.83) whichever is the greater.

Sesquic A ($A\theta$) - an A horizon enriched with illuvial free iron oxide by 1% Fe_2O_3 or 20% of its original content whichever is the greater.

E horizons

Lixivated E ($E\gamma$) - an E horizon depleted of soluble (S) salts so that its conductivity is now less than 4 m.mhos. Decomposition of silicate minerals is often a part of the lixivation process.

Leached E ($E\delta$) - an E horizon depleted of less-soluble (L.S.) salts so that it no longer contains 2% calcium carbonate equivalent.

Lessivated E ($E\varepsilon$) - an E horizon depleted of silicate clay so that its clay content is now either at least 3% less than its original content or the ratio of clay in the $E\varepsilon$ to clay in the B_{ε} is 0.83, whichever is the greater requirement.

Desilicated E ($E\pi$) - an E horizon depleted of silica from the easily weathered minerals so that it now has an apparent increase in its content of sesquioxides. It is often characterised by colours with high chroma (> 5.0).

Podzolised E ($E\theta$) - an E horizon depleted of sesquioxides so that it now has an apparent increase in its content of silica. It is often characterised by colours with low chroma (< 2.0).

B horizons

Salic B ($B\gamma$) - a B horizon enriched in soluble (S) salts so that its conductivity is now greater than 4 m.mhos i.e. it was previously non-saline.

Calcic B ($B\delta$) - a B horizon enriched by less-soluble (L.S.) salts so that its content of calcium carbonate equivalent is now greater than 2% i.e. it was previously non-calcareous.

Argillic B ($B\varepsilon$) - a B horizon enriched in illuvial clay so that its content of clay has increased by at least 3% clay or the ratio of clay in the lessivated E to clay in the argillic B is 0.83, whichever is the greater requirement.

Sesquic B (B δ)	- a B horizon enriched in illuvial iron oxide so that its content of free iron oxide has increased by 1% or by 20% of its free iron oxide content whichever is the greater requirement. Illuvial iron fills pores, forms micro-concretions and causes cementation.

C horizons

Saline C	- a C horizon, normally consisting of a saline siallitic material, with a conductivity greater than 4 m.mhos.
Calcareous C	- a C horizon, not saline, with more than 2% calcium carbonate equivalent. It is often either a calcareous siallitic material or a practically pure calcareous material.
Siallitic C	- a C horizon, not saline and not calcareous which consists mainly of alumino-silicate materials.

DEFINITIONS OF CLASSES

General Rule: (i) All colours are moist colours

(ii) a horizon must be at least 4 inches thick before it is sufficiently thick to be taken into account in the placing of a limiting profile in the categories of major soil group and above. The presence of a horizon which conforms to a given specification except in the matter of thickness can be indicated by using the appropriate symbol modified by underlining i.e. converted to italic type. Example $\underline{B\delta}$

ORDER: CALCISOLS 2.0

- why not 'less-soluble salt' horizons?

Definition: Soils with calcareous horizons

This group includes those soils which have been developed on calcareous materials as well as those that have been developed on siallitic materials in which carbonate has been deposited by groundwater. In temperate regions only the former are prevalent. The A horizon need not be calcareous and there can also be a non-calcareous B δ horizon.

why not non calcar.

SUBORDER: Soils with a carbonate C immediately below A horizon 2.1

Division: Carbonate Aerasols 2.11

Definition: to a depth of 14 inches or to solid rock, whichever is less, have colours associated with good aeration. In particular, if there is a deep A horizon to 14 inches then it should have very few mottles of high chroma ($\geq$ 5.0). If the A horizon is less than 14 inches then the C horizon should have its original colour or a uniform colour with, at most, a few mottles of low ($\leq$ 2.0) or high ($\geq$ 5.0) chroma.

Major Soil Groups

2.111 Rendzina

Definition: the A horizon has a uniform colour of low value ($\leq$ 3.0) with few mottles of high chroma ($\geq$ 5.0). If an $E\delta$ is present, often with a moderate chroma (2.0 to 5.0), it must be less than 4 inches thick.

Sub-groups: Lithurendzina, Regorendzina, Leached Rendzina

2.112 Brown Carbonate Soils

Definition: the A horizon has a colour with moderate value (3.0-6.0) and chroma (2.0-5.0) and very few mottles of high chroma ($\geq$ 5.0). There can be an $E\delta$ but, if so, it must be less than 4 inches thick.

Division: Carbonate Gleysols 2.12

The gleysols throughout the system have been divided into two principal types, the orthic gleysols and the vadose gleysols. The orthic gleysols are essentially groundwater gleys in the sense that gleying increases downwards to a depth of about 4 feet. The vadose gleysols have a maximum of gley features within about 4 feet and in this sense can be considered surface-water gleys.

Definition: within 14 inches of the surface have colours associated with waterlogging, in particular if the A horizon is more than 14 inches thick, there is fine mottling of high chroma ($\geq$ 5.0) within peds and dark faces to peds. If the A horizon is less than 14 inches thick then the C horizon has frequent fine mottles of high chroma ($\geq$ 5.0) and/or ped faces of lower chroma than the base colour.

Major Soil Groups

2.121 Orthic Carbonate Gley

Definition: fine mottles of high chroma ($\geq$ 5.0) increase with depth or to a maximum which is maintained to at least 4 feet or to solid rock.

2.122 Vadose Carbonate Gley

Specification: fine mottles of high chroma ($\geq$ 5.0) reach a maximum then decrease within 4 feet or before solid rock is reached.

SUBORDER: soils with a leached E immediately below the A horizon

This group has a well-defined $E\delta$, at least 4 inches thick, which has still not acquired characteristics of a more definite nature that would place it in another group. For example, some horizons which have lost carbonate ($E\delta$) subsequently lose clay and become an $E\varepsilon$. In turn, the lessivated horizon ($E\varepsilon$) can become a desilicated horizon ($E\pi$) by losing silica and, at the same time, acquiring a high chroma.

Division: Leached Aerasols 2.31

Definition: to a depth of 14 inches have colours associated with good aeration, namely few, at most, mottles of high chroma (≥ 5.0) or low chroma (≤ 2.0). The $E\delta$ has a colour with moderate chroma (2.0 to 5.0). (If it has a chroma ≤ 2.0 it is podzolised, if a chroma ≥ 5.0 it is desilicated and the soils belong to the order Acidisols).

Major Soil Groups

2.311 Leached Brown Soils

Definition: to a depth of 14 inches have colours associated with good aeration. In particular the A horizon is less than 14 inches thick and the $E\delta$ has a moderate chroma (2.0-5.0) and value (3.0-6.0).

2.312 Leached Dark Brown Soils

Definition: the A horizon is more than 14 inches thick and has a chroma ≤ 4.0 and a value ≤ 3.0 with, at most, few mottles of high chroma (≥ 5.0).

Division: Leached Gleysols 2.32

Definition: within 14 inches of the surface have colours associated with waterlogging. In particular, if the A horizon is <14 inches thick the ped faces are darker than the interior of the peds which have mottles of low (≤ 2.0) and high (≥ 5.0) chroma. If the A horizon is <14 inches thick, the $E\delta$ has frequent mottles of low chroma (≤ 2.0) and some of high chroma (≥ 5.0) and in some cases ped faces of low chroma (≤ 2.0).

2.321 Orthic Leached Gleys

Definition: the mottles of low and high chroma and ped faces of low chroma increase with depth or to a maximum which is maintained to at least 4 feet.

2.322 Vadose Leached Gleys

Definition: the mottles of low and high chroma and ped faces of low chroma reach a maximum and start to decrease within 4 feet.

ORDER: BACIDISOLS 3.0

Definition: soils with weakly weathered siallitic horizons

This group contains those soils which have a siallitic horizon immediately under the A horizon. The siallitic horizon has not undergone strong weathering as indicated by high chroma, which is evidence of loss of silica, or low chroma which is evidence of loss of sesquioxides. Also within this group are soils which have undergone either loss or gain of lattice clay. Accordingly many soils which at one time were regarded as Brown Earths will belong to this order.

SUBORDER: soils with a siallitic C horizon immediately below A horizon 3.1

Division: Siallitic Aerasols 3.11

Definition: to a depth of 14 inches from the surface have colours that are associated with good aeration, in particular, the original colour of the material or a uniform base colour of moderate chroma (between 2.0 and 5.0) with, at most, few mottles of low chroma ($\leqslant 2.0$).

Major Soil Groups

3.111 Rankers

Definition: immediately below the A horizon have a C horizon with its more or less original colour which is associated with good aeration.

Sub-group: (a) Lithu-ranker - rock immediately below the A horizon
(b) Sandy ranker - sandy parent material immediately below the A horizon
(c) Loamy ranker - loamy parent material immediately below the A horizon
(d) Clayey ranker - clayey parent material immediately below the A horizon
(e) Frago-ranker - indurated parent material immediately below the A horizon

3.112 Brown Earths

Definition: immediately below the A horizon have a C horizon which has a colour with medium chroma (between 2.0 and 5.0) and is different from the colour of the original parent material by at least 1 unit of chroma or hue.

Sub-groups: Sandy brown earth, Loamy brown earth, Clayey brown earth

Division: Siallitic Gleysols 3.12

Definition: within 14 inches of the surface have colours associated with waterlogging, in particular frequent mottles of low chroma ($\leqslant 2.0$) and/or ped faces of low chroma ($\leqslant 2.0$) accompanied by mottles of high chroma ($\geqslant 5.0$).

Major Soil Groups

3.121 Orthic Siallitic Gleys

Definition: mottling increases with depth or to a maximum which is maintained to approximately 4 feet from the surface.

Sub-groups: (a) sandy orthic siallitic gleys
(b) loamy orthic siallitic gleys
(c) clayey orthic siallitic gleys

3.122 Vadose Siallitic Gleys

Definition: mottling reaches a maximum which then decreases within 4 feet from the surface

Sub-groups: (a) loamy vadose siallitic gleys
(b) clayey vadose siallitic gleys
(c) frago vadose siallitic gleys

SUBORDER: soils with an argillic B immediately below A

Division: Argillic Aerasols 3.21

Definition: to a depth of 14 inches from the surface, have colours associated with good aeration, in particular a uniform base colour of moderate chroma (between 2.0 and 5.0) with few mottles of low ($\leqslant 2.0$) chroma.

Major Soil Groups: probably none in this country but known in U.S.S.R. (Dark Grey Forest Soils and Degraded Chernozems) and in the U.S.A. (Brown Forest Soils).

Division: Argillic Gleysols 3.22

Definition: within 14 inches from the surface have colours associated with waterlogging, in particular frequent mottles of low chroma ($\leqslant 2.0$) and/or ped faces of low chroma ($\leqslant 2.0$) accompanied by mottles of high chroma ($\geqslant 5.0$).

Major Soil Groups: probably none in this country but known in the U.S.S.R. (Meadow Degraded Chernozems).

SUBORDER: soils with lessivated B immediately below A

Division: Lessivated Aerasols 3.31

Definition: to a depth of 14 inches from the surface have colours associated with good aeration, namely a uniform base colour of moderate chroma (between 2.0 and 5.0) with, at most, few mottles of low chroma (≤ 2.0).

Major Soil Groups

3.311 Lessivated Aerasol

Definition: as above

Sub-groups: (a) sandy lessivated aerasol
(b) loamy lessivated aerasol
(c) clayey lessivated aerasol

Division: Lessivated Gleysols 3.32

Definition: within a depth of 14 inches from the surface have colours associated with waterlogging, namely at least frequent mottles of low chroma (≤ 2.0) and/or ped faces of low chroma (≤ 2.0) accompanied by mottles of high chroma (≥ 5.0).

Major Soil Groups

3.321 Orthic Lessivated Gley

Definition: mottling increases with depth or to a maximum which is maintained to at least 4 feet.

Sub-groups: (a) Sandy orthic lessivated gley
Loamy orthic lessivated gley
Clayey orthic lessivated gley

3.322 Vadose Lessivated Gley

Definition: mottling reaches a maximum and then decreases within 4 feet

Sub-groups: Loamy vadose lessivated gley
Clayey vadose lessivated gley

ORDER: ACIDISOLS

Definition: soils with strongly weathered siallitic horizons

The soils belonging to this group are characterised by a horizon (or horizons) in which weatherable silicate minerals have undergone a minimal decomposition and lost sesquioxides and/or silica <u>or</u> have gained from the horizons above or from other loci these same products of decomposition. In general changes of this kind take place in an acid medium but they can take place in an alkaline medium so long as the products and residues have now become acid in reaction. If either Soluble or Less Soluble salts are present then irrespective of other characteristics the soils belong to other orders, the Salisols or Calcisols.

SUBORDER: soils with a desilicated B horizon immediately below the A horizon 4.1

Division: Desilicated Aerasols 4.11

Definition: to a depth of 14 inches from the surface, have colours associated with good aeration, in particular a uniform base colour of high chroma (≥ 5.0) for at least 4 inches. In addition, organic staining is permitted.

Major Soil Groups

4.111 Brown Acid Soils

Definition: as above

Sub-groups: (a) sandy brown acid soils

(b) loamy brown acid soils

Division: Desilicated Gleysols 4.12

Definition: within 14 inches of the surface have colours associated with waterlogging, namely many (≏50% surface area of horizon) mottles of high chroma (≥ 5.0) with frequent mottles of low chroma (≤ 2.0) and/or ped faces of low chroma (≤ 2.0).

Major Soil Groups

4.121 Orthic Desilicated Gley

Definition: mottling of low chroma (≤ 2.0) increases with depth or to a maximum which is maintained to at least 4 feet.

4.122 Vadose Desilicated Gley

Definition: mottling of low chroma increases to a maximum and then decreases within 4 feet.

SUBORDER: soils with a sesquic B immediately below A 4.2

Division: Sesquic Aerasols 4.21

Definition: to a depth of 14 inches have colours associated with good aeration, namely a uniform base colour of high chroma (≥ 5.0) and hue as red or redder than 7.5YR. Few mottles of low chroma (≤ 2.0) are present.

Major Soil Groups: none recognised so far.

Division: Sesquic Gleysols 4.22

Definition: within 14 inches of the surface have colours associated with waterlogging, namely frequent or many mottles of low chroma (≤ 2.0). The sesquic B horizon is cemented with free sesquioxides. If the free sesquioxide is free iron oxide, the colour has often a high chroma and/or a hue redder than 7.5YR.

Major Soil Groups: none recognised so far

SUBORDER: soils with a podzolised E immediately below A horizon 4.3

Division: Podzolised Aerasols 4.31

Definition: to a depth of 14 inches from the surface have colours associated with good aeration namely the base colour of the podzolised E has a low chroma ($\leqslant 2.0$) and without any, or at most very few, mottles of high chroma ($\geqslant 5.0$). Organic staining is permitted.

Sub-groups: Fragopodzol (indurated layer immediately below E δ)

Sandy podzol

Loamy podzol

Division: Podzolised Gleysols 4.32

Definition: within 14 inches from the surface have colours associated with waterlogging, in particular the base colour of the podzolised E has a low chroma ($\leqslant 2.0$) accompanied by few or frequent mottles of high chroma ($\geqslant 5.0$). Organic staining is permitted.

Major Soil Groups

4.321 Orthic Podzolised Gleys

Definition: mottling of low chroma ($\leqslant 2.0$) increases with depth or to a maximum which is maintained for at least 4 feet.

Sub-groups: Sandy Orthic Podzolised Gleys

Loamy Orthic Podzolised Gleys

4.322 Vadose Podzolised Gleys

Definition: mottling of low chroma reaches a maximum and then decreases within 4 feet of the surface.

Sub-groups: (a) Fragogleys

(b) Iron-Pan Gleys

(c) Loamy Podzolised Gleys

(d) Clayey Podzolised Gleys