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Soil
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NATIONAL SOIL TAXONOMY HANDBOOK
430-VI
ISSUE NO. 13

Purpose. To distribute current amendments to Soil Taxonomy, Agriculture Handbook 436.

Effective Date. These amendments and revisions are effective when received.

Filing instructions. File this copy of the changes in the 3-ring binder with Issues Nos. 1 through 12. It is suggested that you keep this binder with the Soil Taxonomy volume for easy reference.

Replace 615 "Contents" dated June 1988 with the enclosed "Contents" July 1989. File "Index to pages of Soil Taxonomy" following "Contents". Replace pages 615-1 through 615-2r with pages 615-1 through 615-2d dated July 1989 and file following "Index to pages of Soil Taxonomy". File pages 615.175-388 following page 615-174.

Supplementation. States and NTC's may not supplement the handbook.

ROBERT R. SHAW
Deputy Chief for Technology

Enclosures

DIST: NSTH



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Department of Agriculture

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Part 615 - Amendments to Soil Taxonomy

615.00 General.

(a) Introduction. This handbook contains amendments to the USDA soil classification system that is published in Agriculture Handbook 436, Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys. This system is dynamic. As new facts accumulate and as soils are examined and described in new places, amendments to update the system are required. Procedures for proposing amendments and supporting evidence required are discussed in 603.1(d) of the National Soils Handbook. This handbook should be maintained in a 3-ring binder. States and NTC's may not supplement it.

615.00-1 Purpose of amendments.

Soil Taxonomy needs to be amended periodically to correct deficiencies that have become apparent through application of the system, to incorporate new knowledge, and to improve the structure of the system. This instruction describes procedures for reviewing and evaluating proposals before they are incorporated in Soil Taxonomy. Various proposals will be handled in different ways. Proposals affecting only one subgroup or editorial changes should be processed with a minimum of reviews and be implemented rapidly. Other proposals affecting taxa at higher categories and diagnostic horizons may require review by many soil scientists and their implementation may have to await republication of the Key to Soil Taxonomy or of the entire handbook.

615.00-2 Changes at the series level. Changes in definitions, addition of new series, deletion of unneeded series.

Procedures for making changes at the soil series level in the United States will be described in the National Soils Handbook (NSH), SCS. In the USA, changes at the soil series level are approved by the respective principal soil correlator. Changes at the series level outside the United States are the responsibility of appropriate national soil survey organizations. No attempt is being made to correlate soil series internationally. To facilitate orderly assembly of information on soil taxa, national organizations are encouraged to develop orderly procedures for establishing and documenting soil series.

615.00-3. Amendments to Soil Taxonomy above the series level.

Changes above the series level are processed through regional, national, or international committees. Kinds of committees and their responsibilities are described below:

(a) Committees for updating Soil Taxonomy.

(1) The Soil Taxonomy Policy Committee

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All technical committees submit their recommendations to the Soil Taxonomy Policy Committee, which makes final decisions on all changes in Soil Taxonomy above the series level. The committee consists of the following:

Director of Soils, SCS, as chairperson.
National Leader (U.S.), Soil Taxonomy, as secretary.
1 soil scientist representing all U.S. Regional Technical Committees.
1 soil scientist representing all Special Soil Taxonomy Technical Committees (ICOM).
1 soil scientist representing the Soil Taxonomy committee of the Soil Science Society of America.
1 soil scientist representing national soil survey organizations outside the U.S. that have adopted Soil Taxonomy as the primary system of soil classification.

(i) Members of the Policy Committee, other than the chairperson and secretary, serve for 2 years, with two members being selected in alternate years. The first term of the representative of the U.S. Regional Technical Committees and the Special Soil Taxonomy Technical Committees will be one year to provide for overlap in the composition of the committee. The representative of the U.S. Regional Committees will be elected by the four chairpersons of the regional committees, and will alternate between SCS and other agencies represented on the regional technical committees. The representative of the Special Soil Taxonomy Technical Committees will be elected by the chairpersons of these committees based on the recommendation of the chairperson of the Soil Taxonomy Policy Committees. The other two representatives will be selected by the groups they represent.

(ii) The responsibility for developing orderly procedures to select representatives to the Policy Committee rests with the chairperson of the respective groups. Until appropriate procedures can be developed, the representative of national soil survey organizations will be invited by the chairperson of the Policy Committee.

(2) Soil Taxonomy Technical Committees.

There are two kinds of soil taxonomy technical committees-- National and Regional, and Special Soil Taxonomy technical committees. In addition, ad hoc committees and referees may be appointed. National and Regional, and Special Soil Taxonomy technical committees make recommendations for amendments to Soil Taxonomy to the Soil Taxonomy Policy Committee. Recommendations may originate within the committee or they may be developed from proposals submitted from outside the committee.

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(i) National and regional Soil Taxonomy technical committees. National and regional Soil Taxonomy technical committees may be established to coordinate development and application of Soil Taxonomy in a geographic area or political entity. They may be multinational, national or regional. Procedures for regional technical committees in the U.S. are outlined in the National Soil Handbook, section 602.00-1(d)(3).

(ii) Special Soil Taxonomy technical committees. Special committees are established by the Soil Taxonomy Policy Committee either at its initiative or in response to a request by a national or international group. Special Soil Taxonomy technical committees may be established to coordinate the establishment or revision of taxa or criteria in Soil Taxonomy. These special committees can request comments on a proposal from any source they consider appropriate. Special committees may establish ad hoc working groups to develop recommendations on specific problems. The secretary of the Soil Taxonomy Policy Committee maintains a record of the charges and chairpersons of all technical committees and distributes a list of active committees each December.

(3) Ad hoc committees and referees.

The chairperson of the Soil Taxonomy Policy Committee or the chairperson of a Soil Taxonomy technical committee may establish ad hoc committees or appoint referees to develop recommendations on specific problems or on proposals that cannot be handled by an existing technical committee.

(4) The Soil Taxonomy Index of Proposed Amendments.
(STIPA)

The secretary of the Soil Taxonomy Policy Committee maintains an index of proposed amendments in a computer file (STIPA). This index contains, in addition to other data, the following information on each proposal:

- (i) The name of the originator (individual or committee).
- (ii) The address of the originator.
- (iii) The date of the proposal.
- (iv) The page in Soil Taxonomy affected.
- (v) The taxonomic element (title of the chapter, paragraph, or subparagraph affected).
- (vi) Action taken.
- (vii) A brief statement of the proposal.
- (viii) Reviewer's comments.

The STIPA is updated on a regular basis, and printouts, sorted by page and element, are distributed in December of each year to chairpersons of all technical committees.

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(b) Procedures for handling proposals to amend Soil Taxonomy.

(1) Editorial changes or implied or parallel subgroups.

Proposals for addition of implied or parallel subgroups ^{1/} or proposals for editorial changes should be addressed to the secretary of the Soil Taxonomy Policy Committee, who normally approves the proposals after comments are received from members of the Soil Taxonomy Policy Committee.

Proposals and requests for the addition of an implied or parallel subgroup should indicate that areas of soils classified in the proposed subgroup have been recognized in a soil resource inventory and should include justification why the taxon should be added to the system. As with series, subgroups should not be established on the basis of a single pedon.

(2) Changes other than proposals for editorial changes or the addition of implied or parallel subgroups.

(i) Proposals sent to Soil Taxonomy technical committees. Proposals for amendments to Soil Taxonomy other than proposals for editorial changes or the addition of implied or parallel subgroups are normally addressed to the chairperson of the appropriate special Soil Taxonomy technical committee or the chairperson of a national or regional technical committee.

(A) The chairperson will acknowledge receipt of all new proposals and inform the originator of the immediate disposition of the proposal. He may request clarification or additional documentation from the originator before accepting the proposal. The chairperson will notify the secretary of the Soil Taxonomy Policy Committee of the acceptance of the proposal for study. The secretary will enter the proposal in the STIPA. After the proposal has been evaluated, the committee chairperson will forward the proposal with the necessary documentation to the secretary of the Soil Taxonomy Policy Committee. In the letter of transmittal the chairperson should include suggestions for the timing and procedures for implementing the recommendation.^{1/}

^{1/} Implied subgroups are subgroups that are excluded from typic subgroups but do not require the addition of an element of definition to the definition of the typic subgroups and that are not included in any intergrade or extragrade. Soils in this category may be handled by extending the range of an existing subgroup or by establishing a new subgroup. Parallel subgroups are subgroups that have been established in one great group and that appear to be desirable in related great groups. Normally, the establishment of a "parallel subgroup" requires the addition of an element of definition to the definition of the typic subgroup.

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(430-VI-NSTH, July 1989)

(B) Proposals made by a committee member as part of an ongoing discussion need not be acknowledged specifically but should be handled as part of the normal communication within a committee.

(ii) Proposals sent directly to the Soil Taxonomy Policy Committee. Proposals may be sent directly to the chairperson of the Soil Taxonomy Policy Committee. The chairperson will send such proposals to the chairperson of an appropriate special Soil Taxonomy technical committee or a national and regional Soil Taxonomy technical committee for review and development of a recommendation. An ad hoc committee or a referee may be appointed if no appropriate committee is available. The proposal will be entered in STIPA and the originator of the proposal informed of its disposition.

(iii) Supporting material for proposed changes in Soil Taxonomy.

(A) Proposals for amendments. Each proposal for an amendment to Soil Taxonomy should be accompanied by the descriptions and the laboratory or other data that caused the originator to make the proposal. The proposal should include an evaluation of changes in parts of the system not directly addressed by the proposal that may be needed to accommodate the proposal, an estimate of the importance and areal extent of the soil for which the new taxon is proposed, and an assessment of the contribution of the proposed amendment to the objectives of Soil Taxonomy. The proposal should also list the names of individuals or organizations that have reviewed and support the proposal.

(B) Recommendations for amendments. Proposals that have been reviewed and approved by a technical committee are forwarded as a recommendation to the secretary of the policy committee. In addition to the documentation, the recommendations should include a list and comments of reviewers of the proposal and a recommendation on possible reviews by other Soil Taxonomy technical committees. A copy of the recommendation should be sent to the originator of the proposal. The secretary of the Soil Taxonomy Policy Committee will inform the chairman of the appropriate technical committee immediately of the receipt of the recommendation. Unless additional documentation is needed, recommendations should be acted on within 6 months of receipt.

(c) Implementation of amendments to Soil Taxonomy. Every recommendation submitted to the Policy Committee should include a plan of implementation. The final decision on implementation will be made by the Policy Committee. The need for all soil scientists to have access to the same updated version of Soil Taxonomy, the complexity of the change, the impact of the amendment on the practical usefulness of Soil Taxonomy, and the

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status of complementary proposals in related taxa will influence the form and timing of implementations. The following alternatives are available.

(1) Implement immediately. The approved amendment is published in the Soil Taxonomy Handbook. An abstract of the amendment is published in the Soil Science Society of America Journal and the Soil Management Support Services Newsletter. It will be included in the next updated edition of the Key to Soil Taxonomy.

(2) Delay implementation until a new Key to Soil Taxonomy can be published. We expect that a new key will be printed at least biannually. This procedure should be used if changes are so extensive, affecting several taxa, that pen and ink changes are impractical, but mere explanatory notes are simple enough to be handled in the key. Explanatory material will be published in the Soil Taxonomy Handbook when the new key is issued. Abstracts are published as in 3.41.

(3) Delay implementation until a new edition of Soil Taxonomy is published.

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615.60 Andisol amendment

Introduction

It is interesting to study the evolution of the concepts of Soil Science. Andisols present a very interesting class of soils for this purpose. Although volcanos have been known to man from time immemorial, volcanic soils as a special class of soils dates back only to the early fifties. Even as recently as 1949, when M. G. Cline and others were making a soil survey of the Territory of Hawaii, some of these soils were considered as "Latosols" and class subdivisions did not focus on the "andic" properties as we know them today.

Developments in the field of mineralogy, particularly the notion of amorphous minerals paved the way for the identification of volcanic soils. The first reference, perhaps dates to the 3rd Approximation, 1953, when a class was provided for "permanently moist soils . . . that dehydrate irreversibly." In the 4th Approximation, 1955, the soils were still considered as Latosols and the subclasses were defined as "with latosolic B horizon, dominated by allophane . . ." When Guy Smith attempted a nomenclature, for the classes defined in the 5th Approximation, the soils were referred to as "Phanats" and specifically "Andophanats" being a lower category of Laterisols. It was during the preparation of the 7th Approximation in 1958-59, that the allophanic soils were brought together into the Inceptisols, in the suborder of Andepts.

In the sixties and seventies, there was considerable study on these soils dominated by short-range order minerals. At the International symposium on "Soils with Variable Charge" held in New Zealand in 1980, many of the concepts were crystallized. Prior to this symposium, however, Dr. Guy Smith was invited by the New Zealand Soil Bureau to spend about a year and correlate their soils. During this year he also formalized his proposal, dated April 10, 1978, to reclassify the Andepts and Andaquepts into a new Order, the Andisols. In the same year, the Soil Conservation Service (SCS) created the International Committee on Andisols (ICOMAND) and invited Dr. Mike Leamy of the New Zealand Soil Bureau to be the Chairman and to follow-up on Dr. Smith's proposal.

The SCS implemented the task of rallying international scientists in the work of ICOMAND through the Soil Management Support Services (SMSS) of the Agency for International Development. Several workshops and training courses were held in Rwanda, Burundi, Philippines, Chile, Ecuador, Canary Islands, Japan and northwestern United States. Through circular letters and correspondence, concepts and special methods were developed and tested and the final draft was developed in late 1988.

The SCS takes this opportunity to thank Dr. Mike Leamy and the staff of the Soil Bureau of New Zealand for the leadership and support which guaranteed the continuity and success of ICOMAND. More than 100 soil scientists from about 45 countries collaborated and is an excellent example of scientific networking. The local experience and contributions are necessary to ensure the international relevance of proposals, and we are indebted to all these scientists. It was through the work of SMSS that the international collaboration, particularly the international meetings, was made possible and this is perhaps one of the more positive contributions of AID to international soil science.

Finally, the National Cooperative Soil Survey and particularly the National Soil Survey Laboratory ensured the continuous testing of the different proposals and made immense contributions to the final product.

Although this is the accepted proposal, this amendment and through publication in the "Keys to Soil Taxonomy", will provide the opportunity for further international testing and evaluation. We welcome corrections of any errors and inconsistencies, as few have had the opportunity to use the whole version for field testing.

The following changes are required in Soil Taxonomy to accommodate these amendments. (Note--Changes in definition, additions, or deletions of affected subgroups in other orders are given in the following section: 615.61 Amendment to change the format of the keys to subgroups.)

Page: Contents. Following Alfisols, add: "Andisols-----
--154"

Page 13, second column. At the end of the first paragraph, add the following sentence: "An exception are the Andisols, defined later, which are generally considered to consist of mineral soils but some may be organic if they meet other criteria for Andisols. Those that exceed the organic matter limit defined for mineral soils have a colloidal fraction dominated by short-range-order minerals or aluminum-humus complexes. In these it is believed that the mineral fraction gives more control to the soil properties than the organic fraction and are, therefore, included with the Andisols rather than the organic soils defined later as Histosols."

Page 14, second column, Diagnostic surface horizons; the epipedon. Change first sentence to read: "Seven diagnostic horizons . . ."

Page 17, second column. Preceding Histic epipedon, add the following:

"Melanic epipedon (Gr. melas-anos, black)

The melanic epipedon is a thick black horizon occurring at or near the surface, containing high concentrations of organic carbon, usually associated with short-range-order minerals or aluminum-humus complexes. The intense black color is ascribed in Japan to the accumulation of organic matter from which "Type A" humic acids are extracted. This organic matter is thought to result from the supply of large amounts of root residues from a graminaceous vegetation, and can be distinguished from organic matter formed under forest by the melanic index (Honna et al., 1988).^{1/}

The suite of secondary minerals is usually dominated by allophane and the soil material

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^{1/} Honna, T.; Yamamoto, S.; Matsui, K. 1988. A simple procedure to determine Melanic Index. See ICOMAND Circular Letter No. 10, p. 76-77.

has a low bulk density and a high anion adsorption capacity.

The melanic epipedon meets the following requirements:

1. It has an upper boundary at or within 30 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, defined later, whichever is shallower;
2. It has, in a cumulative thickness of 30 cm or more within a total thickness of 40 cm:
 - a. Moist Munsell value and chroma of 2 or less throughout and a melanic index of 1.70 or less throughout, and
 - b. Six percent or more organic carbon as a weighted average, and no less than 4 percent organic carbon in any subhorizon; and
3. It has andic soil properties in all parts that meet 1 and 2 above."

Page 36, oxic horizon - NSTH issue No. 11, page 615-113. Delete footnote "1" which was added by NSTH issue No. 11.

Page 36, oxic horizon - NSTH issue No. 11, page 615-118. Delete footnote "3" which was added by NSTH issue No. 11.

Page 47, second column and page 48, first column. Delete the section on "Amorphous material dominant in the exchange complex" and replace with the following:

"Andic soil properties

Andic soil properties result mainly from the presence, in soils, of significant amounts of allophane, imogolite, ferrihydrite or aluminum-humus complexes. These materials, originally termed "amorphous" (but understood to contain allophane) in Soil Taxonomy (1975) are commonly formed during the weathering of tephra and other parent materials with a significant content of volcanic glass^{2/}. Most horizons that have

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^{2/} Volcanic glass is a significant component of fresh tephra. In most environments the volcanic glass weathers to produce short-range-order minerals. The concept of Andisols includes weakly weathered soils with much volcanic glass as well as more strongly weathered soils rich in short-range-order minerals. Hence the content of volcanic glass is one of the characteristics used in defining andic soil properties.

Volcanic glass is defined as optically isotropic translucent glass or pumice of any color, including glassy aggregates and glass coatings on other mineral grains. Composite grains must have at least 50 percent by volume of volcanic glass to be counted as volcanic glass.

andic soil properties consist of mineral soil materials but some consist of organic soil materials but they must have less than 25 percent organic carbon.

To have andic soil properties, the soil material must have less than 25 percent organic carbon and meet one or both of the following two requirements:

1. a. Acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron is 2.0 percent or more in the less than 2.0 mm fraction, and
 - b. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water retention, is 0.90 g cm⁻³ or less, and
 - c. Phosphate retention^{1/} of the less than 2.0 mm fraction is 85 percent or more; or
2. The less than 2.0 mm fraction has phosphate retention of more than 25 percent and the 0.02 - 2.0 mm fraction is at least 30 percent of the less than 2.0 mm fraction; and meets one of the following three requirements:
 - a. The less than 2.0 mm fraction has acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more, and there is at least 30 percent volcanic glass in the 0.02 - 2.0 mm fraction, or
 - b. The less than 2.0 mm fraction has acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of 2.0 percent or more, and there is at least 5 percent volcanic glass in the 0.02 - 2.0 mm fraction, or

In most cases the method used to determine volcanic glass content is not critical. When, however, accurate measurement is required the standard method (D.N. Eden, in preparation), using a polarizing microscope, is recommended.

^{1/} Blakemore, L.C.; Searle, P.L.; Daly, B.K. 1987. Methods for chemical analysis of soils. NZ Soil Bureau Scientific Report 80. p. 44-45.

c. The less than 2.0 mm fraction has acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of between 0.40 percent and 2.0 percent, and there is enough volcanic glass in the 0.02 - 2.0 mm fraction that the percentage of glass, when plotted against the percentage of acid-oxalate-extractable aluminum plus 1/2 acid-oxalate iron, gives a point within the shaded area of Figure 1."

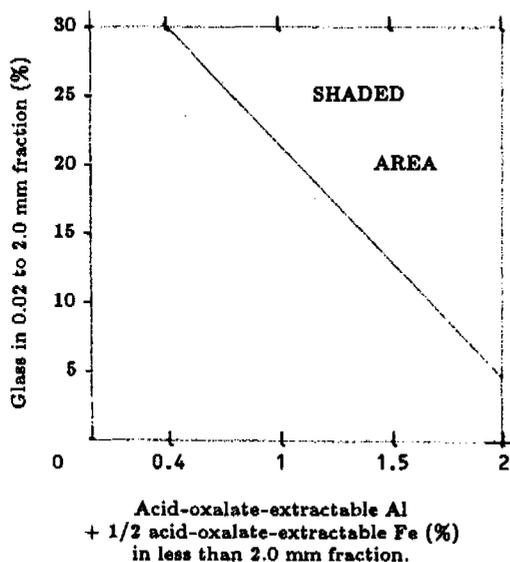


Figure 1.--Soils that plot in the shaded area have andic soil properties if the less than 2.0 mm fraction has phosphate retention of more than 25 percent and the 0.02 to 2.0 mm fraction is at least 30 percent of the less than 2.0 mm fraction.

- Page 49, second column, Particle-size classes, line 6. Change "chapter 18" to "chapter 19".
- Pages 63-64. Delete section on "Thixotropy."
- Page 65, second column (Definition of organic soils). After item 2.b.(2) add item 3. to read as follows: "3. Do not have andic soil properties in layers 35 cm or more thick within a depth of 60 cm from the surface."
- Page 69, second column. At end of second paragraph, change "chapter 11" to "Chapter 12".
- Page 71, first column, line 16. Change the words: "ten orders" to "eleven orders."
- Page 71, first column, third paragraph, lines 25 and 32. Change the words: "47 suborders" to "53 suborders."
- Page 71, first column, third paragraph, line 35. Change the words: "225 great groups" to "261 great groups."
- Page 71, second column, Orders. Change first sentence to read: "There are 11 orders."
- Page 71, second column, third line from bottom. Change "10 orders" to "11 orders."
- Page 72, first column. Preceding Aridisols insert the following:
- "Andisols
- The unique property of Andisols is a dominance of short-range-order minerals or Al-humus complexes that result from weathering and mineral transformation with a minimum of translocation and accumulation. Most Andisols have formed in volcanic ejecta or volcanoclastic materials. Andisols can form in almost any environment as long as suitable temperature and adequate moisture is available to permit weathering and formation of short-range-order minerals. They can have any diagnostic epipedon or subsurface horizon as long as the unique property of Andisols is met throughout a thickness of 35 cm within the upper 60 cm of soil, disregarding O horizons that have more than 45 to 50 percent organic matter.
- Prior to 1989 the soils now classified as Andisols were included with the Inceptisols, mainly as Andepts and Andaquepts which were discontinued with the acceptance of the order of Andisols into Soil Taxonomy. Figure 29 shows the distribution of organic carbon and the bulk density in an Andisol (left) and an Inceptisol as functions of depth. Clay distribution cannot be reliably measured in the Andisol, which was derived from volcanic ash, so it is not given for either of the soils. Plate 9B shows an Andisol that is similar to pedon 74. Plate 11B is another Andisol."
- Page 72, second column, last line. Change "and 11" to "and 12".
- Page 73, first column, first paragraph, line 13. After the words "crystalline clays" add, to the same sentence, the following: ". . . or the unique property of the order of Andisols, mainly the dominance of short-range-order minerals or Al-humus complexes."
- Page 73, first column, first paragraph, sentence starting in line 13. Rewrite sentence as follows: "Prior to 1989 both soils shown in figure 29 were included in Inceptisols, however, with the acceptance of the order of Andisols, the soil, shown on the left and which was derived from volcanic ash, is now an Andisol."
- Page 73, first column, first paragraph, lines 18-22. Delete the last three sentences of this paragraph.
- Page 73, second column, lines 4-7. Change the two sentences to read as follows: "Plate 9C shows an Inceptisol that is similar to pedon 29."

Other Inceptisols are shown in plates 2C, 11A, and 11C."

- Page 75, figure 29. Change description of figure 29 to read as follows: "Figure 29.--Percentage of organic carbon and bulk densities of an Andisol, left, from volcanic ash, and an Inceptisol, right, from old alluvium."
- Page 77, first column, suborders. In first sentence, change the words: "Forty-seven suborders" to "Fifty three suborders."
- Page 77, second column, great groups. In first sentence, change the words: "About 185 great groups" to "About 191 great groups."
- Page 79, first column, subgroups. In first sentence, change the words: "About 970 subgroups" to "About 1033 subgroups."
- Page 80, second column, line 8. Change the words: "4,500 families" to "6755 families."
- Page 80, second column, line 24. Change "chapter 18" to "chapter 19".
- Page 80, second column, series, line 2. Change the words: "About 10,500 series" to "About 16,000 series."
- Page 81, first column, line 23. Change "chapter 18" to "chapter 19".
- Page 81, second column, line 27. Change "chapter 19" to "chapter 20".
- Page 84, Table 6. Insert the word, Andisols, after "Alfisols."
- Page 84, second column, footnote 2. At end of footnote Change "chapter 18" to "chapter 19".
- Page 86, Table 7. Preceding Aridisols, insert the following:
 - Andisols--Aquands-----Cryaquands
 - Duraquands
 - Haplaquands
 - Melanaquands
 - Placaquands
 - Vitraquands
 - Cryands-----Gelicryands
 - Fulvicryands
 - Haplocryands
 - Hydrocryands
 - Melanocryands
 - Vitricryands
 - Torrands-----Vitritorrands
 - Udands-----Durudands
 - Fulvudands
 - Hapludands
 - Hydrudands
 - Melanudands
 - Placudands
 - Ustands-----Durustands
 - Haplustands

-----Vitrand-----Udivitrands
 -----Ustivitrands
 -----Xerands-----Haploxerands
 -----Melanoxerands
 -----Vitrixerands

- Page 87, Table 8. Add, in alphabetical order, the following line: "Andisol---And---Modified from ando---Ando
- Page 88, Table 9. Add, in alphabetical order, the following line: "Cry---Gr. kryos, icy cold---Crystal---Cold.
- Page 88, second column, lines 12-13. Change sentence starting with the word "Hyphens" as follows: "Hyphens are used to connect thapto with the name of the buried soil except in the order Andisols where the name of the buried soil is omitted. In thaptic subgroups of Andisols the buried soil is normally an Andisol."
- Page 89, Table 10. Add, in alphabetical order, the following lines:
 - Fulv---L. fulvus, dull brownish-yellow---
 - Fulvous---Dark brown color, presence of organic carbon.
 - Geli---L. gelare, to freeze---Jell---Extremely cold.
 - Melan--Gr. melas-anos, black---Melanic---
 - Black, presence of organic carbon.
- Page 90, Table 11. Add, in alphabetical order, the following lines:
 - Alic---Modified from aluminum---
 - Aluminum---High Al⁺ status
 - Calcic---L. calis, lime----Calcium----Presents of a calcic horizon.
 - Eutric---Modified from Gr. eu, good: eutrophic, fertile---Eutrophic----High base status.
 - Umbric---L. base of umbra, shade---
 - Umbrella---Presence of umbric epipedon.
 - Ustic---L. ustus, burnt---Combustion---
 - Ustic moisture regime.
- Page 90, Table 11. Change the word "thapto" to "thapto(ic)."
- Page 91, second column, line 18. Change "chapter 18" to "chapter 19".
- Page 91, second column, line 25. Change "1972" to "1989."
- Page 91, second column, Key to soil orders, first sentence. Change first sentence to read: "In this key and . . . the properties of buried soils except their organic carbon if of Holocene age, andic soil properties, and base saturation."

Pages 91-92, Key to soil orders, item A.2.b.(2). At end of this item change the period (.) to a semicolon (;) and add the word "and."

Page 92, item A.2. Add item A.2.c. that reads as follows: "c. Do not have andic soil properties in layers 35 cm or more thick within a depth of 60 cm from the surface."

Histosols, p. 211

Pages 92-93. Change "B. Other . . . Spodosols" to "C. Other . . . Spodosols", "C. Other . . . Oxisols" to "D. Other . . . Oxisols" etc. Also make similar corrections in keys to suborders and great groups in the respective chapters on the orders.

Page 92. After Histosols add:

"B. Other soils that have andic soil properties throughout subhorizons, whether buried or not, which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Andisols, p."

Page 93, first column. Delete all of item "3." and associated footnote.

Page 93, first column, item 3. Delete all of item "3." Also delete ";" and the word "and" at end of item "2.b." and replace with a "." (period).

Page 96, first column, (Definition). Add item 7 to read: "7. Do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."

Page 96, first column, Limits between Alfisols and soils of other orders. Renumber all items by increasing each by one and insert the following as item number 1: "1. To distinguish Alfisols from Andisols, Alfisols must not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."

Page 104, Plate 8C (see also NSTH issue No. 5, page 615-35). Change caption to read: "Plate 8C--A Placic Hydrocryand. The placic horizon is about 50 cm (20 inches) below the surface (scale in feet). Alaska.

Page 105, Plate 9B. Change caption to read: "Plate 9B--An Acrudoxic Thaptic Hydrudand| showing buried A horizons (marks at 15-cm intervals). Hawaii.

Page 107, Plate 11B. Change caption to read: "Plate 11B--A Durustand. Top of duripan is at 3 feet (scale in feet.) Chile.

Page 154. Add the new chapter 9, Andisols, and, starting with Aridisols, renumber all following chapters by adding one to the old chapter numbers. The new chapter 9 follows:

CHAPTER 9

ANDISOLS^{1/}

The central concept of an Andisol is that of a soil developing in volcanic ejecta (such as volcanic ash, pumice, cinders, lava), and/or in volcanoclastic materials, whose colloidal fraction is dominated by short-range-order minerals or Al-humus complexes (plates 8C, 9B, and 11B). Under some environmental conditions, weathering of primary aluminosilicates in parent materials of non-volcanic origin may also lead to the formation of short-range-order minerals; some of these soils are also included in Andisols.

The dominant process in most Andisols is one of weathering and mineral transformation. Translocation within the soil, and accumulation of the translocated compounds, are normally minimal. However, accumulation of organic matter, complexed with aluminum, is characteristic of Andisols in some regimes.

Andisols occupy a central position in the range of weathering of primary volcanic material from, for instance, fresh ash through to clay-dominated soils.

Weathering of primary aluminosilicates has proceeded only to the point of formation of short-range-order minerals such as allophane, imogolite, and ferrihydrite. Commonly, this state has been perceived as a stage in the transition from unweathered to more weathered volcanic material characteristic of some other soil orders. However, under some conditions the short-range-order minerals achieve a stability that allows them to persist with little or only very slow further alteration over long periods.

Andisols may have any diagnostic epipedon, provided the minimum requirements for the order are met in and/or below the epipedon. Andisols may also have any kind of soil moisture and temperature regime and as such may occupy any position in the landscape and at any elevation.

Andic soil properties are exhibited within the top 60 cm of the soil, excluding organic soil materials except those with less than 25 percent organic carbon and andic soil properties, in a layer at least 35 cm thick. The soil may have any kind of diagnostic horizon characteristic for other soils below the 35 cm layer. This is the minimum expression of andic soil properties required for the order. The soils are considered Andisols if the criteria for thickness and position of the andic layer or layers are met, irrespective of the nature of the underlying material or horizons.

Cultivation of the soil, as in puddling of the surface 25 cm for paddy, may change some of the physical properties of the upper soil, such as bulk density. The presence, below this disturbed zone, of a layer at least 35 cm thick having andic soil properties will place the soil into Andisols. Many Andisols are stratified such as in some loess or alluvium; to be considered as Andisols, the layers which meet the requirements for andic soil properties must have a cumulative thickness of at least 35 cm within the upper 60 cm.

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^{1/} This chapter builds on the preliminary Andisol Proposal (1978) by Dr. G. D. Smith (NZ Soil Bureau Record 96) and represents the work of the International Committee on the Classification of Andisols (ICOMAND), chaired by Dr. M. L. Leamy, New Zealand Soil Bureau.

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One of the outstanding features of Andisols is their high natural productivity. There are, of course, exceptions to this very general statement, but the dominance of physical properties which are favorable for the growth of most plants, allied to their most common occurrence in areas of considerable rainfall, have resulted in "volcanic soils" being generally regarded as "highly fertile soils."

Andisols cover more than 124 million hectares or approximately 0.8 percent of the earth's surface. By far the most striking pattern in the distribution of Andisols follows the circum-Pacific Ring of Fire - that concentration of active tectonic zones and volcanoes along the western coast of the American continents both North and South, across the Aleutian Islands, down the Kamchatka peninsula of U.S.S.R., through Japan, the Philippine Islands, and Indonesia, across Papua New Guinea, the Solomon Islands, Vanuatu and other Pacific Islands to New Zealand. Other distinctive patterns occur associated with the Rift Valley of Africa, the west coast of Italy, in the Hawaiian Islands, the West Indies, Iceland, the Canary Islands, and other island locations.

Definition

Andisols are soils that

1. Have andic soil properties throughout subhorizons, whether buried or not, which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to Suborders

BA. Andisols that have a histic epipedon or experienced periods of saturation and reduction, as evidenced by one or more of the following within 50 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, unless irrigated and evidence occurs above a depth of 40 cm and not below:

1. Two percent or more redox segregations^{2/}
2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less.
3. Sufficient active ferrous iron to give a

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^{2/} Redox segregations, e.g., mottles and concretions, are formed as a result of the reduction and solubilisation of iron and/or manganese, their translocation, concentration, and their re-oxidation and precipitation in the form of oxides.

positive reaction to α, α' -dipyridyl^{1/} at some time of the year when not being irrigated.

Aquands

BB. Other Andisols that have a cryic or pergelic soil temperature regime.

Cryands

BC. Other Andisols that have an aridic moisture regime.

Torrands

BD. Other Andisols that have a xeric moisture regime.

Xerands

BE. Other Andisols that have 1500 kPa water retention of less than 15 percent on air-dried samples and less than 30 percent on undried samples, throughout a thickness of 35 cm or more within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Vitrand

BF. Other Andisols that have an ustic soil moisture regime.

Ustands

BG. Other Andisols.

Udands

AQUANDS

Definition

Aquands are the Andisols that

1. Have a histic epipedon; or
2. Experienced periods of saturation and reduction, as evidenced by one or more of the following within 50 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, unless irrigated and evidence occurs above a depth of 40 cm and not below:
 - a. Two percent or more redox segregations^{2/}
 - b. Dominant chromas, moist, of 2 or less on ped faces, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less.

^{1/} A positive reaction to the dipyridyl field test for ferrous iron (Childs 1981) may be used to confirm the existence of reducing conditions, and is especially useful in situations where, despite saturation, normal morphological indicators of such conditions are either absent or obscured (as by the dark colors characteristic of melanic great groups). A negative reaction, however, does not imply that reducing conditions are necessarily, or always, absent; this may merely mean that the level of free iron in the soil is below the sensitivity limit of the test or that the soil is in an oxidized phase at the time of testing.

* Childs, C.W. 1981: Field test for ferrous iron and ferric-organic complexes (on exchange sites or in water-soluble forms) in soils. Australian Journal of Soil Research 19: 175-180.

^{2/} Redox segregations, e.g., mottles and concretions, are formed as a result of the reduction and solubilisation of iron and/or manganese, their translocation, concentration, and their re-oxidation and precipitation in the form of oxides.

c. Sufficient active ferrous iron to give a positive reaction to a, a'-dipyridyl^{3/} at some time of the year when not being irrigated.

Key to great groups

BAA. Aquands that have a cryic or pergelic soil temperature regime.
Cryaquands

BAB. Other Aquands that have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon.
Placaquands

BAC. Other Aquands that have a cemented layer in 75 percent or more of each pedon which does not slake in water after drying, with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.
Duraquands

BAD. Other Aquands that have 1500 kPa water retention of less than 15 percent on air-dried samples and less than 30 percent on undried samples, throughout a thickness of 35 cm or more within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.
Vitraqquands

BAE. Other Aquands that have a melanic epipedon.
Melanaquands

BAF. Other Aquands.
Haplaquands

Cryaquands

Definition

Cryaquands are the Aquands that have a cryic or pergelic soil temperature regime.

Key to subgroups

BAAA. Cryaquands that have a lithic contact within 50 cm of the soil surface.
Lithic Cryaquands

^{3/} A positive reaction to the dipyridyl field test for ferrous iron (Childs 1981) may be used to confirm the existence of reducing conditions, and is especially useful in situations where, despite saturation, normal morphological indicators of such conditions are either absent or obscured (as by the dark colors characteristic of melanic great groups). A negative reaction, however, does not imply that reducing conditions are necessarily, or always, absent; this may merely mean that the level of free iron in the soil is below the sensitivity limit of the test or that the soil is in an oxidized phase at the time of testing.

* Childs, C.W. 1981: Field test for ferrous iron and ferric-organic complexes (on exchange sites or in water-soluble forms) in soils. Australian Journal of Soil Research 19: 175-180.

BAAB. Other Cryaquands that have a mean annual soil temperature of 0° C or lower.
Pergelic Cryaquands

BAAC. Other Cryaquands that have a histic epipedon.
Histic Cryaquands

BAAD. Other Cryaquands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.
Thaptic Cryaquands

BAAE. Other Cryaquands.
Typic Cryaquands

Definition of Typic Cryaquands

Typic Cryaquands are the Cryaquands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Have a mean annual soil temperature of more than 0° C;
3. Do not have a histic epipedon; and
4. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Duraquands

Definition

Duraquands are the Aquands that

1. Have a cemented layer in 75 percent or more of each pedon which does not slake in water after drying, with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;
2. Do not have a cryic or pergelic soil temperature regime; and
3. Do not have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon.

Key to subgroups

BACA. Duraquands that have a histic epipedon.
Histic Duraquands

BACB. Other Duraquands that have extractable bases plus 1N KCl₁ extractable Al³⁺ of less than 2.0 cmol(+) kg⁻¹ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm.
Acraquoxic Duraquands

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BACC. Other Duraquands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Duraquands

BACD. Other Duraquands.

Typic Duraquands

Definition of Typic Duraquands

Typic Duraquands are the Duraquands that

1. Do not have a histic epipedon;
2. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer; and
3. Have extractable bases plus 1N KCl-extractable Al^{3+} of 2.0 or more $cmol(+) kg^{-1}$ fine earth in all subhorizons 30 cm or more thick between 25 and 100 cm.

Haplaquands

Definition

Haplaquands are the Aquands that

1. Do not have a cemented layer in 75 percent or more of each pedon which does not slake in water after drying, with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;
2. Do not have a cryic or pergelic soil temperature regime;
3. Do not have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon;
4. Have 1500 kPa water retention of 15 percent or more on air-dried samples or 30 percent or more on undried samples, throughout a thickness of more than 25 cm within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower; and
5. Do not have a melanic epipedon.

Key to subgroups

BAFA. Haplaquands that have a lithic contact within 50 cm of the soil surface.

Lithic Haplaquands

BAFB. Other Haplaquands that have a petroferic contact within 100 cm of the soil surface.

Petroferic Haplaquands

BAFC. Other Haplaquands that have a horizon with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying.

Duric Haplaquands

BAFD. Other Haplaquands that have a histic epipedon.

Histic Haplaquands

BAFE. Other Haplaquands that have 1N KCl-extractable Al^{3+} of more than 2.0 $cmol(+) kg^{-1}$ fine earth throughout a layer 10 cm or more thick between 25 and 50 cm.

Alic Haplaquands

BAFF. Other Haplaquands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm.

Hydric Haplaquands

BAFG. Other Haplaquands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Haplaquands

BAFH. Other Haplaquands.

Typic Haplaquands

Definition of Typic Haplaquands

Typic Haplaquands are the Haplaquands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Do not have a petroferic contact within 100 cm of the soil surface;
3. Do not have a horizon with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying;
4. Do not have a histic epipedon;
5. Have 1N KCl-extractable Al^{3+} of 2.0 or less $cmol(+) kg^{-1}$ fine earth throughout all layers 10 cm or more thick between 25 and 50 cm;
5. Have undried 1500 kPa water of less than 70 percent throughout any continuous thickness of 35 cm or more within the upper 100 cm; and
6. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and

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organic carbon content 1 percent or more lower than the underlying layer.

Melanaquands

Definition

Melanaquands are the Aquands that

1. Have a melanic epipedon;
2. Do not have a cemented layer in 75 percent or more of each pedon which does not slake in water after drying, with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;
3. Do not have a cryic or pergelic soil temperature regime;
4. Do not have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon; and
5. Have 1500 kPa water retention of 15 percent or more on air-dried samples or 30 percent or more on undried samples, throughout a thickness of more than 25 cm within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to subgroups

BAEA. Melanaquands that have a lithic contact within 50 cm of the soil surface.

Lithic Melanaquands

BAEB. Other Melanaquands that have extractable bases plus 1N KCl-extractable Al^{3+} of less than $2.0 \text{ cmol}(+) \text{ kg}^{-1}$ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm.

Acraquoxic Melanaquands

BAEC. Other Melanaquands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm, and have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.

Hydric Pachic Melanaquands

BAED. Other Melanaquands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm.

Hydric Melanaquands

BAEE. Other Melanaquands that have, between 40 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Melanaquands

BAEF. Other Melanaquands.

Typic Melanaquands

Definition of Typic Melanaquands

Typic Melanaquands are the Melanaquands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Have undried 1500 kPa water of less than 70 percent throughout any continuous thickness of 35 cm or more within the upper 100 cm;
3. Do not have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm if undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm;
4. Do not have, between 40 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer; and
5. Have extractable bases plus 1N KCl-extractable Al^{3+} of 2.0 or more $\text{cmol}(+) \text{ kg}^{-1}$ fine earth in all subhorizons 30 cm or more thick between 25 and 100 cm.

Placaquands

Definition

Placaquands are the Aquands that

1. Have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon; and
2. Do not have a cryic or pergelic soil temperature regime.

Key to subgroups

BABA. Placaquands that have a lithic contact within 50 cm of the soil surface.

Lithic Placaquands

BABB. Other Placaquands that have a horizon with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying, and have a histic epipedon.

Duric Histic Placaquands

BABC. Other Placaquands that have a horizon with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying.

Duric Placaquands

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BABC. Other Placaquands that have a histic epipedon.
Histic Placaquands

BABD. Other Placaquands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Placaquands

BABE. Other Placaquands.

Typic Placaquands

Definition of Typic Placaquands

Typic Placaquands are the Placaquands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Do not have a horizon with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying;
3. Do not have a histic epipedon; and
4. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Vitraquands

Definition

Vitraquands are the Aquands that

1. Have 1500 kPa water retention of less than 15 percent on air-dried samples and less than 30 percent on undried samples, throughout a thickness of 35 cm or more within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;
2. Do not have a cryic or pergelic soil temperature regime;
3. Do not have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon; and
4. Do not have a cemented layer in 75 percent or more of each pedon which does not slake in water after drying, with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to subgroups

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BADA. Vitraquands that have a lithic contact within 50 cm of the soil surface.

Lithic Vitraquands

BADB. Other Vitraquands that have a horizon with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying.

Duric Vitraquands

BADC. Other Vitraquands that have a histic epipedon.
Histic Vitraquands

BADD. Other Vitraquands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Vitraquands

BADE. Other Vitraquands.

Typic Vitraquands

Definition of Typic Vitraquands

Typic Vitraquands are the Vitraquands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Do not have a horizon with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying;
3. Do not have a histic epipedon; and
4. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Cryands

Definition

Cryands are the Andisols that

1. Have a cryic or pergelic soil temperature regime; and
2. Do not have a histic epipedon or experience periods of saturation and reduction that are defined for Aquands.

Key to great groups

BBA. Cryands that have a mean annual soil temperature of 0° C or lower.

Gelicryands

BBB. Other Cryands that have a melanic epipedon.
Melanocryands

BBC. Other Cryands that have an epipedon meeting the depth, thickness and organic carbon requirements of a melanic epipedon and has color value and chroma, moist, of 3 or less.
Fulvicryands

BBD. Other Cryands that have a 1500 kPa water retention of undried samples of 100 percent or more on the weighted average throughout a thickness of 35 cm or more within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.
Hydrocryands

BBE. Other Cryands that have 1500 kPa water retention of less than 15 percent on air-dried samples and less than 30 percent on undried samples, throughout a thickness of 35 cm or more within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.
Vitricryands

BBF. Other Cryands.
Haplocryands

Fulvicryands

Definition

Fulvicryands are the Cryands that

1. Have a mean annual soil temperature of more than 0° C; and
2. Do not have a melanic epipedon but have an epipedon meeting the depth, thickness, and organic carbon requirements of a melanic epipedon with color value and chroma, moist, of 3 or less.

Key to subgroups

BBCA. Fulvicryands that have a lithic contact within 50 cm of the soil surface.
Lithic Fulvicryands

BBCB. Other Fulvicryands that have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.
Vitric Fulvicryands

BBCC. Other Fulvicryands.
Typic Fulvicryands

Definition of Typic Fulvicryands

Typic Fulvicryands are the Fulvicryands that

1. Do not have a lithic contact within 50 cm of the soil surface; and

2. Have 30 percent or more undried 1500 kPa water in all subhorizons that meets the requirements for andic soil properties and that is 25 cm or more thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Gelicryands

Definition

Gelicryands are the Cryands that have a mean annual soil temperature of 0° C or lower.

Key to subgroups

BBAA. All Gelicryands are regarded as Typic.
Typic Gelicryands

Haplocryands

Definition

1. Have a mean annual soil temperature of more than 0° C;

2. Do not have a melanic epipedon or an epipedon meeting the depth, thickness, and organic carbon requirements of a melanic epipedon with color value and chroma, moist, of 3 or less;

3. Have a 1500 kPa water retention as follows:

a. Air-dried samples of 15 percent or more and undried samples between 30 and 100 percent on the weighted average throughout all sections 35 cm or more thick within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower; and

b. Undried samples less than 100 percent on the weighted average throughout all sections 35 cm or more thick between a depth of 60 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to subgroups

BBFA. Haplocryands that have a lithic contact within 50cm of the soil surface.
Lithic Haplocryands

BBFB. Other Haplocryands that have 1N KCl-extractable Al³⁺ of more than 2.0 cmol(+) kg⁻¹ fine earth throughout a layer 10 cm or more thick between 25 and 50 cm.
Alic Haplocryands

BBFC. Other Haplocryands that have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:

1. Two percent or more redox segregations; or

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2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Haplocryands

BBFD. Other Haplocryands that have extractable bases plus 1N KCl₁-extractable Al³⁺ of less than 2.0 cmol(+) kg⁻¹ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm.

Acrodoxic Haplocryands

BBFE. Other Haplocryands that have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Vitric Haplocryands

BBFF. Other Haplocryands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Haplocryands

BBFG. Other Haplocryands that have a xeric soil moisture regime.

Xeric Haplocryands

BBFH. Other Haplocryands that have a spodic horizon, with an associated eluvial horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Spodic Haplocryands

BBFI. Other Haplocryands.

Typic Haplocryands

Definition of Typic Haplocryands

Typic Haplocryands are the Haplocryands that

1. Do not have a lithic contact within 50cm of the soil surface;

2. Do not have, in some subhorizon between 50 and 100 cm:

a. Two percent or more redox segregations; or

b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;

3. Have 30 percent or more undried 1500 kPa water in all subhorizons that meets the requirements for andic soil properties and that are at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;

4. Have 1N KCl-extractable Al³⁺ of 2.0 or less cmol(+) kg⁻¹ fine earth throughout all layers 10 cm or more thick between 25 and 50 cm;

5. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer;

6. Have extractable bases plus 1N KCl-extractable Al³⁺ of 2.0 or more cmol(+) kg⁻¹ fine earth in all subhorizons 30 cm or more thick between 25 and 100 cm; and

7. Do not have a xeric soil moisture regime.

8. Do not have a spodic horizon, with an associated eluvial horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Hydrocryands

Definition

Hydrocryands are the Cryands that

1. Have a mean annual soil temperature of more than 0° C;

2. Do not have a melanic epipedon or an epipedon meeting the depth, thickness, and organic carbon requirements of a melanic epipedon with color value and chroma, moist, of 3 or less; and

3. Have a 1500 kPa water retention of undried samples of 100 percent or more on the weighted average throughout a thickness of 35 cm or more within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to subgroups

BBDA. Hydrocryands that have a lithic contact within 50 cm of the soil surface. Lithic Hydrocryands

BBDB. Other Hydrocryands that have a placic horizon within 100 cm of the soil surface. Placic Hydrocryands

BBDC. Other Hydrocryands that have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:

1. Two percent or more redox segregations; or

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2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

3. Sufficient active ferrous iron to give a positive reaction to a, a'-dipyridyl at some time of the year when not being irrigated.

Aquic Hydrocryands

BBDD. Other Hydrocryands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Hydrocryands

BBDE. Other Hydrocryands.

Typic Hydrocryands

Definition of Typic Hydrocryands

Typic Hydrocryands are the Hydrocryands that

1. Do not have a lithic contact within 50 cm of the soil surface.
2. Do not that have, in some subhorizon between 50 and 100 cm:

- a. Two percent or more redox segregations, or
- b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less, or
- c. Sufficient active ferrous iron to give a positive reaction to a, a'-dipyridyl at some time of the year when not being irrigated.

3. Do not have a placic horizon within 100 cm of the soil surface.

4. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Melanocryands

Definition

Melanocryands are the Cryands that

1. Have a mean annual soil temperature of more than 0° C; and
2. Have a melanic epipedon.

Key to subgroups

BBBA. Melanocryands that have a lithic contact within 50 cm of the soil surface.

Lithic Melanocryands

BBBB. Other Melanocryands that have 1N KCl-extractable Al^{3+} of more than 2.0 cmol(+) kg^{-1} fine earth throughout a layer 10 cm or more thick between 25 and 50 cm.

Alic Melanocryands

BBBC. Other Melanocryands that have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Vitric Melanocryands

BBBD. Other Melanocryands.

Typic Melanocryands

Definition of Typic Melanocryands

Typic Melanocryands are the Melanocryands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Have 30 percent or more undried 1500 kPa water in all subhorizons that meets the requirements for andic soil properties and that are at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower; and
3. Have 1N KCl-extractable Al^{3+} of 2.0 or less cmol(+) kg^{-1} fine earth throughout all layers 10 cm or more thick between 25 and 50 cm.

Vitricryands

Definition

Vitricryands are the Cryands that

1. Have a mean annual soil temperature of more than 0° C;
2. Do not have a melanic epipedon or an epipedon meeting the depth, thickness, and organic carbon requirements of a melanic epipedon with color value and chroma, moist, of 3 or less; and
3. Have 1500 kPa water retention of less than 15 percent on air-dried samples and less than 30 percent on undried samples, throughout a thickness of 35 cm or more within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to subgroups

BBEA. Vitricryands that have a lithic contact within 50 cm of the soil surface.

Lithic Vitricryands

BBEB. Other Vitricryands that have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:

1. Two percent or more redox segregations; or

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2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Vitricryands

BBEC. Other Vitricryands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Vitricryands

BBED. Other Vitricryands that have a xeric moisture regime.

Xeric Vitricryands

BSEE. Other Vitricryands that have a spodic horizon, with an associated eluvial horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Spodic Vitricryands

BBEF. Other Vitricryands that have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Alfic Vitricryands

BBEG. Other Vitricryands.

Typic Vitricryands

Definition of Typic Vitricryands

Typic Vitricryands are the Vitricryands that

1. Do not have a lithic contact within 50 cm of the soil surface;

2. Do not have, in some subhorizon between 50 and 100 cm:

a. Two percent or more redox segregations; or

b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;

3. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer;

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4. Do not have a xeric moisture regime;

5. Do not have a spodic horizon, with an associated eluvial horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower; and

6. Do not have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Torrands

Definition

Torrands are the Andisols that

1. Have an aridic soil moisture regime;

2. Have a frigid or warmer soil temperature regime; and

3. Do not have a histic epipedon or experience periods of saturation and reduction that are defined for Aquands.

Key to great groups

BCA. All Torrands are regarded as Vitritorrands.

Vitritorrands

Vitritorrands

Definition

All Torrands are regarded as Vitritorrands

Key to subgroups

BCAA. Vitritorrands that have a lithic contact within 50 cm of the soil surface.

Lithic Vitritorrands

BCAB. Other Vitritorrands that have a petrocalcic horizon with its upper boundary within 100 cm of the mineral soil surface.

Petrocalcic Vitritorrands

BCAC. Other Vitritorrands that have a horizon with its upper boundary within 100 cm of the mineral soil surface which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying.

Duric Vitritorrands

BCAD. Other Vitritorrands that have, in some subhorizon between 50 and 100 cm:

1. Two percent or more redox segregations; or

2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year.

Aquic Vitritorrands

- BCAE.** Other Vitritorrands that have a calcic horizon with its upper boundary within 125 cm of the mineral soil surface.
Calcic Vitritorrands
- BCAF.** Other Vitritorrands.
Typic Vitritorrands

Definition of Typic Vitritorrands

Typic Vitritorrands are the Vitritorrands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Do not have a horizon with its upper boundary within 100 cm of the mineral soil surface which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying;
3. Do not have a petrocalcic horizon with its upper boundary within 100 cm of the mineral soil surface;
4. Do not have, in some subhorizon between 50 and 100 cm:
 - a. Two percent or more redox segregations; or
 - b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
 - c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year; and
5. Do not have a calcic horizon with its upper boundary within 125 cm of the mineral soil surface.

UDANDS

Definition

Udands are the Andisols that

1. Have an udic soil moisture regime;
2. Have a frigid or warmer soil temperature regime;
3. Do not have a histic epipedon or experience periods of saturation and reduction that are defined for Aquands; and
4. Have 1500 kPa water retention of 15 percent or more on air-dried samples or 30 percent or more on undried samples, throughout all layers of 35 cm or more thickness within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to great groups

- BGA.** Udands that have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon.
Placudands

- BGB.** Other Udands that have a cemented layer in 75 percent or more of each pedon which does not slake in water after air drying, with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.
Durudands

- BGC.** Other Udands that have a melanic epipedon.
Melanudands

- BGD.** Other Udands that have an epipedon meeting the depth, thickness and organic carbon requirements of a melanic epipedon and has color value and chroma, moist, of 3 or less.
Fulvudands

- BGE.** Other Udands that have a 1500 kPa water retention of undried samples of 100 percent or more on the weighted average throughout a thickness of 35 cm or more within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.
Hydrudands

- BGF.** Other Udands.
Hapludands

Durudands

Definition

Durudands are the Udands that

1. Do not have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon; and
2. Have a cemented layer in 75 percent or more of each pedon which does not slake in water after air drying, with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to subgroups

- BGBA.** Durudands that have, in some subhorizon between 50 and 100 cm:
1. Two percent or more redox segregations; or
 2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
 3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.
Aquic Durudands

- BGBB.** Other Durudands that have extractable bases plus 1N KCl extractable Al^{3+} of less than 2.0 cmol(+) kg^{-1} fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm.
Acrudoxic Durudands

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BGBC. Other Durudands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm, and have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.
Hydric Pachic Durudands

BGBD. Other Durudands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.
Thaptic Durudands

BGBE. Other Durudands.
Typic Durudands

Definition of Typic Durudands

Typic Durudands are the Durudands that

1. Do not have, in some subhorizon between 50 and 100 cm:
 - a. Two percent or more redox segregations; or
 - b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
 - c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;
2. Do not have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm, and both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm;
3. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer; and
4. Have extractable bases plus 1N KCl extractable Al³⁺ of 2.0 or more cmol(+) kg⁻¹ fine earth in all subhorizons 30 cm or more thick between 25 and 100 cm.

Fulvudands

Definition

Fulvudands are the Udands that

1. Do not have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon;

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2. Do not have a cemented layer in 75 percent or more of each pedon which does not slake in water after air drying, with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower; and

3. Do not have a melanic epipedon but have an epipedon meeting the depth, thickness and organic carbon requirements of a melanic epipedon that has color value and chroma, moist, of 3 or less.

Key to subgroups

BGDA. Fulvudands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm, and have a lithic contact within 50 cm of the soil surface.

Hydric Lithic Fulvudands

BGDB. Other Fulvudands that have a lithic contact within 50 cm of the soil surface.

Lithic Fulvudands

BGDC. Other Fulvudands that have 1N KCl-extractable Al³⁺ of more than 2.0 cmol(+) kg⁻¹ fine earth throughout a layer 10 cm or more thick between 25 and 50 cm.

Alic Fulvudands

BGDD. Other Fulvudands that have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:

1. Two percent or more redox segregations; or
2. Dominant chromas, moist, of 2 or less on faces of ped, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Fulvudands

BGDE. Other Fulvudands that have extractable bases plus 1N KCl-extractable Al³⁺ of less than 2.0 cmol(+) kg⁻¹ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm, and have undried kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm.

Acrudoxic Hydric Fulvudands

BGDF. Other Fulvudands that have extractable bases plus 1N KCl-extractable Al³⁺ of less than 2.0 cmol(+) kg⁻¹ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm, and have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, and base saturation (by sum of cations) of less than 35 percent throughout the upper 50 cm of that horizon.

Acrudoxic Ultic Fulvudands

BGDG. Other Fulvudands that have extractable bases plus 1N KCl₁-extractable A^{1S+} of less than 2.0 cmol(+) kg⁻¹ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm.

Acrudoxic Fulvudands

BGDH. Other Fulvudands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm, and have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.

Hydric Pachic Fulvudands

BGDI. Other Fulvudands that have sum of bases of more than 25.0 Cmol(+) Kg⁻¹ fine earth throughout some subhorizon 15 cm or more thick between 25 and 75 cm, and have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm, excluding any overlying layers that do not have andic soil properties.

Eutric Pachic Fulvudands

BGDJ. Other Fulvudands that have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.

Pachic Fulvudands

BGDK. Other Fulvudands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm, and have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Hydric Thaptic Fulvudands

BGDL. Other Fulvudands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm.

Hydric Fulvudands

BGDM. Other Fulvudands that have, between 40 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Fulvudands

BGDN. Other Fulvudands that have a sum of bases of more than 25.0 cmol(+) kg⁻¹ fine earth throughout some subhorizon 15 cm or more thick between 25 and 75 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Eutric Fulvudands

BGDO. Other Fulvudands.

Typic Fulvudands

Definition of Typic Fulvudands

Typic Fulvudands are the Fulvudands that

1. Do not have a lithic contact within 50 cm of the soil surface;

2. Do not have, in some subhorizon between 50 and 100 cm:

a. Two percent or more redox segregations; or

b. Dominant chromas, moist, of 2 or less on faces of ped, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;

3. Have 1N KCl-extractable Al³⁺ of 2.0 or less cmol(+) kg⁻¹ fine earth throughout all layers 10 cm or more thick between 25 and 50 cm;

4. Do not have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties;

5. Have undried 1500 kPa water of less than 70 percent throughout all layers of 35 cm or more thickness within the upper 100 cm;

6. Do not have, between 40 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer;

7. Have a sum of bases of 25.0 or less cmol(+) kg⁻¹ fine earth throughout all subhorizons 15 cm or more thick between 25 and 75 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;

8. Have extractable bases plus 1N KCl-extractable A^{1S+} of 2.0 or more cmol(+) kg⁻¹ fine earth in all subhorizons 30 cm or more thick between 25 and 100 cm; and

9. Do not have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, and base saturation (by sum of cations) of less than 35 percent throughout the upper 50 cm of that horizon if extractable bases plus 1N KCl-extractable A^{1S+} of less than 2.0 cmol(+) kg⁻¹ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm.

Hapludands

Definition

Hapludands are the Udands that

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1. Do not have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon;

2. Do not have a cemented layer in 75 percent or more of each pedon which does not slake in water after air drying, with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;

3. Do not have a melanic epipedon or an epipedon meeting the depth, thickness and organic carbon requirements of a melanic epipedon but has color value and chroma, moist, of 3 or less; and

4. Have a 1500 kPa water retention of undried samples of less than 100 percent on the weighted average throughout all layers 35 cm or more thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to subgroups

BGFA. Hapludands that have a lithic contact within 50 cm of the soil surface.

Lithic Hapludands

BGFB. Other Hapludands that have a petroferic contact within 100 cm of the soil surface.

Petroferic Hapludands

BGFC. Other Hapludands that have a horizon with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying, and have, in some subhorizon between 50 and 100 cm:

1. Two percent or more redox segregations; or

2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Duric Hapludands

BGFD. Other Hapludands that have a horizon with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying.

Duric Hapludands

BGFE. Other Hapludands that have 1N KCl-extractable Al^{3+} of more than 2.0 cmol(+) kg^{-1} fine earth throughout a layer 10 cm or more thick between 25 and 50 cm.

Alic Hapludands

BGFF. Other Hapludands that have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:

1. Two percent or more redox segregations; or

2. Dominant chromas, moist, of 2 or less on faces or peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Hapludands

BGFG. Other Hapludands that have extractable bases plus 1N KCl-extractable Al^{3+} of less than 2.0 cmol(+) kg^{-1} fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm, and have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm.

Acrudoxic Hydric Hapludands

BGFH. Other Hapludands that have extractable bases plus 1N KCl-extractable Al^{3+} of less than 2.0 cmol(+) kg^{-1} fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm, and have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Acrudoxic Thaptic Hapludands

BGFI. Other Hapludands that have extractable bases plus 1N KCl-extractable Al^{3+} of less than 2.0 cmol(+) kg^{-1} fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm, and have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, and base saturation (by sum of cations) of less than 35 percent throughout the upper 60 cm of that horizon.

Acrudoxic Ultic Hapludands

BGFJ. Other Hapludands that have extractable bases plus 1N KCl-extractable Al^{3+} of less than 2.0 cmol(+) kg^{-1} fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm.

Acrudoxic Hapludands

BGFK. Other Hapludands that have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Vitric Hapludands

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BGFL. Other Hapludands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm, and have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Hydric Thaptic Hapludands

BGFM. Other Hapludands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm.

Hydric Hapludands

BHFN. Other Hapludands that have a sum of bases of more than $25.0 \text{ cmol}(+) \text{ kg}^{-1}$ fine earth throughout some subhorizon 15 cm or more thick between 25 and 75 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, and have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Eutric Thaptic Hapludands

BGFO. Other Hapludands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Hapludands

BGFP. Other Hapludands that have a sum of bases of more than $25.0 \text{ cmol}(+) \text{ kg}^{-1}$ fine earth throughout some subhorizon 15 cm or more thick between 25 and 75 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Eutric Hapludands

BGFQ. Other Hapludands that have an oxic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Oxic Hapludands

BGFR. Other Hapludands that have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, and base saturation (by sum of cations) of less than 35 percent throughout the upper 50 cm of that horizon.

Ultic Hapludands

BGFS. Other Hapludands that have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Alfic Hapludands

BGFT. Other Hapludands.

Typic Hapludands

Definition of Typic Hapludands

Typic Hapludands are the Hapludands that

1. Do not have a lithic contact within 50 cm of the soil surface;

2. Do not have a petroferric contact within 100 cm of the soil surface;

3. Do not have a horizon with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, which is more than 15 cm thick and which contains 20 percent or more (by volume) cemented soil material that does not slake in water after air drying;

4. Do not have, in some subhorizon between 50 and 100 cm:

1. Two percent or more redox segregations; or

2. Dominant chromas, moist, of 2 or less on faces or peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;

5. Within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, have 30 percent or more undried 1500 kPa water in all subhorizons that meet the requirements for andic soil properties and are at least 25 cm thick but have less than 70 percent in all layers that are 35 cm or more thick;

6. Have 1N KCl-extractable Al^{3+} of 2.0 or less $\text{cmol}(+) \text{ kg}^{-1}$ fine earth throughout all layers 10 cm or more thick between 25 and 50 cm;

7. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer;

8. Have sum of bases of 25.0 or less $\text{cmol}(+) \text{ kg}^{-1}$ fine earth in all subhorizons 15 cm or more thick between 25 and 75 cm;

9. Have extractable bases plus 1N KCl-extractable Al^{3+} of 2.0 or more $\text{cmol}(+) \text{ kg}^{-1}$ fine earth in all subhorizons 30 cm or more thick between 25 and 100 cm; and

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10. Do not have an argillic, kandic, or oxic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;

Hydrudands

Definition

Hydrudands are the Udands that

1. Do not have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon;

2. Do not have a cemented layer in 75 percent or more of each pedon which does not slake in water after air drying, with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;

3. Do not have a melanic epipedon or an epipedon meeting the depth, thickness and organic carbon requirements of a melanic epipedon but has color value and chroma, moist, of 3 or less; and

4. Have a 1500 kPa water retention of undried samples of 100 percent or more on the weighted average throughout a thickness of 35 cm or more within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to subgroups

BGEA. Hydrudands that have a lithic contact within 50 cm of the soil surface.

Lithic Hydrudands

BGEB. Other Hydrudands that have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:

1. Two percent or more redox segregations; or
2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Hydrudands

BGEC. Other Hapludands that have extractable bases plus 1N KCl₇-extractable Al³⁺ of less than 2.0 cmol(+) kg⁻¹ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm, and have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Acruoxic Thaptic Hydrudands

BGED. Other Hydrudands that have extractable bases plus 1N KCl₇-extractable Al³⁺ of less than 2.0 cmol(+) kg⁻¹ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm.

Acruoxic Hydrudands

BGEE. Other Hydrudands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Hydrudands

BGEF. Other Hydrudands that have a sum of bases of more than 25.0 cmol(+) kg⁻¹ fine earth throughout some subhorizon 15 cm or more thick between 25 and 75 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Eutric Hydrudands

BGEG. Other Hydrudands that have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Ultic Hydrudands

BGEH. Other Hydrudands.

Typic Hydrudands

Definition of Typic Hydrudands

Typic Hydrudands are the Hydrudands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Do not have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:
 - a. Two percent or more redox segregations; or
 - b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
 - c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;
3. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer;
4. Have sum of bases of 25.0 or less cmol(+) kg⁻¹ fine earth in all subhorizons 15 cm or more thick between 25 and 75 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;

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5. Have extractable bases plus 1N KCl-extractable Al^{3+} of 2.0 or more $cmol(+) kg^{-1}$ fine earth in all subhorizons 30 cm or more thick between 25 and 100 cm; and

6. Do not have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Melanudands

Definition

Melanudands are the Udands that

1. Do not have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon;

2. Do not have a cemented layer in 75 percent or more of each pedon which does not slake in water after air drying, with its upper boundary within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower; and

3. Have a melanic epipedon.

Key to subgroups

BGCA. Melanudands that have a lithic contact within 50 cm of the soil surface.

Lithic Melanudands

BGCB. Other Melanudands that have 1N KCl-extractable Al^{3+} of more than 2.0 $cmol(+) kg^{-1}$ fine earth throughout a layer 10 cm or more thick between 25 and 50 cm, and have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:

1. Two percent or more redox segregations; or

2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Alic Aquic Melanudands

BGCC. Other Melanudands that have 1N KCl-extractable Al^{3+} of more than 2.0 $cmol(+) kg^{-1}$ fine earth throughout a layer 10 cm or more thick between 25 and 50 cm, and have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.

Alic Pachic Melanudands

BGCD. Other Melanudands that have 1N KCl-extractable Al^{3+} of more than 2.0 $cmol(+) kg^{-1}$ fine earth throughout a layer 10 cm or more thick between 25 and 50 cm, and have,

between 40 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Alic Thaptic Melanudands

BGCE. Other Melanudands that have 1N KCl-extractable Al^{3+} of more than 2.0 $cmol(+) kg^{-1}$ fine earth throughout a layer 10 cm or more thick between 25 and 50 cm.

Alic Melanudands

BGCF. Other Melanudands that have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:

1. Two percent or more redox segregations; or

2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Melanudands

BGCG. Other Melanudands that have extractable bases plus 1N KCl-extractable Al^{3+} of less than 2.0 $cmol(+) kg^{-1}$ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm, and have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Acrodoxic Vitric Melanudands

BGCH. Other Melanudands that have extractable bases plus 1N KCl-extractable Al^{3+} of less than 2.0 $cmol(+) kg^{-1}$ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm, and have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Acrodoxic Hydric Melanudands

BGCI. Other Melanudands that have extractable bases plus 1N KCl-extractable Al^{3+} of less than 2.0 $cmol(+) kg^{-1}$ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Acrodoxic Melanudands

BGCJ. Other Melanudands that have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm, excluding any overlying

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layers that do not have andic soil properties, and have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Pachic Vitric Melanudands

BGCK. Other Melanudands that have a sum of bases of more than 25.0 cmol(+) Kg⁻¹ fine earth throughout some subhorizon 15 Cm or more thick between 25 and 75 cm, and have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Eutric Vitric Melanudands

BGCL. Other Hapludands that have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Vitric Hapludands

BGCM. Other Melanudands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm, and have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.

Hydric Pachic Melanudands

BGCN. Other Melanudands that have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.

Pachic Melanudands

BGCO. Other Melanudands that have a sum of bases of more than 25.0 cmol(+) kg⁻¹ fine earth throughout some subhorizon 15 cm or more thick between 25 and 75 cm, and have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Eutric Hydric Melanudands

BGCP. Other Melanudands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Hydric Melanudands

BGCQ. Other Melanudands that have, between 40 and 100 cm, a layer 10 cm or more thick with more

than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Melanudands

BGCR. Other Melanudands that have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Ultic Melanudands

BGCS. Other Melanudands.

Typic Melanudands

Definition of Typic Melanudands

Typic Melanudands are the Melanudands that

1. Do not have a lithic contact within 50 cm of the soil surface;

2. Do not have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:

a. Two percent or more redox segregations; or

b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;

3. Within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, have 30 percent or more undried 1500 kPa water in all subhorizons that meets the requirements for andic soil properties and are at least 25 cm thick but have less than 70 percent in all layers that are 35 cm or more thick;

4. Have 1N KCl-extractable Al³⁺ of 2.0 or less cmol(+) kg⁻¹ fine earth in all layers 10 cm or more thick between 25 and 50 cm;

5. Do not have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties;

6. Do not have a sum of bases of more than 25.0 cmol(+) kg⁻¹ fine earth throughout some subhorizon 15 cm or more thick between 25 and 75 cm if undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;

7. Do not have, between 40 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout

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occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer;

8. Have extractable bases plus 1N KCl-extractable Al^{3+} of 2.0 or more $cmol(+) kg^{-1}$ fine earth in all subhorizons 30 cm or more thick between 25 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower; and

9. Do not have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Placudands

Definition

Placudands are the Udands that have a placic horizon within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, in half or more of each pedon.

Key to subgroups

BGAA. Placudands that have a lithic contact within 50 cm of the soil surface.

Lithic Placudands

BGAB. Other Placudands that have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:

1. Two percent or more redox segregations; or

2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Placudands

BGAC. Other Placudands that have extractable bases plus 1N KCl₂-extractable Al^{3+} of less than 2.0 $cmol(+) kg^{-1}$ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm, and have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Acrudoxic Hydric Placudands

BGAD. Other Placudands that have extractable bases plus 1N KCl₂-extractable Al^{3+} of less than 2.0 $cmol(+) kg^{-1}$ fine earth in some subhorizon 30 cm or more thick between 25 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Acrudoxic Placudands

BGAE. Other Placudands that have a sum of bases of more than 25.0 $cmol(+) kg^{-1}$ fine earth throughout some subhorizon 15 cm or more thick between 25 and 75 cm, and have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Eutric Vitric Placudands

BGAF. Other Placudands that have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Vitric Placudands

BGAG. Other Placudands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm, and have both more than 6 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.

Hydric Pachic Placudands

BGAH. Other Placudands that have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.

Pachic Placudands

BGAI. Other Placudands that have undried 1500 kPa water of 70 percent or more throughout a continuous thickness of 35 cm or more within the upper 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Hydric Placudands

BGAJ. Other Placudands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Placudands

BGAK. Other Placudands that have a sum of bases of more than 25.0 $cmol(+) kg^{-1}$ fine earth throughout some subhorizon 15 cm or more thick between 25 and 75 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Eutric Placudands

BGAL. Other Placudands.

Typic Placudands

Definition of Typic Placudands

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Typic Placudands are the Placudands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Do not have, in some subhorizon between 50 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower:
 - a. Two percent or more redox segregations; or
 - b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
 - c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;
3. Within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, have 30 percent or more undried 1500 kPa water in all subhorizons that meets the requirements for andic soil properties and are at least 25 cm thick but have less than 70 percent in all layers that are 35 cm or more thick;
4. Have extractable bases plus 1N KCl-extractable Al^{3+} of 2.0 or more $cmol(+) kg^{-1}$ fine earth in all subhorizons 30 cm or more thick between 25 and 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;
5. Do not have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties;
6. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer; and
7. Have a sum of bases of 25.0 or less $cmol(+) kg^{-1}$ fine earth in all subhorizons 15 cm or more thick between 25 and 75 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Ustands

Definition

1. Have an ustic soil moisture regime;
2. Have a frigid or warmer soil temperature regime;
3. Do not have a histic epipedon or experience periods of saturation and reduction that are defined for Aquands; and
4. Have 1500 kPa water retention of 15 percent or more on air-dried samples or 30 percent or more on undried samples, throughout all layers of 35 cm or more

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thickness within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to great groups

BFA. Ustands that have a duripan with its upper boundary within 100 cm of the mineral soil surface.

DURUSTANDS

BFB. Other Ustands.

HAPLUSTANDS

Durustands

Definition

Durustands are the Ustands that have a duripan with its upper boundary within 100 cm of the mineral soil surface.

Key to subgroups

BFAA. Durustands that have, in some subhorizon between 50 and 100 cm:

1. Two percent or more redox segregations; or
2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Durustands

BFAB. Other Durustands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Durustands

BFAC. Other Durustands that have a mollic epipedon.

Mollic Durustands

BFAD. Other Durustands that have an umbric epipedon.

Umbric Durustands

BFAE. Other Durustands.

Typic Durustands

Definition of Typic Durustands

Typic Durustands are the Durustands that

1. Do not have, in some subhorizon between 50 and 100 cm:
 - a. Two percent or more redox segregations; or
 - b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are

absent, other than in any horizon that has color values, moist, of 3 or less; or

c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;

2. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer; and

3. Do not have a mollic or umbric epipedon.

Haplustands

Definition

Haplustands are the Ustands that do not have a duripan with its upper boundary within 100 cm of the mineral soil surface.

Key to subgroups

BFBA. Haplustands that have a lithic contact within 50 cm of the soil surface.
Lithic Haplustands

BFBB. Other Haplustands that have, in some subhorizon between 50 and 100 cm:

1. Two percent or more redox segregations; or
2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.
Aquic Haplustands

BFBC. Other Haplustands that have extractable bases plus 1N KCl-extractable Al³⁺ of less than 15.0 cmol(+) kg⁻¹ in the fine earth throughout at least 60 cm of the upper 75 cm, and have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface.
Dystric Vitric Haplustands

BFBD. Other Haplustands that have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.
Vitric Haplustands

BFBE. Other Haplustands that have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.
Pachic Haplustands

BFBF. Other Haplustands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.
Thaptic Haplustands

BFBG. Other Haplustands that have a calcic horizon with its upper boundary within 125 cm of the mineral soil surface.
Calcic Haplustands

BFBH. Other Haplustands that have extractable bases plus 1N KCl-extractable Al³⁺ of less than 15.0 cmol(+) kg⁻¹ in the fine earth throughout at least 60 cm of the upper 75 cm.
Dystric Haplustands

BFBI. Other Haplustands that have an oxic horizon with its upper boundary within 125 cm of the mineral soil surface.
Oxic Haplustands

BFBJ. Other Haplustands that have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface.
Alfic Haplustands

BFBK. Other Haplustands that have a mollic epipedon.
Mollic Haplustands

BFBL. Other Haplustands that have an umbric epipedon.
Umbric Haplustands

BFBM. Other Haplustands.
Typic Haplustands

Definition of Typic Haplustands

Typic Haplustands are the Haplustands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Do not have, in some subhorizon between 50 and 100 cm:
 - a. Two percent or more redox segregations; or
 - b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
 - c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;

3. Have 30 percent or more undried 1500 kPa water in all subhorizons that meets the requirements for andic soil properties and that are at least 25 cm thick within 100 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower;

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4. Do not have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties;
5. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer;
6. Do not have a calcic horizon with its upper boundary within 125 cm of the mineral soil surface;
7. Have extractable bases plus 1N KCl-extractable Al³⁺ of 15.0 or more cmol(+) kg⁻¹ in the fine earth throughout at least 60 cm of the upper 75 cm;
8. Do not have an oxic horizon with its upper boundary within 125 cm of the mineral soil surface;
9. Do not have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface; and
10. Do not have either a mollic or umbric epipedon.

Vitrands

Definition

Vitrands are the Andisols that

1. Have a frigid or warmer soil temperature regime;
2. Do not have a histic epipedon or experience periods of saturation and reduction that are defined for Aquands;
3. Do not have an aridic or xeric moisture regime; and
4. Have 1500 kPa water retention of less than 15 percent on air-dried samples and less than 30 percent on undried samples, throughout a thickness of 35 cm or more within 60 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Key to great groups

BEA. Vitrands that have an ustic soil moisture regime.
Ustivitrands

BEB. Other Vitrands.
Udivitrands

Udivitrands

Definition

Udivitrands are the Vitrands that have an udic soil moisture regime.

Key to subgroups

BEBA. Udivitrands that have a lithic contact within 50 cm of the soil surface.
Lithic Udivitrands

BEBB. Other Udivitrands that have, in some subhorizon between 50 and 100 cm:

1. Two percent or more redox segregations; or
2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Udivitrands

BEEC. Other Udivitrands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Udivitrands

BEBD. Other Udivitrands that have a spodic horizon, with an associated eluvial horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Spodic Udivitrands

BEBE. Other Udivitrands.

Typic Udivitrands

Definition of Typic Udivitrands

Typic Udivitrands are the Udivitrands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Do not have, in some subhorizon between 50 and 100 cm:
 - a. Two percent or more redox segregations; or
 - b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
 - c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;
3. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer; and
4. Do not have a spodic horizon, with an associated eluvial horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

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Ustivitrands**Definition**

Ustivitrands are the Vitrands that have an ustic soil moisture regime.

Key to subgroups

BEAA. Ustivitrands that have a lithic contact within 50 cm of the soil surface.
Lithic Ustivitrands

BEAB. Other Ustivitrands that have, in some subhorizon between 50 and 100 cm:

1. Two percent or more redox segregations; or
2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Ustivitrands

BEAC. Other Ustivitrands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.
Thaptic Ustivitrands

BEAD. Other Ustivitrands that have a calcic horizon with its upper boundary within 125 cm of the mineral soil surface.
Calcic Ustivitrands

BEAE. Other Ustivitrands that have a mollic epipedon.
Mollic Ustivitrands

BEAF. Other Ustivitrands that have an umbric epipedon.
Umbric Ustivitrands

BEAG. Other Ustivitrands.
Typic Ustivitrands

Definition of Typic Ustivitrands

Typic Ustivitrands are the Ustivitrands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Do not have, in some subhorizon between 50 and 100 cm:
 - a. Two percent or more redox segregations; or
 - b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;

3. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer;

4. Do not have a calcic horizon with its upper boundary within 125 cm of the mineral soil surface; and

5. Do not have either a mollic or umbric epipedon.

Xerands**Definition**

Xerands are the Andisols that

1. Have a xeric soil moisture regime;
2. Have a frigid or warmer soil temperature regime; and
3. Do not have a histic epipedon or experience periods of saturation and reduction that are defined for Aquands.

Key to great groups

BDA. Xerands that have 1500 kPa water retention of less than 15 percent on air-dried samples and less than 30 percent on undried samples, throughout a thickness of 35 cm or more within 60 cm of the mineral soil surface.
Vitraxerands

BDB. Other Xerands that have a melanic epipedon.
Melanoxerands

BDC. Other Xerands.
Haploxerands

Haploxerands**Definition**

Haploxerands are the Xerands that

1. Have 1500 kPa water retention of 15 percent or more on air-dried samples or 30 percent or more on undried samples, in layers that are 35 cm or more thick within 60 cm of the mineral soil surface; and
2. Do not have a melanic epipedon.

Key to subgroups

BDCA. Haploxerands that have a lithic contact within 50 cm of the soil surface.
Lithic Haploxerands

BDCB. Other Haploxerands that have, in some subhorizon between 50 and 100 cm:

1. Two percent or more redox segregations; or
2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are

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absent, other than in any horizon that has color values, moist, of 3 or less; or

3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.
Aquic Haploxerands

BDCC. Other Haploxerands that have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface, and base saturation (by sum of cations) of less than 35 percent throughout the upper 50 cm of that horizon, and have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface.
Ultic Vitric Haploxerands

BDCD. Other Haploxerands that have less than 30 percent undried 1500 kPa water in some subhorizon that meets the requirements for andic soil properties and that is at least 25 cm thick within 100 cm of the mineral soil surface.
Vitric Haploxerands

BDCE. Other Haploxerands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.
Thaptic Haploxerands

BDCF. Other Haploxerands that have a calcic horizon with its upper boundary within 125 cm of the mineral soil surface.
Calcic Haploxerands

BDCG. Other Haploxerands that have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, and base saturation (by sum of cations) of less than 35 percent throughout the upper 50 cm of that horizon.
Ultic Haploxerands

BDCH. Other Haploxerands that have

1. A mollic epipedon; and
2. An argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface.

Argixerollic Haploxerands

BDCI. Other Haploxerands that have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface.
Alfic Haploxerands

BDCJ. Other Haploxerands that have a mollic epipedon.
Mollic Haploxerands

BDCk. Other Haploxerands that have an umbric epipedon.
Umbric Haploxerands

BDCL. Other Haploxerands.

Typic Haploxerands

Definition of Typic Haploxerands

Typic Haploxerands are the Haploxerands that

1. Do not have a lithic contact within 50 cm of the soil surface;

2. Do not have, in some subhorizon between 50 and 100 cm:

a. Two percent or more redox segregations; or

b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or

c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;

3. Have 30 percent or more undried 1500 kPa water in all layers that meet the requirements for andic soil properties and that are at least 25 cm thick within 100 cm of the mineral soil surface;

4. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer;

5. Do not have a calcic horizon with its upper boundary within 125 cm of the mineral soil surface;

6. Do not have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower; and

7. Do not have either a mollic or umbric epipedon.

Melanoxerands

Definition

Melanoxerands are the Xerands that

1. Have a melanic epipedon; and

2. Have 1500 kPa water retention of 15 percent or more on air-dried samples or 30 percent or more on undried samples, in layers that are 35 cm or more thick within 60 cm of the mineral soil surface.

Key to subgroups

BDBA. Melanoxerands that have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.

Pachic Melanoxerands

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BDBB. Other Melanoxerands.

Typic Melanoxerands

Definition of Typic Melanoxerands

Typic Melanoxerands are the Melanoxerands that do not have both more than 6.0 percent organic carbon and colors of the mollic epipedon throughout at least 50 cm of the upper 60 cm excluding any overlying layers that do not have andic soil properties.

Vitrixerands

Definition

Vitrixerands are the Xerands that have 1500 kPa water retention of less than 15 percent on air-dried samples and less than 30 percent on undried samples, throughout a thickness of 35 cm or more within 60 cm of the mineral soil surface.

Key to subgroups

BDAA. Vitrixerands that have a lithic contact within 50 cm of the soil surface.

Lithic Vitrixerands

BDAB. Other Vitrixerands that have, in some subhorizon between 50 and 100 cm:

1. Two percent or more redox segregations; or
2. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
3. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated.

Aquic Vitrixerands

BDAC. Other Vitrixerands that have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer.

Thaptic Vitrixerands

BDAD. Other Vitrixerands that have a spodic horizon, with an associated eluvial horizon with its upper boundary within 125 cm of the mineral soil surface.

Spodic Vitrixerands

BDAE. Other Vitrixerands that have

1. A mollic epipedon; and
2. An argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface.

Argixerollic Vitrixerands

BDAF. Other Vitrixerands that have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface.

Alfic Vitrixerands

BDAG. Other Vitrixerands that have a mollic epipedon.
Mollic Vitrixerands

BDAH. Other Vitrixerands that have an umbric epipedon.

Umbric Vitrixerands

BDAI. Other Vitrixerands.

Typic Vitrixerands

Definition of Typic Vitrixerands

Typic Vitrixerands are the Vitrixerands that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Do not have, in some subhorizon between 50 and 100 cm:
 - a. Two percent or more redox segregations; or
 - b. Dominant chromas, moist, of 2 or less on faces of peds, or in the matrix if peds are absent, other than in any horizon that has color values, moist, of 3 or less; or
 - c. Sufficient active ferrous iron to give a positive reaction to a,a'-dipyridyl at some time of the year when not being irrigated;
3. Do not have, between 25 and 100 cm, a layer 10 cm or more thick with more than 3.0 percent organic carbon and colors of a mollic epipedon throughout occurring below a horizon or horizons, 10 cm or more thick, with color value 1 unit or more higher and organic carbon content 1 percent or more lower than the underlying layer;
4. Do not have a spodic horizon, with an associated eluvial horizon with its upper boundary within 125 cm of the mineral soil surface;
5. Do not have an argillic or kandic horizon with its upper boundary within 125 cm of the mineral soil surface; and
6. Do not have a mollic or umbric epipedon.

Page 156, first column (Definition). After item 3 add item 4 to read as follows: "4. Do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."

Pages 156-157, Limits between Aridisols and soils of other orders. Starting with item 2. renumber the items as "3., 4., 5, . . . 10."

Page 156, second column. Insert new item 2. to read as follows: "2. To distinguish Aridisols from Andisols, Aridisols do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."

Page 179, first column, Definition. Change first 2 lines after the word "Definition" to read as follows: "Entisols are mineral soils that meet requirements 3 and 4 and either 1 or 2:"

- Page 180, first column (Definition). Before "Limits between . . ." add item 4. to read as follows: "4. Do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."
- Page 180, Limits between Entisols and soils of other orders. Starting with item 2. renumber the items as "3., 4., 5, . . . 10."
- Page 180, first column (Limits between . . .). Insert new item 2. to read as follows: "2. To distinguish Entisols from Andisols, Entisols do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."
- Page 212, first column (Definition). After item 2.b.(2) add item 3. to read as follows: "3. Do not have andic soil properties in layers 35 cm or more thick within a depth of 60 cm from the surface."
- Page 227, first column, second paragraph, line 8. Delete ", and a duripan (Plate 11B)" from this line.
- Page 228, first column (Definition). Preceding item 2. insert item g. to read as follows: "g. Do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."
- Page 228, item 3. Change item 3. to read as follows: "3. Have a mollic epipedon and an underlying cambic horizon that has base saturation of less than 50 percent (by NH₄OAc) in some part or that decreases to less than 50 percent at a depth of 180 cm or less below the soil surface."
- Pages 228-229, Limits between Inceptisols and other orders. Starting with item 2. renumber the items as "3., 4., 5, . . . 10."
- Page 228, second column. Insert new item 2. to read as follows: "2. To distinguish Inceptisols from Andisols, Inceptisols do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."
- Page 229, first column, item 6.b (new number 6). Change item 6.b. to read as follows: "b. Have a mollic epipedon and an underlying cambic horizon that has base saturation of less than 50 percent (by NH₄OAc) in some part or that decreases to less than 50 percent at a depth 180 cm or less below the soil surface."
- Page 230, first column, Key to suborders. Delete all of item "JB. . . Andepts, p. 230" and change "JC." to "JB.", "JD." to "JC.", "JE." to "JD.", and "JF." to "JE." Also, make subsequent corrections in Keys to great groups on pages 247, 258, and 264. (Note - Instructions given above, which are referenced to pages 92-93 of Soil Taxonomy, changed the letter "I" as the order identifier for Inceptisols to the letter "J" throughout the chapter on Inceptisols.)
- Pages 230-236, Andepts. Delete "Andepts" including all great groups and subgroups.
- Page 237, first column (Key to great groups). Delete all of item "JAG. . . Andaquepts, p. 237" and change "JAH." to "JAG.", "JAI." to "JAG." and "JAJ." to "JAI." (Note - Instructions given above, which are referenced to pages 92-93 of Soil Taxonomy, changed the letter "I" as the order identifier for Inceptisols to the letter "J" throughout the chapter on Inceptisols.)
- Pages 237-238, Andaquepts. Delete "Andaquepts" including all subgroups.
- Page 241, second column, Definition, item 3. Delete all of item "3." and renumber the subsequent items.
- Page 243, Definition (of Humaquepts), item 3. Delete all of item "3.", including footnote 16 and renumber the subsequent items.
- Page 245, second column, Definition (of Tropaquepts), item 4. Delete all of item "4." and renumber item "5." to "4."
- Page 247, first column, Definition, item 3. Delete all of item "3.", including footnote 18 and renumber the subsequent items.
- Page 257, second column, Plaggepts, first 2 sentences. Delete the second sentence and change the first sentence to read as follows: "Plaggepts are the soils that have a plaggen epipedon."
- Page 257, second column, Tropepts, first sentence, lines 3-4. Place a "." (period) after "regions" and delete remainder of sentence.
- Page 258, first column, Definition, item 3. Delete all of item "3." and renumber the subsequent items.
- Page 264, first column, Definition, item 1. Delete all of item "1." and renumber the subsequent items.
- Page 271, second column, item 3 (Definition). Change item 3. to read as follows: "3. Do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."
- Page 272, Limits between Mollisols and soils of other orders. Starting with item 2. renumber the items as "3., 4., 5, . . . 10."
- Page 272, second column. Insert new item 2. to read as follows: "2. To distinguish Mollisols from Andisols, Mollisols do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."
- Page 272, Limits between Mollisols and soils of other orders, new item 6. Change the new item 6. to read as follows: "6. To distinguish Mollisols from Inceptisols, Mollisols have a mollic epipedon or a mollic epipedon and an argillic, kandic, or a natric horizon, but if they have a mollic epipedon and do not have an argillic, kandic, or natric horizon, they must not have

an underlying layer that has base saturation (by NH_4OAc) that is less than 50 percent in some part within a depth of 180 cm below the surface;"

Page 323, second column, Definition (also see NSTH issue no. 11). Add item 3. to read as follows: "3. Do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."

Page 333, first column, second line. Change "(plates 4C, 7 B, and 8C)" to "(plates 4C and 7B)."

Page 333, first column, 3rd paragraph. Add the following sentence to the end of the 3rd paragraph: "The chemical and physical properties of many Spodosols and Andisols are very similar, however, a soil is considered to be an Andisol if it has andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface even though it may also have a spodic horizon."

Page 333, first column, Definition. Change definition to read as follows:

"Definition

Spodosols are mineral soils that

1. Do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface; and

2. Have a spodic horizon that has its upper boundary within 200 cm of the surface or they have a placic horizon that is cemented by iron, that rests on a spodic horizon, on a fragipan, or on an albic horizon that rests on a fragipan, and that meets all requirements of a spodic horizon except thickness and the index of accumulation."

Page 340, Humods, first line. Change to read: "Humods (plate 4C) are the more or less. . ."

Page 349, second column, Definition (See NSTH issue no. 12). Following item 3. add item 4. to read as follows: "4. Do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."

Page 350, Limits between Ultisols and soils of other orders. Starting with item 2. renumber the items as "3., 4., 5. . . 9."

Page 350, first column. Insert new item 2. to read as follows: "2. To distinguish Ultisols from Andisols, Ultisols do not have andic soil properties throughout subhorizons which have a cumulative thickness of 35 cm or more within 60 cm of the mineral soil surface."

Page 384, Modifiers that replace names of particle-size classes. Delete this section and replace with the following:

"Modifiers that replace names of particle-size classes^{1/}

There are three situations in which particle-size class names are not used. In one, the name is redundant. Psammaents and Psammaquents, by definition, are sandy, and no particle-size class name is needed or used in the family name.

In the second situation, soil materials derived from volcanic ejecta, particle-size analysis is difficult to apply because the soil material commonly consists of aggregates containing volcanic glass and allophane. These components are not adequately described by normal particle-size classes, especially as they often cannot be readily dispersed and the results of dispersion are variable. Consequently, normal particle-size class names are not used for that part of the soil that has andic soil properties or that is high in volcanic glass, as is the situation with Andisols by definition. In families of Andisols and in most andic and vitrandic subgroups of other soil orders the following substitutes for particle-size class names are used for the part of the soil that does not disperse.

In the third situation, the content of allophane and organic matter is also high and particle size has only limited relation to the physical and chemical properties of the soils. This seems to be normal in soils that have both a cryic temperature regime and a spodic horizon. Therefore, particle-size class names are not used for the spodic horizons of most Cryaquods, Cryohumods, Cryorthods, or Cryic Placohumods and for some other Spodosols².

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^{1/} The definition of the geologic terms used in the substitute particle-size classes are the same as those in: Bates, R.L.; Jackson, J.A. (Eds). 1980. Glossary of Geology (Second Edition). American Geological Institute. Falls Church, VA. 751 p., with the following exceptions.

Cinders: Uncemented juvenile vitric vesicular pyroclastic material, more than 2.0 mm in at least one dimension, with an apparent specific gravity (including vesicles) of more than 1.0 and less than 2.0.

Lapilli: Non or slightly vesicular pyroclastics, 2.0 to 76 mm in at least one dimension, with an apparent specific gravity of 2.0 or more.

Pumice-like: Vesicular pyroclastic materials other than pumice but having an apparent specific gravity (including vesicles) of less than 1.0.

^{2/} Particle-size class names are applied to other spodic horizons but with reservations. Somewhat different classes probably should be used for most families of Spodosols, but data are too few to permit the testing of alternatives. Some series that would otherwise be reasonable homogeneous are split at the family level by the particle-size classes. These soils have appreciable but not very large amounts of organic matter in the spodic horizon.

A. Substitutes for the fragmental class

These classes have insufficient fine earth to fill 10 percent of interstices coarser than 1 mm.

Pumiceous - More than 60 percent by weight of the whole soil is composed of volcanic ash, cinders, lapilli, pumice and pumice-like fragments more than 1 mm in diameter; pumice or pumice-like fragments form two-thirds or more by volume of the fraction coarser than 2.0 mm.

Cindery - More than 60 percent by weight of the whole soil is composed of volcanic ash, cinders, lapilli, pumice and pumice-like fragments more than 1 mm in diameter; pumice or pumice-like fragments form less than two-thirds by volume of the fraction coarser than 2.0 mm.

B. Substitutes for the non-fragmental classes

These classes have sufficient fine earth to fill 10 percent or more of the interstices coarser than 1 mm.

Ashy - Rock fragments make up less than 35 percent by volume and the fine earth is either:

a. Thirty percent or more by weight volcanic glass, glass aggregates, glass coated grains or other vitric volcanics; or

b. Thirty percent or more by weight is between 0.02 and 2.0 mm in diameter and 5 percent or more of the 0.02 to 2.0 mm fraction is volcanic glass, glass aggregates, glass coated grains, or other vitric volcanics, and the $Al + Fe / 2$ is 0.4 percent or more, and the water at 1500 KPa is less than 30 percent on undried samples and less than 12 percent on dried samples of the fine earth.

Ashy-pumiceous - Rock fragments make up 35 percent or more by volume; pumice or pumice-like fragments are two-thirds or more by volume of the rock fragments; fine earth is ashy.

Ashy-skeletal - Rock fragments make up 35 percent or more by

volume; pumice or pumice-like fragments are less than two-thirds by volume of the rock fragments; fine earth is ashy.

Medial - The fine earth has andic soil properties; water at 1500 kPa is 12 percent or more on air-dried samples of the fine earth, or is 30 percent or more on undried samples, but is less than 100 percent on undried samples; rock fragments make up less than 35 percent by volume.

Medial-pumiceous - Rock fragments make up 35 percent or more by volume; pumice or pumice-like fragments are two-thirds or more by volume of the rock fragments; fine earth is medial.

Medial-skeletal - Rock fragments make up 35 percent or more by volume; pumice or pumice-like fragments are less than two-thirds by volume of the rock fragments; fine earth is medial.

Hydrous - The fine earth has andic soil properties; water at 1500 kPa is 100 percent or more on undried samples of the fine earth; rock fragments make up less than 35 percent by volume.

Hydrous-pumiceous - Rock fragments make up 35 percent or more by volume; pumice or pumice-like fragments are two-thirds or more by volume of the rock fragments; fine earth is hydrous.

Hydrous-skeletal - Rock fragments make up 35 percent or more by volume; pumice or pumice-like fragments are less than two-thirds by volume of the rock fragments; fine earth is hydrous."

Page 385, first column, Control section for particle-size classes or their substitutes. Change "B." to "C.", "C." to "D." . . . "E." to "F." and add new item "B." to read as follows: "B. In Andisols particle-size modifiers or substitutes are used to describe material from the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower, to 100 cm or to a lithic, paralithic, or petroferic contact, to a duripan, or to a petrocalcic or placic horizon if the depth to any of these is less than 100 cm; or to a depth 25 cm below the level at which the soil temperature is 0° C about 2 months after the summer solstice; whichever is shallower."

Page 385, Strongly contrasting particle-size classes, first paragraph, last sentence. Change sentence to read as follows: "Substitute names for particle-size class names are applied only if the

³ Pumice-like - Vesicular pyroclastic materials other than pumice but having an apparent specific gravity (including vesicles) of less than 1.0 g/cc³.

materials extend at least 10 cm into the upper part of the control section."

Pages 385-386, Strongly contrasting particle-size classes. Delete the current list of strongly contrasting particle-size classes and substitute the following list (The new list is rearranged into alphabetical order and 10 new classes are added.):

1. Ashy over loamy-skeletal.
2. Ashy over loamy.
3. Ashy over medial-skeletal.
4. Ashy over medial.
5. Ashy over pumiceous or cindery if there is an absolute difference of 20 percent or more in volume of rock fragments.
6. Ashy over sandy or sandy-skeletal.
7. Cindery over loamy.
8. Cindery over medial-skeletal.
9. Cindery over medial.
10. Clayey over fine-silty if there is an absolute difference of more than 25 percent in the percentage of clay.
12. Clayey over fragmental.
13. Clayey over loamy if there is an absolute difference of more than 25 percent in the percentage of clay.
14. Clayey over loamy-skeletal if there is an absolute difference of more than 25 percent in the percentage of clay in the fine-earth fraction.
15. Clayey over sandy or sandy-skeletal.
16. Clayey-skeletal over sandy.
17. Coarse-loamy over clayey.
18. Coarse-loamy over fragmental.
19. Coarse-loamy over sandy or sandy-skeletal if the coarse-loamy material has less than 50 percent fine or coarser sand.
20. Coarse-silty over clayey.
21. Coarse-silty over sandy or sandy-skeletal.
22. Fine-loamy over clayey if there is an absolute difference of more than 25 percent in the percentage of clay.
23. Fine-loamy over fragmental.
24. Fine-loamy over pumiceous or cindery.
25. Fine-loamy over sandy or sandy-skeletal.
26. Fine-silty over clayey if there is an absolute difference of more than 25 percent in the percentage of clay.
27. Fine-silty over fragmental.
28. Fine-silty over sandy or sandy-skeletal.
29. Hydrous over clayey-skeletal.
30. Hydrous over clayey.
31. Hydrous over fragmental.
32. Hydrous over loamy-skeletal.
33. Hydrous over loamy.
34. Hydrous over sandy or sandy-skeletal.
35. Loamy over sandy or sandy-skeletal if the loamy material has less than 50 percent fine or coarser sand.

36. Loamy-skeletal over clayey if there is an absolute difference of more than 25 percent in the percentage of clay in the fine-earth fraction.
37. Loamy-skeletal over fragmental.
38. Loamy-skeletal over sandy.
39. Medial over ashy.
40. Medial over clayey-skeletal.
41. Medial over clayey.
42. Medial over fragmental.
43. Medial over hydrous.
44. Medial over loamy-skeletal.
45. Medial over loamy.
46. Medial over pumiceous or cindery.
47. Medial over sandy or sandy-skeletal.
48. Pumiceous or ashy-pumiceous over loamy.
49. Pumiceous or ashy-pumiceous over medial-skeletal.
50. Pumiceous or ashy-pumiceous over medial.
51. Pumiceous or ashy-pumiceous over sandy or sandy-skeletal.
52. Sandy over clayey.
53. Sandy over loamy if the loamy material has less than 50 percent fine or coarser sand.
54. Sandy-skeletal over loamy if the loamy material has less than 50 percent fine or coarser sand.

Page 386, first column, Choice of 7 or 11 particle-size classes, third paragraph, first sentence. Rewrite to read as follows: "Contrasting families are recognized if substitute terms are used to characterize the materials in a part of the particle-size control section. If the substitute terms are used only for the upper part then only the seven particle-size classes are used."

Page 386, second column, Contrasting mineralogy modifiers, second sentence. Delete the second sentence starting with "In those soils there is an overlay of ash . . ."

Page 386, second column, Key to mineralogy classes, first paragraph. Rewrite sentence starting with word "Substitute" to read as follows: "Substitute terms connoting both particle size and mineralogy are based on combined texture, consistence, and mineralogy classes and are used to indicate important variations in Andisols, in many intergrades to Andisols, and in many cryic great groups and cryic subgroups of Spodosols."

615.61 Andic and Vitrandic subgroups

Because of the Andisol amendment (615.60) all previously recognized andaqueptic, andaquic, andeptic, and andic subgroups, which were intergrades to the discontinued Andepts and Andaquepts, require redefinition. They are now considered to be intergrades to Andisols. Also, because the new subgroup criteria is somewhat less restrictive concerning "andic characteristics", many new subgroups are recognized in great groups that previously lacked an equivalent.

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The following is a list of subgroups, by great group, that intergrade to the Andisols. Great groups which previously lacked "andic" intergrades are identified by the mark, (+). (The following section, 615.62 New format for the Keys to subgroups, includes the criteria for each of the redefined and new subgroups.)

Aquandic Albaqualfs (+)
 Aquandic Ochraqualfs
 Aquandic Umbraqualfs (+)
 Andic Cryoboralfs, Vitrandic Cryoboralfs
 Andic Eutroboralfs, Vitrandic Eutroboralfs (+)
 Andic Fragiboralfs, Vitrandic Fragiboralfs (+)
 Andic Glossoboralfs, Vitrandic Glossoboralfs (+)
 Andic Paleboralfs, Vitrandic Paleboralfs (+)
 Andic Hapludalfs, Vitrandic Hapludalfs
 Andic Fragixeralfs, Vitrandic Fragixeralfs (+)
 Andic Haploxeralfs, Vitrandic Haploxeralfs (+)
 Andic Palexeralfs, Vitrandic Palexeralfs (+)
 Vitrixerandic Durargids, Vitrustandic Durargids (+)
 Vitrixerandic Camborthids, Vitrustandic Camborthids (+)
 Vitrixerandic Durorthids, Vitrustandic Durorthids (+)
 Aquandic Cryaquepts
 Aquandic Fluvaquepts
 Andic Cryofluvents, Vitrandic Cryofluvents
 Vitrixerandic Torrifluvents, Vitrandic Torrifluvents (+)
 Andic Udifluvents, Vitrandic Udifluvents (+)
 Vitrandic Xerofluvents (+)
 Alfic Vitrandic Cryorthents, Vitrandic Cryorthents
 Vitrandic Torriorthents (+)
 Andic Troporthents, Vitrandic Troporthents
 Andic Udorthents, Vitrandic Udorthents
 Vitrandic Xerorthents (+)
 Aquandic Cryaquepts
 Aquandic Halaquepts (+)
 Aquandic Haplaquepts (+)
 Aquandic Humaquepts (+)
 Aquandic Placaquepts (+)
 Aquandic Tropaquepts (+)
 Andic Cryochrepts, Vitrandic Cryochrepts
 Andic Durochrepts (+)
 Andic Dystrochrepts, Vitrandic Dystrochrepts
 Andic Eutrochrepts, Vitrandic Eutrochrepts
 Andic Fragiochrepts, Vitrandic Fragiochrepts
 Andic Ustochrepts, Vitrandic Ustochrepts
 Andic Xerochrepts, Vitrandic Xerochrepts
 Andic Dystropepts, Vitrandic Dystropepts (+)
 Andic Eutropepts, Vitrandic Eutropepts
 Ustandic Humitropepts, Andic Humitropepts, Vitrandic Humitropepts
 Andic Cryumbrepts, Vitrandic Cryumbrepts
 Andic Fragiumbrepts, Vitrandic Fragiumbrepts
 Aquandic Haplumbrepts, Andic Haplumbrepts, Vitrandic Haplumbrepts
 Andic Xerumbrepts, Vitrandic Xerumbrepts
 Aquandic Argialbolls (+)
 Aquandic Cryaquolls (+)
 Aquandic Haplaquolls
 Andic Argiborolls, Vitrandic Argiborolls (+)
 Andic Cryoborolls, Vitrandic Cryoborolls
 Andic Haploborolls, Vitrandic Haploborolls (+)
 Andic Argiudolls, Vitrandic Argiudolls (+)
 Andic Hapludolls, Vitrandic Hapludolls (+)
 Andic Argiustolls, Vitritorrandic Argiustolls, Vitrandic Argiustolls (+)
 Andic Haplustolls, Vitritorrandic Haplustolls, Vitrandic Haplustolls (+)
 Andic Argixerolls, Vitritorrandic Argixerolls, Vitrandic Argixerolls (+)
 Vitritorrandic Durixerolls, Vitrandic Durixerolls (+)
 Vitritorrandic Haploxerolls, Vitrandic Haploxerolls (+)

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Andic Haploperox
 Andic Kandiperox
 Andic Hapludox
 Andic Kandiudox
 Andic Cryohumods (+)
 Andic Haplohumods (+)
 Andic Cryorthods (+)
 Andic Haplorthods (+)
 Aquandic Kanhaplaquults
 Andic Haplohumults
 Andic Epiaquic Kandihumults, Ustandic Kandihumults, Andic Kandihumults
 Ustandic Kanhaplohumults, Andic Kanhaplohumults
 Andic Palehumults
 Aquandic Kandiudults, Andic Kandiudults
 Andic Kanhapludults
 Udandic Kandiustults, Andic Kandiustults
 Udandic Kanhaplustults, Andic Kanhaplustults
 Andic Haploxerults (+)

All names and descriptions in the sections titled "Description of subgroups" are corrected on the basis of the above list of names and the criteria provided in the following section on "new format for the keys to subgroups". Descriptions of new subgroups are not being added by this amendment, however.

615.62 New format for the Keys to subgroups

Soil Taxonomy provided sets of keys to the orders, suborders, and great groups for "keying out soils" through these categories. At the subgroup level, however, the user was required to match the set of properties of the soil in question against a set of definitions, which were referenced to the definition of the typic subgroup, to properly classify the soil. This amendment provides keys to subgroups that are in the same format as the keys to the orders, suborders, and great groups.

Many implied subgroups were provided for in Soil Taxonomy but were not given names. Most of these subgroups are given names by this amendment and included in the new keys to subgroups. A list of these new (implied) subgroups is given at the end of this section. This amendment retains the definition of the typic subgroup but because of the reorganization of the keys they are given here for clarification. The definition of some typic subgroups are also changed slightly because statements excluding certain sets of properties from the typic subgroup was not clear as to their meaning or intent, e.g., "fussy" implied subgroups.

The following changes are required in Soil Taxonomy to accommodate this amendment.

Page 91, first column, last paragraph which extends to the second column (also see NSTH issue No. 11, page 615-119). Change paragraph to read: "Next, each great group is followed by a key to the subgroups and the proper subgroup is the first one that appears to include the soil in question. Following each set of the keys to subgroups is a definition of the respective typic subgroup. Following this definition, in most cases, is a brief description and discussion of each known subgroup. It is important to note that essentially all soils, as is true at the order, suborder, and great group levels, can be classified at the subgroup level. The mere fact that a new soil is classified in a particular subgroup, however, does not mean

that the grouping should not be questioned. The soil may have several aberrant features from the other soils in that subgroup, indicating a new subgroup should be proposed to accommodate the new soil if the aberrant features are significant at the subgroup level."

Page 110, second column. Delete the section, Distinctions between Typic Albaqualfs and other subgroups, and replace with the following key to subgroups and definition of Typic Albaqualfs:

"Key to subgroups

IAGA. Albaqualfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 50 cm below the soil surface.

Arenic Albaqualfs

IAGB. Other Albaqualfs that:

1. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap or an albic horizon;

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the soil to a depth of 100 cm or in the whole soil if the depth to a lithic or paralithic contact is more than 50 cm but less than 100 cm;

c. More than 35 percent clay in horizons that have a total thickness of more than 50 cm; and

2. Have a surface horizon that, after the soil to a depth of 18 cm has been mixed, has 30 percent or more clay and is discontinuous throughout each pedon.

Ruptic-Vertic Albaqualfs

IAGC. Other Albaqualfs that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap or an albic horizon;

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the soil to a depth of 100 cm or in the whole soil if the depth to a lithic or paralithic contact is more than 50 cm but less than 100 cm; and

3. More than 35 percent clay in horizons that have a total thickness of more than 50 cm.

Vertic Albaqualfs

IAGD. Other Albaqualfs that:

1. Have chroma of 3 or more in more than 40 percent of the mass between the bottom of the A or the Ap horizon and a depth of 75 cm; and

2. Have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less after the soil has been crushed and smoothed, or have, after the soil to a depth of 18 cm has been mixed, an upper layer that has these colors.

Udolic Albaqualfs

IAGE. Other Albaqualfs that have chroma of 3 or more in more than 40 percent of the mass between the bottom of the A or the Ap horizon and a depth of 75 cm.

Aeric Albaqualfs

IAGF. Other Albaqualfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Albaqualf

IAGG. Other Albaqualfs that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less after the soil has been crushed and smoothed, or have, after the soil to a depth of 18 cm has been mixed, an upper layer that has these colors.

Mollic Albaqualfs

IAGH. Other Albaqualfs that have a horizon within a depth of 100 cm from the surface that is brittle, that is 15 cm or more thick, and that contains some opal coatings or 20 percent or more durinodes.

Durorthidic Albaqualfs

IAGI. Other Albaqualfs.

Typic Albaqualfs

615.62

Definition of Typic Albaqualfs

Typic Albaqualfs are the Albaqualfs that

1. Have chroma of 2 or less in 60 percent or more of the mass between the bottom of the A or the Ap horizon and a depth of 75 cm;

2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus $1/2$ acid-oxalate-extractable iron of 0.40 percent or more;

3. Do not have a horizon within a depth of 100 cm from the surface that is brittle, that is 15 cm or more thick, and that contains some opal coatings or 20 percent or more durinodes;

4. Either have an Ap horizon that has a color value, moist, of 4 or more, or a color value, dry, of 6 or more after the soil has been crushed and smoothed, or have, after the soil to a depth of 18 cm has been mixed, an upper layer that has these colors;

5. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap or an albic horizon;

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the soil to a depth of 100 cm or in the whole soil if the depth to a lithic or paralithic contact is more than 50 cm but less than 100 cm;

c. More than 35 percent clay in horizons that have a total thickness of more than 50 cm;

6. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface; and

7. Have a surface horizon that, after the soil to a depth of 18 cm has been mixed, has less than 30 percent clay and is continuous throughout each pedon."

Page 112, first column. Delete the section, Distinctions between Typic Fragiaqualfs and other subgroups, and replace with the following key to subgroups and definition of Typic Fragiaqualfs:

"Key to subgroups

IADA. Fragiaqualfs that have a mottled horizon between the A or Ap horizon and a fragipan that has dominant chroma more than 2 if the hue is 10YR or redder or more than 3 if the hue is 2.5Y or yellower.

Aeric Fragiaqualfs

IADB. Other Fragiaqualfs that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the surface.

Plinthic Fragiaqualfs

IADC. Other Fragiaqualfs that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less after the soil has been crushed and smoothed; or the upper soil to a depth of 18 cm, after mixing, has these color values.

Umbric Fragiaqualfs

IADD. Other Fragiaqualfs.

Typic Fragiaqualfs

Definition of Typic Fragiaqualfs

Typic Fragiaqualfs are the Fragiaqualfs that

1. Do not have a mottled horizon between the A or Ap horizon and a fragipan that has dominant chroma more than 2 if the hue is 10YR or redder or more than 3 if the hue is 2.5Y or yellower;

2. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the surface; and

3. Have an Ap horizon that has either a color value, moist, of 4 or more or a color value, dry, of 6 or more after the soil has been crushed and smoothed; or the upper soil to a depth of 18 cm, after mixing, has these color values."

Page 113, second column and extending to page 114, first column. Delete the section, Distinctions between Typic Glossaqualfs and other subgroups, and replace with the following key to subgroups and definition of Typic Glossaqualfs:

"Key to subgroups

Iafa. Glossaqualfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Glossaqualfs

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IAFB. Other Glossaqualfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 100 cm below the soil surface.

Glossarenic Glossaqualfs

IAFC. Other Glossaqualfs that have in more than 40 percent of the matrix⁴ in one or more subhorizons between the A or Ap horizon and a depth of 75 cm one of the following:

1. If mottled, the value, moist, is 4 or more and the chroma, moist, is 3 or more;
2. If not mottled, the chroma, moist, is 2 or more.

Aeric Glossaqualfs

IAFD. Other Glossaqualfs that have an Ap horizon that has a color value, moist, of 3 or less, and a color value, dry, of 5 or less after the soil has been crushed and smoothed; or the soil to a depth of 18 cm, after mixing, has these colors.

Mollic Glossaqualfs

IAFE. Other Glossaqualfs.

Typic Glossaqualfs

Definition of Typic Glossaqualfs

Typic Glossaqualfs are the Glossaqualfs that

1. Have in 60 percent or more of the matrix⁴ in all subhorizons between the A or Ap horizon and a depth of 75 cm one of the following:

- a. If mottled and the value, moist, is 4 or more, the chroma, moist, is 2 or less;
- b. If not mottled, the chroma, moist, is 1 or less;

2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface; and

3. Have an Ap horizon that has either a color value, moist, of 4 or more, or a color value, dry, of 6 or more after the soil has been crushed and smoothed; or the soil to a depth of 18 cm, after mixing, has these colors."

Page 114 (See NSTH issue No. 11, page 615-59 to 60).

Delete the section, Distinctions between Typic Kandiaqualfs and other subgroups, and replace with the

following key to subgroups and definition of Typic Kandiaqualfs:

*Key to subgroups

IAEA. Kandiaqualfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface.

Arenic Kandiaqualfs

IAEB. Other Kandiaqualfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is more than 100 cm below the soil surface.

Glossarenic Kandiaqualfs

IAEC. Other Kandiaqualfs that have a horizon within 150 cm of the soil surface that has 5 percent or more plinthite by volume.

Plinthic Kandiaqualfs

IAED. Other Kandiaqualfs that:

1. Have in more than 40 percent of the matrix in one or more subhorizons between the A or Ap horizon and a depth of 75 cm one or more of the following:

a. If mottled and the mean annual soil temperature is lower than 15° C, has chroma, moist, of 3 or more;

b. If mottled and the mean annual soil temperature is 15° C or more:

(1) If the hue is 2.5Y or redder and the value, moist, is more than 5, the chroma, moist, is 3 or more;

(2) If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 2 or more;

(3) If the hue is yellower than 2.5Y, the chroma, moist, is 3 or more;

c. If not mottled, the chroma, moist, is 2 or more; and

2. Have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less after the soil has been crushed; or the upper soil to a depth of 18 cm, after mixing, has these color values.

Aeric Umbric Kandiaqualfs

IAEE. Other Kandiaqualfs that have in more than 40 percent of the matrix in one or more subhorizons between the A or Ap horizon and a depth of 75 cm one or more of the following:

1. If mottled and the mean annual soil temperature is lower than 15° C, has chroma, moist, of 3 or more;

⁴If the hue is 7.5YR or redder and, if peds are present, ped exteriors in the argillic horizon should have dominant chroma, moist, of 1 or less and ped interiors should have mottles that have chroma, moist, of 2 or less; if peds are absent, the chroma, moist, should be 1 or less immediately below any surface horizon that has color value, moist, of 3 or less.

⁵If the hue is 7.5YR or redder and, if peds are present, ped exteriors in the argillic horizon should have dominant chroma, moist, of 1 or less and ped interiors should have mottles that have chroma, moist, of 2 or less; if peds are absent, the chroma, moist, should be 1 or less immediately below any surface horizon that has color value, moist, of 3 or less.

2. If mottled and the mean annual soil temperature is 15° C or more:

a. If the hue is 2.5Y or redder and the value, moist, is more than 5, the chroma, moist, is 3 or more;

b. If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 2 or more;

c. If the hue is yellower than 2.5Y, the chroma, moist, is 3 or more;

3. If not mottled, the chroma, moist, is 2 or more.

Aeric Kandiaqualfs

IAEF. Other Kandiaqualfs that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less after the soil has been crushed; or the upper soil to a depth of 18 cm, after mixing, has these color values.

Umbric Kandiaqualfs

IAEG. Other Kandiaqualfs.

Typic Kandiaqualfs

Definition of Typic Kandiaqualfs

Typic Kandiaqualfs are the Kandiaqualfs that

1. Have in 60 percent or more of the matrix in all subhorizons between the A or Ap horizon and a depth of 75 cm one or more of the following:

a. If mottled and the mean annual soil temperature is lower than 15° C, has chroma, moist, of 2 or less;

b. If mottled and the mean annual soil temperature is 15° C or more:

(1) If the hue is 2.5Y or redder and the value, moist, is more than 5, the chroma, moist, is 2 or less;

(2) If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 1 or less;

(3) If the hue is yellower than 2.5Y, the chroma, moist, is 2 or less;

c. The chroma, moist, is 1 or less whether mottled or not;

2. Have an Ap horizon that has either a color value, moist, of 4 or more or a color value, dry, of 6 or more after the soil has been crushed; or the upper soil to a depth of 18 cm, after mixing, has these color values;

3. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

4. Do not have a horizon within 150 cm of the soil surface that has 5 percent or more plinthite by volume."

Page 114, second column. Delete the section, Distinctions between Typic Natraqualfs and

other subgroups, and replace with the following key to subgroups and definition of Typic Natraqualfs:

"Key to subgroups

IABA. Natraqualfs that

1. Have tonguing or interfingering of albic materials more than 2.5 cm into the natric horizon; and

2. Have, in all horizons within 40 cm of the soil surface, less than 15 percent saturation with sodium and less magnesium and sodium than calcium and extractable acidity.

Albic Glossic Natraqualfs

IABB. Other Natraqualfs that have less than 15 percent saturation with sodium and have less magnesium and sodium than calcium and extractable acidity throughout the upper 15 cm of the natric horizon or in all horizons within 40 cm of the soil surface, whichever is deeper.

Albic Natraqualfs

IABC. Other Natraqualfs that have tonguing or interfingering of albic materials more than 2.5 cm into the natric horizon.

Glossic Natraqualfs

IABD. Other Natraqualfs that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less after the soil has been crushed and smoothed; or the soil to a depth of 18 cm, after mixing, has these colors.

Mollic Natraqualfs

IABE. Other Natraqualfs.

Typic Natraqualfs

Definition of Typic Natraqualfs

Typic Natraqualfs are Natraqualfs that

1. Do not have tonguing or interfingering of albic materials more than 2.5 cm into the natric horizon;

2. Have an Ap horizon that has either a color value, moist, of 4 or more or a color value, dry, of 6 or more after the soil has been crushed and smoothed; or the soil to a depth of 18 cm, after mixing, has these colors; and

3. Have, within 40 cm of the soil surface or in the upper 15 cm of the natric horizon, a horizon that has 15 percent or more saturation with sodium or has more magnesium and sodium than calcium and extractable acidity."

Page 115, second column and extending to page 116, first column. Delete the section, Distinctions between Typic Ochraqualfs and other subgroups, and replace with the following key to subgroups and definition of Typic Ochraqualfs:

"Key to subgroups

IAIA. Ochraqualfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Ochraqualfs

IAIB. Other Ochraqualfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Ochraqualfs

IAIC. Other Ochraqualfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 100 cm below the soil surface.

Grossarenic Ochraqualfs

IAID. Other Ochraqualfs that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap or an albic horizon;

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper soil to a depth of 100 cm or in the whole soil if a lithic, paralithic, or petroferric contact is deeper than 50 cm but not deeper than 100 cm; and

3. More than 35 percent clay in horizons that have total thickness of more than 50 cm.

Vertic Ochraqualfs

IAIE. Other Ochraqualfs that:

1. Have in more than 40 percent of the matrix⁵ in one or more subhorizons between the A or Ap horizon and a depth of 75 cm one or more of the following:

a. If mottled and the mean annual soil temperature is lower than 15° C, chroma, moist, of 3 or more;

b. If mottled and the mean annual soil temperature is 15° C or more:

(1) If the hue is 2.5Y or redder and the value, moist, is more than 5, the chroma is 3 or more;

(2) If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 2 or more;

(3) If the hue is yellower than 2.5Y, the chroma, moist is 3 or more;

c. If not mottled, the chroma, moist, is 2 or more; and

2. Have an Ap horizon that meets all the requirements of an umbric epipedon except thickness; or the upper soil to a depth of 18 cm, after mixing, meets these requirements.

Aeric Umbric Ochraqualfs

IAIF. Other Ochraqualfs that:

1. Have in more than 40 percent of the matrix⁵ in one or more subhorizons between the A or Ap horizon and a depth of 75 cm one or more of the following:

a. If mottled and the mean annual soil temperature is lower than 15° C, chroma, moist, of 3 or more;

b. If mottled and the mean annual soil temperature is 15° C or more:

(1) If the hue is 2.5Y or redder and the value, moist, is more than 5, the chroma is 3 or more;

(2) If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 2 or more;

(3) If the hue is yellower than 2.5Y, the chroma, moist is 3 or more;

c. If not mottled, the chroma, moist, is 2 or more; and

2. Have an Ap horizon that meets all the requirements of a mollic epipedon except thickness; or the upper soil to a depth of 18 cm, after mixing, meets these requirements.

Udolic Ochraqualfs

⁵See footnote 4 on p. 113

⁵See footnote 4 on p. 113

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IAIG. Other Ochraqualfs that have in more than 40 percent of the matrix⁵ in one or more subhorizons between the A or Ap horizon and a depth of 75 cm one or more of the following:

1. If mottled and the mean annual soil temperature is lower than 15° C, chroma, moist, of 3 or more;
2. If mottled and the mean annual soil temperature is 15° C or more:
 - a. If the hue is 2.5Y or redder and the value, moist, is more than 5, the chroma is 3 or more;
 - b. If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 2 or more;
 - c. If the hue is yellower than 2.5Y, the chroma, moist is 3 or more;
3. If not mottled, the chroma, moist, is 2 or more; and

Aeric Ochraqualfs

IAIH. Other Ochraqualfs that have an Ap horizon that meets all the requirements of a mollic epipedon except thickness; or the upper soil to a depth of 18 cm, after mixing, meets these requirements.

Mollic Ochraqualfs

IAII. Other Ochraqualfs that have an Ap horizon that meets all the requirements of an umbric epipedon except thickness; or the upper soil to a depth of 18 cm, after mixing, meets these requirements.

Umbric Ochraqualfs

IAIJ. Other Ochraqualfs.

Typic Ochraqualfs

Definition of Typic Ochraqualfs

Typic Ochraqualfs are the Ochraqualfs that

1. Have in 60 percent or more of the matrix⁵ in all subhorizons between the A or Ap horizon and a depth of 75 cm one or more of the following:

- a. If mottled and the mean annual soil temperature is lower than 15° C, chroma, moist, of 2 or less;
- b. If mottled and the mean annual soil temperature is 15° C or more:
 - (1) If the hue is 2.5Y or redder and the value, moist, is more than 5, the chroma is 2 or less;
 - (2) If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 1 or less;

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(3) If the hue is yellower than 2.5Y, the chroma, moist is 2 or less;

c. The chroma, moist, is 1 or less whether mottled or not;

2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

- a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
- b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
- c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass: or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

3. Have an Ap horizon that has either a color value, moist, of 4 or more or a color value, dry, of 6 or more after the soil has been crushed and smoothed; or the upper soil to a depth of 18 cm, after mixing, has these color values;

4. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface; and

5. Do not have the following combination of characteristics:

- a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap or an albic horizon,
- b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper soil to a depth of 100 cm or in the whole soil if a lithic, paralithic, or petroferic contact is deeper than 50 cm but not deeper than 100 cm, and
- c. More than 35 percent clay in horizons that have total thickness of more than 50 cm."

Page 118, second column and extending to page 119, first column (Also see NSTH issue No. 12, pages 615-163 to 164). Delete the section, Distinctions between Typic Umbraqualfs and other subgroups, and replace with the

⁵ See footnote 4 on p. 113

⁵ See footnote 4 on p. 113

following key to subgroups and definition of Typic Umbraqualfs:

"Key to subgroups

IAHA. Umbraqualfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:
 - a. More than 30 percent volcanic glass; or
 - b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Umbraqualfs

IAHB. Other Umbraqualfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Umbraqualfs

IAHC. Other Umbraqualfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 100 cm below the soil surface.

Grossarenic Umbraqualfs

IAHD. Other Umbraqualfs that have, in the umbric epipedon and in horizons above the argillic horizon, soft discrete nodules 2.5 to 30 cm in diameter that constitute more than 5 percent of the volume, that are cemented by iron, and that lie above and in an irregular or broken upper boundary of the argillic horizon.

Ferrudalfic Umbraqualfs

IAHE. Other Umbraqualfs.

Typic Umbraqualfs

Definition of Typic Umbraqualfs

Typic Umbraqualfs are the Umbraqualfs that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

- a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable

aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- (1) More than 30 percent volcanic glass; or
- (2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have, in the umbric epipedon and in horizons above the argillic horizon, soft discrete nodules 2.5 to 30 cm in diameter that constitute more than 5 percent of the volume, that are cemented by iron, and that lie above and in an irregular or broken upper boundary of the argillic horizon; and

3. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface."

Page 120, first column. Delete the section, Distinctions between Typic Cryoboralfs and other subgroups, and replace with the following key to subgroups and definition of Typic Cryoboralfs:

"Key to subgroups

IBDA. Cryoboralfs that:

1. Have a lithic contact within 50 cm of the surface; and
2. Have an Ap horizon that has a color value, moist, of 3 or less, or the upper soil, to a depth of 15 cm after mixing, has a moist color value of 3 or less.

Lithic Mollic Cryoboralfs

IBDB. Other Cryoboralfs that have a lithic contact within 50 cm of the surface.

Lithic Cryoboralfs

IBDC. Other Cryoboralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Cryoboralfs

IBDD. Other Cryoboralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and

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cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Cryoboralfs

IBDE. Other Cryoboralfs that have mottles that have chroma of 2 or less within 75 cm of the surface, or the soils are continuously saturated with water for 3 months or longer within 100 cm of the surface where undrained.

Aquic Cryoboralfs

IBDF. Other Cryoboralfs that have an argillic horizon that has a texture that is loamy fine sand or coarser or is discontinuous vertically in the upper 15 cm (in lamellae).

Psammentic Cryoboralfs

IBDG. Other Cryoboralfs that have an Ap horizon that has a color value, moist, of 3 or less, or the upper soil has a moist color value of 3 or less after mixing to a depth of 15 cm.

Mollic Cryoboralfs

IBDH. Other Cryoboralfs that have albic materials tonguing in an argillic horizon.

Glossic Cryoboralfs

IBDI. Other Cryoboralfs.

Typic Cryoboralfs

Definition of Typic Cryoboralfs

Typic Cryoboralfs are the Cryoboralfs that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have albic materials tonguing in an argillic horizon;

3. Do not have a lithic contact within 50 cm of the surface;

4. Have an Ap horizon that has a color value, moist, of more than 3, or the upper soil, to a depth of 15 cm after mixing, has a moist color value of 4 or more;

5. Have an argillic horizon that has a texture finer than loamy fine sand and is continuous vertically for at least the upper 15 cm (not in lamellae); and

6. Do not have mottles that have chroma of 2 or less within 75 cm of the surface, or the soils are not continuously saturated with water for as long as 3 months within 100 cm of the surface where undrained."

Page 121, second column. Delete the section, Distinctions between Typic Eutroborealfs and other subgroups, and replace with the following key to subgroups and definition of Typic Eutroborealfs:

"Key to subgroups

IBEA. Eutroborealfs that have a lithic contact within 50 cm of the surface.

Lithic Eutroborealfs

IBEB. Other Eutroborealfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Eutroborealfs

IBEC. Other Eutroborealfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Eutroborealfs

IBED. Other Eutroborealfs that:

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1. Have an argillic horizon that has mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface; and

2. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 50 cm below the soil surface.

Aquic Arenic Eutroboralfs

IBEE. Other Eutroboralfs that:

1. Have an argillic horizon that

a. Has its upper boundary at less than 50 cm below the soil surface and has mottles that have chroma of 2 or less in the upper 25 cm if the mottled layer is saturated with water at some time when the soil temperature is 5° C or higher; or

b. Has an upper boundary at 50 cm or more, and the soil has mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface; and

2. Have tongues of albic materials in the argillic horizon (interfingering is permitted).

Glossaquic Eutroboralfs

IBEF. Other Eutroboralfs that have an argillic horizon that:

1. Has its upper boundary at less than 50 cm below the soil surface and has mottles that have chroma of 2 or less in the upper 25 cm if the mottled layer is saturated with water at some time when the soil temperature is 5° C or higher; or

2. Has an upper boundary at 50 cm or more, and the soil has mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface.

Aquic Eutroboralfs

IBEG. Other Eutroboralfs that have an argillic horizon that has a texture that is loamy fine sand or coarser or is discontinuous vertically in the upper 15 cm (in lamellae).

Psammentic Eutroboralfs

IBEH. Other Eutroboralfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 50 cm below the soil surface.

Arenic Eutroboralfs

IBEI. Other Eutroboralfs that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less (crushed and smoothed), or the soil, after mixing to a depth of 18 cm, has these colors.

Mollic Eutroboralfs

IBEJ. Other Eutroboralfs that have tongues of albic materials in the argillic horizon (interfingering is permitted).

Glossic Eutroboralfs

IBEK. Other Eutroboralfs.

Typic Eutroboralfs

Definition of Typic Eutroboralfs

Typic Eutroboralfs are the Eutroboralfs that

1. Have an argillic horizon that

a. If its upper boundary is less than 50 cm below the soil surface, does not have mottles that have chroma of 2 or less in the upper 25 cm if it is saturated with water within that depth at some time when the soil temperature is 5° C or higher; or

b. If the upper boundary of the argillic horizon is 50 cm or more, does not have mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface;

2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

3. Do not have tongues of albic materials in the argillic horizon (interfingering is permitted);

4. Do not have a lithic contact within 50 cm of the surface;

5. Have an Ap horizon that has a color value, moist, of 4 or more or a color value, dry, of 6 or more (crushed and smoothed), or the soil to a depth of 18 cm, after mixing, has these colors;

6. Have an argillic horizon that has a texture finer than loamy fine sand and is continuous vertically for at least the upper 15 cm (not in lamellae); and

7. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 122, second column. Delete the section, Distinctions between Typic Fragiboralfs and

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other subgroups, and replace with the following key to subgroups and definition of Typic Fragiboralfs:

"Key to subgroups

IBBA. Fragiboralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Fragiboralfs

IBBB. Other Fragiboralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandid Fragiboralfs

IBBC. Other Fragiboralfs that have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon and are saturated with water at some times within that depth when the soil temperature at a depth of 50 cm is 5° C or more.

Aquic Fragiboralfs

IBBD. Other Fragiboralfs.

Typic Fragiboralfs

Definition of Typic Fragiboralfs

Typic Fragiboralfs are the Fragiboralfs that

1. Do not have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon or are not saturated with water at some times within that depth when the soil temperature at a depth of 50 cm is 5° C or more; and

2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 123, second column. Delete the section, Distinctions between Typic Glossoboralfs and other subgroups, and replace with the following key to subgroups and definition of Typic Glossoboralfs:

"Key to subgroups

IBFA. Glossoboralfs that have a lithic contact within 50 cm of the soil surface.

Lithic Glossoboralfs

IBFB. Other Glossoboralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Glossoboralfs

IBFC. Other Glossoboralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandid Glossoboralfs

IBFD. Other Glossoboralfs that have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon if the mottled horizons are saturated with water at a time when the soil temperature is 5° C or higher.

Aquic Glossoboralfs

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IBFE. Other Glossoboralfs that have an argillic horizon that has a texture that is loamy fine sand or coarser or is discontinuous vertically in the upper 15 cm (in lamellae).

Psammentic Glossoboralfs

IBFF. Other Glossoboralfs that do not have tongues of albic materials in the argillic horizon.

Eutric Glossoboralfs

IBFG. Other Glossoboralfs.

Typic Glossoboralfs

Definition of Typic Glossoboralfs

Typic Glossoboralfs are the Glossoboralfs that

1. Do not have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon if the mottled horizons are saturated with water at a time when the soil temperature is 5° C or higher;

2. Have tongues of albic materials in the argillic horizon;

3. Do not have a lithic contact within 50 cm of the soil surface;

4. Have an argillic horizon that has a texture finer than loamy fine sand and is continuous vertically for at least the upper 15 cm (not in lamellae); and

5. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass: or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 124, second column and extending to page 125, first column. Delete the section, Distinctions between Typic Paleboralfs and other subgroups, and replace with the following key to subgroups and definition of Typic Paleboralfs:

"Key to subgroups

IBAA. Paleboralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm

fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Paleboralfs

IBAB. Other Paleboralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass: or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Paleboralfs

IBAC. Other Paleboralfs that have mottles that have chroma of 2 or less within 100 cm of the surface.

Aquic Paleboralfs

IBAD. Other Paleboralfs that have an argillic horizon that has an increase in clay content of 20 percent or more (absolute) within a vertical distance of 7.5 cm from its upper boundary.

Abruptic Paleboralfs

IBAE. Other Paleboralfs that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less when crushed and smoothed, or the soil to a depth of 18 cm has these colors after mixing.

Mollic Paleboralfs

IBAF. Other Paleboralfs.

Typic Paleboralfs

The Paleboralfs have had relatively little study in the field or laboratory. It seems best at this time to consider the definitions of the great group and of its subgroups as tentative.

Definition of Typic Paleboralfs

Typic Paleboralfs are the Paleboralfs that

1. Have an argillic horizon that has an increase in

clay content of less than 20 percent (absolute) within a vertical distance of 7.5 cm from its upper boundary;

2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass: or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

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a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 80 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

3. Do not have mottles that have chroma of 2 or less within 100 cm of the surface; and

4. Have an Ap horizon that has a color value, moist, of 4 or more or a color value, dry, of 6 or more when crushed and smoothed, or the soil to a depth of 18 cm has these colors after mixing."

Page 126, first column. Delete the section, Distinctions between Typic Ferrudalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Ferrudalfs:

"Key to subgroups

IECA. Ferrudalfs that have mottles that have chroma of 2 or less within the upper 60 cm and the horizons that have mottles of low chroma are saturated with water at some time of year or the soil has artificial drainage. The mottles should be distinguished from skeletans that may also have low chroma.

Aquic Ferrudalfs

IECB. Other Ferrudalfs.

Typic Ferrudalfs

Definition of Typic Ferrudalfs

Typic Ferrudalfs are the Ferrudalfs that do not have mottles that have chroma of 2 or less within the upper 60 cm if the horizons that have mottles of low chroma are saturated with water at some time of year or if the soil has artificial drainage. The mottles should be distinguished from skeletans that may also have low chroma."

Page 126, second column and extending to page 127, first column. Delete the section, Distinctions between Typic Fragiudalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Fragiudalfs:

"Key to subgroups

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IEFA. Fragiudalfs that:

1. Do not have an argillic horizon above the fragipan that has clay skins on at least some vertical and horizontal faces of primary or secondary peds, or both;

2. Have, immediately above the fragipan, thick skeletans of clean sand and silt on primary ped faces or have an eluvial horizon (E) that has thick skeletans and as much as 3 percent (absolute) less clay than both the overlying and underlying horizons; and

3. Have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less, when crushed and smoothed, or the soil, after mixing to a depth of 18 cm, has those colors.

Umbreptic Fragiudalfs

IEFB. Other Fragiudalfs that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less, when crushed and smoothed, or the soil, after mixing to a depth of 18 cm, has those colors.

Mollic Fragiudalfs

IEFC. Other Fragiudalfs that:

1. Have, immediately above the fragipan, thick skeletans of clean sand and silt on primary ped faces or have an eluvial horizon (E) that has thick skeletans and as much as 3 percent (absolute) less clay than both the overlying and underlying horizons; and

2. Have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon or have mottles that have chroma of 2 or less within 40 cm of the surface and the horizons that have mottles of low chroma are saturated with water at some time of year when the soil temperature is 5° C or higher in those horizons.

Glossaquic Fragiudalfs

IEFD. Other Fragiudalfs that:

1. Do not have an argillic horizon above the fragipan that has clay skins on at least some vertical and horizontal faces of primary or secondary peds, or both; and

2. Have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon or have mottles that have chroma of 2 or less within 40 cm of the surface and the horizons that have mottles of low chroma are saturated with water at some time of year when the soil temperature is 5° C or higher in those horizons.

Aqueptic Fragiudalfs

IEFE. Other Fragiudalfs that:

1. Have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon or have mottles that have chroma of 2 or less within 40 cm of the surface and the horizons that have mottles of low chroma are saturated with water at some time of year when the soil

temperature is 5° C or higher in those horizons; and

2. Have, within a vertical distance of 7.5 cm at the top of the argillic horizon, a clay increase of more than 15 percent (absolute) in the fine-earth fraction.

Albaquic Fragiudalfs

IEFF. Other Fragiudalfs that have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon or have mottles that have chroma of 2 or less within 40 cm of the surface and the horizons that have mottles of low chroma are saturated with water at some time of year when the soil temperature is 5° C or higher in those horizons.

Aquic Fragiudalfs

IEFG. Other Fragiudalfs that have, immediately above the fragipan, thick skeletons of clean sand and silt on primary ped faces or have an eluvial horizon (E') that has thick skeletons and as much as 3 percent (absolute) less clay than both the overlying and underlying horizons.

Glossic Fragiudalfs

IEFH. Other Fragiudalfs that do not have an argillic horizon above the fragipan that has clay skins on at least some vertical and horizontal faces of primary or secondary ped.

Ochreptic Fragiudalfs

IEFI. Other Fragiudalfs.

Typic Fragiudalfs

Definition of Typic Fragiudalfs

Typic Fragiudalfs are the Fragiudalfs that

1. Have an argillic horizon above the fragipan that has clay skins on at least some vertical and horizontal faces of primary or secondary ped, or both;

2. Do not have, immediately above the fragipan, thick skeletons of clean sand and silt on primary ped faces and do not have an eluvial horizon (E') that has thick skeletons and as much as 3 percent (absolute) less clay than both the overlying and underlying horizons;

3. Either have an Ap horizon that has a color value, moist, of 4 or more or a color value, dry, of 6 or more, when crushed and smoothed, or the soil to a depth of 18 cm, after mixing, has those colors;

4. Do not have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon and do not have mottles that have chroma of 2 or less within 40 cm of the surface if the horizons that have mottles of low chroma are saturated with water at some time of year when the soil temperature is 5° C or higher in those horizons. Mottles are not the same as skeletons that may also have low chroma; and

5. Do not have, within a vertical distance of 7.5 cm at the top of the argillic horizon, a clay increase of more than 15 percent (absolute) in the fine-earth fraction if mottles are present as described in item 5 above."

Page 128, first column (Also see NSTH issue No. 11, pages 615-160 to 161). Delete the section, Distinctions between Typic Fraglossudalfs and

other subgroups, and replace with the following key to subgroups and definition of Typic Fraglossudalfs:

"Key to subgroups

IEEA. Fraglossudalfs that have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon and the mottled horizons are saturated with water at some season when the soil temperature is 5° C.

Aquic Fraglossudalfs

IEEB. Other Fraglossudalfs.

Typic Fraglossudalfs

Definition of Typic Fraglossudalfs

Typic Fraglossudalfs are the Fraglossudalfs that do not have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon if the mottled horizons are saturated with water at some season when the soil temperature is 5° C."

Page 129, first column. Delete the section, Distinctions between Typic Glossudalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Glossudalfs:

"Key to subgroups

IEDA. Glossudalfs that have a brittle matrix in one-fourth or more of some subhorizon that is at least 10 cm thick and that has an upper boundary within 125 cm of the surface.

Fragic Glossudalfs

IEDB. Other Glossudalfs that have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon and the mottled horizons are saturated with water at some season when their temperature is 5° C or higher.

Aquic Glossudalfs

IEDC. Other Glossudalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 50 cm below the soil surface.

Arenic Glossudalfs

IEDD. Other Glossudalfs that do not have tongues of albic materials that extend through at least the upper 50 cm of the argillic horizon.

Haplic Glossudalfs

IEDE. Other Glossudalfs.

Typic Glossudalfs

Definition of Typic Glossudalfs

Typic Glossudalfs are the Glossudalfs that

1. Do not have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon if the mottled horizons are saturated with water at some season when their temperature is 5° C or higher;

2. Have tongues of albic materials that extend through at least the upper 50 cm of the argillic horizon;

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3. Do not have a brittle matrix in one-fourth or more of some subhorizon that is at least 10 cm thick and that has an upper boundary within 125 cm of the surface; and

4. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface."

Page 129, second column and extending to page 130, second column. Delete the section, Distinctions between Typic Hapludalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Hapludalfs:

*Key to subgroups

IEKA. Hapludalfs that:

1. Have mottles with chroma of 2 or less in the upper 25 cm of the argillic horizon or throughout the argillic horizon if the argillic horizon is thinner than 25 cm and are saturated with water within that depth at some time when the soil temperature is 5° C or higher; and

2. Have a lithic contact within 50 cm of the soil surface.

Aquic Lithic Hapludalfs

IEKB. Other Hapludalfs that have a lithic contact within 50 cm of the soil surface.

Lithic Hapludalfs

IEKC. Other Hapludalfs that have the following combinations of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and at least 30 cm long in some part and that extend to the surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness within the control section.

Vertic Hapludalfs

IEKD. Other Hapludalfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Hapludalfs

IEKE. Other Hapludalfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Hapludalfs

IEKF. Other Hapludalfs that:

1. Have an argillic horizon that

a. If its upper boundary is less than 50 cm below the soil surface, has mottles that have chroma of 2 or less in the upper 25 cm and it is saturated with water within that depth at some time when the soil temperature is 5° C or higher; or

b. If the upper boundary of the argillic horizon is deeper than 50 cm, has mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface; and

2. Have an argillic horizon that is discontinuous horizontally, or is discontinuous vertically in the upper 20 cm of its thickness, or has a texture that is loamy fine sand or coarser.

Psammaquentic Hapludalfs

IEKG. Other Hapludalfs that have an argillic horizon that is discontinuous horizontally, or is discontinuous vertically in the upper 20 cm of its thickness, or has a texture that is loamy fine sand or coarser.

Psammentic Hapludalfs

IEKH. Other Hapludalfs that:

1. Have an argillic horizon that

a. If its upper boundary is less than 50 cm below the soil surface, has mottles that have chroma of 2 or less in the upper 25 cm and it is saturated with water within that depth at some time when the soil temperature is 5° C or higher; or

b. If the upper boundary of the argillic horizon is deeper than 50 cm, has mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface; and

2. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class

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and extends to the top of the argillic horizon that is more than 50 cm below the soil surface.
Aquic Arenic Hapludalfs

IEKI. Other Hapludalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 50 cm below the soil surface.

Arenic Hapludalfs

IEKJ. Other Hapludalfs that:

1. Have an abrupt textural change and mottles in the upper 25 cm of the argillic horizon;
2. Have an argillic horizon that:
 - a. If its upper boundary is less than 50 cm below the soil surface, has mottles that have chroma of 2 or less in the upper 25 cm and it is saturated with water within that depth at some time when the soil temperature is 5° C or higher; or
 - b. If the upper boundary of the argillic horizon is deeper than 50 cm, has mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface; and
3. Have base saturation (by sum of cations) of less than 60 percent at a depth 125 cm below the top of the argillic horizon, or 180 cm below the soil surface, or immediately above a lithic or paralithic contact, whichever is least.

Albaquiltic Hapludalfs

IEKK. Other Hapludalfs that:

1. Have an abrupt textural change and mottles in the upper 25 cm of the argillic horizon; and
2. Have an argillic horizon that:
 - a. If its upper boundary is less than 50 cm below the soil surface, has mottles that have chroma of 2 or less in the upper 25 cm and it is saturated with water within that depth at some time when the soil temperature is 5° C or higher; or
 - b. If the upper boundary of the argillic horizon is deeper than 50 cm, has mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface.

Albaquic Hapludalfs

IEKL. Other Hapludalfs that:

1. Have interfingering of albic materials and albic materials surrounding some pedis in the upper part of the argillic horizon; and
2. Have an argillic horizon that
 - a. If its upper boundary is less than 50 cm below the soil surface, has mottles that have chroma of 2 or less

in the upper 25 cm and it is saturated with water within that depth at some time when the soil temperature is 5° C or higher; or

b. If the upper boundary of the argillic horizon is deeper than 50 cm, has mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface.

Glossaquic Hapludalfs

IEKM. Other Hapludalfs that:

1. Have an argillic horizon that:
 - a. If its upper boundary is less than 50 cm below the soil surface, has mottles that have chroma of 2 or less in the upper 25 cm and it is saturated with water within that depth at some time when the soil temperature is 5° C or higher; or
 - b. If the upper boundary of the argillic horizon is deeper than 50 cm, has mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface; and
2. Have base saturation (by sum of cations) of less than 60 percent at a depth 125 cm below the top of the argillic horizon, or 180 cm below the soil surface, or immediately above a lithic or paralithic contact, whichever is least.

Aquiltic Hapludalfs

IEKN. Other Hapludalfs that:

1. Have an argillic horizon that
 - a. If its upper boundary is less than 50 cm below the soil surface, has mottles that have chroma of 2 or less in the upper 25 cm and it is saturated with water within that depth at some time when the soil temperature is 5° C or higher; or
 - b. If the upper boundary of the argillic horizon is deeper than 50 cm, has mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface; and
2. Have an Ap horizon that has a color value, moist, of 3 or less or has a color value, dry, of 5 or less (crushed and smoothed) or the upper soil to a depth of 18 cm, after mixing, has these colors.

Aquollic Hapludalfs

IEKO. Other Hapludalfs that have An argillic horizon that:

1. If its upper boundary is less than 50 cm below the soil surface, has mottles that have chroma of 2 or less in the upper 25 cm and it is saturated with water within that depth at some time when the soil temperature is 5° C or higher; or

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2. If the upper boundary of the argillic horizon is deeper than 50 cm, has mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface.

Aquic Hapludalfs

IEKP. Other Hapludalfs that have albic materials that constitute 5 percent or more of the volume of one or more subhorizons of the argillic horizon and the mean annual soil temperature is 10° C or higher.

Glossic Hapludalfs

IEKQ. Other Hapludalfs that have interfingering of albic materials and albic materials surrounding some peds in the upper part of the argillic horizon and the mean annual soil temperature is lower than 10° C.

Glossoboric Hapludalfs

IEKR. Other Hapludalfs that have base saturation (by sum of cations) of less than 60 percent at a depth 125 cm below the top of the argillic horizon, or 180 cm below the soil surface, or immediately above a lithic or paralithic contact, whichever is least.

Ultic Hapludalfs

IEKS. Other Hapludalfs that have an Ap horizon that has a color value, moist, of 3 or less and has a color value, dry, of 5 or less (crushed and smoothed) or the upper soil to a depth of 18 cm, after mixing, has these colors.

Mollic Hapludalfs

IEKT. Other Hapludalfs.

Typic Hapludalfs

Definition of Typic Hapludalfs

Typic Hapludalfs are the Hapludalfs that

1. Do not have an abrupt textural change if there are mottles in the upper 25 cm of the argillic horizon;
2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:
 - a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
 - b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
 - c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:
 - (1) More than 30 percent volcanic glass; or
 - (2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-

extractable iron of 0.40 percent or more;

3. Have an argillic horizon that

a. If its upper boundary is less than 50 cm below the soil surface, does not have mottles that have chroma of 2 or less in the upper 25 cm if it is saturated with water within that depth at some time when the soil temperature is 5° C or higher; or

b. If the upper boundary of the argillic horizon is deeper than 50 cm, does not have mottles that have chroma of 2 or less within a depth of 75 cm below the soil surface;

4. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

5. Do not have interfingering of albic materials and albic materials surrounding some peds in the upper part of the argillic horizon if the mean annual soil temperature is lower than 10° C;

6. Do not have a lithic contact within 50 cm of the soil surface;

7. Have an Ap horizon that has a color value, moist, of 4 or more or has a color value, dry, of 6 or more (crushed and smoothed) or the upper soil to a depth of 18 cm, after mixing, has these colors;

8. Have an argillic horizon that is continuous horizontally and continuous vertically for at least the upper 20 cm of its thickness and that has texture finer than loamy fine sand;

9. Have base saturation (by sum of cations) of 60 percent or more at a depth 125 cm below the top of the argillic horizon, or 180 cm below the soil surface, or immediately above a lithic or paralithic contact, whichever is least;

10. Do not have the following combinations of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and at least 30 cm long in some part and that extend to the surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness within the control section; and

11. Do not have albic materials that constitute as much as 5 percent of the volume of any subhorizon of the argillic horizon."

Page 133, first column (Also see NSTH issue No. 8, pages 615-62 to 63). Delete the section,

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Distinctions between Typic Kandiodalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Kandiodalfs:

***Key to subgroups**

IEGA. Kandiodalfs that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage; and

2. Have one or more horizons within 150 cm of the surface that has 5 percent or more plinthite by volume.

Plinthic Kandiodalfs

IEGB. Other Kandiodalfs that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage.

Aquic Kandiodalfs

IEGC. Other Kandiodalfs that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface; and

2. Have one or more horizons within 150 cm of the surface that has 5 percent or more plinthite by volume.

Arenic Plinthic Kandiodalfs

IEGD. Other Kandiodalfs that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is more than 100 cm below the soil surface; and

2. Have one or more horizons within 150 cm of the surface that has 5 percent or more plinthite by volume.

Grossarenic Plinthic Kandiodalfs

IEGE. Other Kandiodalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface.

Arenic Kandiodalfs

IEGF. Other Kandiodalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is more than 100 cm below the soil surface.

Grossarenic Kandiodalfs

IEGG. Other Kandiodalfs that have one or more horizons within 150 cm of the surface that has 5 percent or more plinthite by volume.

Plinthic Kandiodalfs

IEGH. Other Kandiodalfs that have throughout the argillic or kandic horizon a hue of 2.5YR or redder and have a value, moist, of 3 or less and have a value, dry, that is no more than one unit more than the value moist.

Rhodic Kandiodalfs

IEGI. Other Kandiodalfs that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less after the soil has been crushed, or the upper soil, after mixing to a depth of 18 cm, has these color values.

Mollic Kandiodalfs

IEGJ. Other Kandiodalfs.

Typic Kandiodalfs

Definition of Typic Kandiodalfs

Typic Kandiodalfs are the Kandiodalfs that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizon is saturated with water at some time when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage;

2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

3. Have an Ap horizon that has either a color value, moist, of 4 or more or a color value, dry, of 6 or more after the soil has been crushed, or the upper soil to a depth of 18 cm, after mixing, has these color values;

4. Have an argillic or kandic horizon that has a color value, dry, of 5 or more in some subhorizon, or a color value, moist, that is less than the value, dry, by more than one unit unless the hue in some part of the argillic or kandic horizon is 5YR or yellower; and

5. Do not have a horizon within 150 cm of the surface that has 5 percent or more plinthite by volume."

Page 133, first column (Also see NSTH issue No. 8, pages 615-63 to 64). Delete the section, Distinctions between Typic Kanhapludalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Kanhapludalfs:

***Key to subgroups**

IEHA. Kanhapludalfs that have a lithic contact within 50 cm of the soil surface.

Lithic Kanhapludalfs

IEHB. Other Kanhapludalfs that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizons are saturated with water at some time when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage.

Aquic Kanhapludalfs

IEHC. Other Kanhapludalfs that have throughout the argillic or kandic horizon a hue of 2.5YR or redder and have a value, moist, of 3 or less

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and have a value, dry, that is no more than one unit more than the value moist.

Rhodic Kanhapludalfs

IEHD. Other Kanhapludalfs.

Typic Kanhapludalfs

Definition of Typic Kanhapludalfs

Typic Kanhapludalfs are the Kanhapludalfs that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizons are saturated with water at some time when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage;

2. Do not have a lithic contact within 50 cm of the soil surface; and

3. Have an argillic or a kandic horizon that has a color value, dry, of 5 or more in some subhorizon or a color value, moist, that is less than the value, dry, by more than 1 unit, unless the hue in some part of the argillic or kandic horizon is 5YR or yellower."

Page 133, first column and extending to second column.

Delete the section, Distinctions between Typic Natrudalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Natrudalfs:

"Key to subgroups

IEBA. Natrudalfs that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part and that extend to the surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Natrudalfs

IEBB. Other Natrudalfs that have tonguing or interfingering of albic materials more than 2.5 cm into the natric horizon.

Glossic Natrudalfs

IEBC. Other Natrudalfs that have an Ap horizon that has a color value, moist, of 2 or less, or the soil to a depth of 18 cm, after mixing, has that color value.

Mollic Natrudalfs

IEBD. Other Natrudalfs that do not have mottles that have chroma of 2 or less within 25 cm of the upper boundary of the natric horizon.

Aeric Natrudalfs

IEBE. Other Natrudalfs.

Typic Natrudalfs

Definition of Typic Natrudalfs

Typic Natrudalfs are the Natrudalfs that

1. Have mottles that have chroma of 2 or less within 25 cm of the upper boundary of the natric horizon;

2. Have an Ap horizon that has a color value, moist, of 3 or more, or the soil to a depth of 18 cm, after mixing, has that color value;

3. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part and that extend to the surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

4. Do not have tonguing or interfingering of albic materials more than 2.5 cm into the natric horizon."

Page 134, first column and extending to second column.

Delete the section, Distinctions between Typic Paleudalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Paleudalfs:

"Key to subgroups

IEIA. Paleudalfs that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Paleudalfs

IEIB. Other Paleudalfs that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizons are saturated with water at some time when the soil temperature at that

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depth is 5° C or higher or the soil has artificial drainage; and

2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the surface.

Plinthaquic Paleudalfs

IEIC. Other Paleudalfs that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizons are saturated with water at some time when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage; and

2. Have subhorizons in the upper part of the argillic horizon that have skeletons that

- a. Have moist chroma of 2 or less; and

- b. Occupy 5 percent or more of the volume of the subhorizon.

Glossaquic Paleudalfs

IEID. Other Paleudalfs that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizons are saturated with water at some time when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage; and

2. Have an increase of 15 percent clay or more (absolute) within a vertical distance of 2.5 cm at the upper boundary of the argillic horizon.

Albaquic Paleudalfs

IEIE. Other Paleudalfs that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizons are saturated with water at some time when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage.

Aquic Paleudalfs

IEIF. Other Paleudalfs that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface; and

2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the surface.

Areneic Plinthic Paleudalfs

IEIG. Other Paleudalfs that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 100 cm below the soil surface; and

2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the surface.

Grossareneic Plinthic Paleudalfs

IEIH. Other Paleudalfs that have an argillic horizon that is discontinuous horizontally, or is discontinuous vertically in the upper 20 cm of its thickness, or has a texture that is loamy fine sand or coarser.

Psammentic Paleudalfs

IEII. Other Paleudalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Areneic Paleudalfs

IEIJ. Other Paleudalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 100 cm below the soil surface.

Grossareneic Paleudalfs

IEIK. Other Paleudalfs that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the surface.

Plinthic Paleudalfs

IEIL. Other Paleudalfs that:

1. Have subhorizons in the upper part of the argillic horizon that have skeletons that

- a. Have moist chroma of 2 or less; and

- b. Occupy 5 percent or more of the volume of the subhorizon; or

2. Have albic materials that constitute as much as 5 percent of some subhorizon of the argillic horizon.

Glossic Paleudalfs

IEIM. Other Paleudalfs that have throughout the argillic or kandic horizon a hue of 2.5YR or redder and have a value, moist, of 3 or less and have a value, dry, that is no more than one unit more than the value moist.

Rhodic Paleudalfs

IEIN. Other Paleudalfs that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, no more than 1 unit more than the value, moist, or the soil, after mixing to a depth of 18 cm, has these color values.

Mollic Paleudalfs

IEIO. Other Paleudalfs.

Typic Paleudalfs

Definition of Typic Paleudalfs

Typic Paleudalfs are the Paleudalfs that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizons are saturated with water at some time when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage and do not have an increase of 15 percent clay or more (absolute) within a vertical

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distance of 2.5 cm at the upper boundary of the argillic horizon;

2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

3. Have an Ap horizon that has a color value, moist, of 3.5 or more or a color value, dry, more than 1 unit higher than the value, moist, or the upper soil to a depth of 18 cm, after mixing, has these colors;

4. Have an argillic horizon that has a color value, dry, of 4.5 or more in some subhorizon, or a color value, moist, that is less than the value, dry, by more than one unit unless the hue in some part of the argillic horizon is 5YR or yellower;

5. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

6. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the surface;

7. Have an argillic horizon that is continuous horizontally, that is continuous vertically for at least the upper 20 cm, and that has a texture finer than loamy fine sand;

8. Do not have subhorizons in the upper part of the argillic horizon that have skeletons that

a. Have moist chroma of 2 or less; and

b. Occupy 5 percent or more of the volume of the subhorizon;

9. Do not have albic materials that constitute as much as 5 percent of any subhorizon of the argillic horizon."

Page 139, first column and extending to second column. Delete the section, Distinctions between Typic Haplustalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Haplustalfs:

"Key to subgroups

ICHA. Haplustalfs that have a lithic contact within 50 cm of the soil surface.

Lithic Haplustalfs

ICHB. Other Haplustalfs that:

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1. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5^o C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8^o C; and

2. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend to the surface or to the base of an Ap horizon if the soil is not irrigated;

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Udertic Haplustalfs

ICHC. Other Haplustalfs that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend to the surface or to the base of an Ap horizon if the soil is not irrigated;

2. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Haplustalfs

ICHD. Other Haplustalfs that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time during the year or the soil has artificial drainage; and

2. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 50 cm below the soil surface.
Aquic Arenic Haplustalfs

ICHE. Other Haplustalfs that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time during the year or the soil has artificial drainage; and

2. Have an argillic horizon that has base saturation (by sum of cations) of less than 75 percent throughout.

Aquatic Haplustalfs

ICHF. Other Haplustalfs that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time during the year or the soil has artificial drainage.

Aquic Haplustalfs

ICHG. Other Haplustalfs that have an argillic horizon that is discontinuous horizontally, or is discontinuous vertically in the upper 20 cm of its thickness, or has a texture that is loamy fine sand or coarser.

Psammentic Haplustalfs

ICHH. Other Haplustalfs that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 50 cm below the soil surface; and

2. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry six-tenths or less of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, or isomesic or a warmer iso-temperature regime, the soils are moist in most years in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Arenic Aridic Haplustalfs

ICHI. Other Haplustalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 50 cm below the soil surface.

Arenic Haplustalfs

ICHJ. Other Haplustalfs that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry six-tenths or less of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, or isomesic or a warmer iso-temperature regime, the soils are moist in most years in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Aridic Haplustalfs

ICHK. Other Haplustalfs that have CEC of less than 24 cmol(+) per kg clay (by 1N NH₄OAc pH7) in the major part of the argillic horizon or in the major part of the upper 100 cm if the argillic horizon is more than 100 cm thick.

Kanhaplic Haplustalfs

ICHL. Other Haplustalfs that have an argillic horizon that has base saturation (by sum of cations) of less than 75 percent throughout.

Ultic Haplustalfs

ICHM. Other Haplustalfs that, When neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C

Udic Haplustalfs

ICHN. Other Haplustalfs.

Typic Haplustalfs

Definition of Typic Haplustalfs

Typic Haplustalfs are the Haplustalfs that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizon is saturated with water at some time during the year or the soil has artificial drainage;

2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

3. Do not have a lithic contact within 50 cm of the soil surface;

4. Have CEC of 24 or more cmol(+) per kg clay (by 1N NH₄OAc pH7) in the major part of the argillic horizon or in the major part of the upper 100 cm if the argillic horizon is more than 100 cm thick;

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5. Have an argillic horizon that is continuous horizontally, that is continuous vertically for at least the upper 20 cm, that is not composed entirely of lamellae, and that has a texture finer than loamy fine sand;

6. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for more than four-tenths of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C;

7. Have an argillic horizon that has base saturation (by sum of cations) of 75 percent or more in some part;

8. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend to the surface or to the base of an Ap horizon if the soil is not irrigated;

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

9. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry less than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, or isomesic or a warmer isothermic regime, the soils are moist in most years in some or all parts of the moisture control section for 90 consecutive days or more during a period when the soil temperature at a depth of 50 cm exceeds 8° C."

Page 141, first column (Also see NSTH issue No. 8, pages 615-67 to 68). Delete the section, Distinctions between Typic Kandiuustalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Kandiuustalfs:

"Key to subgroups

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ICDA. Kandiuustalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is more than 100 cm below the soil surface.

Grossarenic Kandiuustalfs

ICDB. Other Kandiuustalfs that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time of the year when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage; and

2. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface.

Aquic Arenic Kandiuustalfs

ICDC. Other Kandiuustalfs that have 5 percent or more plinthite by volume in one or more horizons within 150 cm of the soil surface.

Plinthic Kandiuustalfs

ICDD. Other Kandiuustalfs that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time of the year when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage.

Aquic Kandiuustalfs

ICDE. Other Kandiuustalfs that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface; and

2. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are moist six-tenths or less of the time in half or more years in some part of the moisture control section (not necessarily the same part) when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for less than 180 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Arenic Aridic Kandiuustalfs

ICDF. Other Kandiuustalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface.

Arenic Kandiuustalfs

ICDG. Other Kandiuustalfs that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are moist six-tenths or less of the time in half or more years in some part of the moisture control section (not necessarily the same part) when the soil temperature at a depth of 50 cm exceeds 5° C; or
2. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for less than 180 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Aridic Kandiuustalfs

ICDH. Other Kandiuustalfs that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry for 135 or less cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or
2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udic Kandiuustalfs

ICDI. Other Kandiuustalfs that have, throughout the argillic or kandic horizon, a hue of 2.5YR or redder, and have a value, moist, of 3 or less and have a value, dry, that is no more than one unit more than the value, moist.

Rhodic Kandiuustalfs

ICDJ. Other Kandiuustalfs.

Typic Kandiuustalfs

Definition of Typic Kandiuustalfs

Typic Kandiuustalfs are the Kandiuustalfs that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizon is saturated with water at some time of the year when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage;
2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;
3. Do not have a horizon within 150 cm of the soil surface that has less than 5 percent plinthite by volume;
4. When neither irrigated nor fallowed to store moisture:
 - a. If the soil temperature regime is mesic or thermic, are moist more than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for 180 or more days during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

5. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for more than 135 cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

6. Have an argillic or kandic horizon that has a color hue of 5YR or yellower in some part, or has a value, moist, of 4 or more in some part, or has a value, dry, that is more than one unit higher than the value, moist."

Page 141, first column (Also see NSTH issue No. 8, pages 615-68 to 69). Delete the section, Distinctions between Typic Kandiuustalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Kandiuustalfs:

"Key to subgroups

ICEA. Kanhaplustalfs that have a lithic contact within 50 cm of the soil surface.

Lithic Kanhaplustalfs

ICEB. Other Kanhaplustalfs that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at sometime when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage.

Aquic Kanhaplustalfs

ICEC. Other Kanhaplustalfs that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are moist less than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for less than 180 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C

Aridic Kanhaplustalfs

ICED. Other Kanhaplustalfs that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry for 135 or less cumulative

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days in some part of the Moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udic Kanhaplustalfs

ICEE. Other Kanhaplustalfs that have, throughout the argillic or kandic horizon, a hue of 2.5YR or redder, and have a value, moist, of 3 or less and have a value, dry, that is no more than one unit more than the value, moist.

Rhodic Kanhaplustalfs

ICEF. Other Kanhaplustalfs.

Typic Kanhaplustalfs

Definition of Typic Kanhaplustalfs

Typic Kanhaplustalfs are the Kanhaplustalfs that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizon is saturated with water at sometime when the soil temperature at that depth is 5° C or higher or the soil has artificial drainage;

2. Do not have a lithic contact within 50 cm of the soil surface;

3. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are moist more than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for 180 or more days during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

4. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for more than 135 cumulative days in some part of the Moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

5. Have an argillic or kandic horizon that has a color hue of 5YR or yellower in some part, or has a value, moist, of 4 or more in some part, or has a value, dry, that is more than one unit higher than the value, moist."

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Page 141, second column. Delete the section, Distinctions between Typic Natrustalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Natrustalfs:

*Key to subgroups

ICCA. Natrustalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the natric horizon that is more than 100 cm below the soil surface.

Grossarenic Natrustalfs

ICCB. Other Natrustalfs that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface and there is ground water in the mottled horizon at some time of year when the soil temperature is 5° C or higher; and

2. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Aquic Arenic Natrustalfs

ICCC. Other Natrustalfs that have mottles that have chroma of 2 or less within 75 cm of the soil surface and there is ground water in the mottled horizon at some time of year when the soil temperature is 5° C or higher.

Aquic Natrustalfs

ICCD. Other Natrustalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Natrustalfs

ICCE. Other Natrustalfs that have a petrocalcic horizon that has its upper boundary within 150 cm of the surface.

Petrocalcic Natrustalfs

ICCF. Other Natrustalfs that have a salic horizon that has its upper boundary within 75 cm of the soil surface.

Salorthidic Natrustalfs

ICCG. Other Natrustalfs that have an Ap horizon that has a color value, moist, of 3 or less, or the soil, after mixing to a depth of 18 cm, has a color value, moist, of 3 or less.

Mollic Natrustalfs

ICCH. Other Natrustalfs.

Typic Natrustalfs

Definition of Typic Natrustalfs

Typic Natrustalfs are the Natrustalfs that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if there is ground water in the mottled horizon at some time of year when the soil temperature is 5° C or higher;

2. Have an Ap horizon that has a color value, moist, more than 3, or the surface soil to a depth of 18 cm, after mixing, has a color value, moist, more than 3;
3. Do not have a salic horizon that has its upper boundary within 75 cm of the soil surface;
4. Do not have a petrocalcic horizon that has its upper boundary within 150 cm of the surface; and
5. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface."

Page 142, second column and extending to page 143, second column. Delete the section, Distinctions between Typic Paleustalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Paleustalfs:

"Key to subgroups

ICFA. Paleustalfs that:

1. When neither irrigated nor fallowed to store moisture:

- a. If the soil temperature regime is mesic or thermic, are dry for less than four-tenths of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

- b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

2. Have the following combination of characteristics:

- a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon if the soil is not irrigated;

- b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; and

- c. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Udertic Paleustalfs

ICFB. Other Paleustalfs that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon if the soil is not irrigated;

2. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Paleustalfs

ICFC. Other Paleustalfs that have an argillic horizon that is discontinuous horizontally, or is discontinuous vertically in the upper 20 cm of its thickness, or has a texture that is loamy fine sand or coarser.

Psammentic Paleustalfs

ICFD. Other Paleustalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 100 cm below the soil surface.

Grossarenic Paleustalfs

ICFE. Other Paleustalfs that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time of the year when the temperature of the horizon is 5° C or higher; and

2. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Aquic Arenic Paleustalfs

ICFF. Other Paleustalfs that have 5 percent or more plinthite by volume in one or more subhorizons within 150 cm of the soil surface.

Plinthic Paleustalfs

ICFG. Other Paleustalfs that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time of the year when the temperature of the horizon is 5° C or higher.

Aquic Paleustalfs

ICFH. Other Paleustalfs that have a petrocalcic horizon that has its upper boundary within 150 cm of the soil surface.

Petrocalcic Paleustalfs

ICFI. Other Paleustalfs that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface; and

2. When not irrigated and when not fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Arenic Aridic Paleustalfs

ICFJ. Other Paleustalfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Paleustalfs

ICFK. Other Paleustalfs that:

1. When not irrigated and when not fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

2. Have a calcic horizon within a depth of 100 cm if the weighted average particle-size class of the upper 50 cm of the argillic horizon is sandy, 60 cm if it is loamy, or 50 cm if it is clayey, and they have carbonates in all subhorizons above the calcic horizon.

Calciorthidic Paleustalfs

ICFL. Other Paleustalfs that, when not irrigated and when not fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Aridic Paleustalfs

ICFM. Other Paleustalfs that have CEC of less than 24 cmol(+) per kg clay (by 1N NH₄OAc pH7) in the major part of the argillic horizon or the major part of the upper 100 cm of the argillic horizon if thicker than 100 cm.

Kandic Paleustalfs

ICFN. Other Paleustalfs that have, throughout the argillic or kandic horizon, a hue of 2.5YR or redder, and have a value, moist, of 3 or less and have a value, dry, that is no more than one unit more than the value, moist.

Rhodic Paleustalfs

ICFO. Other Paleustalfs that have an argillic horizon that has base saturation (by sum of cations) of less than 75 percent throughout.

Ultic Paleustalfs

ICFP. Other Paleustalfs that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry for less than four-tenths of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udic Paleustalfs

ICFQ. Other Paleustalfs.

Typic Paleustalfs

Definition of Typic Paleustalfs

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizon

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is saturated with water at some time of the year when the temperature of the horizon is 5° C or higher;

2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

3. Have less than 5 percent plinthite by volume in all subhorizons within 150 cm of the soil surface;

4. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for more than four-tenths of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C;

5. Have an argillic horizon that has base saturation (by sum of cations) of 75 percent or more in some part;

6. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon if the soil is not irrigated;

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

7. Do not have a petrocalcic horizon that has its upper boundary within 150 cm of the soil surface;

8. When not irrigated and when not fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry less than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for 90 consecutive days or more during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

c. Do not have a calcic horizon whose upper boundary is within a depth of 100 cm below the soil surface if the weighted average particle-size class of the upper 50 cm of the argillic horizon is sandy, or 60 cm if it is loamy, or 50 cm if it is clayey.

9. Have CEC of 24 or more cmol(+) per kg clay (by 1N NH₄OAc pH7) in the major part of the argillic horizon or the major part of the upper 100 cm of the argillic horizon is thicker than 100 cm;

10. Have an argillic horizon that has a color hue of 5YR or yellower in some part, or has a value, moist, of 4 or more in some part, or has a value, dry, that is more than one unit higher than the value, moist; and

11. Have an argillic horizon that is continuous horizontally, that is continuous vertically for at least

the upper 20 cm, and that has a texture finer than loamy fine sand."

Page 146, first column. Delete the section, Distinctions between Typic Rhodustalfs and other subgroups, and replace with the following key to subgroups and definition of Typic Rhodustalfs:

"Key to subgroups

Because these soils are rare in the United States, the classification that follows probably is incomplete, and it is provisional.

ICGA. Rhodustalfs that have a lithic contact within 50 cm of the soil surface.

Lithic Rhodustalfs

ICGB. Other Rhodustalfs that have CEC of less than 24 cmol(+) per kg clay (by 1N NH₄OAc pH7) in the major part of the argillic horizon or the major part of the upper 100 cm of the argillic horizon if the argillic horizon is thicker than 100 cm.

Kanhaplic Rhodustalfs

ICGC. Other Rhodustalfs that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udic Rhodustalfs

ICGD. Other Rhodustalfs.

Typic Rhodustalfs

Definition of Typic Rhodustalfs

Typic Rhodustalfs are the Rhodustalfs that

1. Do not have a lithic contact within 50 cm of the soil surface;

2. Have CEC of 24 or more cmol(+) per kg clay (by 1N NH₄OAc pH7) in the major part of the argillic horizon or the major part of the upper 100 cm of the argillic horizon if the argillic horizon is thicker than 100 cm; and

3. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for more than four-tenths of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture

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control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C."

Page 147, second column. Delete the section, Distinctions between Typic Durixeralfs and other subgroups, and replace with the following key to subgroups and definition of Typic Durixeralfs:

"Key to subgroups

IDAA. Durixeralfs that have a natric horizon.
Natric Durixeralfs

IDAB. Other Durixeralfs that have mottles in the argillic horizon that have chroma of 2 or less.
Aquic Durixeralfs

IDAC. Other Durixeralfs that:

1. Have an argillic horizon that:

- a. Has 35 percent or more clay in some subhorizon at least 7.5 cm thick; and
- b. Has an increase in clay content that is 15 percent or more (absolute) within a vertical distance of 2.5 cm or is 20 percent or more (absolute) within a vertical distance of 7.5 cm at the upper boundary or within some part; and

2. Have a duripan that is not both massive, platy, or prismatic and more than half of its upper boundary indurated and coated with opal or with opal and sesquioxides, or indurated in some subhorizon below the upper boundary.

Abruptic Haplic Durixeralfs

IDAD. Other Durixeralfs that have an argillic horizon that:

1. Has 35 percent or more clay in some subhorizon at least 7.5 cm thick; and
2. Has an increase in clay content that is 15 percent or more (absolute) within a vertical distance of 2.5 cm or is 20 percent or more (absolute) within a vertical distance of 7.5 cm at the upper boundary or within some part.

Abruptic Durixeralfs

IDAE. Other Durixeralfs that have a duripan that is not both massive, platy, or prismatic and more than half of its upper boundary indurated and coated with opal or with opal and sesquioxides, or indurated in some subhorizon below the upper boundary.

Haplic Durixeralfs

IDAF. Other Durixeralfs.

Typic Durixeralfs

Definition of Typic Durixeralfs

Typic Durixeralfs are the Durixeralfs that

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1. Have an argillic horizon that has one or more of the following:

- a. Have less than 35 percent clay in all subhorizons that are 7.5 cm or thicker, or
- b. The increase in clay content is less than 15 percent (absolute) within a vertical distance of 2.5 cm or is less than 20 percent (absolute) within a vertical distance of 7.5 cm at the upper boundary or within some part;

2. Do not have mottles in the argillic horizon that have chroma of 2 or less;

3. Have a duripan that is massive, platy, or prismatic and that has half or more of its upper boundary indurated and coated with opal or with opal and sesquioxides or that is indurated in some subhorizon below the upper boundary; and

4. Do not have a natric horizon."

Page 148, first column (Also see NSTH issue No. 1, page 615-70. Delete the section, Distinctions between Typic Fragixeralfs and other subgroups, and replace with the following key to subgroups and definition of Typic Fragixeralfs:

"Key to subgroups

IDCA. Fragixeralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Fragixeralfs

IDCB. Other Fragixeralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Fragixeralfs

IDCC. Other Fragixeralfs that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less, when crushed and smoothed, or the soil to a depth of 18 cm, after mixing, has those colors.

Mollic Fragixeralfs

IDCD. Other Fragixeralfs that have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon or have mottles that have chroma of 2 or less within 40 cm of the surface and the horizons that have mottles of low chroma are saturated with water at some time of the year when the soil temperature is 5 °C or higher in those horizons. Mottles are not the same as skeletans that may also have low chroma.

Aquic Fragixeralfs

IDCE. Other Fragixeralfs that do not have an argillic horizon, above the fragipan, that has clay skins on at least some vertical and horizontal faces of primary or secondary peds, or both.

Ochreptic Fragixeralfs

IDCF. Other Fragixeralfs.

Typic Fragixeralfs

Definition of Typic Fragixeralfs

Typic Fragixeralfs are the Fragixeralfs that

1. Above the fragipan have an argillic horizon that has clay skins on at least some vertical and horizontal faces of primary or secondary peds, or both;

2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

3. Either have an Ap horizon that has a color value, moist, of 4 or more or a color value, dry, of 6 or more, when crushed and smoothed, or the soil to a depth of 18 cm, after mixing, has those colors; and

4. Do not have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon and do not have mottles that have chroma of 2 or less within 40 cm of the surface if the horizons that have mottles of low chroma are saturated with water at some time of the year when the soil temperature is 5 °C or higher in those horizons. Mottles are not the same as skeletans that may also have low chroma."

Page 148, second column and extending to page 149, first column. Delete the section, Distinctions between Typic Haploxeralfs and other subgroups, and replace with the following key to subgroups and definition of Typic Haploxeralfs:

***Key to subgroups**

IDGA. Haploxeralfs that:

1. Have a lithic contact within 50 cm of the soil surface; and

2. Have an A horizon that throughout its upper 10 cm has a color value, moist, of 3 or less and has 0.7 percent or more organic carbon throughout, or have an Ap horizon that has a color value, moist, of 3 or less and contains 0.7 percent or more organic carbon.

Lithic Mollic Haploxeralfs

IDGB. Other Haploxeralfs that:

1. Have a lithic contact within 50 cm of the soil surface; and

2. Have an argillic horizon that is discontinuous horizontally throughout the area of each pedon.

Lithic Ruptic-Xerochreptic Haploxeralfs

IDGC. Other Haploxeralfs that have a lithic contact within 50 cm of the soil surface.

Lithic Haploxeralfs

IDGD. Other Haploxeralfs that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon if the soil is not irrigated;

2. A coefficient of linear extensibility (COLE) of 0.06 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Haploxeralfs

IDGE. Other Haploxeralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Haploxeralfs

IDGF. Other Haploxeralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

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1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Haploxeralfs

IDGG Other Haploxeralfs that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time when the temperature of that horizon is 5° C or higher or there is artificial drainage; and

2. Have an argillic horizon that has base saturation (by sum of cations) of less than 75 percent in one or more subhorizons of the upper 75 cm or to a lithic or paralithic contact, whichever is shallower.

Aquiltic Haploxeralfs

IDGH. Other Haploxeralfs that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time when the temperature of that horizon is 5° C or higher or there is artificial drainage.

Aquic Haploxeralfs

IDGI. Other Haploxeralfs that have exchangeable sodium that is 15 percent or more of the CEC (at pH 8.2) in one or more subhorizons in the argillic horizon.

Natric Haploxeralfs

IDGJ. Other Haploxeralfs that have an argillic horizon that is discontinuous vertically within the upper 20 cm or has a sandy particle-size class.

Psammentic Haploxeralfs

IDGK. Other Haploxeralfs that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Haploxeralfs

IDGL. Other Haploxeralfs that have a calcic horizon that has its upper boundary within the upper 100 cm of soil.

Calcic Haploxeralfs

IDGM. Other Haploxeralfs that have an argillic horizon that has base saturation (by sum of cations) of less than 75 percent in one or more subhorizons of the upper 75 cm or to a lithic or paralithic contact, whichever is shallower.

Ultic Haploxeralfs

IDGN. Other Haploxeralfs that have an A horizon that has throughout its upper 10 cm a color value, moist, of 3 or less and 0.7 percent or more organic carbon, or have an Ap horizon that has a color value, moist, of 3 or less and contains 0.7 percent or more organic carbon.

Mollic Haploxeralfs

IDGO. Other Haploxeralfs.

Typic Haploxeralfs

Definition of Typic Haploxeralfs

Typic Haploxeralfs are the Haploxeralfs that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizon is saturated with water at some time when the temperature of that horizon is 5° C or higher or there is artificial drainage;

2. Have an A horizon that throughout its upper 10 cm has a color value, moist, of 4 or more or has less than 0.7 percent organic carbon in some part, or have an Ap horizon that has a color value, moist, of 4 or more or contains less than 0.7 percent organic carbon;

3. Do not have a lithic contact within 50 cm of the soil surface;

4. Have exchangeable sodium that is less than 15 percent of the CEC (at pH 8.2) throughout the argillic horizon;

5. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface;

6. Have an argillic horizon that has base saturation (by sum of cations) of 75 percent or more throughout the upper 75 cm or to a lithic or paralithic contact, whichever is shallower;

7. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon if the soil is not irrigated;

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b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

8. Have an argillic horizon that is continuous vertically for at least the upper 20 cm that is not composed entirely of lamellae, and that has a texture finer than loamy fine sand;

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9. Do not have a calcic horizon that has its upper boundary within the upper 100 cm of soil;
10. Have an argillic horizon that is continuous horizontally throughout the area of each pedon; and
11. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

- a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of more than 1.0 percent; or
- b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
- c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- (1) More than 30 percent volcanic glass: or
- (2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus $1/2$ acid-oxalate-extractable iron of 0.40 percent or more."

Page 150, second column. Delete the section, Distinctions between Typic Natrixeralfs and other subgroups, and replace with the following key to subgroups and definition of Typic Natrixeralfs:

***Key to subgroups**

IDBA. Natrixeralfs that have mottles that have chroma of 2 or less within 75 cm of the soil surface and there is ground water in the mottled horizon at some time when the temperature of that horizon is 5°C or higher.

Aquic Natrixeralfs

IDBB. Other Natrixeralfs.

Typic Natrixeralfs

Definition of Typic Natrixeralfs

Typic Natrixeralfs are the Natrixeralfs that do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if there is ground water in the mottled horizon at some time when the temperature of that horizon is 5°C or higher."

Page 151, second column and extending to page 152, first column. Delete the section, Distinctions between Typic Palexeralfs and other subgroups, and replace with the following key to subgroups and definition of Typic Palexeralfs:

***Key to subgroups**

The list of subgroups is incomplete for the world. A few subgroups are defined that are not known to occur in

the United States, but a number of others that have not yet been defined are known to exist.

IDFA. Palexeralfs that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap horizon if the soil is not irrigated; and

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm, and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Palexeralfs

IDFB. Other Palexeralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of more than 1.0 percent.

Andic Palexeralfs

IDFC. Other Palexeralfs that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass: or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus $1/2$ acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Palexeralfs

IDFD. Other Palexeralfs that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time of the year when its temperature is 5°C or higher or there is artificial drainage.

Aquic Palexeralfs

IDFE. Other Palexeralfs that have a petrocalcic horizon whose upper boundary is within 150 cm of the soil surface.

Petrocalcic Palexeralfs

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IDFF. Other Palexeralfs that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 50 cm below the soil surface.

Arenic Palexeralfs

IDFG. Other Palexeralfs that have 15 percent or more saturation with sodium in one or more subhorizons within 100 cm of the soil surface.

Natric Palexeralfs

IDFH. Other Palexeralfs that have a calcic horizon within 150 cm of the soil surface.

Calcic Palexeralfs

IDFI. Other Palexeralfs that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Palexeralfs

IDFJ. Other Palexeralfs that have an argillic horizon that has less than 75 percent base saturation (by sum of cations) throughout.

Ultic Palexeralfs

IDFK. Other Palexeralfs that have an argillic horizon in which the upper part does not have a clayey particle-size class or there is an increase of less than 20 percent clay (absolute) within a vertical distance of 7.5 cm or less than 15 percent clay (absolute) within 2.5 cm at the upper boundary.

Haplic Palexeralfs

IDFL. Other Palexeralfs that have an A horizon that, throughout its upper 10 cm, has a color value, moist, of 3 or less and contains 0.7 percent or more organic carbon, or they have an Ap horizon that has a color value, moist, of 3 or less and contains 0.7 percent or more organic carbon.

Mollic Palexeralfs

IDFM. Other Palexeralfs.

Typic Palexeralfs

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Definition of Typic Palexeralfs

Typic Palexeralfs are the Palexeralfs that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizon is saturated with water at some time of the year when its temperature is 5° C or higher or there is artificial drainage;

2. Do not have a calcic horizon within 150 cm of the soil surface;

3. Have an A horizon that, throughout its upper 10 cm, has a color value, moist, of 4 or more or contains less than 0.7 percent organic carbon, or they have an Ap horizon that has a color value, moist, of 4 or more or contains less than 0.7 percent organic carbon;

4. Do not have a petrocalcic horizon whose upper boundary is within 150 cm of the soil surface;

5. Have an argillic horizon that has at least 75 percent base saturation (by sum of cations) in some part;

6. Have an argillic horizon in which the upper part has a clayey particle-size class and there is an increase of at least 20 percent clay (absolute) within a vertical distance of 7.5 cm or of at least 15 percent clay (absolute) within 2.5 cm at the upper boundary;

7. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface;

8. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap horizon if the soil is not irrigated; and

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

9. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

10. Have less than 15 percent saturation with sodium in all subhorizons within 100 cm of the soil surface; and

11. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 153, first column and extending to second column.

Delete the section, Distinctions between Typic Rhodoxeralfs and other subgroups, and replace with the following key to subgroups and definition of Typic Rhodoxeralfs:

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"Key to subgroups

The list of subgroups that follows is incomplete because the soils are of such limited extent in the United States.

IDEA. Rhodoxeralfs that have a lithic contact within 50 cm of the soil surface.

Lithic Rhodoxeralfs

IDEB. Other Rhodoxeralfs that have a petrocalcic horizon whose upper boundary is within 150 cm of the soil surface.

Petrocalcic Rhodoxeralfs

IDEC. Other Rhodoxeralfs that have a calcic horizon whose upper boundary is within 150 cm of the soil surface.

Calcic Rhodoxeralfs

IDED. Other Rhodoxeralfs that have an argillic horizon that is 15 cm or less thick or is discontinuous in each pedon.

Chreptic Rhodoxeralfs

IDEE. Other Rhodoxeralfs.

Typic Rhodoxeralfs

Definition of Typic Rhodoxeralfs

Typic Rhodoxeralfs are the Rhodoxeralfs that

1. Have an argillic horizon that is more than 15 cm thick and is continuous in each pedon;
2. Do not have a lithic contact within 50 cm of the soil surface;
3. Do not have a petrocalcic horizon whose upper boundary is within 150 cm of the soil surface; and
4. Do not have a calcic horizon whose upper boundary is within 150 cm of the soil surface."

Page 157, second column and extending to page 158, second column. Delete the section, Distinctions between Typic Durargids and other subgroups, and replace with the following key to subgroups and definition of Typic Durargids:

"Key to subgroups

FAAA. Durargids that are saturated with water within 100 cm of the surface for 90 consecutive days or more in most years or have any of the following characteristics within 100 cm of the soil surface if there is ground water within this depth at some time in most years:

1. Dominant chroma of 1 or less throughout the horizons and hue as yellow or yellower than 2.5Y in some part;
2. Dominant chroma of 2 or less and mottles that are not due to segregated lime; or
3. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable sodium) in more than half the thickness of the horizon between the surface and 50 cm depth than in the saturated zone.

Aquic Durargids

FAAB. Other Durargids that have the following combination of characteristics:

1. A duripan at a depth 18 cm or more;
2. The weighted average percentage of organic carbon in the upper soil to a depth of 40 cm is 0.6 or more if the weighted average ratio of sand to clay in the upper soil to that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or is intermediate between 0.6 percent and one-seventh percent if the ratio of sand to clay in the upper soil is more than 1.0 but less than 13; and the weighted average percentage of organic carbon in the upper soil to a depth of 18 cm is one-fifth or more than the values just stated if a duripan is present at a depth of less than 40 cm but more than 18 cm;
3. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differ by 5° C or more, and an aridic moisture regime that borders on a xeric regime;
4. An argillic horizon that has 35 percent or more clay in some part and also has either:

- a. An increase of 15 percent or more clay (absolute) within a vertical distance of 2.5 cm at the upper boundary of the argillic horizon; or
- b. An increase of 10 percent or more clay (absolute) if cultivated and the lower boundary of the Ap horizon is the upper boundary of the argillic horizon.

Abruptic Xerollic Durargids

FAAC. Other Durargids that have an argillic horizon that has 35 percent or more clay in some part and also has either:

1. An increase of 15 percent or more clay (absolute) within a vertical distance of 2.5 cm at the upper boundary of the argillic horizon; or
2. An increase of 10 percent or more clay (absolute) if cultivated and the lower boundary of the Ap horizon is the upper boundary of the argillic horizon.

Abruptic Durargids

FAAD. Other Durargids that have

1. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime; and
2. Throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:
 - a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice,

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and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrixerandic Durargids

FAAE. Other Durargids that

1. Are dry in all parts of the moisture control section three-fourths of the time (cumulative) or less that the soil temperature at a depth of 50 cm is 5° C or higher; and

2. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrustrandic Durargids

FAAF. Other Durargids that do not have a platy or massive duripan that is indurated in some subhorizon and that have the following combination of characteristics:

1. A duripan at a depth 18 cm or more;

2. The weighted average percentage of organic carbon in the upper soil to a depth of 40 cm is 0.6 or more if the weighted average ratio of sand to clay in the upper soil to that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or is intermediate between 0.6 percent and one-seventh percent if the ratio of sand to clay in the upper soil is more than 1.0 but less than 13; and the weighted average percentage of organic carbon in the upper soil to a depth of 18 cm is one-

fifth or more than the values just stated if a duripan is present at a depth of less than 40 cm but more than 18 cm; and

3. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Haploxerollic Durargids

FAAG. Other Durargids that do not have a platy or massive duripan that is indurated in some subhorizon.

Haplic Durargids

FAAH. Other Durargids that have the following combination of characteristics:

1. A duripan at a depth 18 cm or more;

2. The weighted average percentage of organic carbon in the upper soil to a depth of 40 cm is 0.6 or more if the weighted average ratio of sand to clay in the upper soil to that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or is intermediate between 0.6 percent and one-seventh percent if the ratio of sand to clay in the upper soil is more than 1.0 but less than 13; and the weighted average percentage of organic carbon in the upper soil to a depth of 18 cm is one-fifth or more than the values just stated if a duripan is present at a depth of less than 40 cm but more than 18 cm; and

3. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperatures at a depth of 50 cm that differ by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Xerollic Durargids

FAAI. Other Durargids that are dry in all parts of the moisture control section three-fourths of the time (cumulative) or less that the soil temperature at a depth of 50 cm is 5° C or higher.

Ustic Durargids

FAAJ. Other Durargids.

Typic Durargids

Definition of Typic Durargids

Typic Durargids are the Durargids that

1. Are not saturated with water for 90 consecutive days or more within 100 cm of the surface in most years and do not have any of the following characteristics within 100 cm of the soil surface if there is ground water within this depth at some time in most years:

a. Dominant chroma of 1 or less throughout the horizons and hue as yellow or yellower than 2.5Y in some part;

b. Dominant chroma of 2 or less and mottles that are not due to segregated lime;

c. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable

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sodium) in more than half the thickness of the horizon between the surface and 50 cm depth than in the saturated zone;

2. Have a platy or massive duripan that is indurated in some subhorizon;

3. Have one or more of the following:

a. A duripan at a depth of less than 18 cm;

b. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm is less than 0.6 if the weighted average ratio of sand to clay in the upper soil to that depth is 1.0 or less, or is less than one-seventh percent if the ratio is 13 or more, or is intermediate between 0.6 percent and one-seventh percent if the ratio of sand to clay in the upper soil is more than 1.0 but less than 13; or the weighted average percentage of organic carbon in the upper soil to a depth of 18 cm is not as much as one-fifth more than the values just stated if a duripan is present at a depth of less than 40 cm but more than 18 cm; or

c. A mean annual soil temperature of 22° C or higher, or mean summer and mean winter soil temperatures at a depth of 50 cm that differ by less than 5° C, or an aridic moisture regime that does not border on a xeric regime.

4. Do not have an argillic horizon that has 35 percent or more clay in some part and also has either

a. An increase of 15 percent or more clay (absolute) within a vertical distance of 2.5 cm at the upper boundary of the argillic horizon; or

b. An increase of 10 percent or more clay (absolute) if cultivated and the lower boundary of the Ap horizon is the upper boundary of the argillic horizon;

5. Are dry in all parts of the moisture control section more than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher; and

6. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 159, first column and extending to page 160, second column. Delete the section, Distinctions between Typic Haplargids and other subgroups, and replace with the following key to subgroups and definition of Typic Haplargids:

"Key to subgroups

FAEA. Haplargids that have the following combination of characteristics:

1. A frigid or colder temperature regime and an aridic moisture regime that borders on an ustic regime;

2. A lithic contact within 50 cm of the surface; and

3. A weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm.

Borollic Lithic Haplargids

FAEB. Other Haplargids that have the following combination of characteristics:

1. A lithic contact within 50 cm of the surface;

2. A weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm;

3. An argillic horizon that is not continuous throughout the area of each pedon; and

4. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Lithic Ruptic-Entic Xerollic Haplargids

FAEC. Other Haplargids that have the following combination of characteristics:

1. A lithic contact within 50 cm of the surface;

2. A weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand

to clay in the soil above that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

3. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Lithic Xerollic Haplargids

FAED. Other Haplargids that have the following combination of characteristics:

1. A lithic contact within 50 cm of the surface;

2. A weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

3. A mean annual soil temperature of 8° C or higher and an aridic moisture regime that borders on an ustic regime.

Lithic Ustollic Haplargids

FAEE. Other Haplargids that have a lithic contact within 50 cm of the surface.

Lithic Haplargids

FAEF. Other Haplargids that have the following combination of characteristics:

1. A frigid or colder temperature regime;

2. A weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm;

3. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface, to the base of an Ap horizon, or to the top of the argillic horizon and the cracks are not closed for as many as 60 consecutive days of the 120 days

following the winter solstice in 3 or more years out of 10;

4. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

5. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Borollic Vertic Haplargids

FAEG. Other Haplargids that have:

1. A frigid or colder temperature regime and an aridic moisture regime that borders on an ustic regime; and

2. A weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm.

Borollic Haplargids

FAEH. Other Haplargids that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface, to the base of an Ap horizon, or to the top of the argillic horizon and the cracks close for 60 consecutive days or more during the 120 days following the winter solstice in more than 7 out of 10 years;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm;

3. More than 35 percent clay in horizons that total of more than 50 cm in thickness; and

4. A thermic, mesic, or frigid soil temperature regime.

Xerertic Haplargids

FAEI. Other Haplargids that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface, to the base of an Ap horizon, or to the top of the argillic

horizon and the cracks remain open from 175 to 240 days, cumulative, in most years;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm;

3. More than 35 percent clay in horizons that total of more than 50 cm in thickness.

Ustertic Haplargids

FAEJ. Other Haplargids that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface, to the base of an Ap horizon, or to the top of the argillic horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm;

3. More than 35 percent clay in horizons that total of more than 50 cm in thickness.

Vertic Haplargids

FAEK. Other Haplargids that are saturated with water for 90 consecutive days or more within 100 cm of the surface in most years or have any of the following characteristics within a depth of 100 cm below the surface if there is ground water within this depth at some time in most years:

1. Dominant chroma of 1 or less throughout and a hue 2.5Y or yellower in some part;

2. Dominant chroma of 2 or less and mottles that are not due to segregated lime; or

3. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable Na) in more than half the thickness of the horizons between the surface and 50 cm depth than in the saturated zone.

Aquic Haplargids

FAEL. Other Haplargids that have the following combination of characteristics:

1. A texture that is loamy fine sand or coarser in all subhorizons above a depth of 50 cm;

2. A weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon

in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

3. A mean annual soil temperature of 8° C or higher and an aridic moisture regime that borders on an ustic regime.

Arenic Ustollic Haplargids

FAEM. Other Haplargids that have the following combination of characteristics:

1. A texture that is loamy fine sand or coarser in all subhorizons above a depth of 50 cm;

2. Dry in all parts of the moisture control section three-fourths or less of the time (cumulative) that the soil temperature is 5° C or higher at a depth of 50 cm; and

3. A mean annual soil temperature of 8° C or higher and an aridic moisture regime that borders on an ustic regime.

Arenic Ustalfic Haplargids

FAEN. Other Haplargids that have a texture that is loamy fine sand or coarser in all subhorizons above a depth of 50 cm.

Arenic Haplargids

FAEO. Other Haplargids that have the following combination of characteristics:

1. A horizon within 100 cm of the surface that is more than 15 cm thick and that either contains 20 percent or more (by volume) durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist;

2. A weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

3. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Durixerollic Haplargids

FAEP. Other Haplargids that have a horizon within 100 cm of the surface that is more than 15 cm thick and that either contains 20 percent or more (by volume) durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist.

Duric Haplargids

FAEQ. Other Haplargids that have:

1. A weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

2. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Xerollic Haplargids

FAER. Other Haplargids that are:

1. Dry in all parts of the moisture control section three-fourths or less of the time (cumulative) that the soil temperature is 5° C or higher at a depth of 50 cm; and

2. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperatures at a depth of 50 cm differ by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Xeralfic Haplargids

FAES. Other Haplargids that have:

1. A weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

2. A mean annual soil temperature of 8° C or higher and an aridic moisture regime that borders on an ustic regime.

Ustollic Haplargids

FAET. Other Haplargids that are:

1. Dry in all parts of the moisture control section three-fourths or less of the time (cumulative) that the soil temperature is 5° C or higher at a depth of 50 cm; and

2. A mean annual soil temperature of 8° C or higher and an aridic moisture regime that borders on an ustic regime.

Ustalfic Haplargids

FAEU. Other Haplargids.

Typic Haplargids

Definition of Typic Haplargids

Typic Haplargids are the Haplargids that

1. Are not saturated with water for 90 consecutive days or more within 100 cm of the surface in most years and do not have any of the following characteristics within a depth of 100 cm below the surface if there is ground water within this depth at some time in most years:

a. Dominant chroma of 1 or less throughout and a hue as yellow or yellower than 2.5Y in some part;

b. Dominant chroma of 2 or less and mottles that are not due to segregated lime; or

c. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable Na) in more than half the thickness of the horizons between the surface and 50 cm depth than in the saturated zone;

2. Have texture finer than loamy fine sand in some subhorizon above a depth of 50 cm;

3. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick and that either contains 20 percent or more (by volume) durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist;

4. Do not have a lithic contact within 50 cm of the surface;

5. Have a weighted average percentage of organic carbon in the upper 40 cm that is less than 0.6 percent if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is less than one-seventh percent if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; or have a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is not as much as one-fifth more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm;

6. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface, to the base of an Ap horizon, or to the top of the argillic horizon;

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

c. More than 35 percent clay in horizons that total of more than 50 cm in thickness; and

7. Are dry in all parts of the moisture control section more than three-fourths of the time (cumulative) that the soil temperature is 5° C or higher at a depth of 50 cm."

Page 162, second column and extending to page 163, first column. Delete the section, Distinctions between Typic Nadurargids and other subgroups, and replace with the following key to subgroups and definition of Typic Nadurargids:

***Key to subgroups**

FABA. Nadurargids that:

1. Are saturated with water in some horizon within a depth of 100 cm at time period and have either of the following characteristics within the horizon or horizons that are saturated:

- a. Dominant chroma of 1 or less throughout and hue of 2.5Y or yellower in some part;
- b. Both a dominant chroma of 2 or less and mottles that are not due to segregated lime; and

2. Do not have a platy or massive duripan that is indurated in some subhorizon.

Aquic Haplic Nadurargids

FABB. Other Nadurargids that are saturated with water in some horizon within a depth of 100 cm at some time and have either of the following characteristics within the horizon or horizons that are saturated:

1. Dominant chroma of 1 or less throughout and hue of 2.5Y or yellower in some part;
 2. Both a dominant chroma of 2 or less and mottles that are not due to segregated lime.
- Aquic Nadurargids

FABC. Other Nadurargids that have the following combination of characteristics:

1. Do not have a duripan that is indurated in some subhorizon.
2. A duripan 18 cm or deeper;
3. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average ratio of sand to clay to that depth is 1.0 or less, or that is one-seventh percent or more if the ratio of sand to clay is 13 or more, or have an intermediate amount of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a duripan that is shallower than 40 cm but deeper than 18 cm;
4. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime; and

5. An aridic moisture regime that borders on a xeric regime.

Haploxerollic Nadurargids

FABD. Other Nadurargids that do not have a platy or massive duripan that is indurated in some subhorizon.

Haplic Nadurargids

FABE. Other Nadurargids that have:

1. A duripan 18 cm or deeper;
2. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average ratio of sand to clay to that depth is 1.0 or less, or that is one-seventh percent or more if the ratio of sand to clay is 13 or more, or have an intermediate amount of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a duripan that is shallower than 40 cm but deeper than 18 cm; and
3. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Xerollic Nadurargids

FABF. Other Nadurargids.

Typic Nadurargids

Definition of Typic Nadurargids

Typic Nadurargids are the Nadurargids that

1. Are not saturated with water in any horizon within a depth of 100 cm at any period or do not have either of the following characteristics within the horizon or horizons that are saturated:

- a. Dominant chroma of 1 or less throughout and hue as yellow or yellower than 2.5Y in some part;
- b. Both a dominant chroma of 2 or less and mottles that are not due to segregated lime;

2. Have a duripan that is indurated in some subhorizon; and

3. Have one or more of the following:

- a. A duripan shallower than 18 cm;
- b. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is less than 0.6 if the weighted average ratio of sand to clay to that depth is 1.0 or less, or that is less than one-seventh percent if the ratio of sand to clay is 13 or more, or have an intermediate amount of organic carbon if the ratio of sand to clay is between 1.0 and 13; or have a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is not one-fifth more than the values just stated if there is a duripan that is

shallower than 40 cm but deeper than 18 cm;
or

c. A mean annual soil temperature of 22° C or higher, or mean summer and mean winter soil temperatures at a depth of 50 cm that differ by less than 5° C, or an aridic moisture regime that does not border on a xeric regime."

Page 163, second column and extending to page 164, first column. Delete the section, Distinctions between Typic Natrargids and other subgroups, and replace with the following key to subgroups and definition of Typic Natrargids:

"Key to subgroups

FACA. Natrargids that have the following combination of characteristics:

1. A lithic contact within 50 cm of the soil surface;
2. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average of sand to clay in that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or has an intermediate percentage of organic carbon if the ratio is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact that is shallower than 40 cm but deeper than 18 cm; and
3. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Lithic Xerollic Natrargids

FACB. Other Natrargids that have a lithic contact within 50 cm of the soil surface.

Lithic Natrargids

FACC. Other Natrargids that have the following combination of characteristics:

1. More than 10 percent of the ped surfaces deeper than 2.5 cm below the upper boundary of the natric horizon covered by skeletons;
2. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average of sand to clay in that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or has an intermediate percentage of organic carbon if the ratio is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact that is shallower than 40 cm but deeper than 18 cm; and

3. A frigid or colder temperature regime and an aridic moisture regime bordering on ustic.
Borollic Glossic Natrargids

FACD. Other Natrargids that have:

1. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average of sand to clay in that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or has an intermediate percentage of organic carbon if the ratio is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact that is shallower than 40 cm but deeper than 18 cm; and

2. A frigid or colder temperature regime and an aridic moisture regime bordering on ustic.
Borollic Natrargids

FACE. Other Natrargids that are saturated with water in some horizon within 100 cm of the surface at some time and have either of the following characteristics in the horizon or horizons that are saturated:

1. Dominant chroma of 1 or less throughout and hue of 2.5Y or yellow in some part; or

2. Both a dominant chroma of 2 or less and mottles that are not due to segregated lime.

Aquic Natrargids

FACF. Other Natrargids that have the following combination of characteristics:

1. A horizon within 100 cm of surface that is more than 15 cm thick and that either contains 20 percent or more durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist;

2. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average of sand to clay in that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or has an intermediate percentage of organic carbon if the ratio is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact that is shallower than 40 cm but deeper than 18 cm; and

3. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Durixerollic Natrargids

FACG. Other Natrargids that have a horizon within 100 cm of surface that is more than 15 cm thick and that either contains 20 percent or more durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist.

Duric Natrargids

FACH. Other Natrargids that have the following combination of characteristics:

1. More than 10 percent of the ped surfaces deeper than 2.5 cm below the upper boundary of the natric horizon covered by skeletalans;
2. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average of sand to clay in that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or has an intermediate percentage of organic carbon if the ratio is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact that is shallower than 40 cm but deeper than 18 cm; and
3. An aridic moisture regime that borders on ustic.

Glossic Ustollic Natrargids

FACI. Other Natrargids that have the following combination of characteristics:

1. An SAR of less than 13 or have less than 15 percent saturation with sodium throughout the major part of the natric horizon;
2. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average of sand to clay in that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or has an intermediate percentage of organic carbon if the ratio is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact that is shallower than 40 cm but deeper than 18 cm; and
3. A mean annual soil temperature of 8° C or higher and an aridic moisture regime that borders on ustic.

Haplustollic Natrargids

FACJ. Other Natrargids that have the following combination of characteristics:

1. An SAR of less than 13 or have less than 15 percent saturation with sodium throughout the major part of the natric horizon;
2. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average of sand to clay in that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or has an intermediate percentage of organic carbon if the ratio is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact that is shallower than 40 cm but deeper than 18 cm; and

3. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperatures at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on xeric.

Haploxerollic Natrargids

FACK. Other Natrargids that have an SAR of less than 13 or have less than 15 percent saturation with sodium throughout the major part of the natric horizon.

Haplic Natrargids

FACL. Other Natrargids that have:

1. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average of sand to clay in that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or has an intermediate percentage of organic carbon if the ratio is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact that is shallower than 40 cm but deeper than 18 cm; and

2. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperatures at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on xeric.

Xerollic Natrargids

FACM. Other Natrargids that have:

1. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average of sand to clay in that depth is 1.0 or less, or is one-seventh percent or more if the ratio is 13 or more, or has an intermediate percentage of organic carbon if the ratio is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact that is shallower than 40 cm but deeper than 18 cm; and

2. A mean annual soil temperature of 8° C or higher and an aridic moisture regime that borders on an ustic regime.

Ustollic Natrargids

FACN. Other Natrargids that have more than 10 percent of the ped surfaces deeper than 2.5 cm below the upper boundary of the natric horizon covered by skeletalans.

Glossic Natrargids

FACO. Other Natrargids.

Typic Natrargids

Definition of Typic Natrargids

Typic Natrargids are the Natrargids that

1. Either are not saturated with water in any horizon within 100 cm of the surface at any time or do not have

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either of the following characteristics in the horizon or horizons that are saturated:

- a. Dominant chroma of 1 or less throughout and hue as yellow or yellower than 2.5Y in some part; or
 - b. Both a dominant chroma of 2 or less accompanied by mottles that are not due to segregated lime;
2. Do not have a horizon within 100 cm of surface that is more than 15 cm thick and that either contains 20 percent or more durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist;
 3. Do not have more than 10 percent of the ped surfaces deeper than 2.5 cm below the upper boundary of the natric horizon covered by skeletones;
 4. Do not have a lithic contact within 50 cm of the soil surface;
 5. Have a weighted average percentage of organic carbon in the upper soil to a depth of 40 cm that is less than 0.6 if the weighted average of sand to clay in that depth is 1.0 or less, or is not more than one-seventh percent if the ratio is 13 or more, or has an intermediate percentage of organic carbon if the ratio is between 1.0 and 13; or have a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is not one-fifth more than the values just stated if there is a lithic or paralithic contact that is shallower than 40 cm but deeper than 18 cm; and
 6. Have an SAR of 13 or more or have 15 percent or more saturation with sodium throughout the major part of the natric horizon."

Page 166, first column and extending to second column. Delete the section, Distinctions between Typic Paleargids and other subgroups, and replace with the following key to subgroups and definition of Typic Paleargids:

"Key to subgroups

FADA. Paleargids that have the following combinations of characteristics:

1. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm of 0.6 percent or more if the weighted average ratio of sand to clay above this depth is 1.0 or less, or one-seventh percent or less if the ratio is 13 or more, or an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a petrocalcic horizon whose upper boundary is shallower than 40 cm but deeper than 18 cm;
2. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface, to the base of an Ap horizon, or to the top of the argillic horizon and the cracks are not closed for as many as 60 consecutive days of the 120

days following the winter solstice in 3 or more years out of 10;

3. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm;
4. More than 35 percent clay in horizons that total of more than 50 cm in thickness; and
5. A frigid or colder soil temperature regime.
Borollic Vertic Paleargids

FADB. Other Paleargids that have:

1. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm of 0.6 percent or more if the weighted average ratio of sand to clay above this depth is 1.0 or less, or one-seventh percent or less if the ratio is 13 or more, or an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a petrocalcic horizon whose upper boundary is shallower than 40 cm but deeper than 18 cm; and
2. A frigid or colder soil temperature regime and an aridic moisture regime that borders on an ustic regime.
Borollic Paleargids

FADC. Other Paleargids that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface, to the base of an Ap horizon, or to the top of the argillic horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

3. More than 35 percent clay in horizons that total of more than 50 cm in thickness
Vertic Paleargids

FADD. Other Paleargids that have the following combinations of characteristics:

1. A petrocalcic horizon whose upper boundary is within 100 cm of the soil surface;
2. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm of 0.6 percent or more if the weighted average ratio of sand to clay above this depth is 1.0 or less, or one-seventh percent or less if the ratio

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is 13 or more, or an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a petrocalcic horizon whose upper boundary is shallower than 40 cm but deeper than 18 cm; and

3. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Petrocalcic Xerollic Paleargids

FADE. Other Paleargids that have the following combinations of characteristics:

1. A petrocalcic horizon whose upper boundary is within 100 cm of the soil surface;

2. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm of 0.6 percent or more if the weighted average ratio of sand to clay above this depth is 1.0 or less, or one-seventh percent or less if the ratio is 13 or more, or an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a petrocalcic horizon whose upper boundary is shallower than 40 cm but deeper than 18 cm; and

3. A mean annual soil temperature that is 8° C or higher and an aridic moisture regime that borders on an ustic regime.

Petrocalcic Ustollic Paleargids

FADF. Other Paleargids that:

1. Have a petrocalcic horizon whose upper boundary is within 100 cm of the soil surface;

2. Are dry in all parts of the moisture control section three-fourths or less of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher; and

3. Have a mean annual soil temperature that is 8° C or higher and an aridic moisture regime that borders on an ustic regime.

Petrocalcic Ustalfic Paleargids

FADG. Other Paleargids that have a petrocalcic horizon whose upper boundary is within 100 cm of the soil surface.

Petrocalcic Paleargids

FADH. Other Paleargids that have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.

Duric Paleargids

FADI. Other Paleargids that have:

1. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm of 0.6 percent or more if the weighted average ratio of sand to clay above this depth is 1.0 or less, or one-seventh percent or less if the ratio is 13 or more, or an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a petrocalcic horizon whose upper boundary is shallower than 40 cm but deeper than 18 cm; and

2. A mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Xerollic Paleargids

FADJ. Other Paleargids that have:

1. A weighted average percentage of organic carbon in the upper soil to a depth of 40 cm of 0.6 percent or more if the weighted average ratio of sand to clay above this depth is 1.0 or less, or one-seventh percent or less if the ratio is 13 or more, or an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a petrocalcic horizon whose upper boundary is shallower than 40 cm but deeper than 18 cm; and

2. An aridic moisture regime that borders on an ustic regime.

Ustollic Paleargids

FADK. Other Paleargids that:

1. Are dry in all parts of the moisture control section three-fourths or less of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher.

2. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more; and an aridic moisture regime that borders on a xeric regime.

Xeralfic Paleargids

FADL. Other Paleargids that:

1. Are dry in all parts of the moisture control section three-fourths or less of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher.

2. A mean annual soil temperature that is 8° C or higher and an aridic moisture regime that borders on an ustic regime.

Ustalfic Paleargids

FADM. Other Paleargids.

Typic Paleargids

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Definition of Typic Paleargids

Typic Paleargids are the Paleargids that

1. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist;
2. Have a weighted average percentage of organic carbon in the upper soil to a depth of 40 cm of less than 0.6 percent if the weighted average ratio of sand to clay above this depth is 1.0 or less, or one-seventh percent if the ratio is 13 or more, or an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; or a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is not one-fifth more than the values just stated if there is a petrocalcic horizon whose upper boundary is shallower than 40 cm but deeper than 18 cm;
3. Do not have a petrocalcic horizon whose upper boundary is within 100 cm of the soil surface;
4. Have either
 - a. An increase of 15 percent or more clay (absolute) within a vertical distance of 2.5 cm at the upper boundary of the argillic horizon, or
 - b. An increase of 10 percent or more clay (absolute) if the soil is cultivated and the lower boundary of the Ap horizon is the upper boundary of the argillic horizon;
5. Do not have the following combination of characteristics:
 - a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface, to the base of an Ap horizon, or to the top of the argillic horizon;
 - b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and
 - c. More than 35 percent clay in horizons that total of more than 50 cm in thickness; and

6. Are dry in all parts of the moisture control section more than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher."

Page 168, second column and extending to page 169, first column. Delete the section, Distinctions between Typic Calciorrhids and other subgroups, and replace with the following key to subgroups and definition of Typic Calciorrhids:

"Key to subgroups

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FBEA. Calciorrhids that have the following combination of characteristics:

1. Have a frigid temperature regime and an aridic moisture regime that borders on an ustic regime;
2. Have a lithic contact within 50 cm of the surface; and
3. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm.

Borollic Lithic Calciorrhids

FBEB. Other Calciorrhids that have:

1. A frigid temperature regime and an aridic moisture regime that borders on an ustic regime; and
2. A weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm.

Borollic Calciorrhids

FBEC. Other Calciorrhids that have the following combination of characteristics:

1. Have a lithic contact within 50 cm of the surface;
2. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and
3. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Lithic Xerollic Calciorrhids

FBED. Other Calciorrhids that have the following combination of characteristics:

1. Have a lithic contact within 50 cm of the surface;
2. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and
3. Have an aridic moisture regime that borders on an ustic regime.

Lithic Ustollic Calciorrhids

FBEE. Other Calciorrhids that have a lithic contact within 50 cm of the surface.

Lithic Calciorrhids

FBEF. Other Calciorrhids that have the following combination of characteristics:

1. Are saturated with water for 90 consecutive days or more in most years within 100 cm of the surface or have any of the following characteristics within a depth of 100 cm below the surface if the soil above that depth is saturated with water at some period in most years or the soil is artificially drained:

- a. Dominant chroma of 1 or less throughout and hue of 2.5Y or yellow in some part;
- b. Dominant chroma of 2 or less and mottles that are not due to segregated lime; or
- c. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable Na) in more than half the thickness of the horizons between the surface and 50 cm than in the saturated zone; and

2. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.

Aquic Duric Calciorrhids

FBEG. Other Calciorrhids that are saturated with water for 90 consecutive days or more in most years within 100 cm of the surface or have any of the following characteristics within a depth of 100 cm below the surface if the soil above that depth is saturated with water at some period in most years or the soil is artificially drained:

1. Dominant chroma of 1 or less throughout and hue of 2.5Y or yellow in some part;

2. Dominant chroma of 2 or less and mottles that are not due to segregated lime; or

3. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable Na) in more than half the thickness of the horizons between the surface and 50 cm than in the saturated zone

Aquic Calciorrhids

FBEH. Other Calciorrhids that have the following combination of characteristics:

1. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist;

2. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

3. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Durixerollic Calciorrhids

FBEI. Other Calciorrhids that have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.

Duric Calciorrhids

FBEJ. Other Calciorrhids that have the following combination of characteristics:

1. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

2. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Xerollic Calciorrhids

FBEK. Other Calciorrhids that have the following combination of characteristics:

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1. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

2. Have an aridic moisture regime that borders on an ustic regime.

Ustollic Calciorthids

FBEL. Other Calciorthids that are dry in all parts of the moisture control section three-fourths or less of the time (cumulative) that the soil temperature is 5°C or higher at a depth of 50 cm and have a mean annual soil temperature lower than 22°C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5°C or more, and an aridic moisture regime that borders on a xeric regime.

Xerochreptic Calciorthids

FBEM. Other Calciorthids that are dry in all parts of the moisture control section three-fourths or less of the time (cumulative) that the soil temperature is 5°C or higher at a depth of 50 cm and have an aridic moisture regime that borders on an ustic regime.

Ustochreptic Calciorthids

FBEN. Other Calciorthids that have reddish peds below the calcic horizon that are weakly calcareous or noncalcareous but that are thickly coated with lime.

Argic Calciorthids

FBEO. Other Calciorthids.

Typic Calciorthids

Definition of Typic Calciorthids

Typic Calciorthids are the Calciorthids that

1. Are not saturated with water for 90 consecutive days or more in most years within 100 cm of the surface and do not have any of the following characteristics within a depth of 100 cm below the surface if the soil above that depth is saturated with water at some period in most years or the soil is artificially drained:

- a. Dominant chroma of 1 or less throughout and hue as yellow or yellower than 2.5Y in some part;
- b. Dominant chroma of 2 or less and mottles that are not due to segregated lime; or
- c. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable Na) in more than half the thickness of the horizons between the surface and 50 cm than in the saturated zone;

2. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist;

3. Do not have a lithic contact within 50 cm of the surface;

4. Have a weighted average content of organic carbon in the upper soil to a depth of 40 cm that is less than 0.6 percent if the weighted average ratio of sand to noncarbonate clay for this depth is 1.0 or less, or is less than 0.15 percent if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13; or a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth more than the values just stated if there is a lithic or paralithic contact that is shallower than 40 cm but deeper than 18 cm;

5. Are dry in all parts of the moisture control section more than three-fourths of the time (cumulative) that the soil temperature is 5°C or higher at a depth of 50 cm; and

6. Do not have reddish peds below the calcic horizon that are weakly calcareous or noncalcareous but that are thickly coated with lime."

Page 171, first column and extending to page 172, first column. Delete the section, Distinctions between Typic Camborthids and other subgroups, and replace with the following key to subgroups and definition of Typic Camborthids:

"Key to subgroups

FBFA. Camborthids that have the following combination of characteristics:

1. Have a frigid or colder temperature regime and an aridic moisture regime that borders on an ustic regime;
2. Have a lithic contact within 50 cm of the surface; and

3. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm.

Borollic Lithic Camborthids

FBFB. Other Camborthids that have the following combination of characteristics:

1. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist;

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2. Have a lithic contact within 50 cm of the surface;

3. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

4. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Durixerollic Lithic Camborthids

FBFC. Other Camborthids that have the following combination of characteristics:

1. Have a lithic contact within 50 cm of the surface;

2. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

3. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Lithic Xerollic Camborthids

FBFD. Other Camborthids that have a lithic contact within 50 cm of the surface.

Lithic Camborthids

FBFE. Other Camborthids that have an SAR of more than 45 or 40 percent or more saturation with sodium throughout the cambic horizon and the saturated hydraulic conductivity is slow or very slow.

Natric Camborthids

FBFF. Other Camborthids that have the following combination of characteristics:

1. Have a frigid or colder temperature regime;

2. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon and the cracks are

not closed for as many as 60 consecutive days of the 120 days following the winter solstice in 3 or more years out of 10;

3. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm;

4. More than 35 percent clay in horizons that total of more than 50 cm in thickness; and

5. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm.

Borollic Vertic Camborthids

FBFG. Other Camborthids that have the following combination of characteristics:

1. Have a frigid or colder temperature regime and an aridic moisture regime that borders on an ustic regime; and

2. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm.

Borollic Camborthids

FBFH. Other Camborthids that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm;

3. More than 35 percent clay in horizons that total of more than 50 cm in thickness; and

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4. Have a thermic, mesic, or frigid soil temperature regime and have cracks that are closed for 60 consecutive days or more during the 120 days following the winter solstice in more than 7 years out of 10.

Xerertic Camborthids

FBFI. Other Camborthids that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm;

3. More than 35 percent clay in horizons that total of more than 50 cm in thickness; and

4. In most years, unless irrigated, have cracks that remain open for 175 to 240 days, cumulative and the cracks are not closed for as many as 60 consecutive days during the 120 days following the winter solstice in 3 or more years out of 10 if the soil temperature regime is thermic, mesic, or frigid

Ustertic Camborthids

FBFJ. Other Camborthids that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm;

3. More than 35 percent clay in horizons that total of more than 50 cm in thickness; and

4. Unless the soils are irrigated, the cracks remain open in most years for more than 240 days, cumulative, and are not closed in most years for as many as 60 consecutive days at any season.

Vertic Camborthids

FBFK. Other Camborthids that have the following combination of characteristics:

1. Are saturated with water for 90 consecutive days or more within 100 cm of the surface in most years or have any of the following characteristics within 100 cm of the soil surface if the soil of that zone is saturated

with water at some period in most years or the soil is artificially drained:

a. Dominant chroma of 1 or less throughout and hue of 2.5Y or yellow in some part,

b. Dominant chroma of 2 or less and mottles that are due to segregation of iron or manganese, or

c. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable Na) in more than half the thickness of the horizons between the surface and a depth of 50 cm than in the saturated zone; and

2. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.

Aquic Duric Camborthids

FBFL. Other Camborthids that are saturated with water for 90 consecutive days or more within 100 cm of the surface in most years or have any of the following characteristics within 100 cm of the soil surface if the soil of that zone is saturated with water at some period in most years or the soil is artificially drained:

1. Dominant chroma of 1 or less throughout and hue of 2.5Y or yellow in some part,

2. Dominant chroma of 2 or less and mottles that are due to segregation of iron or manganese, or

3. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable Na) in more than half the thickness of the horizons between the surface and a depth of 50 cm than in the saturated zone.

Aquic Camborthids

FBFM. Other Camborthids that:

1. Are dry in all parts of the moisture control section for three-fourths or less of the time (cumulative) that the soil temperature is 5° C or more at a depth of 50 cm unless the soil is irrigated and have an aridic moisture regime that borders on a xeric moisture regime; and

2. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

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(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrixerandic Camborthids

FBFN. Other Camborthids that:

1. Are dry in all parts of the moisture control section for three-fourths or less of the time (cumulative) that the soil temperature is 5° C or more at a depth of 50 cm unless the soil is irrigated and have an aridic moisture regime that borders on an ustic moisture regime and a hyperthermic, thermic, or mesic soil temperature regime; and

2. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrustrandic Camborthids

FBFO. Other Camborthids that have the following combination of characteristics:

1. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist;

2. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

3. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Durixerollic Camborthids

FBFP. Other Camborthids that have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.

Duric Camborthids

FBFQ. Other Camborthids that have a content of organic carbon that decreases irregularly with depth below a depth of 25 cm or, unless a lithic or paralithic contact occurs at a shallower depth, has a level of 0.2 percent or more at a depth 125 cm below the surface.

Fluventic Camborthids

FBFR. Other Camborthids that:

1. Have an anthropic epipedon; and

2. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm.

Anthropic Camborthids

FBFS. Other Camborthids that:

1. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

2. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and an aridic moisture regime that borders on a xeric regime.

Xerollic Camborthids

FBFT. Other Camborthids that:

1. Have a weighted average percentage of organic carbon in the upper 40 cm that is 0.6 percent or more if the weighted average ratio of sand to clay in the soil above that depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or have an intermediate

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percentage of organic carbon if the ratio of sand to clay is between 1.0 and 13; and a weighted average percentage of organic carbon in the soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a lithic or paralithic contact at a depth of less than 40 cm but more than 18 cm; and

2. Have an aridic moisture regime that borders on an ustic regime.

Ustollic Camborthids

FBFU. Other Camborthids that are dry in all parts of the moisture control section for three-fourths or less of the time (cumulative) that the soil temperature is 5°C or more at a depth of 50 cm unless the soil is irrigated and have an aridic moisture regime that borders on a xeric moisture regime.

Xerochreptic Camborthids

FBFV. Other Camborthids that are dry in all parts of the moisture control section for three-fourths or less of the time (cumulative) that the soil temperature is 5°C or more at a depth of 50 cm unless the soil is irrigated and have an aridic moisture regime that borders on an ustic moisture regime and a hyperthermic, thermic, or mesic soil temperature regime.

Ustochreptic Camborthids

FBFW. Other Camborthids.

Typic Camborthids

Definition of Typic Camborthids

Typic Camborthids are the Camborthids that

1. Are not saturated with water for 90 consecutive days or more within 100 cm of the surface in most years and do not have any of the following characteristics within 100 cm of the soil surface if the soil of that zone is saturated with water at some period in most years or the soil is artificially drained:

a. Dominant chroma of 1 or less throughout and hue as yellow or yellowish than 2.5Y in some part,

b. Dominant chroma of 2 or less and mottles that are due to segregation of iron or manganese, or

c. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable Na) in more than half the thickness of the horizons between the surface and a depth of 50 cm than in the saturated zone;

2. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist;

3. Do not have a lithic contact within 50 cm of the surface;

4. Have a weighted average organic-carbon content in the upper soil to a depth of 40 cm that is less than 0.6 percent if the weighted average ratio of sand to noncarbonate clay to this depth is 1.0 or less, or is less than 0.15 percent if the ratio is 13 or more, or an

intermediate weighted average percentage of organic carbon if the ratio is between 1.0 and 13; or a weighted average percentage of organic carbon in the upper soil to a depth of 18 cm that is not as much as one-fifth more than the values just stated if there is a lithic or paralithic contact shallower than 40 cm but deeper than 18 cm;

5. Are dry in all parts of the moisture control section for more than three-fourths of the time (cumulative) that the soil temperature is 5°C or more at a depth of 50 cm unless the soil is irrigated;

6. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

7. Have a content of organic carbon that decreases regularly with depth below a depth of 25 cm and, unless a lithic or paralithic contact occurs at a shallower depth, reaches a level of less than 0.2 percent at a depth 125 cm below the surface;

8. Have an SAR of 45 or less or less than 40 percent saturation with sodium throughout the cambic horizon if the saturated hydraulic conductivity is slow or very slow;

9. Do not have an anthropic epipedon; and

10. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 60 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 174, first column and extending to second column. Delete the section, Distinctions between Typic Durorthids and other subgroups, and replace

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with the following key to subgroups and definition of Typic Durorthids:

***Key to subgroups**

FBCA. Durorthids that have the following combination of characteristics:

1. Are saturated with water for 90 consecutive days or more in most years within 100 cm of the surface or have one or more subhorizons within 100 cm of the soil surface that has any of the following characteristics if the horizon is saturated with water at some period in most years or the soil is artificially drained:

- a. Dominant chroma of 1 or less throughout and hue of 2.5Y or yellower in some part;
- b. Dominant chroma of 2 or less accompanied by mottles that are not due to segregated lime; or
- c. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable sodium) in more than half the thickness of the horizons between the surface and 50 cm depth than in the saturated zone; and

2. Have a duripan that is not indurated in any subhorizon.

Aqueptic Durorthids

FBCB. Other Durorthids that are saturated with water for 90 consecutive days or more in most years within 100 cm of the surface or have one or more subhorizons within 100 cm of the soil surface that has any of the following characteristics if the horizon is saturated with water at some period in most years or the soil is artificially drained:

- 1. Dominant chroma of 1 or less throughout and hue of 2.5Y or yellower in some part;
- 2. Dominant chroma of 2 or less accompanied by mottles that are not due to segregated lime; or
- 3. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable sodium) in more than half the thickness of the horizons between the surface and 50 cm depth than in the saturated zone.

Aquic Durorthids

FBCC. Other Durorthids that:

- 1. Are dry in all parts of the moisture control section for three-fourths or less of the time that the soil temperature at a depth of 50 cm is 5° C or higher and have an aridic moisture regime that borders on a xeric regime; and
- 2. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrixerandic Durorthids

FBCD. Other Durorthids that:

1. Are dry in all parts of the moisture control section for three-fourths or less of the time that the soil temperature at a depth of 50 cm is 5° C or higher; and

2. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrustandic Durorthids

FBCE. Other Durorthids that have the following combination of characteristics:

1. Have a duripan that is not indurated in any subhorizon;

2. Have a duripan whose upper boundary is 18 cm or deeper and have a weighted average content of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average ratio of sand to noncarbonate clay above that depth is 1.0 or less or is 0.15 percent or more if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13; and

3. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and have an aridic moisture regime that borders on a xeric regime.

Haploxerollic Durorthids

FBCD. Other Durorthids that have the following combination of characteristics:

1. Have a duripan that is not indurated in any subhorizon;

2. Have a duripan whose upper boundary is 18 cm or deeper and have a weighted average content of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average ratio of sand to noncarbonate clay above that depth is 1.0 or less or is 0.15 percent or more if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13; and

3. Have an aridic moisture regime that borders on an ustic regime.

Haplustollic Durorthids

FBCF. Other Durorthids that have the following combination of characteristics:

1. Have a duripan whose upper boundary is 18 cm or deeper and have a weighted average content of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average ratio of sand to noncarbonate clay above that depth is 1.0 or less or is 0.15 percent or more if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13; and

2. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and have an aridic moisture regime that borders on a xeric regime.

Xerollic Durorthids

FBCF. Other Durorthids that are dry in all parts of the moisture control section for three-fourths or less of the time that the soil temperature at a depth of 50 cm is 5° C or higher and have an aridic moisture regime that borders on a xeric regime.

Xerochreptic Durorthids

FBCF. Other Durorthids that have the following combination of characteristics:

1. Have a duripan whose upper boundary is 18 cm or deeper and have a weighted average content of organic carbon in the upper soil to a depth of 40 cm that is 0.6 or more if the weighted average ratio of sand to noncarbonate clay above that depth is 1.0 or less or is 0.15 percent or more if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13; and

2. Have an aridic moisture regime that borders on an ustic regime.

Ustollic Durorthids

FBCG. Other Durorthids that are dry in all parts of the moisture control section for three-fourths or less of the time that the soil temperature at a depth of 50 cm is 5° C or higher.

Ustochreptic Durorthids

FBCF. Other Durorthids that have a duripan that is not indurated in any subhorizon

Entic Durorthids

FBCI. Other Durorthids.

Typic Durorthids

Definition of Typic Durorthids

Typic Durorthids are the Durorthids that

1. Are not saturated with water for 90 consecutive days or more in most years within 100 cm of the surface and do not have a subhorizon within 100 cm of the soil surface that has the following characteristics if the horizon is saturated with water at some period in most years or the soil is artificially drained:

a. Dominant chroma of 1 or less throughout and hue as yellow or yellower than 2.5Y in some part;

b. Dominant chroma of 2 or less accompanied by mottles that are not due to segregated lime; or

c. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable sodium) in more than half the thickness of the horizons between the surface and 50 cm depth than in the saturated zone;

2. Have a duripan that is indurated in some subhorizon;

3. Have one or more of the following:

a. A duripan whose upper boundary is shallower than 18 cm;

b. A weighted average content of organic carbon in the upper soil to a depth of 40 cm that is less than 0.6 if the weighted average ratio of sand to noncarbonate clay above that depth is 1.0 or less or is less than 0.15 percent if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13; or a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is not one-fifth more than the values just stated if there is a duripan shallower than 40 cm but deeper than 18 cm; or

c. A mean annual soil temperature of 22° C or higher, or mean summer and mean winter soil temperatures at a depth of 50 cm that differ by less than 5° C, or an aridic moisture regime that does not border on a xeric regime;

4. Are dry in all parts of the moisture control section for more than three-fourths of the time that the soil temperature at a depth of 50 cm is 5° C or higher; and

5. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 175, second column. Delete the section, Distinctions between Typic Gypsiorthids and other subgroups, and replace with the following key to subgroups and definition of Typic Gypsiorthids:

"Key to subgroups

FBDA. Gypsiorthids that have a petrogypsic horizon whose upper boundary is within 100 cm of the soil surface.

Petrogypsic Gypsiorthids

FBDB. Other Gypsiorthids that have a gypsic horizon in which the product of the percentage of gypsum and the thickness in centimeters above a depth of 150 cm is less than 3,000 and have a calcic horizon above the gypsic horizon.

Calcic Gypsiorthids

FBDC. Other Gypsiorthids that have a gypsic horizon in which the product of the percentage of gypsum and the thickness in centimeters above a depth of 150 cm is less than 3,000.

Cambic Gypsiorthids

FBDD. Other Gypsiorthids.

Typic Gypsiorthids

Definition of Typic Gypsiorthids

Typic Gypsiorthids are the Gypsiorthids that

1. Do not have a petrogypsic horizon whose upper boundary is within 100 cm of the soil surface; and
2. Have a gypsic horizon in which the product of the percentage of gypsum and the thickness in centimeters above a depth of 150 cm is 3,000 or more."

Page 176, first column and extending to second column. Delete the section, Distinctions between Typic Paleorthids and other subgroups, and replace with the following key to subgroups and definition of Typic Paleorthids:

"Key to subgroups

FBBA. Paleorthids that:

1. have a petrocalcic horizon whose upper boundary is 18 cm or deeper, and have a weighted average content of organic carbon in the upper soil to a depth of 40 cm that is 0.6 percent or more if the weighted average ratio of sand to noncarbonate clay to this depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13; and have a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a petrocalcic horizon that is shallower than 40 cm but deeper than 18 cm; and

2. Have a frigid or colder temperature regime and an aridic moisture regime that borders on an ustic regime.

Borollic Paleorthids

FBBB. Other Paleorthids that are saturated with water for 90 consecutive days or more in most years within 100 cm below the soil surface or have one or more subhorizons that has any of the following characteristics within 100 cm of the surface if the horizon is saturated with water at some period in most years or the soil is artificially drained:

1. Dominant chroma of 1 or less throughout and hue of 2.5Y or yellower in some part;

2. Dominant chroma of 2 or less and mottles that are not due to segregated lime; or

3. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable Na) in more than half the thickness of the horizons between the surface and 50 cm depth than in the saturated zone.

Aquic Paleorthids

FBBC. Other Paleorthids that:

1. have a petrocalcic horizon whose upper boundary is 18 cm or deeper, and have a weighted average content of organic carbon in the upper soil to a depth of 40 cm that is 0.6 percent or more if the weighted average ratio of sand to noncarbonate clay to this depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13; and have a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a petrocalcic horizon that is shallower than 40 cm but deeper than 18 cm; and

2. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and have an aridic moisture regime that borders on a xeric regime.

Xerollic Paleorthids

FBBD. Other Paleorthids that:

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1. have a petrocalcic horizon whose upper boundary is 18 cm or deeper, and have a weighted average content of organic carbon in the upper soil to a depth of 40 cm that is 0.6 percent or more if the weighted average ratio of sand to noncarbonate clay to this depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13; and have a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is one-fifth or more than the values just stated if there is a petrocalcic horizon that is shallower than 40 cm but deeper than 18 cm; and

2. Have an aridic moisture regime that borders on an ustic regime.

Ustollic Paleorthids

FBBE. Other Paleorthids that:

1. Are dry in all parts of the moisture control section for three-fourths or less of the time (cumulative) that the soil temperature is 5° C or higher at a depth of 50 cm; and

2. Have a mean annual soil temperature lower than 22° C, a mean summer and mean winter soil temperature at a depth of 50 cm that differs by 5° C or more, and have an aridic moisture regime that borders on a xeric regime.

Xerochreptic Paleorthids

FBBF. Other Paleorthids that:

1. Are dry in all parts of the moisture control section for three-fourths or less of the time (cumulative) that the soil temperature is 5° C or higher at a depth of 50 cm; and

2. Have a mesic, thermic, or hyperthermic soil temperature regime and an aridic moisture regime that borders on an ustic regime.

Ustochreptic Paleorthids

FBBG. Other Paleorthids.

Typic Paleorthids

Definition of Typic Paleorthids

Typic Paleorthids are the Paleorthids that

1. Are not saturated with water for 90 consecutive days or more in most years within 100 cm below the soil surface and do not have a subhorizon that has the following characteristics within 100 cm of the surface if the horizon is saturated with water at some period in most years or the soil is artificially drained. The soils do not have:

a. Dominant chroma of 1 or less throughout and hue as yellow or yellower than 2.5Y in some part;

b. Dominant chroma of 2 or less and mottles that are not due to segregated lime; or

c. Both a dominant chroma of 2 or less and a greater SAR (or percentage of exchangeable Na) in more than half the thickness of the

horizons between the surface and 50 cm depth than in the saturated zone;

2. Have a petrocalcic horizon whose upper boundary is shallower than 18 cm, or have a weighted average content of organic carbon in the upper soil to a depth of 40 cm that is less than 0.6 percent if the weighted average ratio of sand to noncarbonate clay to this depth is 1.0 or less, or is less than 0.15 percent if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13; or have a weighted average percentage of organic carbon in the surface soil to a depth of 18 cm that is not one-fifth more than the values just stated if there is a petrocalcic horizon that is shallower than 40 cm but deeper than 18 cm; and

3. Are dry in all parts of the moisture control section for more than three-fourths of the time (cumulative) that the soil temperature is 5° C or higher at a depth of 50 cm."

Page 177, second column. Delete the section, Distinctions between Typic Salorthids and other subgroups, and replace with the following key to subgroups and definition of Typic Salorthids:

"Key to subgroups

FBA. Salorthids that have a weighted average content of organic carbon in the upper soil to a depth of 40 cm that is 0.6 percent or more if the weighted average ratio of sand to noncarbonate clay to this depth is 1.0 or less, or is 0.15 percent or more if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13.

Aquollic Salorthids

FBAB. Other Salorthids.

Typic Salorthids

Definition of Typic Salorthids

Typic Salorthids are the Salorthids that have a weighted average content of organic carbon in the upper soil to a depth of 40 cm that is less than 0.6 percent if the weighted average ratio of sand to noncarbonate clay to this depth is 1.0 or less, or is less than 0.15 percent if the ratio is 13 or more, or is intermediate if the ratio of sand to clay is between 1.0 and 13."

Page 182, first column. Delete the section, Distinctions between Typic Cryaquents and other subgroups, and replace with the following key to subgroups and definition of Typic Cryaquents:

"Key to subgroups

KACA. Cryaquents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and

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cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- a. More than 30 percent volcanic glass: or
- b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Cryaquents

KACB. Other Cryaquents.

Typic Cryaquents

Definition of Typic Cryaquents

Typic Cryaquents are the Cryaquents that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- (1) More than 30 percent volcanic glass: or
- (2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 182, second column and extending to page 183, second column. Delete the section, Distinctions between Typic Fluvaquents and other subgroups, and replace with the following key to subgroups and definition of Typic Fluvaquents:

"Key to subgroups

KADA. Fluvaquents that have sulfidic materials within 100 cm of the mineral soil surface.

Sulfic Fluvaquents

KADB. Other Fluvaquents that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm,

that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;

2. The cracks are not open permanently.

3. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

4. More than 35 percent clay in horizons that total of more than 50 cm in thickness;

Vertic Fluvaquents

KADC. Other Fluvaquents that:

1. Have a buried Histosol or a buried histic epipedon that has its upper boundary within 100 cm of the soil surface; and

2. Have a difference of less than 5° C between the mean summer and mean winter soil temperatures at a depth of 50 cm or at a lithic or paralithic contact, whichever is shallower.

Thapto-Histic Tropic Fluvaquents

KADD. Other Fluvaquents that have a buried Histosol or a buried histic epipedon that has its upper boundary within 100 cm of the soil surface.

Thapto-Histic Fluvaquents

KADE. Other Fluvaquents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass: or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Fluvaquents

KADF. Other Fluvaquents that:

1. Have in more than 40 percent of the matrix in one or more subhorizons between the Ap horizon or a depth of 25 cm, whichever is

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deeper, and a depth of 75 cm, one or more of the following:

a. If mottled and

(1) If the hue is 2.5Y or redder¹ and the value, moist, is more than 5, the chroma, moist, is 3 or more;

(2) If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 2 or more; or

(3) If the hue is yellower than 2.5Y, the chroma, moist, is 3 or more; or

b. The chroma, moist, is 2 or more and there are no mottles; and

2. Have a difference of less than 5° C between the mean summer and mean winter soil temperatures at a depth of 50 cm or at a lithic or paralithic contact, whichever is shallower.
Aeric Tropic Fluvaquents

KADG. Other Fluvaquents that have in more than 40 percent of the matrix in one or more subhorizons between the Ap horizon or a depth of 25 cm, whichever is deeper, and a depth of 75 cm, one or more of the following:

1. If mottled and

a. If the hue is 2.5Y or redder² and the value, moist, is more than 5, the chroma, moist, is 3 or more;

b. If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 2 or more; or

c. If the hue is yellower than 2.5Y, the chroma, moist, is 3 or more; or

2. The chroma, moist, is 2 or more and there are no mottles.

Aeric Fluvaquents

KADH. Other Fluvaquents that have a difference of less than 5° C between the mean summer and mean winter soil temperatures at a depth of 50

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¹If the hue of the matrix is 7.5YR or redder and if peds are present, ped exteriors have dominant chroma, moist, of 1 or less, and ped interiors have mottles that have chroma, moist, of 2 or less; if peds are absent, the chroma, moist, is 1 or less immediately below any surface horizon that has value, moist, 3 or less.

²If the hue of the matrix is 7.5YR or redder and if peds are present, ped exteriors have dominant chroma, moist, of 1 or less, and ped interiors have mottles that have chroma, moist, of 2 or less; if peds are absent, the chroma, moist, is 1 or less immediately below any surface horizon that has value, moist, 3 or less.

cm or at a lithic or paralithic contact, whichever is shallower.

Tropic Fluvaquents

KADI. Other Fluvaquents that:

1. Have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less when crushed and smoothed, or the A horizon is 15 cm or more thick and has these colors; and

2. Have base saturation (by NH₄OAc) of less than 50 percent in some horizon and does not increase to 50 percent or more within a depth of 100 cm below the soil surface.

Humaqueptic Fluvaquents

KADJ. Other Fluvaquents that:

1. Have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less when crushed and smoothed, or the A horizon is 15 cm or more thick and has these colors; and

2. Have base saturation (by NH₄OAc) of 50 percent or more throughout the soil or increases to 50 percent or more within a depth of 100 cm below the soil surface.

Mollic Fluvaquents

KADK. Other Fluvaquents.

Typic Fluvaquents

Definition of Typic Fluvaquents

Typic Fluvaquents are the Fluvaquents that

1. Have, in 60 percent or more of the matrix in all subhorizons between the Ap horizon or a depth of 25 cm, whichever is deeper, and a depth of 75 cm, one or more of the following:

a. If mottled and

(1) If the hue is 2.5Y or redder¹ and the value, moist, is more than 5, the chroma, moist, is 2 or less;

(2) If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 1 or less; or

(3) If the hue is yellower than 2.5Y, the chroma, moist, is 2 or less; or

b. The chroma, moist, is 1 or less and mottles may or may not be present;

2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

¹If the hue of the matrix is 7.5YR or redder and if peds are present, ped exteriors have dominant chroma, moist, of 1 or less, and ped interiors have mottles that have chroma, moist, of 2 or less; if peds are absent, the chroma, moist, is 1 or less immediately below any surface horizon that has value, moist, 3 or less.

- a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
- b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
- c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:
- (1) More than 30 percent volcanic glass; or
 - (2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;
3. Do not have the following combination of characteristics:
- a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;
 - b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm;
 - c. More than 35 percent clay in horizons that total of more than 50 cm in thickness; and
 - d. The cracks are not open permanently;
4. Have an Ap horizon that has a color value, moist, of 4 or more or has a color value, dry, of 6 or more when crushed and smoothed, or the A horizon is less than 15 cm thick if its color value, moist, is 3 or less;
5. Do not have a buried Histosol or a buried histic epipedon that has its upper boundary within 100 cm of the soil surface;
6. Do not have sulfidic materials within 100 cm of the mineral soil surface; and
7. Have a difference of 5° C or more between the mean summer and mean winter soil temperatures at a depth of 50 cm or at a lithic or paralithic contact, whichever is shallower."

Page 184, second column and extending to page 185, first column. Delete the section, Distinctions between Typic Haplaquents and other subgroups, and replace with the following key to subgroups and definition of Typic Haplaquents:

*Key to subgroups

KAGA. Haplaquents that have sulfidic materials within 100 cm of the mineral soil surface.
Sulfic Haplaquents

KAGB. Other Haplaquents that have a lithic contact within 50 cm of the soil surface.
Lithic Haplaquents

KAGC. Other Haplaquents that have in more than 40 percent of the matrix in one or more subhorizons between the Ap horizon or a depth of 25 cm, whichever is deeper, and 75 cm one or more of the following:

1. If mottled and

a. If the hue is 2.5Y or redder¹ and the value, moist, is more than 5, the chroma, moist, is 3 or more;

b. If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 2 or more;

c. If the hue is yellower than 2.5Y, the chroma, moist, is 3 or more; or

2. The chroma, moist, is 2 or more if there are no mottles.

Aeric Haplaquents

KAGD. Other Haplaquents that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less when crushed and smoothed, or the A horizon is 15 cm or more thick and has these colors.

Mollic Haplaquents

KAGE. Other Haplaquents.

Typic Haplaquents

Definition of Typic Haplaquents

Typic Haplaquents are the Haplaquents that

1. Have in 60 percent or more of the matrix in all subhorizons between the Ap horizon or a depth of 25 cm, whichever is deeper, and 75 cm one or more of the following:

a. If mottled and

(1) If the hue is 2.5Y or redder² and the value, moist, is more than 5, the chroma, moist, is 2 or less;

(2) If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 1 or less;

(3) If the hue is yellower than 2.5Y, the chroma, moist, is 2 or less; or

b. The chroma, moist, is 1 or less and mottles may or may not be present;

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¹See footnote 4 on p. 182.

²See footnote 4 on p. 182.

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2. Have an Ap horizon that has a color value, moist, of 4 or more or that has a color value, dry, of 6 or more when crushed and smoothed, or the A1 horizon is less than 15 cm thick if its color value, moist, is 3 or less;
3. Do not have a lithic contact within 50 cm of the soil surface; and
4. Do not have sulfidic materials within 100 cm of the mineral soil surface."

Page 185, second column. Following item 3 of the definition of Hydraquents, insert:

"Key to subgroups

KABA. All Hydraquents (provisionally).
Typic Hydraquents"

Page 186, first column. Delete the section, Distinctions between Typic Psammaquents and other subgroups, and replace with the following key to subgroups and definition of Typic Psammaquents:

"Key to subgroups

KAFA. Psammaquents that have a lithic contact within 50 cm of the soil surface.
Lithic Psammaquents

KAFB. Other Psammaquents that have an albic horizon at the surface or immediately under an A or Ap horizon that, in turn, is underlain by another horizon that has a color value more than one unit darker or that has chroma of 6 or more.
Spodic Psammaquents

KAFC. Other Psammaquents that:

1. Have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less when crushed and smoothed, or the A horizon is 15 cm or more thick and has these colors; and
2. Have base saturation (by NH_4OAc) of less than 50 percent in more than half the thickness of the subhorizons within the upper 100 cm.

Humaqueptic Psammaquents

KADD. Other Psammaquents that:

1. Have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less when crushed and smoothed, or the A horizon is 15 cm or more thick and has these colors; and
2. Have base saturation (by NH_4OAc) of 50 percent or more in more than half the thickness of the subhorizons within the upper 100 cm.

Mollic Psammaquents

KADE. Other Psammaquents.
Typic Psammaquents

Definition of Typic Psammaquents

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Typic Psammaquents are the Psammaquents that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Have an Ap horizon that has a color value, moist, of 4 or more or has a value, dry, of 6 or more when crushed and smoothed (smoothed with a knife to eliminate shadows), or the A horizon is less than 15 cm thick if its color value, moist, is 3 or less; and
3. Do not have an albic horizon at the surface or immediately under an A or Ap horizon that, in turn, is underlain by another horizon that has a color value more than one unit darker or that has chroma of 6 or more."

Page 187, first column. Delete the section, Definition of Typic Sulfaquents, and replace with the following key to subgroups and definition of Typic Sulfaquents:

Key to subgroups

KAAA. Sulfaquents that have sulfidic materials at a depth of 30 cm or more and an n value of less than 1.
Haplic Sulfaquents

KAAB. Other Sulfaquents.
Typic Sulfaquents

Definition of Typic Sulfaquents

Typic Sulfaquents are the Sulfaquents that have sulfidic materials within 30 cm if the n value is less than 1."

Page 187, second column (Also see NSTH issue No. 12, page 615-168). Delete the sections, Definitions of subgroups (of Udarents and Xerarents), and replace with the following key to subgroups (of Udarents and Xerarents):

Key to subgroups

KBDA. Udarents that have fragments of an argillic horizon that has base saturation (by sum of cations) that is 35 percent or more within the upper 100 cm of the soil.
Alfic Udarents

KBDB. Other Udarents that have fragments of an argillic horizon within the upper 100 cm of the soil.
Ultic Udarents

KBDC. Other Udarents that have fragments of a mollic epipedon within the upper 100 cm of the soil.
Mollic Udarents

KBDC. Other Udarents.
Udarents

Key to subgroups

KBBA. Xerarents that have fragments of an argillic horizon that has base saturation (by sum of cations) that is 35 percent or more within the upper 100 cm of the soil.
Alfic Xerarents

KBBB. Other Xerarents.
Xerarents"

Page 188, second column and extending to page 189, first column. Delete the section, Distinctions between Typic Cryofluvents and other subgroups, and replace with the following key to subgroups and definition of Typic Cryofluvents:

"Key to subgroups

KDAA. Cryofluvents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.
Andic Cryofluvents

KDAB. Other Cryofluvents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- a. More than 30 percent volcanic glass; or
- b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Cryofluvents

KDAC. Other Cryofluvents that have mottles that have chroma of 2 or less within 50 cm of the soil surface.

Aquic Cryofluvents

KDAD. Other Cryofluvents that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less when crushed and smoothed, or the A horizon is 15 cm or more thick and has these colors.

Mollic Cryofluvents

KDAE. Other Cryofluvents.

Typic Cryofluvents

Definition of Typic Cryofluvents

Typic Cryofluvents are the Cryofluvents that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:
 - a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable

aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- (1) More than 30 percent volcanic glass; or
- (2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have mottles that have chroma of 2 or less within 50 cm of the soil surface; and

3. Have an Ap horizon that has a color value, moist, of 4 or more or has a color value, dry, of 6 or more when crushed and smoothed, or the A horizon is less than 15 cm thick if its color value, moist, is 3 or less."

Page 189, second column. Delete the section, Distinctions between Typic Torrifluvents and other subgroups, and replace with the following key to subgroups and definition of Typic Torrifluvents:

"Key to subgroups

KDDA. Torrifluvents that:

1. Have all three of the following characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

c. More than 35 percent clay in horizons that total of more than 50 cm in thickness within the upper 100 cm; and

2. Unless the soils are irrigated, the cracks remain open in most years from 175 to 240 days, cumulative, and are not closed for as many as 60 consecutive days during the 120 days following the winter solstice in 3 or more years out of 10 if the soil temperature regime is thermic, mesic, or frigid.

Ustertic Torrifluvents

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KDDB. Other Torrifuvents that have all three of the following characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

3. More than 35 percent clay in horizons that total of more than 50 cm in thickness within the upper 100 cm.

Vertic Torrifuvents

KDDC. Other Torrifuvents that:

1. Are dry in all parts of the moisture control section for less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or more and they have a thermic, mesic, or frigid soil temperature regime and a torric moisture regime that borders on a xeric regime; and

2. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass: or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrixerandic Torrifuvents

KDDD. Other Torrifuvents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass: or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Torrifuvents

KDDE. Other Torrifuvents that:

1. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains as much as 20 percent durinodes or is brittle and has firm consistence when moist; and

2. Are dry in all parts of the moisture control section for less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or more and they have a thermic, mesic, or frigid soil temperature regime and a torric moisture regime that borders on a xeric regime.

Durorthidic Xeric Torrifuvents

KDDD. Other Torrifuvents that have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains as much as 20 percent durinodes or is brittle and has firm consistence when moist.

Durorthidic Torrifuvents

KDDE. Other Torrifuvents that are dry in all parts of the moisture control section for less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or more and they have a torric moisture regime that borders on an ustic regime.

Ustic Torrifuvents

KDDF. Other Torrifuvents that are dry in all parts of the moisture control section for less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or more and they have a thermic, mesic, or frigid soil temperature regime and a torric moisture regime that borders on a xeric regime.

Xeric Torrifuvents

KDDG. Other Torrifuvents that have an anthropic epipedon.

Anthropic Torrifuvents

KDDH. Other Torrifuvents.

Typic Torrifuvents

Definition of Typic Torrifuvents

Typic Torrifuvents are the Torrifuvents that

1. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains as much as 20 percent durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist;

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2. Do not have all three of the following characteristics:

- a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;
- b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and
- c. More than 35 percent clay in horizons that total of more than 50 cm in thickness within the upper 100 cm;

3. Do not have an anthropic epipedon;

4. Are dry in all parts of the moisture control section three-fourths or more of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or more; and

5. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

- a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
- b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 191, first column. Delete the section, Distinctions between Typic Udifluvents and other subgroups, and replace with the following key to subgroups and definition of Typic Udifluvents:

"Key to subgroups

KDFA. Udifluvents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Udifluvents

KDFB. Other Udifluvents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Udifluvents

KDFC. Other Udifluvents that have mottles within 50 cm of the surface that have chroma of 2 or less or, at a depth between 50 and 100 cm, have one or more horizons that are saturated with water at some period or that are artificially drained and have chroma less than 1 or hue bluer than 10Y and value, moist, of 4 or more.

Aquic Udifluvents

KDFD. Other Udifluvents that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less when crushed and smoothed, or the A horizon is 15 cm or more thick and has these colors.

Mollic Udifluvents

KDFE. Other Udifluvents.

Typic Udifluvents

Definition of Typic Udifluvents

Typic Udifluvents are the Udifluvents that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

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2. Do not have mottles within 50 cm of the surface that have chroma of 2 or less or, at a depth between 50 and 100 cm, do not have any horizons that are saturated with water at some period or that are artificially drained and have chroma less than 1 or hue bluer than 10Y and value, moist, of 4 or more; and

3. Have an Ap horizon that has a color value, moist, of 4 or more or has a color value, dry, of 6 or more when crushed and smoothed, or the A horizon is less than 15 cm thick if its color value, moist, is 3 or less."

Page 192, second column. Delete the section, Distinctions between Typic Ustifluvents and other subgroups, and replace with the following key to subgroups and definition of Typic Ustifluvents:

"Key to subgroups

KDCA. Ustifluvents that have the following combination of characteristics:

1. Cracks at some period in most years, when the soil is not irrigated, that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; and

3. More than 35 percent clay in horizons that total of more than 50 cm in thickness.

Vertic Ustifluvents

KDCB. Other Ustifluvents that have mottles within 50 cm of the surface that have chroma of 2 or less or have, at a depth within 150 cm of the surface, a horizon that is saturated with water at some period or is artificially drained and that has chroma less than 1 or a hue bluer than 10Y.

Aquic Ustifluvents

KDCC. Other Ustifluvents that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less when crushed and smoothed, or the A horizon is 15 cm or more thick and has these colors.

Mollic Ustifluvents

KDCD. Other Ustifluvents.

Typic Ustifluvents

Definition of Typic Ustifluvents

Typic Ustifluvents are the Ustifluvents that

1. Do not have mottles within 50 cm of the surface that have chroma of 2 or less and do not have, at a depth within 150 cm of the surface, a horizon that is saturated with water at some period or is artificially drained and that has chroma less than 1 or a hue bluer than 10Y; and

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2. Do not have the following combination of characteristics:

a. Cracks at some period in most years, when the soil is not irrigated, that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; and

c. More than 35 percent clay in horizons that total of more than 50 cm in thickness.

3. Have an Ap horizon that has a color value, moist, of 4 or more or has a color value, dry, of 6 or more when crushed and smoothed, or the A horizon is less than 15 cm thick if its color value, moist, is 3 or less"

Page 193, second column. Delete the section, Distinctions between Typic Xerofluvents and other subgroups, and replace with the following key to subgroups and definition of Typic Xerofluvents:

"Key to subgroups

KDBA. Xerofluvents that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

3. More than 35 percent clay in horizons that total of more than 50 cm in thickness.

Vertic Xerofluvents

KDBB. Other Xerofluvents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Xerofluvents

KDBC. Other Xerofluvents that:

1. Are saturated with water within 150 cm of the surface during any period in most years; and
2. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or that is brittle and has firm consistence when moist.

Aquic Durorthidic Xerofluvents

KDBD. Other Xerofluvents that are saturated with water within 150 cm of the surface during any period in most years.

Aquic Xerofluvents

KDBE. Other Xerofluvents that have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or that is brittle and has firm consistence when moist.

Durorthidic Xerofluvents

KDBF. Other Xerofluvents that have an Ap horizon that has a color value, moist, of 3 or less and a color value, dry, of 5 or less when crushed and smoothed, or the A horizon is 15 cm or more thick and has these colors.

Mollic Xerofluvents

KDBG. Other Xerofluvents.

Typic Xerofluvents

Definition of Typic Xerofluvents

Typic Xerofluvents are the Xerofluvents that

1. Are not saturated with water within 150 cm of the surface during any period in most years;
2. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes in a nonbrittle matrix or that is brittle and has firm consistence when moist;
3. Do not have the following combination of characteristics:
 - a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;
 - b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

c. More than 35 percent clay in horizons that total of more than 50 cm in thickness;

4. Have an Ap horizon that has a color value, moist, of 4 or more or has a color value, dry, of 6 or more when crushed and smoothed, or the A horizon is less than 15 cm thick if its color value, moist, is 3 or less; and

5. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 195, second column. Delete the section, Distinctions between Typic Cryorthents and other subgroups, and replace with the following key to subgroups and definition of Typic Cryorthents:

"Key to subgroups

KEAA. Cryorthents that have a lithic contact within 50 cm of the soil surface.

Lithic Cryorthents

KEAB. Other Cryorthents that have a mean annual soil temperature that is 0° C or lower.

Pergelic Cryorthents

KEAC. Other Cryorthents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Cryorthents

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KEAD. Other Cryorthents that have mottles that have chroma of 2 or less within 50 cm of the soil surface.

Aquic Cryorthents

KEAE. Other Cryorthents that have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness.

Alfic Cryorthents

KEAF. Other Cryorthents.

Typic Cryorthents

Definition of Typic Cryorthents

Typic Cryorthents are the Cryorthents that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have mottles that have chroma of 2 or less within 50 cm of the soil surface;

3. Do not have a lithic contact within 50 cm of the soil surface;

4. Have a mean annual soil temperature that is higher than 0°C; and

5. Do not have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness.¹²

Page 196, second column and extending to page 197, first column. Delete the section, Distinctions between Typic Torriorthents and other subgroups, and replace with the following key to subgroups and definition of Typic Torriorthents:

*Key to subgroups

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¹²The clay content cannot be estimated with precision in lamellae that are very thin. The lamellae in soils of alfic subgroups generally are about 0.5 to 1 cm thick, but their total thickness is less than the 15 cm required for an argillic horizon.

KEBA. Torriorthents that:

1. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

2. Unless irrigated, they have cracks that remain open from 175 to 240 days, cumulative, and are not closed for as many as 60 consecutive days during the 120 days following the winter solstice in 3 or more years out of 10 if the soil temperature regime is thermic, mesic, or frigid.

Ustertic Torriorthents

KEBB. Other Torriorthents that:

1. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

2. Have a thermic, mesic, or frigid soil temperature regime and have cracks that are closed for 60 consecutive days or more during the 120 days following the winter solstice in more than 7 years out of 10.

Xerertic Torriorthents

KEBC. Other Torriorthents that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Torriorthents

KEBD. Other Torriorthents that:

1. Have a lithic contact within 50 cm of the surface; and

2. Are dry in all parts of the moisture control section less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher and they either (1) have a hyperthermic or an iso soil temperature regime or (2) have a thermic, mesic or frigid soil temperature regime and have an aridic moisture regime that borders on an ustic regime.

Lithic Ustic Torriorthents

KEBE. Other Torriorthents that:

1. Have a lithic contact within 50 cm of the surface; and

2. Are dry in all parts of the moisture control section less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher and they have a thermic, mesic, or frigid soil temperature regime and an aridic moisture regime that borders on a xeric regime.

Lithic Xeric Torriorthents

KEBF. Other Torriorthents that have a lithic contact within 50 cm of the surface.

Lithic Torriorthents

KEBG. Other Torriorthents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-

aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Torriorthents

KEBH. Other Torriorthents that:

1. Are saturated with water within 150 cm of the surface at any time of year in most years; and

2. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.

Aquic Durorthidic Torriorthents

KEBI. Other Torriorthents that are saturated with water within 150 cm of the surface at any time of year in most years.

Aquic Torriorthents

KEBJ. Other Torriorthents that:

1. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist; and

2. Are dry in all parts of the moisture control section less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher and they have a thermic, mesic, or frigid soil temperature regime and have a torric moisture regime that borders on a xeric regime.

Durorthidic Xeric Torriorthents

KEBK. Other Torriorthents that have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.

Durorthidic Torriorthents

KEBL. Other Torriorthents that are dry in all parts of the moisture control section less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher and they either (1) have a hyperthermic or an iso soil temperature regime or (2) have a thermic, mesic, or a frigid soil temperature regime and have an aridic moisture regime that borders on an ustic regime.

Ustic Torriorthents

KEBM. Other Torriorthents that are dry in all parts of the moisture control section less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher and they have a thermic, mesic, or frigid soil temperature regime and a torric moisture regime that borders on a xeric regime.

Xeric Torriorthents

KEBN. Other Torriorthents.

Typic Torriorthents

Definition of Typic Torriorthents

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Typic Torriorthents are the Torriorthents that

1. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist;

2. Do not have a lithic contact within 50 cm of the surface;

3. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

4. Are dry in all parts of the moisture control section three-fourths or more of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher;

5. Are not saturated with water within 150 cm of the surface at any time of year in most years; and

6. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 198, second column and extending to page 199, first column. Delete the section, Distinctions between Typic Troporthents and other subgroups, and replace with the following key to subgroups and definition of Typic Troporthents:

"Key to subgroups

KEDA. Troporthents that have a lithic contact within 50 cm of the soil surface.

Lithic Troporthents

KEDE. Other Troporthents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Troporthents

KEDC. Other Troporthents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Troporthents

KEDD. Other Troporthents.

Typic Troporthents

Definition of Typic Troporthents

Typic Troporthents are the Troporthents that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more; and

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2. Do not have a lithic contact within 50 cm of the soil surface."

Page 199, second column. Delete the section, Distinctions between Typic Udorthents and other subgroups, and replace with the following key to subgroups and definition of Typic Udorthents:

"Key to subgroups

KEEA. Udorthents that have a lithic contact within 50 cm of the surface.

Lithic Udorthents

KEEB. Other Udorthents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Udorthents

KEEC. Other Udorthents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass: or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandid Udorthents

KEED. Other Udorthents that are saturated with water for as long as 1 month within 150 cm of the surface.

Aquic Udorthents

KEEE. Other Udorthents that have 50 percent or more by volume of wormholes, wormcasts, and filled animal burrows between the bottom of the Ap horizon or a depth of 25 cm, whichever is deeper, and either a depth of 100 cm or a lithic or paralithic contact if one is present above a depth of 100 cm.

Vermic Udorthents

KEEF. Other Udorthents.

Typic Udorthents

Definition of Typic Udorthents

Typic Udorthents are the Udorthents that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass: or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Are not saturated with water for as long as 1 month within 150 cm of the surface;

3. Do not have a lithic contact within 50 cm of the surface; and

4. Have less than 50 percent by volume of wormholes, wormcasts, and filled animal burrows between the bottom of the Ap horizon or a depth of 25 cm, whichever is deeper, and either a depth of 100 cm or a lithic or paralithic contact if one is present above a depth of 100 cm."

Page 200, second column. Delete the section, Distinctions between Typic Ustorthents and other subgroups, and replace with the following key to subgroups and definition of Typic Ustorthents:

"Key to subgroups

KEFA. Ustorthents that have a lithic contact within 50 cm of the surface.

Lithic Ustorthents

KEFB. Other Ustorthents that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon; and

2. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; and

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3. More than 35 percent clay in horizons that total more than 50 cm in thickness.
Vertic Ustorthents

KEFC. Other Ustorthents that are saturated with water within 150 cm of the surface for as long as 1 month in most years.
Aquic Ustorthents

KEFD. Other Ustorthents that have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.
Durorthidic Ustorthents

KEFE. Other Ustorthents that have 50 percent or more (by volume) wormholes, wormcasts, and filled animal burrows between the bottom of the Ap horizon or a depth of 25 cm, whichever is deeper, and a depth of 100 cm or a lithic or paralithic or petroferic contact, whichever is shallower.
Vermic Ustorthents

KEFF. Other Ustorthents.
Typic Ustorthents

Definition of Typic Ustorthents

Typic Ustorthents are the Ustorthents that

1. Are not saturated with water within 150 cm of the surface for as long as 1 month in most years;
2. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist;
3. Do not have a lithic contact within 50 cm of the surface;
4. Have less than 50 percent (by volume) wormholes, wormcasts, and filled animal burrows between the bottom of the Ap horizon or a depth of 25 cm, whichever is deeper, and a depth of 100 cm or a lithic or paralithic or petroferic contact, whichever is shallower; and
5. Do not have the following combination of characteristics:
 - a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon; and
 - b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; and
 - c. More than 35 percent clay in horizons that total more than 50 cm in thickness."

Page 201, second column. Delete the section, Distinctions between Typic Xerorthents and

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other subgroups, and replace with the following key to subgroups and definition of Typic Xerorthents:

*Key to subgroups

KECA. Xerorthents that have a lithic contact within 50 cm of the soil surface.
Lithic Xerorthents

KECB. Other Xerorthents that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandidic Xerorthents

KECC. Other Xerorthents that:

1. Are saturated with water within 150 cm of the surface at any time of year in most years; and

2. Have a horizon within 100 cm of the surface that is more than 15 cm thick, that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.

Aquic Durorthidic Xerorthents

KECD. Other Xerorthents that are saturated with water within 150 cm of the surface at any time of year in most years.
Aquic Xerorthents

KECE. Other Xerorthents that have a horizon within 100 cm of the surface that is more than 15 cm thick, that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.
Durorthidic Xerorthents

KECF. Other Xerorthents that have base saturation (by NH₄ OAc) of less than 60 percent in all parts of the soil between depths of 25 and 75 cm below the soil surface.
Dystric Xerorthents

KEDG. Other Xerorthents.
Typic Xerorthents

Definition of Typic Xerorthents

Typic Xerorthents are the Xerorthents that

1. Are not saturated with water within 150 cm of the surface at any time of year in most years;
2. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick, that either contains 20 percent or more durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist;
3. Do not have a lithic contact within 50 cm of the soil surface;
4. Have base saturation (by NH_4OAc) of 60 percent or more in some part of the soil between depths of 25 and 75 cm below the soil surface; and
5. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus $1/2$ acid-oxalate-extractable iron of 0.40 percent or more."

Page 202, second column. Delete the section, Distinctions between Typic Cryopsamments and other subgroups, and replace with the following key to subgroups and definition of Typic Cryopsamments:

"Key to subgroups

KCAA. Cryopsamments that have a lithic contact within 50 cm of the soil surface.

Lithic Cryopsamments

KCAB. Other Cryopsamments that have a mean annual soil temperature that is 0°C or lower.

Pergelic Cryopsamments

KCAC. Other Cryopsamments that have mottles that have chroma of 2 or less within 50 cm of the soil surface.

Aquic Cryopsamments

KCAD. Other Cryopsamments that have an albic horizon that is 5 cm or more thick and underlain by a horizon that has a color value one unit or more darker and that meets all requirements of a spodic horizon except the index of accumulation.

Spodic Cryopsamments

KCAE. Other Cryopsamments that have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness.

Alfic Cryopsamments

KCAF. Other Cryopsamments.

Typic Cryopsamments

Definition of Typic Cryopsamments

Typic Cryopsamments are the Cryopsamments that

1. Do not have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness;
2. Do not have mottles that have chroma of 2 or less within 50 cm of the soil surface;
3. Have a mean annual soil temperature that is higher than 0°C ;
4. Do not have a lithic contact within 50 cm of the soil surface; and
5. Do not have an albic horizon that is 5 cm or more thick and underlain by a horizon that has a color value one unit or more darker and that meets all requirements of a spodic horizon except the index of accumulation."

Page 203, second column and extending to 204, first column. Delete the section, Distinctions between Typic Quartsipsamments and other subgroups, and replace with the following key to subgroups and definition of Typic Quartsipsamments:

"Key to subgroups

KCCA. Quartsipsamments that have a lithic contact within 50 cm of the soil surface.

Lithic Quartsipsamments

KCCB. Other Quartsipsamments that:

1. Have mottles above a depth of 100 cm that have chroma of 2 or less or, if the color is due to uncoated sand grains, have the water table within 100 cm of the soil surface for 60 or more days, cumulative, in most years;
2. Have an albic horizon²⁰ at the surface or immediately under an A or an Ap horizon that is underlain by another horizon that has a color value more than one unit darker or chroma of 6 or more; and

3. Have a difference of less than 5°C between the mean winter and mean summer soil temperatures at a depth of 50 cm.

Tropaquodic Quartsipsamments

KCCC. Other Quartsipsamments that:

1. Have mottles above a depth of 100 cm that have chroma of 2 or less or, if the color is due to uncoated sand grains, have a water table within 100 cm of the soil surface for 60 or more days, cumulative, in most years; and

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²⁰The albic horizon must be thick enough to be preserved after the soil to a depth of 18 cm is mixed.

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2. Have an albic horizon²⁰ at the surface or immediately under an A or an Ap horizon that is underlain by another horizon that has a color value more than one unit darker or chroma of 6 or more.

Haplaquodic Quartzipsamments

KCCD. Other Quartzipsamments that have mottles above a depth of 100 cm that have chroma of 2 or less or, if the color is due to uncoated sand grains, have the water table within 100 cm of the soil surface for 60 or more days, cumulative, in most years.

Aquic Quartzipsamments

KCCE. Other Quartzipsamments that:

1. Have an ustic moisture regime; and
2. Have a clay fraction that has a CEC equal to that of the clay of an oxic horizon and have enough clay to coat at least 75 percent of the surfaces of the sand grains.

Ustoxic Quartzipsamments

KCCF. Other Quartzipsamments that

1. Have an udic moisture regime; and
2. Have a clay fraction that has a CEC equal to that of the clay of an oxic horizon and have enough clay to coat at least 75 percent of the surfaces of the sand grains.

Orthoxic Quartzipsamments

KCCG. Other Quartzipsamments that have 5 percent or more plinthite in one or more subhorizons above a depth of 100 cm.

Plinthic Quartzipsamments

KCCH. Other Quartzipsamments that have an ustic moisture regime.

Ustic Quartzipsamments

KCCI. Other Quartzipsamments that have a xeric moisture regime.

Xeric Quartzipsamments

KCCJ. Other Quartzipsamments that have an albic horizon²⁰ at the surface or immediately under an A or an Ap horizon that is underlain by another horizon that has a color value more than one unit darker or chroma of 6 or more.

Spodic Quartzipsamments

KCCK. Other Quartzipsamments.

Typic Quartzipsamments

Definition of Typic Quartzipsamments

Typic Quartzipsamments are the Quartzipsamments that

1. Do not have mottles above a depth of 100 cm that have chroma of 2 or less or, if the color is due to uncoated sand grains, do not have the water table

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²⁰The albic horizon must be thick enough to be preserved after the soil to a depth of 18 cm is mixed.

²⁰The albic horizon must be thick enough to be preserved after the soil to a depth of 18 cm is mixed.

within 100 cm of the soil surface for as many as 60 days, cumulative, in most years;

2. Do not have an albic horizon²⁰ at the surface or immediately under an A or an Ap horizon that is underlain by another horizon that has a color value more than one unit darker or chroma of 6 or more;

3. Do not have a lithic contact within 50 cm of the soil surface;

4. Have a clay fraction that has a higher CEC than that of the clay of an oxic horizon or more than 25 percent of the surfaces of sand grains are uncoated;

5. Have less than 5 percent plinthite in all horizons above a depth of 100 cm; and

6. Have a udic moisture regime."

Page 205, first column. Delete the section, Distinctions between Typic Torripsamments and other subgroups, and replace with the following key to subgroups and definition of Typic Torripsamments:

*Key to subgroups

KCBA. Torripsamments that have a lithic contact within 50 cm of the soil surface.

Lithic Torripsamments

KCBB. Other Torripsamments that:

1. Have a horizon within 100 cm of the surface that is more than 15 cm thick and either contains 20 percent or more durinodes or is brittle and has firm consistence when moist; and

2. Are dry in all parts of the moisture control section for less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher and have a thermic, mesic, or frigid soil temperature regime and a torric moisture regime that borders on xeric.

Durorthidic Xeric Torripsamments

KCBC. Other Torripsamments that have a horizon within 100 cm of the surface that is more than 15 cm thick and either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.

Durorthidic Torripsamments

KCBD. Other Torripsamments that are dry in all parts of the moisture control section less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher and have a torric moisture regime that borders on an ustic regime.

Ustic Torripsamments

KCBE. Other Torripsamments that are dry in all parts of the moisture control section less than three-fourths of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or

²⁰The albic horizon must be thick enough to be preserved after the soil to a depth of 18 cm is mixed.

higher and have a thermic, mesic, or frigid soil temperature regime and a torric moisture regime that borders on an xeric regime.

Xeric Torripsamments

KCBF. Other Torripsamments.
Typic Torripsamments

Definition of Typic Torripsamments

Typic Torripsamments are the Torripsamments that

1. Do not have a lithic contact within 50 cm of the soil surface;
2. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick and either contains 20 percent or more durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist; and
3. Are dry in all parts of the moisture control section three-fourths or more of the time (cumulative) that the soil temperature at a depth of 50 cm is 5° C or higher."

Page 205, second column. Delete the section, Distinctions between Typic Tropopsamments and other subgroups, and replace with the following key to subgroups and definition of Typic Tropopsamments:

"Key to subgroups

KCEA. Tropopsamments that have a lithic contact within 50 cm of the soil surface.
Lithic Tropopsamments

KCEB. Tropopsamments that have mottles above a depth of 100 cm that have chroma of 2 or less, or if the color is due to uncoated sand grains, have a ground-water table within 100 cm of the soil surface for 60 or more cumulative days in most years.
Aquic Tropopsamments

KCEC. Other Tropopsamments.
Typic Tropopsamments

Definition of Typic Tropopsamments

Typic Tropopsamments are the Psamments that

1. Do not have a lithic contact within 50 cm of the soil surface; and
2. Do not have mottles above a depth of 100 cm that have chroma of 2 or less, or if the color is due to uncoated sand grains, have a ground-water table within 100 cm of the soil surface for less than 60 cumulative days in most years."

Page 206, first column and extending to second column. Delete the section, Distinctions between Typic Udipsamments and other subgroups, and replace with the following key to subgroups and definition of Typic Udipsamments:

"Key to subgroups

KCDA. Udipsamments that have a lithic contact within a depth of 50 cm.
Lithic Udipsamments

KCDB. Other Udipsamments that have mottles that have chroma of 2 or less above a depth of 100 cm.
Aquic Udipsamments

KCDC. Other Udipsamments that have an albic horizon that is thick enough to be preserved after the soil has been mixed to a depth of 18 cm and is underlain by a horizon that has a color value one unit or more darker and that meets all requirements for a spodic horizon except the index of accumulation.
Spodic Udipsamments

KCDD. Other Udipsamments that have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness²¹ and base saturation of 35 percent or more in some horizon less than 125 cm below the uppermost lamella or have a frigid temperature regime.
Alfic Udipsamments

KCDE. Other Udipsamments that have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness²¹ and base saturation of less than 35 percent in some horizon less than 125 cm below the uppermost lamella.
Ultic Udipsamments

KCDF. Other Udipsamments that have a surface horizon between 25 and 50 cm thick that meets all requirements for a plaggen epipedon except thickness.
Plaggeptic Udipsamments

KCDG. Other Udipsamments.
Typic Udipsamments

Definition of Typic Udipsamments

Typic Udipsamments are the Udipsamments that

1. Do not have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness;
2. Do not have mottles that have chroma of 2 or less above a depth of 100 cm;
3. Do not have a lithic contact within a depth of 50 cm;
4. Do not have an albic horizon that is thick enough to be preserved after the soil has been mixed to a depth of 18 cm and is underlain by a horizon that has a color value one unit or more darker and that meets all requirements for a spodic horizon except the index of accumulation; and
5. Do not have a surface horizon between 25 and 50 cm thick that meets all requirements for a plaggen epipedon except thickness."

Page 207, first column and extending to second column. Delete the section, Distinctions between Typic Ustipsamments and other subgroups, and

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²¹ See footnote 12 on p. 195.
²¹ See footnote 12 on p. 195.
²¹ See footnote 12 on p. 195.

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replace with the following key to subgroups and definition of Typic Ustipsamments:

"Key to subgroups

KCGA. Ustipsamments that have a lithic contact within 50 cm of the surface.

Lithic Ustipsamments

KCGB. Other Ustipsamments that have distinct or prominent mottles above a depth of 100 cm or are saturated with water within 100 cm of the surface during some time of year in most years.

Aquic Ustipsamments

KCGC. Other Ustipsamments that have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness²² and base saturation of 35 percent or more in some horizon less than 125 cm below the uppermost lamella.

Alfic Ustipsamments

KCGD. Other Ustipsamments that have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness²² and base saturation of less than 35 percent in all horizon less than 125 cm below the uppermost lamella.

Ultic Ustipsamments

KCGE. Other Ustipsamments.

Typic Ustipsamments

Definition of Typic Ustipsamments

Typic Ustipsamments are the Ustipsamments that

1. Do not have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness;²²

2. Do not have distinct or prominent mottles above a depth of 100 cm and are not saturated with water within 100 cm of the surface during any time of year in most years; and

3. Do not have a lithic contact within 50 cm of the surface."

Page 208, second column. Delete the section, Distinctions between Typic Xeropsamments and other subgroups, and replace with the following key to subgroups and definition of Typic Xeropsamments:

"Key to subgroups

KCFA. Xeropsamments that have a lithic contact within 50 cm of the soil surface.

Lithic Xeropsamments

KCFB. Other Xeropsamments that:

1. Have distinct or prominent mottles above a depth of 100 cm or are saturated with water

within 100 cm of the surface during some time of year in most years; and

2. Have a horizon within 100 cm of the surface that is more than 15 cm thick and that either contains 20 percent or more durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist.

Aquic Durorthidic Xeropsamments

KCFC. Other Xeropsamments that have distinct or prominent mottles above a depth of 100 cm or are saturated with water within 100 cm of the surface during some time of year in most years.

Aquic Xeropsamments

KCFD. Other Xeropsamments that have a horizon within 100 cm of the surface that is more than 15 cm thick and that either contains 20 percent or more durinodes or is brittle and has firm consistence when moist.

Durorthidic Xeropsamments

KCFE. Other Xeropsamments that have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness²³ and have base saturation of 35 percent or more in some horizon less than 125 cm below the uppermost lamella.

Alfic Xeropsamments

KCFF. Other Xeropsamments that have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness²³.

Ultic Xeropsamments

KCFG. Other Xeropsamments that have base saturation (by NH₄OAc) of less than 60 percent throughout the soil between depths of 25 and 75 cm below the soil surface.

Dystric Xeropsamments

KCFH. Other Xeropsamments.

Typic Xeropsamments

Definition of Typic Xeropsamments

Typic Xeropsamments are the Xeropsamments that

1. Do not have lamellae within 150 cm of the soil surface that meet all requirements for an argillic horizon except thickness;²³

2. Do not have distinct or prominent mottles above a depth of 100 cm and are not saturated with water within 100 cm of the surface during any time of year in most years;

3. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick and that either contains 20 percent or more durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist;

4. Do not have a lithic contact within 50 cm of the soil surface; and

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²² See footnote 12 on p. 195.

²² See footnote 12 on p. 195.

²² See footnote 12 on p. 195.

²⁰ See footnote 12 on p. 195.

²³ See footnote 12 on p. 195.

²³ See footnote 12 on p. 195.

5. Have base saturation (by NH_4OAc) of 60 percent or more in some part of the soil between depths of 25 and 75 cm below the soil surface."

Page 213, second column. Delete the section, Distinctions between Typic Borofibrists and other subgroups, and replace with the following key to subgroups and definition of Typic Borofibrists:

"Key to subgroups

ABCA. Borofibrists that have a layer of water within the control section below the surface tier.
Hydric Borofibrists

ABCB. Other Borofibrists that have a lithic contact within the control section.
Lithic Borofibrists

ABCC. Other Borofibrists that:

1. Have three-fourths or more of the fibers (by volume) derived from Sphagnum in the surface tier or more of the control section; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Sphagmic Terric Borofibrists

ABCD. Other Borofibrists that:

1. Have 25 cm or more of the subsurface and bottom tiers consisting of hemic materials; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Hemic Terric Borofibrists

ABCE. Other Borofibrists that:

1. Have 12.5 cm or more of the subsurface and bottom tiers consisting of sapric materials; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Sapric Terric Borofibrists

ABCF. Other Borofibrists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Terric Borofibrists

ABCG. Other Borofibrists that have limnic layer(s) within the control section 5 cm or more thick.
Limnic Borofibrists

ABCH. Other Borofibrists that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier.
Fluvaquentic Borofibrists

ABCI. Other Borofibrists that have three-fourths or more of the fibers (by volume) derived from Sphagnum in the surface tier or more of the control section.
Sphagmic Borofibrists

ABCJ. Other Borofibrists that have 25 cm or more of the subsurface and bottom tiers consisting of hemic materials.
Hemic Borofibrists

ABCK. Other Borofibrists that have 12.5 cm or more of the subsurface and bottom tiers consisting of sapric materials.
Sapric Borofibrists

ABCL. Other Borofibrists.
Typic Borofibrists

Definition of Typic Borofibrists

Typic Borofibrists are the Borofibrists that

1. Have

a. Less than 25 cm of the subsurface and bottom tiers consisting of hemic materials; and

b. Less than 12.5 cm of the subsurface and bottom tiers consisting of sapric materials;

2. Have less than three-fourths of the fibers (by volume) derived from Sphagnum in the surface tier or more of the control section;

3. Do not have limnic layer(s) within the control section 5 cm or more thick;

4. Do not have a lithic contact within the control section;

5. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier;

6. Do not have a mineral layer 30 cm or more thick whose upper boundary is below the surface tier in the control section; and

7. Do not have a layer of water within the control section beneath the surface tier."

Page 214, first column and extending to second column. Delete the section, Distinctions between Typic Cryofibrists and other subgroups, and replace with the following key to subgroups and definition of Typic Cryofibrists:

"Key to subgroups

ABBA. Cryofibrists that have a lithic contact within the control section.
Lithic Cryofibrists

ABBB. Other Cryofibrists that have a mean annual soil temperature of 0°C or lower.
Pergelic Cryofibrists

ABBC. Other Cryofibrists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Terric Cryofibrists

ABBD. Other Cryofibrists that have a mineral layer between 5 and 30 cm thick or two or more

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thin, continuous mineral layers, within organic materials, in the control section below the surface tier.

Fluvaquentic Cryofibrists

ABBE. Other Cryofibrists that have three-fourths or more of their fiber volume derived from Sphagnum spp. in the surface tier or more of the control section.

Sphagnic Cryofibrists

ABBF. Other Cryofibrists.

Typic Cryofibrists

Definition of Typic Cryofibrists

Typic Cryofibrists are the Cryofibrists that

1. Have less than three-fourths of their fiber volume derived from Sphagnum spp. in the surface tier or more of the control section;
2. Have a mean annual soil temperature higher than 0° C;
3. Do not have a lithic contact within the control section;
4. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier; and
5. Do not have a mineral layer 30 cm or more thick whose upper boundary is below the surface tier in the control section."

Page 215, first column and extending to second column. Delete the section, Distinctions between Typic Medifibrists and other subgroups, and replace with the following key to subgroups and definition of Typic Medifibrists:

"Key to subgroups

ABEA. Medifibrists that have a layer of water within the control section below the surface tier.
Hydric Medifibrists

ABEB. Other Medifibrists that have a lithic contact within the control section.
Lithic Medifibrists

ABEC. Other Medifibrists that:

1. Have three-fourths or more of the fibers (by volume) derived from Sphagnum in the surface tier or more of the control section; and
2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Sphagnic Terric Medifibrists

ABED. Other Medifibrists that:

1. Have 25 cm or more of the subsurface and bottom tiers consisting of hemic materials; and
2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Hemic Terric Medifibrists

ABEE. Other Medifibrists that:

1. Have 12.5 cm or more of the subsurface and bottom tiers consisting of sapric materials; and
2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Sapric Terric Medifibrists

ABEF. Other Medifibrists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Terric Medifibrists

ABEG. Other Medifibrists that have limnic layer(s) that are 5 cm or more thick within the control section.
Limnic Medifibrists

ABEH. Other Medifibrists that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier.
Fluvaquentic Medifibrists

ABEI. Other Medifibrists that have three-fourths or more of the fiber volume in the surface tier or more of the control section derived from Sphagnum.
Sphagnic Medifibrists

ABEJ. Other Medifibrists that have 25 cm or more of the subsurface and bottom tiers consisting of hemic materials.
Hemic Medifibrists

ABEK. Other Medifibrists that have 12.5 cm or more of the subsurface and bottom tiers consisting of sapric materials.
Sapric Medifibrists

ABEL. Other Medifibrists.
Typic Medifibrists

Definition of Typic Medifibrists

Typic Medifibrists are the Medifibrists that

1. Have
 - a. Less than 25 cm of the subsurface and bottom tiers consisting of hemic materials; and
 - b. Less than 12.5 cm of the subsurface and bottom tiers consisting of sapric materials;
2. Have less than three-fourths of the fiber volume in the surface tier or more of the control section derived from Sphagnum;
3. Do not have limnic layer(s) that are 5 cm or more thick within the control section;
4. Do not have a lithic contact within the control section;
5. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers,

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within organic materials, in the control section below the surface tier;

6. Do not have a mineral layer 30 cm or more thick whose upper boundary in the control section is below the surface tier; and

7. Do not have a layer of water within the control section beneath the surface tier."

Page 216, second column. Delete the section, Distinctions between Typic Sphagnofibrists and other subgroups, and replace with the following key to subgroups and definition of Typic Sphagnofibrists:

"Key to subgroups

ABAA. Sphagnofibrists that:

1. Have a mean annual soil temperature of 0° C or less; and

2. Are frozen within the control section about 2 months after the summer solstice or are frozen below a depth of 5 cm in most years.
Pergelic Sphagnofibrists

ABAB. Other Sphagnofibrists that have a layer of water within the control section beneath the surface tier.

Hydric Sphagnofibrists

ABAC. Other Sphagnofibrists that have a lithic contact within the control section.

Lithic Sphagnofibrists

ABAD. Other Sphagnofibrists that are frozen within the control section about 2 months after the summer solstice or are frozen below a depth of 5 cm in most years and have a mean annual soil temperature lower than 8° C but higher than 0° C.

Cryic Sphagnofibrists

ABAE. Other Sphagnofibrists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Terric Sphagnofibrists

ABAF. Other Sphagnofibrists that have limnic layer(s) that are 5 cm or more thick within the control section.

Limnic Sphagnofibrists

ABAG. Other Sphagnofibrists that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier.

Fluvaquentic Sphagnofibrists

ABAH. Other Sphagnofibrists that have 25 cm or more of the subsurface and bottom tiers consisting of hemic materials.

Hemic Sphagnofibrists

ABAI. Other Sphagnofibrists that have 12.5 cm or more of the subsurface and bottom tiers consisting of sapric materials.

Sapric Sphagnofibrists

ABAJ. Other Sphagnofibrists.

Typic Sphagnofibrists

Definition of Typic Sphagnofibrists

Typic Sphagnofibrists are the Sphagnofibrists that

1. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier;

2. Have

a. Less than 25 cm of the subsurface and bottom tiers consisting of hemic materials; and

b. Less than 12.5 cm of the subsurface and bottom tiers consisting of sapric materials;

3. Do not have a layer of water within the control section beneath the surface tier;

4. Do not have limnic layer(s) that are 5 cm or more thick within the control section;

5. Do not have a lithic contact within the control section;

6. Do not have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier;

7. Are never frozen within the control section about 2 months after the summer solstice or are never frozen below a depth of 5 cm in most years if the mean annual soil temperature is lower than 8° C; and

8. Have a mean annual soil temperature higher than 0° C."

Page 217, first column and extending to second column. Delete the section, Distinctions between Typic Tropofibrists and other subgroups, and replace with the following key to subgroups and definition of Typic Tropofibrists:

"Key to subgroups

ABDA. Tropofibrists that have a layer of water within the control section below the surface tier.

Hydric Tropofibrists

ABDB. Other Tropofibrists that have a lithic contact within the control section.

Lithic Tropofibrists

ABDC. Other Tropofibrists that:

1. Have 25 cm or more of the thickness of the subsurface and bottom tiers consisting of hemic materials; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Hemic Terric Tropofibrists

ABDD. Other Tropofibrists that:

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1. Have 12.5 cm or more of the thickness of the subsurface and bottom tiers consisting of sapric materials; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Sapric Terric Tropofibrists

ABDE. Other Tropofibrists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Terric Tropofibrists

ABDF. Other Tropofibrists that have limnic layer(s) that are 5 cm or more thick within the control section.

Limnic Tropofibrists

ABDG. Other Tropofibrists that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier.

Fluvaquentic Tropofibrists

ABDH. Other Tropofibrists that have 25 cm or more of the thickness of the subsurface and bottom tiers consisting of hemic materials.

Hemic Tropofibrists

ABDI. Other Tropofibrists that have 12.5 cm or more of the thickness of the subsurface and bottom tiers consisting of sapric materials.

Sapric Tropofibrists

ABDJ. Other Tropofibrists.

Typic Tropofibrists

Definition of Typic Tropofibrists

Typic Tropofibrists are the Tropofibrists that

1. Have

a. Less than 25 cm of the thickness of the subsurface and bottom tiers consisting of hemic materials, and

b. Less than 12.5 cm of the thickness of the subsurface and bottom tiers consisting of sapric materials;

2. Have less than three-fourths of their fibers, by volume, derived from Sphagnum in the surface tier or in more of the control section;

3. Do not have limnic layer(s) that are 5 cm or more thick within the control section;

4. Do not have a lithic contact within the control section;

5. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier;

6. Do not have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier; and

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7. Do not have a layer of water within the control section beneath the surface tier."

Page 218, second column. Delete the section, Distinctions between Typic Borofolists and other subgroups, and replace with the following key to subgroups and definition of Typic Borofolists:

"Key to subgroups

AACA. Borofolists that have a lithic contact within 100 cm of the surface.

Lithic Borofolists

AACB. Other Borofolists.

Typic Borofolists

Definition of Typic Borofolists

Typic Borofolists are the Borofolists that do not have a lithic contact within 100 cm of the surface."

Page 219, first column. Delete the section, Distinctions between Typic Cryofolists and other subgroups, and replace with the following key to subgroups and definition of Typic Cryofolists:

"Key to subgroups

AAAA. Cryofolists that have a lithic contact within 100 cm of the surface.

Lithic Cryofolists

AAAB. Other Cryofolists.

Typic Cryofolists

Definition of Typic Cryofolists

Typic Cryofolists are the Cryofolists that do not have a lithic contact within 100 cm of the surface."

Page 219, first column and extending to second column. Delete the section, Distinctions between Typic Tropofolists and other subgroups, and replace with the following key to subgroups and definition of Typic Tropofolists:

"Key to subgroups

AABA. Tropofolists that have a lithic contact within 100 cm of the surface.

Lithic Tropofolists

AABB. Other Tropofolists.

Typic Tropofolists

Definition of Typic Tropofolists

Typic Tropofolists are the Tropofolists that do not have a lithic contact within 100 cm of the surface."

Page 220, second column. Delete the section, Distinctions between Typic Borohemists and other subgroups, and replace with the following key to subgroups and definition of Typic Borohemists:

"Key to subgroups

ACEA. Borohemists that have a layer of water within the control section below the surface tier.
Hydric Borohemists

ACEB. Other Borohemists that have a lithic contact within the control section.
Lithic Borohemists

ACEC. Other Borohemists that:

1. Have 25 cm or more of the subsurface and bottom tiers consisting of fibric materials; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Fibric Terric Borohemists

ACED. Other Borohemists that:

1. Have 25 cm or more of the subsurface and bottom tiers consisting of sapric materials; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Sapric Terric Borohemists

ACEE. Other Borohemists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Terric Borohemists

ACEF. Other Borohemists that have limnic layer(s) 5 cm or more thick within the control section.
Limnic Borohemists

ACEG. Other Borohemists that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier.
Fluvaquentic Borohemists

ACEH. Other Borohemists that have 25 cm or more of the subsurface and bottom tiers consisting of fibric materials.
Fibric Borohemists

ACEI. Other Borohemists that have 25 cm or more of the subsurface and bottom tiers consisting of sapric materials.
Sapric Borohemists

ACEJ. Other Borohemists.
Typic Borohemists

Definition of Typic Borohemists

Typic Borohemists are the Borohemists that

1. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier;

2. Have

a. Less than 25 cm of the subsurface and bottom tiers consisting of fibric materials; and

b. Less than 25 cm of the subsurface and bottom tiers consisting of sapric materials;

3. Do not have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier;

4. Do not have a layer of water within the control section beneath the surface tier;

5. Do not have limnic layer(s) 5 cm or more thick within the control section; and

6. Do not have a lithic contact within the control section."

Page 221, first column. Delete the section, Distinctions between Typic Cryohemists and other subgroups, and replace with the following key to subgroups and definition of Typic Cryohemists:

"Key to subgroups

ACDA. Cryohemists that have a lithic contact within the control section.
Lithic Cryohemists

ACDB. Other Cryohemists that have a mean annual soil temperature of 0° C or lower.
Pergelic Cryohemists

ACDC. Other Cryohemists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Terric Cryohemists

ACDD. Other Cryohemists that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier.
Fluvaquentic Cryohemists

ACDE. Other Cryohemists.
Typic Cryohemists

Definition of Typic Cryohemists

Typic Cryohemists are the Cryohemists that

1. Do not have a lithic contact within the control section;

2. Have a mean annual soil temperature higher than 0° C;

3. Do not have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier; and

4. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier."

Page 222, first column and extending to second column. Delete the section, Distinctions between Typic Medihemists and other subgroups, and replace with the following key to subgroups and definition of Typic Medihemists:

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"Key to subgroups

ACGA. Medihemists that have a layer of water within the control section below the surface tier.
Hydric Medihemists

ACEB. Other Medihemists that have a lithic contact within the control section.
Lithic Medihemists

ACEC. Other Medihemists that:

1. Have 25 cm or more of the subsurface and bottom tiers consisting of fibric materials; and
2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Fibric Terric Medihemists

ACED. Other Medihemists that:

1. Have 25 cm or more of the subsurface and bottom tiers consisting of sapric materials; and
2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Sapric Terric Medihemists

ACEE. Other Medihemists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Terric Medihemists

ACEF. Other Medihemists that have limnic layer(s) 5 cm or more thick within the control section.
Limnic Medihemists

ACEG. Other Medihemists that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier.
Fluvaquentic Medihemists

ACEH. Other Medihemists that have 25 cm or more of the subsurface and bottom tiers consisting of fibric materials.
Fibric Medihemists

ACEI. Other Medihemists that have 25 cm or more of the subsurface and bottom tiers consisting of sapric materials.
Sapric Medihemists

ACEJ. Other Medihemists.
Typic Medihemists

Definition of Typic Medihemists

Typic Medihemists are the Medihemists that

1. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier;
2. Have
 - a. Less than 25 cm of the subsurface and bottom tiers consisting of fibric materials; and

- b. Less than 25 cm of the subsurface and bottom tiers consisting of sapric materials;

3. Do not have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier;

4. Do not have a layer of water within the control section beneath the surface tier;

5. Do not have limnic layer(s) that are 5 cm or more thick within the control section; and

6. Do not have a lithic contact within the control section."

Page 222, second column (Also see NSTH issue No. 2, page 615-20). Delete the section, Distinctions between Typic Sulfishemists and other subgroups, and replace with the following key to subgroups and definition of Typic Sulfishemists:

"Key to subgroups

ACBA. Sulfishemists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.
Terric Sulfishemists

ACBB. Other Sulfishemists.
Typic Sulfishemists

Definition of Typic Sulfishemists

Typic Sulfishemists are the Sulfishemists that do not have a mineral layer 30 cm or more thick that has its lower boundary in the control section below the surface tier."

Page 222, second column, definition (of Sulfohemists). Delete the second paragraph after the heading, definition, and replace with the following:

"Key to subgroups

ACAA. All Sulfohemists (provisionally).
Typic Sulfohemists"

Page 223, first column and extending to second column. Delete the section, Distinctions between Typic Tropohemists and other subgroups, and replace with the following key to subgroups and definition of Typic Tropohemists:

"Key to subgroups

ACFA. Tropohemists that have a layer of water within the control section below the surface tier.
Hydric Tropohemists

ACEB. Other Tropohemists that have a lithic contact within the control section.
Lithic Tropohemists

ACEC. Other Tropohemists that:

1. Have 25 cm or more of the subsurface and bottom tiers consisting of fibric materials; and

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2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Fibric Terric Trophohemists

ACED. Other Trophohemists that:

1. Have 25 cm or more of the subsurface and bottom tiers consisting of sapric materials; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Sapric Terric Trophohemists

ACEE. Other Trophohemists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Terric Trophohemists

ACEF. Other Trophohemists that have limnic layer(s) 5 cm or more thick within the control section.

Limnic Trophohemists

ACEG. Other Trophohemists that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier.

Fluvaquentic Trophohemists

ACEH. Other Trophohemists that have 25 cm or more of the subsurface and bottom tiers consisting of fibric materials.

Fibric Trophohemists

ACEI. Other Trophohemists that have 25 cm or more of the subsurface and bottom tiers consisting of sapric materials.

Sapric Trophohemists

ACEJ. Other Trophohemists.

Typic Trophohemists

Definition of Typic Trophohemists

Typic Trophohemists are the Trophohemists that

1. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier;

2. Have

a. Less than 25 cm of the subsurface and bottom tiers consisting of fibric materials; and

b. Less than 25 cm of the subsurface and bottom tiers consisting of sapric materials;

3. Do not have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier;

4. Do not have a layer of water within the control section beneath the surface tier;

5. Do not have a limnic layer(s) that are 5 cm or more thick within the control section; and

6. Do not have a lithic contact within the control section."

Page 224, first column and extending to second column. Delete the section, Distinctions between Typic Borosaprists and other subgroups, and replace with the following key to subgroups and definition of Typic Borosaprists:

"Key to subgroups

ADBA. Borosaprists that have a lithic contact within the control section.

Lithic Borosaprists

ADBB. Other Borosaprists that:

1. Have 12.5 cm or more of the subsurface and bottom tiers consisting of fibric materials; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Fibric Terric Borosaprists

ADBC. Other Borosaprists that:

1. Have 25 cm or more of the subsurface and bottom tiers consisting of hemic materials; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Hemic Terric Borosaprists

ADBD. Other Borosaprists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Terric Borosaprists

ADBE. Other Borosaprists that have limnic layer(s) that are 5 cm or more thick within the control section.

Limnic Borosaprists

ADBF. Other Borosaprists that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier.

Fluvaquentic Borosaprists

ADBG. Other Borosaprists that have 12.5 cm or more of the subsurface and bottom tiers consisting of fibric materials.

Fibric Borosaprists

ADBH. Other Borosaprists that have 25 cm or more of the subsurface and bottom tiers consisting of hemic materials.

Hemic Borosaprists

ADBI. Other Borosaprists.

Typic Borosaprists

Definition of Typic Borosaprists

Typic Borosaprists are the Borosaprists that

1. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers,

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within organic materials, in the control section below the surface tier;

2. Have

- a. Less than 12.5 cm of the subsurface and bottom tiers consisting of fibric materials; and
- b. Less than 25 cm of the subsurface and bottom tiers consisting of hemic materials;

3. Do not have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier;

4. Do not have limnic layer(s) that are 5 cm or more thick within the control section; and

5. Do not have a lithic contact within the control section."

Page 225, first column. Delete the section, Distinctions between Typic Cryosaprists and other subgroups, and replace with the following key to subgroups and definition of Typic Cryosaprists:

"Key to subgroups

- ADAA. Cryosaprists that have a lithic contact within the control section. Lithic Cryosaprists
- ADAB. Other Cryosaprists that have a mean annual soil temperature of 0° C or lower. Pergelic Cryosaprists
- ADAC. Other Cryosaprists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier. Terric Cryosaprists
- ADAD. Other Cryosaprists that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier. Fluvaquentic Cryosaprists
- ADAE. Other Cryosaprists. Typic Cryosaprists

Definition of Typic Cryosaprists

Typic Cryosaprists are the Cryosaprists that

- 1. Do not have a lithic contact within the control section;
- 2. Have a mean annual soil temperature higher than 0° C;
- 3. Do not have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier; and
- 4. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier."

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Page 225, second column and extending to page 226, first column. Delete the section, Distinctions between Typic Medisaprists and other subgroups, and replace with the following key to subgroups and definition of Typic Medisaprists:

"Key to subgroups

- ADDA. Medisaprists that have a lithic contact within the control section. Lithic Medisaprists
- ADDB. Other Medisaprists that:
 - 1. Have 12.5 cm or more of the subsurface and bottom tiers consisting of fibric materials; and
 - 2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier. Fibric Terric Medisaprists
- ADDC. Other Medisaprists that:
 - 1. Have 25 cm or more of the subsurface and bottom tiers consisting of hemic materials; and
 - 2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier. Hemic Terric Medisaprists
- ADDD. Other Medisaprists that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier. Terric Medisaprists
- ADDE. Other Medisaprists that have limnic layer(s) that are 5 cm or more thick within the control section. Limnic Medisaprists
- ADDF. Other Medisaprists that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier. Fluvaquentic Medisaprists
- ADDG. Other Medisaprists that have 12.5 cm or more of the subsurface and bottom tiers consisting of fibric materials. Fibric Medisaprists
- ADDH. Other Medisaprists that have 25 cm or more of the subsurface and bottom tiers consisting of hemic materials. Hemic Medisaprists
- ADDI. Other Medisaprists. Typic Medisaprists

Definition of Typic Medisaprists

Typic Medisaprists are the Medisaprists that

- 1. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier;

2. Have

- a. Less than 12.5 cm of the subsurface and bottom tiers consisting of fibric materials; and
- b. Less than 25 cm of the subsurface and bottom tiers consisting of hemic materials;

3. Do not have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier;

4. Do not have limnic layer(s) that are 5 cm or more thick within the control section; and

5. Do not have a lithic contact within the control section."

Page 226, second column. Delete the section, Distinctions between Typic Tropoapristis and other subgroups, and replace with the following key to subgroups and definition of Typic Tropoapristis:

"Key to subgroups

ADCA. Tropoapristis that have a lithic contact within the control section.

Lithic Tropoapristis

ADCB. Other Tropoapristis that:

1. Have 12.5 cm or more of the subsurface and bottom tiers consisting of fibric materials; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Fibric Terric Tropoapristis

ADCC. Other Tropoapristis that:

1. Have 25 cm or more of the subsurface and bottom tiers consisting of hemic materials; and

2. Have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Hemic Terric Tropoapristis

ADCD. Other Tropoapristis that have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier.

Terric Tropoapristis

ADCE. Other Tropoapristis that have limnic layer(s) that are 5 cm or more thick within the control section.

Limnic Tropoapristis

ADCF. Other Tropoapristis that have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier.

Fluvaquentic Tropoapristis

ADCG. Other Tropoapristis that have 12.5 cm or more of the subsurface and bottom tiers consisting of fibric materials.

Fibric Tropoapristis

ADCH. Other Tropoapristis that have 25 cm or more of the subsurface and bottom tiers consisting of hemic materials.

Hemic Tropoapristis

ADCI. Other Tropoapristis.

Typic Tropoapristis

Definition of Typic Tropoapristis

Typic Tropoapristis are the Tropoapristis that

1. Do not have a mineral layer between 5 and 30 cm thick or two or more thin, continuous mineral layers, within organic materials, in the control section below the surface tier;

2. Have

a. Less than 12.5 cm of the subsurface and bottom tiers consisting of fibric materials; and

b. Less than 25 cm of the subsurface and bottom tiers consisting of hemic materials;

3. Do not have a mineral layer 30 cm or more thick that has its upper boundary in the control section below the surface tier;

4. Do not have limnic layer(s) that are 5 cm or more thick within the control section; and

5. Do not have a lithic contact within the control section."

Page 238, second column. Delete the section, Distinctions between Typic Cryaquepts and other subgroups, and replace with the following key to subgroups and definition of Typic Cryaquepts:

"Key to subgroups

(It seems probable that a number of subgroups besides those here defined will be needed when the soils that occur in striped or polygonal patterns have been studied in more detail.)

JAEA. Cryaquepts that have a histic epipedon and have a lithic contact within 50 cm of the soil surface.

Histic Lithic Cryaquepts

JAEB. Other Cryaquepts that:

1. Have a histic epipedon that is continuous in each pedon; and

2. Have a mean annual soil temperature that is 0° C or lower.

Histic Pergelic Cryaquepts

JAEC. Other Cryaquepts that:

1. Have a histic epipedon that is discontinuous in each pedon; and

2. Have a mean annual soil temperature that is 0° C or lower.

Pergelic Ruptic-Histic Cryaquepts

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JAED. Other Cryaquepts that:

1. Have an umbric epipedon; and
2. Have a mean annual soil temperature that is 0° C or lower.

Humic Pergelic Cryaquepts

JAEE. Other Cryaquepts that have a mean annual soil temperature that is 0° C or lower.

Pergelic Cryaquepts

JAEF. Other Cryaquepts that have a histic epipedon.

Histic Cryaquepts

JAEG. Other Cryaquepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:
 - a. More than 30 percent volcanic glass; or
 - b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Cryaquepts

JAEH. Other Cryaquepts that:

1. Have chroma of 3 or more in more than 40 percent of the mass of one or more horizons between depths of 15 and 50 cm; and
2. Have an umbric epipedon.

Aeric Humic Cryaquepts

JAEI. Other Cryaquepts that have chroma of 3 or more in more than 40 percent of the mass of one or more horizons between depths of 15 and 50 cm.

Aeric Cryaquepts

JA EJ. Other Cryaquepts that have an umbric epipedon.

Humic Cryaquepts

JA EK. Other Cryaquepts.

Typic Cryaquepts

Definition of Typic Cryaquepts

Typic Cryaquepts are the Cryaquepts that

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1. Have chroma of 2 or less in 60 percent or more of the mass of all horizons between depths of 15 and 50 cm;

2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

3. Do not have a histic, umbric, or mollic epipedon;

4. Do not have a lithic contact within 50 cm of the soil surface; and

5. Have a mean annual soil temperature that is higher than 0° C."

Page 239, second column and extending to page 240, first column. Delete the section, Distinctions between Typic Fragiaquepts and other subgroups, and replace with the following key to subgroups and definition of Typic Fragiaquepts:

"Key to subgroups

JADA. Fragiaquepts that have in more than 40 percent of the matrix of one or more subhorizons between the plow layer and 75 cm or, if there is no plow layer, between a depth of 15 and 75 cm, moist colors as follows:

1. If there is mottling, chroma of 3 or more;
2. If there is no mottling, chroma of 2 or more.

Aeric Fragiaquepts

JADB. Other Fragiaquepts that have a histic, mollic, or umbric epipedon.

Humic Fragiaquepts

JADC. Other Fragiaquepts.

Typic Fragiaquepts

Definition of Typic Fragiaquepts

Typic Fragiaquepts are the Fragiaquepts that

1. Do not have a histic, mollic, or umbric epipedon; and

2. Have, in 60 percent or more of the matrix of all subhorizons between the plow layer and 75 cm or, if there is no plow layer, between a depth of 15 and 75 cm, moist colors as follows:

- a. If there is mottling, chroma of 2 or less;
- b. If there is no mottling, chroma of 1 or less."

Page 240, second column and extending to page 241, first column. Delete the section, Distinctions between Typic Halaquepts and other subgroups, and replace with the following key to subgroups and definition of Typic Halaquepts:

"Key to subgroups

JACA. Halaquepts that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;
2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and
3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Halaquepts

JACB. Other Halaquepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- a. More than 30 percent volcanic glass: or
- b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Halaquepts

JACC. Other Halaquepts that have chroma of 3 or more in more than 40 percent of the matrix in one or more subhorizons between depths of 15 and 75 cm.

Aeric Halaquepts

JACD. Other Halaquepts that have a mollic epipedon.

Mollic Halaquepts

JACE. Other Halaquepts.

Typic Halaquepts

Definition of Typic Halaquepts

Typic Halaquepts are the Halaquepts that

1. Have chroma of 2 or less in 60 percent or more of the matrix in all subhorizons between depths of 15 and 75 cm;

2. Do not have a mollic epipedon;

3. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

4. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass: or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

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Page 242, first column and extending to second column. Delete the section, Distinctions between Typic Haplaquepts and other subgroups, and replace with the following key to subgroups and definition of Typic Haplaquepts:

*Key to subgroups

JAIA. Haplaquepts that have one or both of the following:

1. Jarosite mottles and a pH between 3.5 and 4.0 (1:1 water, air dried slowly in shade) in some subhorizon within 50 cm of the soil surface; or
2. Jarosite mottles and a pH of less than 4.0 (1:1 water, air dried slowly in shade) in some subhorizon between depths of 50 and 150 cm.

Sulfic Haplaquepts

JAIB. Other Haplaquepts that have a lithic contact within 50 cm of the soil surface.

Lithic Haplaquepts

JAIC. Other Haplaquepts that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon; and

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Haplaquepts

JAID. Other Haplaquepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- a. More than 30 percent volcanic glass; or
- b. At least 5 percent volcanic glass and acid-oxalate-extractable-

aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Haplaquepts

JAIE. Other Haplaquepts that have in more than 40 percent of the matrix in one or more subhorizons between the A or Ap horizon and a depth of 75 cm, one or more of the following:

1. If mottled and the mean annual soil temperature is lower than 15° C, moist chroma of 3 or more;

2. If mottled and the mean annual soil temperature is 15° C or higher:

- a. If the hue is 2.5Y or redder¹⁵ and the value, moist, is more than 5, the chroma, moist, is 3 or more;

- b. If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 2 or more;

- c. If the hue is 5Y or yellower, the chroma, moist, is 3 or more;

3. The chroma, moist, is 2 or more if mottles are not present.

Aeric Haplaquepts

JAIF. Other Haplaquepts that:

1. Have an Ap horizon that has a color value, moist, of 3 or less and has a value, dry, of 5 or less when crushed and smoothed, or have an A horizon that is 15 cm or more thick if its color value, moist, is 3 or less; and

2. Have base saturation (by NH₄OAc) of less than 50 percent in some horizon and does not increase with depth to a value of 50 percent or more.

Humic Haplaquepts

JAIG. Other Haplaquepts that:

1. Have an Ap horizon that has a color value, moist, of 3 or less and has a value, dry, of 5 or less when crushed and smoothed, or have an A horizon that is 15 cm or more thick if its color value, moist, is 3 or less; and

2. Have base saturation (by NH₄OAc) of 50 percent or more throughout or increases with depth to a value of 50 percent or more.

Mollic Haplaquepts

JAIH. Other Haplaquepts.

Typic Haplaquepts

Definition of Typic Haplaquepts

¹⁵ If the hue is 7.5YR or redder in the matrix and if peds are present, the ped exteriors should have dominant chroma, moist, of 1 or less and the ped interiors should have mottles that have chroma, moist, of 2 or less; if there are no peds, the chroma, moist, should be 1 or less immediately below any surface horizon that has a value, moist, less than 5.

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Typic Haplaquepts are the Haplaquepts that

1. Have, in 60 percent or more of the matrix in all subhorizons between the A or Ap horizon and a depth of 75 cm, one or more of the following:

a. If mottled and the mean annual soil temperature is lower than 15° C, moist chroma of 2 or less;

b. If mottled and the mean annual soil temperature is 15° C or higher:

(1) If the hue is 2.5Y or redder¹⁵ and the value, moist, is more than 5, the chroma, moist, is 2 or less;

(2) If the hue is 2.5Y or redder and the value, moist, is 5 or less, the chroma, moist, is 1 or less;

(3) If the hue is yellower than 2.5Y, the chroma, moist, is 2 or less;

c. The chroma, moist, is 1 or less and mottles may or may not be present;

2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

3. Have an Ap horizon that has a color value, moist, of 4 or more or has a value, dry, of 6 or more when crushed and smoothed, or have an A horizon that is less than 15 cm thick if its color value, moist, is 3 or less;

4. Have an n value of less than 0.9 between depths of 50 and 80 cm and less than 0.7 in all layers between 20 and 50 cm;

5. Do not have a lithic contact within 50 cm of the soil surface;

6. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon; and

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

7. Do not have either of the following:

a. Jarosite mottles and a pH between 3.5 and 4.0 (1:1 water, air dried slowly in shade) in some subhorizon within 50 cm of the soil surface, or

b. Jarosite mottles and a pH of less than 4.0 (1:1 water, air dried slowly in shade) in some subhorizon between depths of 50 and 150 cm."

Page 243, second column and extending to page 244, first column. Delete the section, Distinctions between Typic Humaquepts and other subgroups, and replace with the following key to subgroups and definition of Typic Humaquepts:

"Key to subgroups

JAHA. Humaquepts that have an n value of 0.9 or more between depths of 50 and 80 cm or of more than 0.7 in one or more layers between depths of 20 and 50 cm.

Hydraqueptic Humaquepts

JAHB. Other Humaquepts that have a histic epipedon whose upper boundary is at or near the soil surface.

Histic Humaquepts

JAHC. Other Humaquepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments

¹⁵ If the hue is 7.5YR or redder in the matrix and if peds are present, the ped exteriors should have dominant chroma, moist, of 1 or less and the ped interiors should have mottles that have chroma, moist, of 2 or less; if there are no peds, the chroma, moist, should be 1 or less immediately below any surface horizon that has a value, moist, less than 5.

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make up more than 66 percent of these fragments; or

3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- a. More than 30 percent volcanic glass; or
- b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Humaquepts

JAHD. Other Humaquepts that:

- 1. Have an epipedon that is 60 cm or more thick; and
- 2. Have a content of organic carbon that decreases irregularly with depth or, are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface.

Cumulic Humaquepts

JAHE. Other Humaquepts that have a content of organic carbon that decreases irregularly with depth or, are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface.

Fluvaquentic Humaquepts

JAHF. Other Humaquepts that have chroma of 3 or more, moist, and hue of 5Y or redder in more than 40 percent of the matrix in one or more subhorizons between depths of 15 and 75 cm.

Aeric Humaquepts

JAHG. Other Humaquepts.

Typic Humaquepts

Definition of Typic Humaquepts

Typic Humaquepts are the Humaquepts that

- 1. Have chroma of 2 or less, moist, and hue of 5Y or redder in 60 percent or more of the matrix in all subhorizons between depths of 15 and 75 cm;
- 2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

- a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
- b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

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c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- (1) More than 30 percent volcanic glass; or
- (2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

- 3. Have an epipedon that is less than 60 cm thick;
- 4. Have a content of organic carbon that decreases regularly with depth and, unless a lithic or a paralithic contact occurs at a shallower depth, reaches a level of 0.2 percent or less within 125 cm of the soil surface;
- 5. Do not have a histic epipedon whose upper boundary is at or near the soil surface; and
- 6. Have an n value of less than 0.9 between depths of 50 and 80 cm and of 0.7 or less in all layers between depths of 20 and 50 cm."

Page 245, first column. Delete the section, Distinctions between Typic Placaquepts and other subgroups, and replace with the following key to subgroups and definition of Typic Placaquepts:

"Key to subgroups

JABA. Placaquepts that have a histic epipedon.
Histic Placaquepts

JABB. Other Placaquepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

- 1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
- 2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
- 3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- a. More than 30 percent volcanic glass; or
- b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Placaquepts

JABC. Other Placaquepts that do not have a continuous placic horizon within 100 cm of the soil surface throughout each pedon.
Haplic Placaquepts

JABD. Other Placaquepts.**Typic Placaquepts**Definition of Typic Placaquepts

Typic Placaquepts are the Placaquepts that

1. Do not have a histic epipedon;
2. Have a continuous placic horizon within 100 cm of the soil surface throughout each pedon; and
3. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:
 - a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
 - b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
 - c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:
 - (1) More than 30 percent volcanic glass; or
 - (2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 245, second column, definition (Sulfaquepts). After the first paragraph, add the following key to subgroups:

"Key to subgroups

JAAA. All Sulfaquepts (provisional).**Typic Sulfaquepts"**

Page 246, first column. Delete the section, Distinctions between Typic Tropaquepts and other subgroups, and replace with the following key to subgroups and definition of Typic Tropaquepts:

"Key to subgroups

JAGA. Tropaquepts that have one or both of the following:

1. Jarosite mottles and a pH between 3.5 and 4.0 (1:1 water, air dried slowly in shade) in some subhorizon within 50 cm of the soil surface; or
 2. Jarosite mottles and a pH of less than 4.0 (1:1 water, air dried slowly in shade) in some subhorizon between depths of 50 and 150 cm.
- Sulfic Tropaquepts

JAGB. Other Tropaquepts that have a lithic contact within 50 cm of the soil surface.

Lithic Tropaquepts

JAGC. Other Tropaquepts that have the following combination of characteristics:

1. Cracks at some time in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;
2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and
3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Tropaquepts

JAGD. Other Tropaquepts that have a histic epipedon that has its upper boundary at or near the surface.

Histic Tropaquepts

JAGE. Other Tropaquepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Tropaquepts

JAGF. Other Tropaquepts that have 5 percent or more (by volume) of plinthite in one or more subhorizons within 150 cm of the soil surface.

Plinthic Tropaquepts

JAGG. Other Tropaquepts that have in more than 40 percent of the matrix in one or more subhorizons between the A or Ap horizon and a depth of 75 cm one or more of the following:

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1. If mottled and if the hue is 2.5Y or redder and the value, moist, is more than 5, the chroma, moist, is 3 or more; if the value, moist, is 5 or less, the chroma, moist, is 2 or more;
2. If mottled and if the hue is yellower than 2.5Y, the chroma, moist, is 3 or more;
3. The chroma, moist, is 2 or more if not mottled.

Aeric Tropaquepts

JAGH. Other Tropaquepts.

Typic Tropaquepts

Definition of Typic Tropaquepts

Typic Tropaquepts are the Tropaquepts that

1. Have in 60 percent or more of the matrix in all subhorizons between the A or Ap horizon and a depth of 75 cm one or more of the following:
 - a. If mottled and if the hue is 2.5Y or redder and the value, moist, is more than 5, the chroma, moist, is 2 or less; if the value, moist, is 5 or less, the chroma, moist, is 1 or less;
 - b. If mottled and if the hue is yellower than 2.5Y, the chroma, moist, is 2 or less;
 - c. The chroma, moist, is 1 or less whether mottled or not;

2. Do not have a histic epipedon that has its upper boundary at or near the surface;

3. Do not have a lithic contact within 50 cm of the soil surface;

4. Do not have the following combination of characteristics:
 - a. Cracks at some time in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;
 - b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and
 - c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

5. Have less than 5 percent (by volume) of plinthite in all subhorizons within 150 cm of the soil surface;

6. Do not have either of the following:
 - a. Jarosite mottles and a pH between 3.5 and 4.0 (1:1 water, air dried slowly in shade) in some subhorizon within 50 cm of the soil surface; or

- b. Jarosite mottles and a pH of less than 4.0 (1:1 water, air dried slowly in shade) in some subhorizon between depths of 50 and 150 cm; and

7. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:
 - a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
 - b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
 - c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:
 - (1) More than 30 percent volcanic glass; or
 - (2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 248, first column. Delete the section, Distinctions between Typic Cryochrepts and other subgroups, and replace with the following key to subgroups and definition of Typic Cryochrepts:

*Key to subgroups

- JDCA. Cryochrepts that have a lithic contact within 50 cm of the soil surface. Lithic Cryochrepts
- JDCB. Other Cryochrepts that have a mean annual soil temperature of 0° C or lower. Pergelic Cryochrepts
- JDCC. Other Cryochrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent. Andic Cryochrepts

- JDCD. Other Cryochrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

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2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- a. More than 30 percent volcanic glass: or
- b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandid Cryochrepts

JDCE. Other Cryochrepts that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some period when its temperature is 5° C or more or the soil has artificial drainage.

Aquic Cryochrepts

JDCE. Other Cryochrepts that have lamellae within 75 cm of the soil surface that meet all requirements for an argillic horizon except thickness.

Alfic Cryochrepts

JDCG. Other Cryochrepts that have base saturation (by NH₄OAc) that is less than 60 percent in all subhorizons within 75 cm of the surface.

Dystric Cryochrepts

JDCH. Other Cryochrepts.

Typic Cryochrepts

Definition of Typic Cryochrepts

Typic Cryochrepts are the Cryochrepts that

1. Have a mean annual soil temperature higher than 0° C;
2. Do not have a lithic contact within 50 cm of the soil surface;
3. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizon is saturated with water at some period when its temperature is 5° C or more or the soil has artificial drainage.
4. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:
 - a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
 - b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
 - c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass: or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

5. Have base saturation (by NH₄OAc) that is 60 percent or more in some subhorizon within 75 cm of the surface; and

6. Do not have lamellae within 75 cm of the soil surface that meet all requirements for an argillic horizon except thickness."

Page 249, first column. Delete the section, Distinctions between Typic Durochrepts and other subgroups, and replace with the following key to subgroups and definition of Typic Durochrepts:

"Key to subgroups

JDBA. Durochrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Durochrepts

JDBB. Other Durochrepts that have distinct or prominent mottles within the upper 30 cm.

Aquic Durochrepts

JDBC. Other Durochrepts that do not have a xeric moisture regime.

Ustic Durochrepts

JDBD. Other Durochrepts that:

1. Do not have a platy or massive indurated duripan; and

2. Have base saturation (by NH₄OAc) of less than 60 percent throughout the soil between depths of 25 and 75 cm below the soil surface.

Dystric Entic Durochrepts

JDBE. Other Durochrepts that do not have a platy or massive indurated duripan.

Entic Durochrepts

JDBF. Other Durochrepts that have base saturation (by NH₄OAc) of less than 60 percent throughout the soil between depths of 25 and 75 cm below the soil surface.

Dystric Durochrepts

JDBG. Other Durochrepts.

Typic Durochrepts

Definition of Typic Durochrepts

Typic Durochrepts are the Durochrepts that

1. Have a platy or massive indurated duripan;

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2. Do not have distinct or prominent mottles within the upper 30 cm;
3. Have a xeric moisture regime;
4. Have base saturation (by NH_4OAc) of 60 percent or more in some part of the soil between depths of 25 and 75 cm below the soil surface; and
5. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.¹⁰

Page 249, second column and extending to page 250, first column. Delete the section, Distinctions between Typic Dystrachrepts and other subgroups, and replace with the following key to subgroups and definition of Typic Dystrachrepts:

*Key to subgroups

JDGA. Dystrachrepts that:

1. Have a lithic contact within 50 cm of the soil surface; and
2. Have an argillic horizon in less than half of each pedon, and the base saturation (by sum of cations) in the subhorizon just above the lithic contact is 35 percent or more.
Lithic Ruptic-Alfic Dystrachrepts

JDGB. Other Dystrachrepts that:

1. Have a lithic contact within 50 cm of the soil surface; and
2. Have an argillic horizon in less than half of each pedon and have base saturation (by sum of cations) in the subhorizon just above the lithic contact that is less than 35 percent.
Lithic Ruptic-Ultic Dystrachrepts

JDGC. Other Dystrachrepts that have a lithic contact within 50 cm of the soil surface.
Lithic DystrachreptsJDGD. Other Dystrachrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.
Andic Dystrachrepts

JDGE. Other Dystrachrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- a. More than 30 percent volcanic glass; or
- b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Dystrachrepts

JDGF. Other Dystrachrepts that:

1. Have mottles that have chroma of 2 or less within 60 cm of the soil surface and the mottled horizon is saturated with water at a time when its temperature is 5°C or higher, or the soil has artificial drainage; and
2. Have a content of organic carbon¹⁹ that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface; and
3. Have slopes of 25 percent or less.

Fluvaquentic Dystrachrepts

JDGG. Other Dystrachrepts that have mottles that have chroma of 2 or less within 60 cm of the soil surface and the mottled horizon is saturated with water at a time when its temperature is 5°C or higher, or the soil has artificial drainage.

Aquic Dystrachrepts

JDGH. Other Dystrachrepts that:

1. Have a content of organic carbon¹⁹ that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface;
2. Have slopes of 25 percent or less; and
3. Have an Ap horizon that has a color value, moist, of 3 or less or a color value, dry, of 5 or less, crushed and smoothed, or the upper soil to a depth of 18 cm, after mixing, has these colors.

Fluventic Umbric Dystrachrepts

JDGI. Other Dystrachrepts that:

1. Have a content of organic carbon¹⁹ that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface; and

¹⁰The carbon should be of Holocene age. It is not the intent to include fossil carbon from bedrock.

¹⁹The carbon should be of Holocene age. It is not the intent to include fossil carbon from bedrock.

¹⁹The carbon should be of Holocene age. It is not the intent to include fossil carbon from bedrock.

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2. Have slopes of 25 percent or less.

Fluventic Dystrachrepts

JDGJ. Other Dystrachrepts that have an Ap horizon that has a color value, moist, of 3 or less or a color value, dry, of 5 or less, crushed and smoothed, or the upper soil to a depth of 18 cm, after mixing, has these colors.

Umbric Dystrachrepts

JDGK. Other Dystrachrepts that have an argillic horizon in less than half of each pedon, and the base saturation (by sum of cations) at a depth of 125 cm below the upper boundary of the argillic horizon or in the subhorizon just above a lithic or paralithic contact is 35 percent or more.

Ruptic-Alfic Dystrachrepts

JDGL. Other Dystrachrepts that have an argillic horizon in less than half of each pedon and have base saturation (by sum of cations) at a depth of 125 cm below the upper boundary of the argillic horizon or in the subhorizon just above a lithic or paralithic contact is less than 35 percent.

Ruptic-Ultic Dystrachrepts

JDGM. Other Dystrachrepts.

Typic Dystrachrepts

Definition of Typic Dystrachrepts

Typic Dystrachrepts are the Dystrachrepts that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have mottles that have chroma of 2 or less within 60 cm of the soil surface if the mottled horizon is saturated with water at a time when its temperature is 5°C or higher, or the soil has artificial drainage;

3. Have a content of organic carbon¹⁹ that decreases regularly with depth and, unless a lithic or a paralithic contact occurs at a shallower depth, reaches a level of 0.2 percent or less within 125 cm of the surface; or have slopes of more than 25 percent;

4. Do not have a lithic contact within 50 cm of the soil surface;

5. Do not have an argillic horizon in any part of the pedon; and

6. Have an Ap horizon that has a color value, moist, of 4 or more or a color value, dry, of 6 or more, crushed and smoothed, or the upper soil to a depth of 18 cm, after mixing, has these colors."

Page 251, first column and extending to page 252, first column. Delete the section, Distinctions between Typic Eutrochrepts and other subgroups, and replace with the following key to subgroups and definition of Typic Eutrochrepts:

"Key to subgroups

JDFA. Eutrochrepts that:

1. Have a lithic contact within 50 cm of the soil surface; and

2. Have an argillic horizon in some part but in less than half of each pedon.

Lithic Ruptic-Alfic Eutrochrepts

JDFB. Other Eutrochrepts that have a lithic contact within 50 cm of the soil surface.

Lithic Eutrochrepts

JDFC. Other Eutrochrepts that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend to the soil surface or to the base of an Ap horizon,

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm, and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Eutrochrepts

JDFD. Other Eutrochrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of more than 1.0 percent.

Andic Eutrochrepts

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¹⁹The carbon should be of Holocene age. It is not the intent to include fossil carbon from bedrock.

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JDFE. Other Eutrochrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Eutrochrepts

JDFF. Other Eutrochrepts that:

1. Have mottles that have chroma of 2 or less within 60 cm of the soil surface and the mottled horizon is saturated with water at some period when its temperature is 5° C or more or the soil has artificial drainage; and
2. Have a content of organic carbon that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface; and
3. Have slopes of 25 percent or less.

Fluvaquentic Eutrochrepts

JDFG. Other Eutrochrepts that:

1. Have mottles that have chroma of 2 or less within 60 cm of the soil surface and the mottled horizon is saturated with water at some period when its temperature is 5° C or more or the soil has artificial drainage; and
2. Do not have carbonates within a depth of 100 cm in all parts of each pedon.

Aquic Dystric Eutrochrepts

JDFH. Other Eutrochrepts that have mottles that have chroma of 2 or less within 60 cm of the soil surface and the mottled horizon is saturated with water at some period when its temperature is 5° C or more or the soil has artificial drainage.

Aquic Eutrochrepts

JDFI. Other Eutrochrepts that:

1. Do not have carbonates within a depth of 100 cm in all parts of each pedon;
2. Have a content of organic carbon that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact

and have more than 0.2 percent organic carbon at 125 cm below the soil surface; and

3. Have slopes of 25 percent or less.

Dystric Fluventic Eutrochrepts

JDFJ. Other Eutrochrepts that:

1. Have a content of organic carbon that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface; and

2. Have slopes of 25 percent or less.

Fluventic Eutrochrepts

JDFK. Other Eutrochrepts that have a sandy particle-size class from the soil surface to a depth of 50 cm or more or more.

Arenic Eutrochrepts

JDFL. Other Eutrochrepts that do not have carbonates within a depth of 100 cm in all parts of each pedon.

Dystric Eutrochrepts

JDFM. Other Eutrochrepts that have 40 percent or more carbonates, including the coarse fragments up to 75 mm in diameter, in and below the cambic horizon but above a lithic or paralithic contact and above a depth of 100 cm.

Rendollic Eutrochrepts

JDFN. Other Eutrochrepts that have an argillic horizon in some part but in less than half of each pedon.

Ruptic-Alfic Eutrochrepts

JDFO. Other Eutrochrepts.

Typic Eutrochrepts

Definition of Typic Eutrochrepts

Typic Eutrochrepts are the Eutrochrepts that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-

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aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have mottles that have chroma of 2 or less within 60 cm of the soil surface if the mottled horizon is saturated with water at some period when its temperature is 5° C or more or if the soil has artificial drainage;

3. Have texture of very fine sand or finer within 50 cm of the soil surface;

4. Have carbonates within a depth of 100 cm in some part of each pedon;

5. Have a content of organic carbon that decreases regularly with depth and, unless a lithic or paralithic contact occurs at a shallower depth, reaches a level of 0.2 percent or less within 125 cm of the soil surface; or have slopes of more than 25 percent;

6. Do not have a lithic contact within 50 cm of the soil surface;

7. Do not have an argillic horizon in any part of the pedon;

8. Have an ochric epipedon;

9. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend to the soil surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

10. Have less than 40 percent carbonates, including the coarse fragments up to 75 mm in diameter, in and below the cambic horizon but above a lithic or paralithic contact and above a depth of 100 cm."

Page 253, second column. Delete the section, Distinctions between Typic Fragiochrepts and other subgroups, and replace with the following key to subgroups and definition of Typic Fragiochrepts:

"Key to subgroups

JDAA. Fragiochrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Fragiochrepts

JDAB. Other Fragiochrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass: or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Fragiochrepts

JDAC. Other Fragiochrepts that have distinct or prominent mottles in the upper 30 cm of the soil.

Aquic Fragiochrepts

JDAD. Other Fragiochrepts that do not have an ochric epipedon.

Umbric Fragiochrepts

JDAE. Other Fragiochrepts.

Typic Fragiochrepts

Definition of Typic Fragiochrepts

Typic Fragiochrepts are the Fragiochrepts that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass: or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have distinct or prominent mottles in the upper 30 cm of the soil; and

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3. Have an ochric epipedon."

Page 254, second column and extending to page 255, first column. Delete the section, Distinctions between Typic Ustochrepts and other subgroups, and replace with the following key to subgroups and definition of Typic Ustochrepts:

"Key to subgroups

JDDA. Ustochrepts that have a lithic contact within 50 cm of the surface.

Lithic Ustochrepts

JDDB. Other Ustochrepts that:

1. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

2. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and that are at least 30 cm long in some part and that extend upward to the soil surface or the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Udertic Ustochrepts

JDDC. Other Ustochrepts that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and that are at least 30 cm long in some part and that extend upward to the soil surface or the base of an Ap horizon,

2. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at

least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Ustochrepts

JDDD. Other Ustochrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Ustochrepts

JDDE. Other Ustochrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Ustochrepts

JDDF. Other Ustochrepts that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some period when its temperature is 50 C or more or the soil has artificial drainage.

Aquic Ustochrepts

JDDG. Other Ustochrepts that:

1. Have a content of organic carbon²⁰ that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface; and

2. Have slopes of 25 percent or less.

Fluventic Ustochrepts

JDDH. Other Ustochrepts that when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry sixth-tenths or more of the time in half or more years in some part of the

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²⁰ See footnote 19 on p. 249.

moisture control section (not necessarily the same part) during the period when the soil temperature, at a depth 50 cm below the surface, exceeds 5° C; or

2. If the soil temperature regime is hyperthermic or isomesic or warmer, are moist in some or all parts of the soil moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth 50 cm below the soil surface is higher than 8° C.

Aridic Ustochrepts

JDDI. Other Ustochrepts that when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udic Ustochrepts

JDDJ. Other Ustochrepts.

Typic Ustochrepts

Definition of Typic Ustochrepts

Typic Ustochrepts are the Ustochrepts that

1. Have a content of organic carbon²⁰ that decreases regularly with depth and, unless a lithic or paralithic contact occurs at a shallower depth, reaches a level of 0.2 percent or less within 125 cm of the soil surface; or have slopes of more than 25 percent;

2. Do not have a lithic contact within 50 cm of the surface;

3. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and that are at least 30 cm long in some part and that extend upward to the soil surface or the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

4. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizon is

saturated with water at some period when its temperature is 5° C or more or if the soil has artificial drainage;

5. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for more than four-tenths of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C;

6. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

7. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry less than sixth-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) during the period when the soil temperature, at a depth 50 cm below the surface, exceeds 5° C;

b. If the soil temperature regime is hyperthermic or isomesic or warmer, are moist in some or all parts of the soil moisture control section for 90 consecutive days or more during a period when the soil temperature at a depth 50 cm below the soil surface is higher than 8° C."

Page 256, first column and extending to second column. Delete the section, Distinctions between Typic Xerochrepts and other subgroups, and replace with the following key to subgroups and definition of Typic Xerochrepts:

²⁰ See footnote 19 on p. 249.

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"Key to subgroups

JDEA. Xerochrepts that have a lithic contact within 50 cm of the soil surface in some part but less than half of each pedon.

Ruptic-Lithic Xerochrepts

JDEB. Other Xerochrepts that:

1. Have base saturation (by NH_4OAc) of less than 60 percent in all parts of the soil between depths of 25 and 75 cm below the soil surface; and

2. Have a lithic contact within 50 cm of the soil surface.

Dystric Lithic Xerochrepts

JDEC. Other Xerochrepts that:

1. Have a lithic contact within 50 cm of the soil surface; and

2. Have an intermittent cambic horizon.
Lithic Ruptic-Xerorthentic Xerochrepts

JDED. Other Xerochrepts that have a lithic contact within 50 cm of the soil surface.

Lithic Xerochrepts

JDEE. Other Xerochrepts that have a petrocalcic horizon within a depth of 100 cm of the soil surface.

Petrocalcic Xerochrepts

JDEF. Other Xerochrepts that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Xerochrepts

JDEG. Other Xerochrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Xerochrepts

JDEH. Other Xerochrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandid Xerochrepts

JDEI. Other Xerochrepts that have a gypsic horizon within a depth of 100 cm of the soil surface.

Gypsic Xerochrepts

JDEJ. Other Xerochrepts that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface; and

2. Have base saturation (by NH_4OAc) of less than 60 percent in all parts of the soil between depths of 25 and 75 cm below the soil surface.

Aquic Dystric Xerochrepts

JDEK. Other Xerochrepts that have mottles that have chroma of 2 or less within 75 cm of the soil surface.

Aquic Xerochrepts

JDEL. Other Xerochrepts that:

1. Have base saturation (by NH_4OAc) of less than 60 percent in all parts of the soil between depths of 25 and 75 cm below the soil surface;

2. Have a content of organic carbon that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface; and

3. Have slopes of 25 percent or less.

Dystric Fluventic Xerochrepts

JDEM. Other Xerochrepts that:

1. Have a content of organic carbon that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface; and

2. Have slopes of 25 percent or less.

Fluventic Xerochrepts

JDEN. Other Xerochrepts that have base saturation (by NH_4OAc) of less than 60 percent in all parts of the soil between depths of 25 and 75 cm below the soil surface.

Dystric Xerochrepts

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JDEO. Other Xerochrepts that have a calcic horizon or soft powdery lime within a depth of 150 cm if the weighted average particle-size class from depths of 25 to 100 cm is sandy or to a lithic or paralithic contact if one is shallower than 100 cm, or within a depth of 110 cm if the weighted average particle-size class is loamy, or within a depth of 90 cm if it is clayey.
Calcixerollic Xerochrepts

JDEP. Other Xerochrepts.

Typic Xerochrepts

Definition of Typic Xerochrepts

Typic Xerochrepts are the Xerochrepts that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface;
2. Have base saturation (by NH_4OAc) of 60 percent or more in some part of the soil between depths of 25 and 75 cm below the soil surface;
3. Have a content of organic carbon that decreases regularly with depth, and unless a lithic or a paralithic contact occurs at a shallower depth, reaches a level of 0.2 percent or less within 125 cm of the soil surface; or have slopes of more than 25 percent;
4. Do not have a lithic contact within 50 cm of the soil surface in any part of each pedon;
5. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

6. Do not have a calcic horizon or soft powdery lime within a depth of 150 cm if the weighted average particle-size class from depths of 25 to 100 cm is sandy or to a lithic or paralithic contact if one is shallower than 100 cm, or within a depth of 110 cm if the weighted average particle-size class is loamy, or within a depth of 90 cm if it is clayey;

7. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

8. Do not have a petrocalcic horizon within a depth of 100 cm of the soil surface;

9. Do not have a gypsic horizon within a depth of 100 cm of the soil surface; and

10. Do not have an intermittent cambic horizon if there is a lithic contact within 50 cm of the soil surface."

Page 258, second column and extending to page 259, first column. Delete the section, Distinctions between Typic Dystropepts and other subgroups, and replace with the following key to subgroups and definition of Typic Dystropepts:

*Key to subgroups

JCEA. Dystropepts that have a lithic contact within 50 cm of the soil surface.

Lithic Dystropepts

JCEB. Other Dystropepts that have a petroferic contact within 50 cm of the soil surface.

Petroferic Dystropepts

JCEC. Other Dystropepts that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.09 or more if the soil moisture regime is udic, or 0.07 or more if it is ustic, in a horizon or horizons at least 50 cm thick, and a potential linear extensibility of 6 cm or more in the upper 100 cm or 125 cm, respectively, of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm or 125 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Dystropepts

JCED. Other Dystropepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa

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water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of more than 1.0 percent.

Andic Dystropepts

JCEE. Other Dystropepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus $1/2$ acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Dystropepts

JCEF. Other Dystropepts that have mottles that have chroma of 2 or less within 100 cm of the soil surface and the mottled horizon is saturated with water at some time of year or the soil has artificial drainage.

Aquic Dystropepts

JCEG. Other Dystropepts that:

1. Have a content of organic carbon²² that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface; and

2. Have slopes of 25 percent or less.

Fluventic Dystropepts

JCEH. Other Dystropepts that:

1. Have a ustic moisture regime; and

2. Have a CEC (by $1\text{N NH}_4\text{OAc pH 7}$) of less than $24 \text{ cmol}(+) \text{ per kg clay}^{23}$ in the major part of the soil below a depth of 25 cm but above 100 cm or a lithic or paralithic contact if one is shallower than 100 cm.

Ustoxic Dystropepts

JCEI. Other Dystropepts that have a CEC (by $1\text{N NH}_4\text{OAc pH 7}$) of less than $24 \text{ cmol}(+) \text{ per kg}$

clay²³ in the major part of the soil below a depth of 25 cm but above 100 cm or a lithic or paralithic contact if one is shallower than 100 cm.

Oxic Dystropepts

JCEJ. Other Dystropepts that have a ustic moisture regime.

Ustic Dystropepts

JCEK. Other Dystropepts.

Typic Dystropepts

Definition of Typic Dystropepts

Typic Dystropepts are the Dystropepts that

1. Do not have mottles that have chroma of 2 or less within 100 cm of the soil surface if the mottled horizon is saturated with water at some time of year or the soil has artificial drainage.

2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus $1/2$ acid-oxalate-extractable iron of 0.40 percent or more;

3. Have a content of organic carbon²² that decreases regularly with depth and, unless a lithic or paralithic contact is present at a shallower depth, reaches a level of 0.2 percent or less within 125 cm of the soil surface, or have slopes of more than 25 percent;

4. Do not have a lithic or a petroferric contact within 50 cm of the soil surface;

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²²See footnote 19 on p. 249.

²³Some cambic horizons that have properties that approach those of an oxic horizon do not disperse well. If the ratio of the percentage of water retained at tension of 1500 kPa to the percentage of measured clay is 0.6 or more, the percentage of clay is determined by the higher value of (1) the measured percentage of clay or (2) 2.5 times the percentage of water retained at tension of 1500 kPa.

²⁵Some cambic horizons that have properties that approach those of an oxic horizon do not disperse well. If the ratio of the percentage of water retained at tension of 1500 kPa to the percentage of measured clay is 0.6 or more, the percentage of clay is determined by the higher value of (1) the measured percentage of clay or (2) 2.5 times the percentage of water retained at tension of 1500 kPa.

²²See footnote 19 on p. 249.

5. Have a CEC (by 1N NH₄OAc pH 7) of 24 or more cmol(+) per kg clay²³ in the major part of the soil below a depth of 25 cm but above 100 cm or a lithic or paralithic contact if one is shallower than 100 cm;

6. Have a udic moisture regime; and

7. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.09 or more if the soil moisture regime is udic, or 0.07 or more if it is ustic, in a horizon or horizons at least 50 cm thick, and a potential linear extensibility of 6 cm or more in the upper 100 cm or 125 cm, respectively, of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm or 125 cm;

c. More than 35 percent clay in horizons that total more than 50 cm in thickness."

Page 260, first column and extending to second column. Delete the section, Distinctions between Typic Eutropepts and other subgroups, and replace with the following key to subgroups and definition of Typic Eutropepts:

"Key to subgroups

JCDA. Eutropepts that have a lithic contact within 50 cm of the soil surface.

Lithic Eutropepts

JCDB. Other Eutropepts that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part and that extend upward to the soil surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil, or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Eutropepts

JCDC. Other Eutropepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Eutropepts

JCDD. Other Eutropepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandidic Eutropepts

JCDE. Other Eutropepts that:

1. Have a content of organic carbon²⁴ that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface;

2. Have slopes of 25 percent or less; and

3. Have mottles that have chroma of 2 or less within 100 cm of the soil surface and the mottle horizon is saturated with water at some time during the year or there is artificial drainage.

Fluvaquentic Eutropepts

JCDF. Other Eutropepts that have mottles that have chroma of 2 or less within 100 cm of the soil surface and the mottle horizon is saturated with water at some time during the year or there is artificial drainage.

Aquic Eutropepts

JCDG. Other Eutropepts that:

1. Have a content of organic carbon²⁴ that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface; and

2. Have slopes of 25 percent or less.

Fluventic Eutropepts

²³Some cambic horizons that have properties that approach those of an oxic horizon do not disperse well. If the ratio of the percentage of water retained at tension of 1500 kPa to the percentage of measured clay is 0.6 or more, the percentage of clay is determined by the higher value of (1) the measured percentage of clay or (2) 2.5 times the percentage of water retained at tension of 1500 kPa.

²⁴See footnote 19 on p. 249.

²⁴See footnote 19 on p. 249.

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JCDH. Other Eutropepts.

Typic Eutropepts

Definition of Typic Eutropepts

Typic Eutropepts are the Eutropepts that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have mottles that have chroma of 2 or less within 100 cm of the soil surface if the mottle horizon is saturated with water at some time during the year or if there is artificial drainage.

3. Have a content of organic carbon²⁴ that decreases regularly with depth and, unless a lithic or paralithic contact is present at a shallower depth, reaches a level of 0.2 percent organic carbon or less within 125 cm of the soil surface; or have slopes of more than 25 percent;

4. Do not have a lithic contact within 50 cm of the soil surface; and

5. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part and that extend upward to the soil surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil, or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness."

Page 261, second column and extending to page 262, first column. Delete the section, Distinctions between Typic Humitropepts and other subgroups, and replace with the following key to subgroups and definition of Typic Humitropepts:

"Key to subgroups

JCAA. Humitropepts that have a lithic contact within 50 cm of the soil surface.

Lithic Humitropepts

JCAB. Other Humitropepts that:

1. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; and

2. Have an ustic moisture regime.

Ustalic Humitropepts

JCAC. Other Humitropepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Humitropepts

JCAD. Other Humitropepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Humitropepts

JCAE. Other Humitropepts that have mottles that have chroma of 2 or less within 100 cm of the soil surface and the mottled horizon is saturated with water at some time of year or there is artificial drainage.

Aquic Humitropepts

JCAF. Other Humitropepts that:

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²⁴ See footnote 19 on p. 249.

1. Have a content of organic carbon that decreases irregularly with depth to the base of the cambic horizon; and

2. Have slopes of 25 percent or less.

Fluventic Humitropepts

JCAG. Other Humitropepts that:

1. Have a ustic moisture regime; and

2. Have a CEC (by NH_4OAc pH 7) of less than 24 cmol(+) per kg clay²⁵ in the major part of the soil below a depth of 25 cm but above 100 cm or a lithic or paralithic contact if one is shallower than 100 cm.

Ustoxic Humitropepts

JCAH. Other Humitropepts that have a CEC (by NH_4OAc pH 7) of less than 24 cmol(+) per kg clay²⁵ in the major part of the soil below a depth of 25 cm but above 100 cm or a lithic or paralithic contact if one is shallower than 100 cm.

Oxic Humitropepts

JCAI. Other Humitropepts that have a ustic soil moisture regime.

Ustic Humitropepts

JCAJ. Other Humitropepts.

Typic Humitropepts

Definition of Typic Humitropepts

Typic Humitropepts are the Humitropepts that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have mottles that have chroma of 2 or less within 100 cm of the soil surface if the mottled horizon

is saturated with water at some time of year or if there is artificial drainage;

3. Do not have a lithic contact within 50 cm of the soil surface;

4. Have a CEC (by NH_4OAc pH 7) of 24 or more cmol per kg clay²⁵ in the major part of the soil below a depth of 25 cm but above 100 cm or a lithic or paralithic contact if one is shallower than 100 cm;

5. Have a content of organic carbon that decreases regularly with depth to the base of the cambic horizon, or have slopes of more than 25 percent; and

6. Have a udic moisture regime."

Page 263, first column and extending to second column.

Delete the section, Distinctions between Typic Ustropepts and other subgroups, and replace with the following key to subgroups and definition of Typic Ustropepts:

"Key to subgroups

JCCA. Ustropepts that have a lithic contact within 50 cm of the soil surface.

Lithic Ustropepts

JCCB. Other Ustropepts that have cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

Vertic Ustropepts

JCCC. Other Ustropepts that have mottles that have chroma of 2 or less within 100 cm of the soil surface and the mottled horizon is saturated with water at some time of the year or there is artificial drainage.

Aquic Ustropepts

JCCD. Other Ustropepts that have a CEC (by NH_4OAc pH7) of less than 24 cmol(+) per kg clay²⁵ in the major part of the soil below a depth of 25 cm but above 100 cm or a lithic or paralithic contact if one is shallower than 100 cm.

Oxic Ustropepts

JCCD Other Ustropepts that:

1. Have a content of organic carbon that decreases irregularly with depth or are 125 cm or more deep to a lithic or a paralithic contact and have more than 0.2 percent organic carbon at 125 cm below the soil surface; and

2. Have slopes of 25 percent or less;

Fluventic Ustropepts

JCCE. Other Ustropepts.

Typic Ustropepts

Definition of Typic Ustropepts

Typic Ustropepts are the Ustropepts that

²⁵See footnote 23 on p. 259.

²⁵See footnote 23 on p. 259.

²⁵See footnote 23 on p. 259.

²⁶See footnotes 23 on p. 259.

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1. Do not have mottles that have chroma of 2 or less within 100 cm of the soil surface if the mottled horizon is saturated with water at some time of the year or if there is artificial drainage;

2. Have a content of organic carbon that decreases regularly with depth and, unless a lithic or paralithic contact occurs at a shallower depth, reaches a level of 0.2 percent organic carbon or less within 125 cm of the soil surface; or have slopes of more than 25 percent;

3. Do not have a lithic contact within 50 cm of the soil surface;

4. Have a CEC (by $\text{NH}_4\text{OAc pH7}$) of 24 or more $\text{cmol}(+) \text{ per kg clay}^{26}$ in the major part of the soil below a depth of 25 cm but above 100 cm or a lithic or paralithic contact if one is shallower than 100 cm; and

5. Do not have cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon."

Page 265, first column. Delete the section, Distinctions between Typic Cryumbrepts and other subgroups, and replace with the following key to subgroups and definition of Typic Cryumbrepts:

"Key to subgroups

JEBA. Cryumbrepts that have a lithic contact within 50 cm of the surface in only part of each pedon.
Ruptic-Lithic Cryumbrepts

JEBB. Other Cryumbrepts that:

1. Have a lithic contact within 50 cm of the surface; and

2. Have an umbric epipedon that is discontinuous in each pedon.
Lithic Ruptic-Entic Cryumbrepts

JEBC. Other Cryumbrepts that have a lithic contact within 50 cm of the surface.
Lithic Cryumbrepts

JEBD. Other Cryumbrepts that have a mean annual soil temperature of 0°C or lower.
Pergelic Cryumbrepts

JEBE. Other Cryumbrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.
Andic Cryumbrepts

JEBF. Other Cryumbrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and

cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandonic Cryumbrepts

JEBG. Other Cryumbrepts that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time of the year when its temperature is 5°C or more or there is artificial drainage.

Aquic Cryumbrepts

JEBH. Other Cryumbrepts that do not have a cambic horizon.

Entic Cryumbrepts

JEBI. Other Cryumbrepts.

Typic Cryumbrepts

Definition of Typic Cryumbrepts

Typic Cryumbrepts are the Cryumbrepts that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Have a cambic horizon;

3. Do not have a lithic contact within 50 cm of the surface in any part of each pedon;

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²⁶ See footnote 23 on p. 259.

4. Have a mean annual soil temperature higher than 0° C;

5. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizon is saturated with water at some time of the year when its temperature is 5° C or more or if there is artificial drainage; and

6. Have an umbric epipedon that is continuous in each pedon."

Page 266, first column. Delete the section, Distinctions between Typic Fragiumbrepts and other subgroups, and replace with the following key to subgroups and definition of Typic Fragiumbrepts:

"Key to subgroups

The definitions that follow are incomplete because there are few of these soils in the United States.

JEAA. Fragiumbrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.
Andic Fragiumbrepts

JEAB. Other Fragiumbrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandid Fragiumbrepts

JEAC. Other Fragiumbrepts that have mottles that have chroma of 2 or less within 50 cm of the soil surface.

Aquic Fragiumbrepts

JEAD. Other Fragiumbrepts.

Typic Fragiumbrepts

Definition of Typic Fragiumbrepts

Typic Fragiumbrepts are the Fragiumbrepts that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more; and

2. Do not have mottles that have chroma of 2 or less within 50 cm of the soil surface."

Page 267, first column and extending to second column. Delete the section, Distinctions between Typic Haplumbrepts and other subgroups, and replace with the following key to subgroups and definition of Typic Haplumbrepts:

"Key to subgroups

JEDA. Haplumbrepts that have a lithic contact within 50 cm of the soil surface.

Lithic Haplumbrepts

JEDB. Other Haplumbrepts that:

1. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; and

2. Have mottles that have chroma of 2 or less within 50 cm of the soil surface and the mottled horizon is saturated with water at some time of the year when its temperature is more than 5° C or there is artificial drainage.

Aquandic Haplumbrepts

JEDC. Other Haplumbrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Haplumbrepts

JEDD. Other Haplumbrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

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1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Haplumbrepts

JEDE. Other Haplumbrepts that:

1. Do not have a cambic horizon; and

2. Have sandy particle-size class from the mineral soil surface to a depth of 100 cm or more, and have in the 0.02 to 2mm fraction more than 90 percent silica minerals (quartz, chalcedony or opal) or other extremely durable minerals that are resistant to weathering.

Quartzipsammentic Haplumbrepts

JEDF. Other Haplumbrepts that have a sandy particle-size class from the mineral soil surface to a depth of 100 cm or more.

Psammentic Haplumbrepts

JEDG. Other Haplumbrepts that:

1. Have an umbric or a mollic epipedon that is 50 cm or more thick;

2. Have a content of organic carbon²⁸ that decreases irregularly with depth; and

3. Have slopes of 25 percent or less.

Cumulic Haplumbrepts

JEDH. Other Haplumbrepts that have an umbric or a mollic epipedon that is 50 cm or more thick.

Pachic Haplumbrepts

JEDI. Other Haplumbrepts that have mottles that have chroma of 2 or less within 50 cm of the soil surface and the mottled horizon is saturated with water at some time of the year when its temperature is more than 5° C or there is artificial drainage.

Aquic Haplumbrepts

JEDJ. Other Haplumbrepts that:

1. Have a content of organic carbon²⁸ that decreases irregularly with depth; and

2. Have slopes of 25 percent or less.

Fluventic Haplumbrepts

JEDK. Other Haplumbrepts that do not have a cambic horizon.

Entic Haplumbrepts

JEDL. Other Haplumbrepts.

Typic Haplumbrepts

Definition of Typic Haplumbrepts

Typic Haplumbrepts are the Haplumbrepts that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have mottles that have chroma of 2 or less within 50 cm of the soil surface if the mottled horizon is saturated with water at some time of the year when its temperature is more than 5° C or if there is artificial drainage;

3. Have a cambic horizon;

4. Have a content of organic carbon²⁸ that decreases regularly with depth or have slopes more than 25 percent;

5. Do not have a lithic contact within 50 cm of the soil surface;

6. Have an umbric or a mollic epipedon that is less than 50 cm thick; and

7. Have texture finer than loamy fine sand within a depth of 50 cm."

Page 268, second column. Delete the section, Distinctions between Typic Xerumbrepts and other subgroups, and replace with the following key to subgroups and definition of Typic Xerumbrepts:

"Key to subgroups

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²⁸See footnote 19 on p. 249.

²⁸See footnote 19 on p. 249.

²⁸See footnote 19 on p. 249.

JECA. Xerumbrepts that have a lithic contact within 50 cm of the soil surface.

Lithic Xerumbrepts

JECB. Other Xerumbrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Xerumbrepts

JECC. Other Xerumbrepts that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Xerumbrepts

JECD. Other Xerumbrepts that have an umbric or mollic epipedon that is 50 cm or more thick.

Pachic Xerumbrepts

JECE. Other Xerumbrepts that have mottles that have chroma of 2 or less within 75 cm of the soil surface and the mottled horizon is saturated with water at some time of the year when its temperature is more than 5°C or there is artificial drainage.

Aquic Xerumbrepts

JECF. Other Xerumbrepts that:

1. Have a content of organic carbon that decreases irregularly with depth; and

2. Have slopes of 25 percent or less.

Fluventic Xerumbrepts

JECG. Other Xerumbrepts that do not have a cambic horizon.

Entic Xerumbrepts

JECH. Other Xerumbrepts.

Typic Xerumbrepts

Definition of Typic Xerumbrepts

Typic Xerumbrepts are the Xerumbrepts that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface if the mottled horizon is

saturated with water at some time of the year when its temperature is more than 5°C or if there is artificial drainage;

2. Have an umbric or mollic epipedon that is less than 50 cm thick;

3. Have a cambic horizon;

4. Have a content of organic carbon that decreases regularly with depth or have slopes of more than 25 percent;

5. Do not have a lithic contact within 50 cm of the soil surface; and

6. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 274, first column. Delete the section, Distinctions between Typic Argialbolls and other subgroups, and replace with the following key to subgroups and definition of Typic Argialbolls:

"Key to subgroups

HABA. Argialbolls that:

1. Have an abrupt textural change from the albic to the argillic horizon; and

2. When not irrigated, are dry in all parts of the moisture control section for as long as 45 consecutive days during the 120 days following the summer solstice in more than 6 out of 10 years.

Argiaquic Xeric Argialbolls

HABB. Other Argialbolls that have an abrupt textural change from the albic to the argillic horizon.

Argiaquic Argialbolls

HABC. Other Argialbolls that, when not irrigated, are dry in all parts of the moisture control section for as long as 45 consecutive days during the

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120 days following the summer solstice in more than 6 out of 10 years.

Xeric Argialbolls

HABD. Other Argialbolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Argialbolls

HABE. Other Argialbolls.

Typic Argialbolls

Definition of Typic Argialbolls

Typic Argialbolls are the Argialbolls that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Have an abrupt textural change from the albic to the argillic horizon; and

3. When not irrigated, are not dry in all parts of the moisture control section for as long as 45 consecutive days during the 120 days following the summer solstice in more than 6 out of 10 years."

Page 274, second column (Also see NSTH issue No. 1, page 615-14). After the definition of Natralbolls, add the following key to subgroups:

"Key to subgroups

HAAA. All Natralbolls (provisionally).

Typic Nartalbolls"

Page 276, first column and extending to second column. Delete the section, Distinctions between Typic Argiaquolls and other subgroups, and replace with the following key to subgroups and definition of Typic Argiaquolls:

"Key to subgroups

HBEA. Argiaquolls that have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to the upper boundary of the argillic horizon and the upper boundary of the argillic horizon is between 50 and 100 cm below the soil surface.

Arenic Argiaquolls

HBEB. Other Argiaquolls that have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to the upper boundary of the argillic horizon and the upper boundary of the argillic horizon is more than 100 cm below the soil surface.

Grossarenic Argiaquolls

HBEC. Other Argiaquolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface of the soil or to the base of the Ap horizon,

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the soil to a depth of 100 cm or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm, and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Argiaquolls

HBED. Other Argiaquolls that have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm below the upper boundary.

Abruptic Argiaquolls

HBEE. Other Argiaquolls.

Typic Argiaquolls

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Definition of Typic Argiaquolls

Typic Argiaquolls are the Argiaquolls that

1. Do not have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm below the upper boundary;

2. Have a texture finer than loamy fine sand in some subhorizon within 50 cm of the surface; and

3. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface of the soil or to the base of the Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the soil to a depth of 100 cm or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness."

Page 277, first column. Delete the section, Distinctions between Typic Calciaquolls and other subgroups, and replace with the following key to subgroups and definition of Typic Calciaquolls:

"Key to subgroups

HBDA. Calciaquolls that have a petrocalcic horizon that has its upper boundary within 100 cm of the surface.

Petrocalcic Calciaquolls

HBDB. Other Calciaquolls that have color that has dominant chroma of 3 or more in the matrix or on the ped surfaces in one or more subhorizons within 75 cm of the surface or have one of the following colors immediately below the mollic epipedon:

1. If the hue is 2.5Y or yellow and there are distinct or prominent mottles, the chroma, moist, is 3 or more; if there are no mottles, the chroma, moist, is 2 or more; or

2. If the hue is 10YR or redder the chroma, moist, is 2 or more.

Aeric Calciaquolls

HBDC. Other Calciaquolls.

Typic Calciaquolls

Definition of Typic Calciaquolls

Typic Calciaquolls are the Calciaquolls that

1. Do not have color that has dominant chroma of 3 or more in the matrix or on the ped surfaces in any subhorizon within 75 cm of the surface and do have one or more of the following colors immediately below the mollic epipedon:

a. If the nearest hue is 2.5Y or yellow and there are distinct or prominent mottles, the chroma, moist, is 2 or less; if there are no mottles, the chroma, moist, is 1 or less; or

b. If the nearest hue is 10YR or redder and there are distinct or prominent mottles, the chroma is nearer to 1 than to 2; if there are no mottles, the chroma is 1 or less; and

2. Do not have a petrocalcic horizon that has its upper boundary within 100 cm of the surface."

Page 277, second column and extending to page 278, first column. Delete the section, Distinctions between Typic Cryaquolls and other subgroups, and replace with the following key to subgroups and definition of Typic Cryaquolls:

"Key to subgroups

HBAA. Cryaquolls that have a mean annual soil temperature of 0° C or lower.

Pergelic Cryaquolls

HBAB. Other Cryaquolls that have a histic epipedon.

Histic Cryaquolls

HBAC. Other Cryaquolls that have a buried Histosol that has its upper boundary within a depth of 100 cm.

Thapto-Histic Cryaquolls

HBAD. Other Cryaquolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

2. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

3. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass: or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Aquandic Cryaquolls

HBAE. Other Cryaquolls that have an argillic horizon.

Agric Cryaquolls

HBAF. Other Cryaquolls that have a calcic horizon within or immediately below the mollic epipedon.

Calcic Cryaquolls

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HBAG. Other Cryaquolls that have a mollic epipedon that is 50 cm or more thick.
Cumulic Cryaquolls

HBAH. Other Cryaquolls.
Typic Cryaquolls

Definition of Typic Cryaquolls

Typic Cryaquolls are the Cryaquolls that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have an argillic horizon;

3. Do not have a calcic horizon within or immediately below the mollic epipedon;

4. Have a mollic epipedon that is less than 50 cm thick;

5. Do not have a histic epipedon;

6. Have a mean annual soil temperature higher than 0° C; and

7. Do not have a buried Histosol that has its upper boundary within a depth of 100 cm."

Page 279, first column. Delete the section, Distinctions between Typic Duraquolls and other subgroups, and replace with the following key to subgroups and definition of Typic Duraquolls:

"Key to subgroups

HBBA. Duraquolls that have a natric horizon.
Natric Duraquolls

HBBB. Other Duraquolls that have an argillic horizon.
Argic Duraquolls

HBBC. Other Duraquolls.
Typic Duraquolls

Definition of Typic Duraquolls

Typic Duraquolls are the Duraquolls that do not have an argillic horizon or natric horizon."

Page 279, second column and extending to page 280, first column. Delete the section, Distinctions between Typic Haplaquolls and other subgroups, and replace with the following key to subgroups and definition of Typic Haplaquolls:

"Key to subgroups

HBFA. Haplaquolls that have a lithic contact within a depth of 50 cm of the surface.
Lithic Haplaquolls

HBFB. Other Haplaquolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon; and

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.
Vertic Haplaquolls

HBFC. Other Haplaquolls that have a histic epipedon.
Histic Haplaquolls

HBFD. Other Haplaquolls that have a buried Histosol that has its upper boundary within 100 cm of the soil surface.
Thapto-Histic Haplaquolls

HBFE. Other Haplaquolls that have a layer in the upper 75 cm that has a texture finer than loamy fine sand, that is as much as 18 cm thick, that has a bulk density (at 33 kPa water tension) of 0.95 g per cubic centimeter or less in the fine-earth fraction, and that has either of the following:

1. A ratio of measured clay to 1500 kPa water (percentages) of 1.25 or less; or

2. A ratio of CEC (at pH near 8) to 1500 kPa water of more than 1.5 and more exchange acidity than the sum of bases plus KCl-extractable aluminum.
Andaqueptic Haplaquolls

HBFF. Other Haplaquolls that have a horizon 15 cm or more thick that is within 100 cm of the surface and that contains at least 20 percent (by volume) of durinodes or is brittle and has firm consistence when moist.
Duric Haplaquolls

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HBFG. Other Haplaquolls that have a mollic epipedon that is 60 cm or more thick.
Cumulic Haplaquolls

HBFH. Other Haplaquolls that have slope of less than 25 percent; and

1. Have a content of organic carbon that decreases irregularly with increasing depth; or
2. Have more than 0.3 percent carbon in all subhorizons within 125 cm of the soil surface.
Fluvaquentic Haplaquolls

HBFI. Other Haplaquolls.
Typic Haplaquolls

Definition of Typic Haplaquolls

Typic Haplaquolls are the Haplaquolls that

1. Do not have a layer in the upper 75 cm that has a texture finer than loamy fine sand, that is as much as 18 cm thick, that has a bulk density (at 33 kPa water tension) of 0.95 g per cubic centimeter or less in the fine-earth fraction, and that has either of the following:

- a. A ratio of measured clay to 1500 kPa water (percentages) of 1.25 or less; or
- b. A ratio of CEC (at pH near 8) to 1500 kPa water of more than 1.5 and more exchange acidity than the sum of bases plus KCl-extractable aluminum;

2. Do not have a buried Histosol that has its upper boundary within 100 cm of the soil surface;

3. Have a mollic epipedon that is less than 60 cm thick;

4. Do not have a horizon 15 cm or more thick that is within 100 cm of the surface and that contains at least 20 percent (by volume) of durinodes or is brittle and has firm consistence when moist;

5. Have a content of organic carbon that decreases regularly with increasing depth and reaches a level of 0.3 percent carbon or less in some subhorizon within 125 cm of the soil surface, or the slope is 25 percent or more;

6. Do not have a histic epipedon;

7. Do not have a lithic contact within 50 cm of the surface; and

8. Do not have the following combination of characteristics:

- a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon; and
- b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness."

Page 281, first column. Delete the paragraph following the description of a Typic Natraquoll and replace with the following key to subgroups and rewrite of deleted paragraph:

"Key to subgroups

HBCA. All Natraquolls (provisional).
Typic Natraquolls

The range in properties of the Natraquolls is slight. Some have a noncalcareous surface horizon, but most are calcareous throughout. In the United States, all Natraquolls are therefore considered to be Typic Natraquolls. Other subgroups may be needed elsewhere, but none have been proposed."

Page 282, first column and extending to page 283, first column. Delete the section, Distinctions between Typic Argiborolls and other subgroups, and replace with the following key to subgroups and definition of Typic Argiborolls:

"Key to subgroups

HEDA. Argiborolls that have a lithic contact within a depth of 50 cm of the surface.
Lithic Argiborolls

HEDB. Other Argiborolls that:

1. Have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm below the upper boundary; and

2. Have either or both

a. A color value, dry, of 5 or more in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm thick; or

b. A moisture control section that is dry in some part six-tenths or more of the time in most years that the soil temperature at a depth of 50 cm is above 5° C.

Abruptic Aridic Argiborolls

HEDC. Other Argiborolls that:

1. Have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm below the upper boundary; and

2. Have a chroma (rubbed), moist, of 1 or less in the upper 18 cm of the mollic epipedon after mixing, or in any Ap horizon that is more than 18 cm thick or the soil is moist in some or all parts of the moisture control section at all times in most years.

Abruptic Udic Argiborolls

HEDD. Other Argiborolls that:

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1. Have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm below the upper boundary; and

2. Have an albic horizon immediately below the mollic epipedon; and

3. Have mottles that have chroma of 2 or less within 100 cm of the surface and, if undrained, are continuously saturated with water for as long as 90 days within 100 cm of the surface.

Albic Argiborolls

HEDE. Other Argiborolls that have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm below the upper boundary.

Abruptic Argiborolls

HEDF. Other Argiborolls that:

1. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;

b. A potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

2. Have both

a. A color value, dry, of 5 in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm thick; and

b. A moisture control section that is dry in some part six-tenths or more of the time that the soil temperature at a depth of 50 cm is above 5°C in most years.

Ustertic Argiborolls

HEDG. Other Argiborolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;

2. A potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Argiborolls

HEDH. Other Argiborolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Argiborolls

HEDI. Other Argiborolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Argiborolls

HEDJ. Other Argiborolls that:

1. Have a mollic epipedon that is 40 cm or more thick, and its texture is finer than loamy fine sand; and

2. Have a chroma (rubbed), moist, of 1 or less in the upper 18 cm of the mollic epipedon after mixing, or in any Ap horizon that is more than 18 cm thick or the soil is moist in some or all parts of the moisture control section at all times in most years.

Pachic Udic Argiborolls

HEDK. Other Argiborolls that have a mollic epipedon that is 40 cm or more thick, and its texture is finer than loamy fine sand.

Pachic Argiborolls

HEDL. Other Argiborolls that have both:

1. A color value, dry, of 5 in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm thick; and

2. A moisture control section that is dry in some part six-tenths or more of the time that the soil temperature at a depth of 50 cm is above 5°C in most years.

Aridic Argiborolls

HEDM. Other Argiborolls that have mottles that have chroma of 2 or less within 100 cm of the

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surface and, if undrained, are continuously saturated with water for as long as 90 days within 100 cm of the surface.

Aquic Argiborolls

HEDN. Other Argiborolls that:

1. Have tonguing or interfingering of albic materials in the upper part of the argillic horizon, or skeletons of clean silt and sand covering more than half the ped faces in the upper 5 cm or more of the argillic horizon; and

2. Have a chroma (rubbed), moist, of 1 or less in the upper 18 cm of the mollic epipedon after mixing, or in any Ap horizon that is more than 18 cm thick or the soil is moist in some or all parts of the moisture control section at all times in most years.

Boralfic Udic Argiborolls

HEDO. Other Argiborolls that have tonguing or interfingering of albic materials in the upper part of the argillic horizon, or skeletons of clean silt and sand covering more than half the ped faces in the upper 5 cm or more of the argillic horizon.

Boralfic Argiborolls

HEDP. Other Argiborolls that have a chroma (rubbed), moist, of 1 or less in the upper 18 cm of the mollic epipedon after mixing, or in any Ap horizon that is more than 18 cm thick or the soil is moist in some or all parts of the moisture control section at all times in most years.

Udic Argiborolls

HEDQ. Other Argiborolls that have an albic horizon that lies immediately below the mollic epipedon.

Albollic Argiborolls

HEDR. Other Argiborolls.

Typic Argiborolls

Definition of Typic Argiborolls

Typic Argiborolls are the Argiborolls that

1. Do not have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm below the upper boundary;

2. Do not have either

a. An albic horizon that lies immediately below the mollic epipedon; or

b. Tonguing or interfingering of albic materials in the upper part of the argillic horizon, or skeletons of clean silt and sand covering more than half the ped faces in the upper 5 cm or more of the argillic horizon;

3. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable

aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

4. Do not have mottles that have chroma of 2 or less within 100 cm of the surface or, if undrained, are not continuously saturated with water for as long as 90 days within 100 cm of the surface;

5. Do not have a lithic contact within a depth of 50 cm of the surface;

6. Have

a. Either or both

(1) A color value, dry, of 4 or less in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm thick; or

(2) A moisture control section that is dry in some part less than six-tenths of the time that the soil temperature at a depth of 50 cm is above 5° C in most years; and

b. A chroma (rubbed), moist, of 2 or more in the upper 18 cm of the mollic epipedon after mixing, or in any Ap horizon that is more than 18 cm thick and the soil is dry in all parts of the moisture control section at some time in most years;

7. Have a mollic epipedon that is less than 40 cm thick, or its texture is loamy fine sand or coarser; and

8. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;

b. A potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

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c. More than 35 percent clay in horizons that total more than 50 cm in thickness."

Page 285, first column. Delete the section, Distinctions between Typic Calciborolls and other subgroups, and replace with the following key to subgroups and definition of Typic Calciborolls:

"Key to subgroups

HEFA. Calciborolls that have a lithic contact within a depth of 50 cm of the surface.
Lithic Calciborolls

HEFB. Other Calciborolls that have a petrocalcic horizon that has its upper boundary within 100 cm of the surface.
Petrocalcic Calciborolls

HEFC. Other Calciborolls that have both the following:

1. A color value, dry, of 5 in the upper 18 cm of the mollic epipedon after mixing, or in any Ap horizon that is more than 18 cm thick; and
2. A moisture control section that is dry in some part six-tenths or more of the time in most years that the soil temperature at a depth of 50 cm is above 5° C.

Aridic Calciborolls

HEFD. Other Calciborolls that have distinct or prominent mottles that are due to segregation of iron or manganese within 100 cm of the surface and, if undrained, are continuously saturated with water for as long as 90 days within 100 cm of the surface.
Aquic Calciborolls

HEFE. Other Calciborolls.
Typic Calciborolls

Definition of Typic Calciborolls

Typic Calciborolls are the Calciborolls that

1. Do not have distinct or prominent mottles that are due to segregation of iron or manganese within 100 cm of the surface and, if undrained, continuous saturation with water for as long as 90 days within 100 cm of the surface;

2. Have either or both

a. A color value, dry, of 4 or less in the upper 18 cm of the mollic epipedon after mixing, or in any Ap horizon that is more than 18 cm thick; or

b. A moisture control section that is dry in some part less than six-tenths of the time in most years that the soil temperature at a depth of 50 cm is above 5° C;

3. Do not have a lithic contact within 50 cm of the surface; and

4. Do not have a petrocalcic horizon that has its upper boundary within 100 cm of the surface."

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Page 285, second column and extending to page 286, second column. Delete the section, Distinctions between Typic Cryoborolls and other subgroups, and replace with the following key to subgroups and definition of Typic Cryoborolls:

"Key to subgroups

HEBA. Cryoborolls that have the following combination of characteristics:

1. Have an argillic horizon;
 2. Have an albic horizon immediately below the mollic epipedon; and
 3. Have a lithic contact within a depth of 50 cm of the surface.
- Boralfic Lithic Cryoborolls

HEBB. Other Cryoborolls that have an argillic horizon that is continuous throughout each pedon and have a lithic contact within a depth of 50 cm of the surface.
Argic Lithic Cryoborolls

HEBC. Other Cryoborolls that have a lithic contact within a depth of 50 cm of the surface and have a mollic epipedon that is discontinuous in each pedon.
Lithic Ruptic-Entic Cryoborolls

HEBD. Other Cryoborolls that have a lithic contact within a depth of 50 cm of the surface and have an argillic horizon that is intermittent in each pedon.
Lithic Ruptic-Argic Cryoborolls

HEBE. Other Cryoborolls that have a lithic contact within a depth of 50 cm of the surface.
Lithic Cryoborolls

HEBF. Other Cryoborolls that have a mean annual soil temperature of 0° C or less.
Pergelic Cryoborolls

HEBG. Other Cryoborolls that have an argillic horizon and an SAR of 13 or more (or 15 percent or more saturation with exchangeable sodium) in the major part of the argillic horizon.
Natric Cryoborolls

HEBH. Other Cryoborolls that have an argillic horizon and the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon; and
2. A potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and
3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Argic Vertic Cryoborolls

HEBI. Other Cryoborolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon; and

2. A potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Cryoborolls

HEBJ. Other Cryoborolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Cryoborolls

HEBK. Other Cryoborolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Cryoborolls

HEBL. Other Cryoborolls that have a duripan that has its upper boundary within 100 cm of the soil surface.

Duric Cryoborolls

HEBM. Other Cryoborolls that have an albic horizon immediately below the mollic epipedon and have an argillic horizon.

Boralfic Cryoborolls

HEBN. Other Cryoborolls that:

1. Have a mollic epipedon that is 40 cm or more thick and that has texture finer than loamy fine sand; and

2. Have an irregular decrease in organic carbon content with increasing depth or have

an organic carbon content of more than 0.3 percent at a depth of 125 cm below the surface; and

3. Have a slope 25 percent or less.

Cumulic Cryoborolls

HEBO. Other Cryoborolls that:

1. Have a calcic horizon within or immediately below the mollic epipedon and do not have an argillic horizon in the lower part of the mollic epipedon; and

2. Have a mollic epipedon that is 40 cm or more thick and that has texture finer than loamy fine sand.

Calcic Pachic Cryoborolls

HEBP. Other Cryoborolls that:

1. Have an argillic horizon; and

2. Have a mollic epipedon that is 40 cm or more thick and that has texture finer than loamy fine sand.

Argic Pachic Cryoborolls

HEBQ. Other Cryoborolls that have a mollic epipedon that is 40 cm or more thick and that has texture finer than loamy fine sand.

Pachic Cryoborolls

HEBR. Other Cryoborolls that:

1. Have an argillic horizon; and

2. Have distinct or prominent mottles that are due to segregation of iron or manganese within 100 cm of the surface if artificially drained and, if undrained, are continuously saturated with water within a depth of 100 cm for 90 days or longer.

Argiaquic Cryoborolls

HEBS. Other Cryoborolls that:

1. Have an irregular decrease in organic carbon content with increasing depth or have an organic carbon content of more than 0.3 percent at a depth of 125 cm of the surface; and

2. Have distinct or prominent mottles that are due to segregation of iron or manganese within 100 cm of the surface and, if undrained, are continuously saturated with water within a depth of 100 cm for 90 days or longer; and

3. Have a slope of less than 25 percent.

Fluvaquentic Cryoborolls

HEBT. Other Cryoborolls that have distinct or prominent mottles that are due to segregation of iron or manganese within 100 cm of the surface and, if undrained, are continuously saturated with water within a depth of 100 cm for 90 days or longer.

Aquic Cryoborolls

HEBU. Other Cryoborolls that:

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1. Have an irregular decrease in organic carbon content with increasing depth or have an organic carbon content of more than 0.3 percent at a depth of 125 cm below the surface; and

2. Have a slope of less than 25 percent.

Fluventic Cryoborolls

HEBV. Other Cryoborolls that:

1. Have an argillic horizon; and

2. Have an albic horizon immediately below the mollic epipedon; and

3. Have an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm below the upper boundary of the argillic horizon.

Abruptic Cryoborolls

HEBW. Other Cryoborolls that have an argillic horizon that is continuous throughout each pedon.

Argic Cryoborolls

HEBX. Other Cryoborolls that have a calcic horizon within or immediately below the mollic epipedon.

Calcic Cryoborolls

HEBY. Other Cryoborolls that have an albic horizon immediately below the mollic epipedon.

Albic Cryoborolls

HEBZ. Other Cryoborolls.

Typic Cryoborolls

Definition of Typic Cryoborolls

Typic Cryoborolls are the Cryoborolls that

1. Do not have an argillic horizon;

2. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

3. Do not have distinct or prominent mottles that are due to segregation of iron or manganese within 100 cm of the surface if artificially drained, or if undrained, are not continuously saturated with water within a depth of 100 cm for as long as 90 days;

4. Do not have a calcic horizon within or immediately below the mollic epipedon;

5. Have a mollic epipedon that is less than 40 cm thick or that has texture of loamy fine sand or coarser;

6. Do not have a lithic contact within 50 cm of the surface;

7. Have a mean annual soil temperature higher than 0° C;

8. Do not have an albic horizon immediately below the mollic epipedon;

9. Do not have a duripan that has its upper boundary within 100 cm of the soil surface;

10. Have a regular decrease in organic carbon content with increasing depth and unless a lithic or a paralithic contact is at some depth between 50 and 125 cm below the soil surface, have an organic carbon content of 0.3 percent or less at a depth within 125 cm of the surface; or the slope is 25 percent or more; and

11. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon; and

b. A potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness."

Page 288, second column and extending to page 289, first column. Delete the section, Distinctions between Typic Haploborolls and other subgroups, and replace with the following key to subgroups and definition of Typic Haploborolls:

"Key to subgroups

HEGA. Haploborolls that have a salic horizon that has its upper boundary within a depth of 75 cm of below the surface.

Salorthidic Haploborolls

HEGB. Other Haploborolls that have a lithic contact within a depth of 50 cm in part of each pedon.

Ruptic-Lithic Haploborolls

HEGC. Other Haploborolls that have a lithic contact within a depth of 50 cm of the surface.

Lithic Haploborolls

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HEGD. Other Haploborolls that:

1. Have a chroma, moist, after rubbing of 1 or less in the upper part of the mollic epipedon after it has been mixed to a depth of 18 cm or in any Ap horizon that is more than 18 cm thick, or the soil is never dry in all parts of the moisture control section at some time in most years; and
2. Have the following combination of characteristics:

- a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and that are at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap horizon;
- b. Potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and
- c. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Udertic Haploborolls**HEGE. Other Haploborolls that have the following combination of characteristics:**

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and that are at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap horizon;
2. Potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and
3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Haploborolls**HEGF. Other Haploborolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.****Andic Haploborolls****HEGG. Other Haploborolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:**

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- a. More than 80 percent volcanic glass; or
- b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Haploborolls**HEGH. Other Haploborolls that:**

1. Have a mollic epipedon 40 cm or more thick, and the epipedon does not have a sandy particle-size class in the major part, and there is no paralithic contact or a sandy contrasting layer between depths of 40 and 50 cm; and
2. Have an irregular decrease in organic carbon content with increasing depth, or have an organic carbon content of more than 0.3 percent at a depth of 125 cm below the surface; and
3. Have a slope of less than 25 percent and a concave shape; and
4. Have a chroma, moist, after rubbing of 1 or less in the upper part of the mollic epipedon after it has been mixed to a depth of 18 cm or in any Ap horizon that is more than 18 cm thick, or the soil is moist in some or all parts of the moisture control section at all times in most years.

Cumulic Udic Haploborolls**HEGI. Other Haploborolls that:**

1. Have a mollic epipedon 40 cm or more thick, and the epipedon does not have a sandy particle-size class in the major part, and there is no paralithic contact or a sandy contrasting layer between depths of 40 and 50 cm; and
2. Have an irregular decrease in organic carbon content with increasing depth, or have an organic carbon content of more than 0.3 percent at a depth of 125 cm below the surface; and
3. Have a slope of less than 25 percent and a concave shape.

Cumulic Haploborolls**HEGJ. Other Haploborolls that:**

1. Have a mollic epipedon 40 cm or more thick, and the epipedon does not have a sandy particle-size class in the major part, and there is no paralithic contact or a sandy contrasting layer between depths of 40 and 50 cm; and
2. Have a chroma, moist, after rubbing of 1 or less in the upper part of the mollic epipedon after it has been mixed to a depth of 18 cm or in any Ap horizon that is more than 18 cm thick, or the soil is moist in some or all parts

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of the moisture control section at all times in most years.

Pachic Udic Haploborolls

HEGK. Other Haploborolls that have a mollic epipedon 40 cm or more thick, and the epipedon does not have a sandy particle-size class in the major part, and there is no paralithic contact or a sandy contrasting layer between depths of 40 and 50 cm.

Pachic Haploborolls

HEGL. Other Haploborolls that:

1. Have an irregular decrease in organic carbon content with increasing depth, or have an organic carbon content of more than 0.3 percent at a depth of 125 cm below the surface; and

2. Have mottles that have chroma of 2 or less within 100 cm of the surface and, if undrained, are continuously saturated with water in the mottled horizon for 90 days or more in most years; and

3. Have a slope of less than 25 percent.

Fluvaquentic Haploborolls

HEGM. Other Haploborolls that have mottles that have chroma of 2 or less within 100 cm of the surface and, if undrained, are continuously saturated with water in the mottled horizon for 90 days or more in most years.

Aquic Haploborolls

HEGN. Other Haploborolls that:

1. Have both of the following:

a. A color value, dry, of 5 in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm thick; and

b. A moisture control section that is dry in some part six-tenths or more of the time that the soil temperature at a depth of 50 cm is above 5°C in most years; and

2. Have an irregular decrease in organic carbon content with increasing depth, or have an organic carbon content of more than 0.3 percent at a depth of 125 cm below the surface; and

3. Have a slope of less than 25 percent.

Torrifluventic Haploborolls

HEGO. Other Haploborolls that have the following combination of characteristics:

1. A color value, dry, of 5 in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm thick;

2. A moisture control section that is dry in some part six-tenths or more of the time that the soil temperature at a depth of 50 cm is above 5°C in most years; and

3. Do not have a cambic horizon, and the lower part of the mollic epipedon does not meet the requirements of a cambic horizon except for color.

Torriorthentic Haploborolls

HEGP. Other Haploborolls that have both of the following:

1. A color value, dry, of 5 in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm thick; and

2. A moisture control section that is dry in some part six-tenths or more of the time that the soil temperature at a depth of 50 cm is above 5°C in most years.

Aridic Haploborolls

HEGQ. Other Haploborolls that have an irregular decrease in organic carbon content with increasing depth, or have an organic carbon content of more than 0.3 percent at a depth of 125 cm below the surface; and have a slope of less than 25 percent.

Fluventic Haploborolls

HEGR. Other Haploborolls that:

1. Have a chroma, moist, after rubbing of 1 or less in the upper part of the mollic epipedon after it has been mixed to a depth of 18 cm or in any Ap horizon that is more than 18 cm thick, or the soil is moist in some or all parts of the moisture control section at all times in most years; and

2. Do not have a cambic horizon, and the lower part of the mollic epipedon does not meet the requirements of a cambic horizon except for color.

Udorthentic Haploborolls

HEGS. Other Haploborolls that have a chroma, moist, after rubbing of 1 or less in the upper part of the mollic epipedon after it has been mixed to a depth of 18 cm or in any Ap horizon that is more than 18 cm thick, or the soil is moist in some or all parts of the moisture control section at all times in most years.

Udic Haploborolls

HEGT. Other Haploborolls that do not have a cambic horizon, and the lower part of the mollic epipedon does not meet the requirements of a cambic horizon except for color.

Entic Haploborolls

HEGU. Other Haploborolls.

Typic Haploborolls

Definition of Typic Haploborolls

Typic Haploborolls are the Haploborolls that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable

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aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more;

2. Do not have mottles that have chroma of 2 or less within 100 cm of the surface and, if undrained, are not continuously saturated with water in the mottled horizon for as long as 90 days in most years;

3. Have both the following:

a. Either or both:

(1) A color value, dry, of 4 or less in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm thick; or

(2) A moisture control section that is dry in some part less than six-tenths of the time that the soil temperature at a depth of 50 cm is above 5° C in most years; and

b. A chroma, moist, after rubbing of 2 or more in the upper part of the mollic epipedon after it has been mixed to a depth of 18 cm or in any Ap horizon that is more than 18 cm thick, and the soil is dry in all parts of the moisture control section at some time in most years;

4. Have a cambic horizon, or the lower part of the mollic epipedon meets the requirements of a cambic horizon except for color and organic-carbon content;

5. Have a regular decrease in organic carbon content with increasing depth and unless a lithic or a paralithic contact is at some depth between 50 and 125 cm below the soil surface, have an organic carbon content of 0.3 percent or less at a depth within 125 cm of the surface; or the slope is 25 percent or more;

6. Do not have a lithic contact within 50 cm of the surface;

7. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm and that are at least 30 cm long in some part and that extend upward to the surface or to the base of an Ap horizon;

b. Potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

8. Do not have a salic horizon that has its upper boundary within 75 cm of the surface; and

9. Have a mollic epipedon less than 40 cm thick, or the epipedon has a sandy particle-size class in the major part, or there is a paralithic contact or a sandy contrasting layer between depths of 40 and 50 cm."

Page 291, first column. Delete the section, Distinctions between Typic Natriborolls and other subgroups, and replace with the following key to subgroups and definition of Typic Natriborolls:

"Key to subgroups

HECA. Natriborolls that have visible crystals or nests of gypsum or more soluble salts within 40 cm of the surface of the soil.

Leptic Natriborolls

HECB. Other Natriborolls that have both of the following:

1. A color value, dry, of 5 in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm; and

2. A moisture control section that is dry in some part six-tenths or more of the time that the soil temperature at a depth of 50 cm is above 5° C in most years.

Aridic Natriborolls

HECC. Other Natriborolls that:

1. Have tonguing or interfingering of an albic horizon more than 2.5 cm into the natric horizon; and

2. Have a chroma, moist, after rubbing, of 1 or less in the upper part of the mollic epipedon to a depth of 18 cm, after mixing, or in any Ap horizon that is more than 18 cm thick.

Glossic Udic Natriborolls

HECD. Other Natriborolls that have a chroma, moist, after rubbing, of 1 or less in the upper part of the mollic epipedon to a depth of 18 cm, after mixing, or in any Ap horizon that is more than 18 cm thick.

Udic Natriborolls

HECE. Other Natriborolls that have tonguing or interfingering of an albic horizon more than 2.5 cm into the natric horizon.

Glossic Natriborolls

HECF. Other Natriborolls.

Typic Natriborolls

Definition of Typic Natriborolls

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Typic Natriborolls are the Natriborolls that

1. Do not have tonguing or interfingering of an albic horizon more than 2.5 cm into the natric horizon;

2. Have

a. Either or both

(1) A color value, dry, of 4 or less in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm; or

(2) A moisture control section that is dry in some part less than six-tenths of the time that the soil temperature at a depth of 50 cm is above 5° C in most years; or

b. A chroma, moist, after rubbing, of 2 or more in the upper part of the mollic epipedon to a depth of 18 cm, after mixing, or in any Ap horizon that is more than 18 cm thick; and

3. Do not have visible crystals or nests of gypsum or more soluble salts within 40 cm of the surface of the soil."

Page 292, second column. Delete the section, Distinctions between Typic Paleborolls and other subgroups, and replace with the following key to subgroups and definition of Typic Paleborolls:

"Key to subgroups

HEAA. Paleborolls that:

1. Have a mean summer soil temperature at a depth of 50 cm or at a lithic or paralithic contact, whichever is shallower, of less than 15° C if there is no O horizon or less than 8° C if there is an O horizon; and

2. Have a mollic epipedon that is 50 cm or more thick.

Cryic Pachic Paleborolls

HEAB. Other Paleborolls that:

1. Have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm below its upper boundary; and

2. Have a mean summer soil temperature at a depth of 50 cm or at a lithic or paralithic contact, whichever is shallower, of less than 15° C if there is no O horizon or less than 8° C if there is an O horizon.

Abruptic Cryic Paleborolls

HEAC. Other Paleborolls that have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm below its upper boundary.

Abruptic Paleborolls

HEAD. Other Paleborolls that have a mean summer soil temperature at a depth of 50 cm or at a lithic

or paralithic contact, whichever is shallower, of less than 15° C if there is no O horizon or less than 8° C if there is an O horizon.

Cryic Paleborolls

HEAE. Other Paleborolls that have a mollic epipedon that is 50 cm or more thick.

Pachic Paleborolls

HEAF. Other Paleborolls that have mottles that have chroma of 2 or less within 100 cm of the surface and, if undrained, are continuously saturated with water in the mottled horizon for as long as 90 days in most years.

Aquic Paleborolls

HEAG. Other Paleborolls.

Typic Paleborolls

Definition of Typic Paleborolls

Typic Paleborolls are the Paleborolls that

1. Do not have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm below its upper boundary;

2. Do not have mottles that have chroma of 2 or less within 100 cm of the surface and, if undrained, are not continuously saturated with water in the mottled horizon for as long as 90 days in most years;

3. Have a mean summer soil temperature at a depth of 50 cm or at a lithic or paralithic contact, whichever is shallower, of 15° C or higher if there is no O horizon and 8° C or higher if there is an O horizon; and

4. Have a mollic epipedon that is less than 50 cm thick."

Page 293, first column and extending to second column. Delete the section, Distinctions between Typic Vermiborolls and other subgroups, and replace with the following key to subgroups and definition of Typic Vermiborolls:

"Key to subgroups

HEEA. Vermiborolls that have a lithic contact within a depth of 50 cm of the surface.

Lithic Vermiborolls

HEEB. Other Vermiborolls that have both of the following:

1. A color value, dry, 5 in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm thick; and

2. A moisture control section that is dry in some part six-tenths or more of the time that the soil temperature at a depth of 50 cm is above 5° C in most years.

Aridic Vermiborolls

HEEC. Other Vermiborolls that:

1. Have a mollic epipedon less than 75 cm thick; and

2. Have a chroma, moist, after rubbing, of 1 or less in the upper part of the mollic epipedon to

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a depth of 18 cm, after mixing, or in any Ap horizon that is more than 18 cm thick.

Hapludic Vermiborolls

HEED. Other Vermiborolls that have a chroma, moist, after rubbing, of 1 or less in the upper part of the mollic epipedon to a depth of 18 cm, after mixing, or in any Ap horizon that is more than 18 cm thick.

Udic Vermiborolls

HEEE. Other Vermiborolls that have a mollic epipedon less than 75 cm thick.

Haplic Vermiborolls

HEEF. Other Vermiborolls.

Typic Vermiborolls

Definition of Typic Vermiborolls

Typic Vermiborolls are the Vermiborolls that

1. Have a mollic epipedon 75 cm or more thick;

2. Have

a. Either or both

(1) A color value, dry, of 4 or less in the upper 18 cm of the mollic epipedon, after mixing, or in any Ap horizon that is more than 18 cm thick; or

(2) A moisture control section that is dry in some part less than six-tenths of the time that the soil temperature at a depth of 50 cm is above 5° C in most years; and

b. A chroma, moist, after rubbing, of 2 or more in the upper part of the mollic epipedon to a depth of 18 cm, after mixing, or in any Ap horizon that is more than 18 cm thick; and

3. Do not have a lithic contact within 50 cm of the surface."

Page 294, first column and extending to second column. Delete the section, Distinctions between Typic Rendolls and other subgroups, and replace with the following key to subgroups and definition of Typic Rendolls:

"Key to subgroups

HCAA. Rendolls that:

1. Have a soil temperature regime that is cryic or pergelic; and

2. Have a lithic contact within a depth of 50 cm of the surface.

Cryic Lithic Rendolls

H CAB. Other Rendolls that have a lithic contact within a depth of 50 cm of the surface.

Lithic Rendolls

HCA C. Other Rendolls that have a soil temperature regime that is cryic or pergelic.

Cryic Rendolls

HCA D. Other Rendolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon, and

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm, and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Rendolls

HCA E. Other Rendolls that have a cambic horizon throughout the pedon and the mean summer and mean winter soil temperatures at a depth of 50 cm differ by less than 5° C.

Eutropeptic Rendolls

HCA F. Other Rendolls that have a cambic horizon throughout the pedon.

Eutrochreptic Rendolls

HCA G. Other Rendolls that have a dry color value of 6 or more after the surface soil to a depth of 18 cm has been mixed or of any Ap horizon that is deeper than 18 cm.

Entic Rendolls

HCA H. Other Rendolls.

Typic Rendolls

Definition of Typic Rendolls

Typic Rendolls are the Rendolls that

1. Have a soil temperature regime warmer than cryic;

2. Do not have a cambic horizon throughout the pedon;

3. Do not have a lithic contact within 50 cm of the surface;

4. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

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5. Have a dry color value of 5 or less after the surface soil to a depth of 18 cm has been mixed or of any Ap horizon that is deeper than 18 cm."

Page 295, second column and extending to page 296, first column. Delete the section, Distinctions between Typic Argiudolls and other subgroups, and replace with the following key to subgroups and definition of Typic Argiudolls:

"Key to subgroups

HGBA. Argiudolls that have a lithic contact within 50 cm of the surface.

Lithic Argiudolls

HGBB. Other Argiudolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm, and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Argiudolls

HGBC. Other Argiudolls that have texture that is loamy fine sand or coarser in the argillic horizon, or the argillic horizon does consist entirely of lamellae with a combined thickness of 15 cm or more.

Psammentic Argiudolls

HGBD. Other Argiudolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Argiudolls

HGBE. Other Argiudolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandonic Argiudolls

HGBF. Other Argiudolls that have mottles within 40 cm of the surface and, unless artificially drained, the mottled horizon is saturated with water at some period of the year when the soil temperature in the mottled horizon is above 5° C, or have a horizon 15 cm or more thick immediately below the mollic epipedon that:

1. Has a hue of 10YR or redder and chroma of 2 or less, or has mottles that have chroma of 2 or less and value of 4 or more and, unless artificially drained, the mottled horizon is saturated with water at some period of the year when the soil temperature in the mottled horizon is above 5° C; or

2. Has a hue of 2.5Y or yellower and chroma of 3 or less.

Aquic Argiudolls

HGBG. Other Argiudolls that have CEC (by 1N NH₄OAc pH7) of less than 24 in the major part of the argillic horizon or the major part of the upper 100 cm of the argillic horizon if the argillic horizon is thicker than 100 cm.

Oxic Argiudolls

HGBH. Other Argiudolls.

Typic Argiudolls

Definition of Typic Argiudolls

Typic Argiudolls are the Argiudolls that

1. Do not have mottles within 50 cm of the surface if the mottled horizon is saturated with water at some period of the year when the soil temperature in the mottled horizon is above 5° C or if the soil is artificially drained; and have a horizon 15 cm or more thick immediately below the mollic epipedon that either

a. Has a hue of 10YR or redder and chroma of 3 or more, and does not have mottles that have chroma of 2 or less and value of 4 or more if the mottled horizon is saturated with water at some period of the year when the soil temperature in the mottled horizon is above 5° C or if the soil is artificially drained; or

b. Has a hue of 2.5Y or yellower and chroma of 4 or more;

2. Do not have a lithic contact within 50 cm of the surface;

3. Have texture finer than loamy fine sand in the argillic horizon, or the argillic horizon does not consist entirely of lamellae with a combined thickness of less than 15 cm;

4. Do not have the following combination of characteristics:

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a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

5. Have CEC (by 1N NH₄OAc pH7) of 24 or more in the major part of the argillic horizon or the major part of the upper 100 cm of the argillic horizon if the argillic horizon is thicker than 100 cm; and

6. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass: or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 296, second column and extending to page 297, first column. Delete the section, Distinctions between Typic Hapludolls and other subgroups, and replace with the following key to subgroups and definition of Typic Hapludolls:

"Key to subgroups

HGDA. Hapludolls that have a lithic contact within 50 cm of the surface.

Lithic Hapludolls

HGDB. Other Hapludolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Hapludolls

HGDC. Other Hapludolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Hapludolls

HGDD. Other Hapludolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass: or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Hapludolls

HGDE. Other Hapludolls that:

1. Have a mollic epipedon 60 cm or more thick with a texture finer than loamy fine sand; and

2. Have an irregular decrease in organic carbon content with increasing depth or have an organic carbon content of more than 0.3 percent at a depth of 125 cm below the surface and no lithic or paralithic contact within a depth of 125 cm; and

3. Have a slope of 25 percent or less.

Cumulic Hapludolls

HGDF. Other Hapludolls that:

1. Have mottles within 40 cm of the surface and, unless artificially drained, the mottled horizon is saturated with water at some period of the year when the soil temperature in the mottled horizon is above 5°C, or have a horizon 15 cm or more thick immediately below the mollic epipedon that:

a. Has a hue of 10YR or redder and chroma of 2 or less, or has mottles that have chroma of 2 or less and value of 4 or more and, unless artificially drained, the mottled horizon is saturated with water at some period of the year when the soil temperature in the mottled horizon is above 5° C; or

b. Has a hue of 2.5Y or yellow and chroma of 3 or less.

2. Have an irregular decrease in organic carbon content with increasing depth or have an organic carbon content of more than 0.3 percent at a depth of 125 cm below the surface; and

3. Have a slope of less than 25 percent.
Fluvaquentic Hapludolls

HGDG. Other Hapludolls have mottles within 40 cm of the surface and, unless artificially drained, the mottled horizon is saturated with water at some period of the year when the soil temperature in the mottled horizon is above 5° C, or have a horizon 15 cm or more thick immediately below the mollic epipedon that:

1. Has a hue of 10YR or redder and chroma of 2 or less, or has mottles that have chroma of 2 or less and value of 4 or more and, unless artificially drained, the mottled horizon is saturated with water at some period of the year when the soil temperature in the mottled horizon is above 5° C; or

2. Has a hue of 2.5Y or yellow and chroma of 3 or less.

Aquic Hapludolls

HGDH. Other Hapludolls that:

1. Have an irregular decrease in organic carbon content with increasing depth or have an organic carbon content of more than 0.3 percent at a depth of 125 cm below the surface; and

2. Have a slope of less than 25 percent.
Fluventic Hapludolls

HGDI. Other Hapludolls that:

1. Have a mollic epipedon 60 cm or more thick with a texture finer than loamy fine sand; and

2. Do not have a cambic horizon, and the lower part of the mollic epipedon does not meet the requirements of a cambic horizon except for color; or either the cambic horizon or the lower part of the epipedon have carbonates throughout; and

3. The mollic epipedon, below any Ap horizon, has 50 percent or more by volume of wormholes, wormcasts, or filled animal burrows.

Vermic Hapludolls

HGDJ. Other Hapludolls that do not have a cambic horizon, and the lower part of the mollic epipedon does not meet the requirements of a cambic horizon except for color; or either the cambic horizon or the lower part of the epipedon have carbonates throughout.

Entic Hapludolls

HGDK. Other Hapludolls.

Typic Hapludolls

Definition of Typic Hapludolls

Typic Hapludolls are the Hapludolls that

1. Do not have mottles within 40 cm of the surface if the mottled horizon is saturated with water at some period of the year when the soil temperature in the mottled horizon is above 5° C or if the soil is artificially drained; and have a horizon 15 cm or more thick immediately below the mollic epipedon that either

a. Has a hue of 10YR or redder and chroma of 3 or more, and does not have mottles that have chroma of 2 or less and value of 4 or more if the mottled horizon is saturated with water at some period of the year when the soil temperature in the mottled horizon is above 5° C or if the soil is artificially drained, or

b. Has a hue of 2.5 Y or redder and chroma of 4 or more;

2. Have a mollic epipedon less than 60 cm thick or texture that is loamy fine sand or coarser if the mollic epipedon is 60 cm or more thick;

3. Have a cambic horizon, or the lower part of the mollic epipedon meets the requirements of a cambic horizon except for color, and either the cambic horizon or the lower part of the epipedon is free of carbonates in some part;

4. Have a regular decrease in organic carbon content with increasing depth and unless a lithic or a paralithic contact is at some depth between 50 and 125 cm below the soil surface, have an organic carbon content of 0.3 percent or less at a depth within 125 cm of the surface; or the slope is 25 percent or more;

5. Do not have a lithic contact within 50 cm of the surface;

6. Do not have the following combination of characteristics;

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

7. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass: or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 298, first column. Delete the section, Distinctions between Typic Paleudolls and other subgroups, and replace with the following key to subgroups and definition of Typic Paleudolls:

"Key to subgroups

HGAA. Paleudolls that have mottles that have chroma of 2 or less in the upper 50 cm of the argillic horizon and the mottled horizon is saturated with water at some period when its temperature is more than 5° C or the soil has artificial drainage.

Aquic Paleudolls

HGAB. Other Paleudolls.

Typic Paleudolls

Definition of Typic Paleudolls

Typic Paleudolls are the Paleudolls that do not have mottles that have chroma of 2 or less in the upper 50 cm of the argillic horizon if the mottled horizon is saturated with water at some period when its temperature is more than 5° C or if the soil has artificial drainage."

Page 298, second column. Delete the section, Distinctions between Typic Vermudolls and other subgroups, and replace with the following key to subgroups and definition of Typic Vermudolls:

"Key to subgroups

HGCA. Vermudolls that have a lithic contact within 50 cm of the surface.

Lithic Vermudolls

HGCB. Other Vermudolls that Have a cambic horizon.

Haplic Vermudolls

HGCC. Other Vermudolls that have a mollic epipedon that is less than 75 cm thick.

Entic Vermudolls

HGCD. Other Vermudolls.

Typic Vermudolls

Definition of Typic Vermudolls

Typic Vermudolls are the Vermudolls that

1. Have a mollic epipedon that is 75 cm or more thick;
2. Do not have a cambic horizon; and
3. Do not have a lithic contact within 50 cm of the surface."

Page 299, second column and extending to page 300, second column. Delete the section, Distinctions between Typic Argiustolls and other subgroups, and replace with the following key to subgroups and definition of Typic Argiustolls:

"Key to subgroups

HFEA. Argiustolls that:

1. Have an albic horizon or other eluvial horizon above the argillic horizon that has a color value too high for a mollic epipedon and chroma too high for an albic horizon; and

2. Have a lithic contact within 50 cm of the surface.

Albic Lithic Argiustolls

HFEB. Other Argiustolls that have a lithic contact within 50 cm of the surface.

Lithic Argiustolls

HFEC. Other Argiustolls that:

1. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

2. The cracks are open 6 months or more in most years.

Torrertic Argiustolls

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HFED. Other Argiustolls that:

1. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry in some or all parts of the moisture control section for four-tenths or less of the cumulative days when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

2. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

3. The cracks are open less than 135 days in most years.

Udertic Argiustolls

HFEE. Other Argiustolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

2. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Argiustolls

HFEEF. Other Argiustolls that have, throughout a cumulative thickness of 18 cm or more and

within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Argiustolls

HFEG. Other Argiustolls that:

1. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in some or all parts of the moisture control section (not necessarily the same part) in half or more years during the period when the soil temperature at a depth of 50 cm is higher than 5° C, or

b. If the soil temperature regime is hyperthermic, or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm is higher than 8° C; and

2. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitritorrandic Argiustolls

HFEEH. Other Argiustolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

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- a. More than 30 percent volcanic glass: or
- b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.
- Vitrandic Argiustolls
- HFEL.** Other Argiustolls that have an albic horizon or other eluvial horizon above the argillic horizon that has a color value too high for a mollic epipedon and chroma too high for an albic horizon and the mean annual soil temperature is lower than 10° C.
- Boralfic Argiustolls
- HF EJ.** Other Argiustolls that have an albic horizon or other eluvial horizon above the argillic horizon that has a color value too high for a mollic epipedon and chroma too high for an albic horizon and the mean annual soil temperature is 10° C or more.
- Ustalfic Argiustolls
- HF EK.** Other Argiustolls that have a mollic epipedon 50 cm or more thick with a texture finer than loamy fine sand.
- Pachic Argiustolls
- HF EL.** Other Argiustolls that have mottles that have chroma of 2 or less within 100 cm of the soil surface and are continuously saturated with water within 100 cm of the soil surface for 3 months or more in most years unless artificially drained.
- Aquic Argiustolls
- HF EM.** Other Argiustolls that, when neither irrigated nor fallowed to store moisture,
1. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in some or all parts of the moisture control section (not necessarily the same part) in half or more years during the period when the soil temperature at a depth of 50 cm is higher than 5° C, or
 2. If the soil temperature regime is hyperthermic, or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm is higher than 8° C.
- Aridic Argiustolls
- HF EN.** Other Argiustolls that, when neither irrigated nor fallowed to store moisture:
1. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or
 2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.
- Udic Argiustolls
- HF EO.** Other Argiustolls that have a brittle horizon 15 cm or more thick within 100 cm of the soil surface that contains some opal coatings or 20 percent or more by volume durinodes.
- Duric Argiustolls
- HF EP.** Other Argiustolls.
- Typic Argiustolls
- Definition of Typic Argiustolls
- Typic Argiustolls are the Argiustolls that
1. Do not have mottles that have chroma of 2 or less within 100 cm of the soil surface if artificially drained or, if undrained, are not continuously saturated with water within 100 cm of the soil surface for as long as 3 months in most years;
 2. Do not have a brittle horizon 15 cm or more thick within 100 cm of the soil surface that contains some opal coatings or 20 percent or more by volume durinodes;
 3. Do not have a lithic contact within 50 cm of the surface;
 4. Do not have an albic horizon or other eluvial horizon above the argillic horizon that has a color value too high for a mollic epipedon and chroma too high for an albic horizon;
 5. Have a mollic epipedon less than 50 cm thick, or the texture is loamy fine sand or coarser if the mollic epipedon is more than 50 cm thick;
 6. When neither irrigated nor fallowed to store moisture:
 - a. If the soil temperature regime is mesic or thermic, are dry for more than four-tenths of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or
 - b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C;
 7. Do not have the following combination of characteristics:
 - a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,
 - b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

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c. More than 35 percent clay in horizons that total more than 50 cm in thickness;

8. When neither irrigated nor fallowed to store moisture,

a. If the soil temperature regime is mesic or thermic, are dry less than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm is higher than 5° C, or

b. If the soil temperature regime is hyperthermic, or isomesic, or warmer, are moist in some or all parts of the moisture control section for 90 consecutive days or more during a period when the soil temperature at a depth of 50 cm is higher than 8° C; and

9. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 301, second column and extending to page 302, first column. Delete the section, Distinctions between Typic Calciustolls and other subgroups, and replace with the following key to subgroups and definition of Typic Calciustolls:

"Key to subgroups

HFDA. Calciustolls that have a salic horizon that has its upper boundary within 75 cm of the surface.

Salorthidic Calciustolls

HFDB. Other Calciustolls that have a petrocalcic horizon and have a lithic contact within 50 cm of the soil surface.

Lithic Petrocalcic Calciustolls

HFDC. Other Calciustolls that have a lithic contact within 50 cm of the soil surface.

Lithic Calciustolls

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HFDD. Other Calciustolls that:

1. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

2. The cracks are open 180 days or more, cumulative, in most years.

Torrertic Calciustolls

HFDE. Other Calciustolls that:

1. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

2. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

3. The cracks are open less than 135 days in most years.

Udertic Calcicustolls

HFDG. Other Calcicustolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

2. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Calcicustolls

HFDG. Other Calcicustolls that have a petrocalcic horizon that has its upper boundary within 100 cm of the surface.

Petrocalcic Calcicustolls

HFDH. Other Calcicustolls that have a mollic epipedon that is 50 cm or more thick and its texture is finer than loamy fine sand.

Pachic Calcicustolls

HFDI. Other Calcicustolls that have mottles within 75 cm of the surface that are due to segregation of iron or manganese and are continuously saturated with water for 90 days or longer within 100 cm of the surface unless artificially drained.

Aquic Calcicustolls

HFDJ. Other Calcicustolls that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry in some or all parts of the moisture control section (not necessarily the same part) six-tenths or more of the time in half or more years during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

2. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during any period when the soil temperature at a depth of 50 cm exceeds 8° C.

Aridic Calcicustolls

HFDK. Other Calcicustolls that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry in some or all parts of the moisture control section for four-tenths or less

of the cumulative days when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udic Calcicustolls

HFDL. Other Calcicustolls.

Typic Calcicustolls

Definition of Typic Calcicustolls

Typic Calcicustolls are the Calcicustolls that

1. Do not have mottles within 75 cm of the surface that are due to segregation of iron or manganese and are not continuously saturated with water for as long as 90 days within 100 cm of the surface unless artificially drained;

2. When neither irrigated nor fallowed to store moisture

a. If the soil temperature regime is mesic or thermic, are dry less than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

b. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for 90 consecutive days or more during a period when the soil temperature at a depth of 50 cm exceeds 8° C;

3. Do not have a lithic contact within 50 cm of the soil surface;

4. Have a mollic epipedon that is less than 50 cm thick, or the texture is loamy fine sand or coarser if the mollic epipedon is 50 cm or more thick;

5. Do not have a petrocalcic horizon that has its upper boundary within 100 cm of the surface;

6. Do not have a salic horizon that has its upper boundary within 75 cm of the surface;

7. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

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c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

temperature at a depth of 50 cm exceeds 8° C; and

8. When neither irrigated nor fallowed to store moisture:

3. Have an aridic moisture regime that borders on ustic.

a. If the soil temperature regime is mesic or thermic, are dry for more than four-tenths of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

Aridic Durustolls

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C."

HFAD. Other Durustolls that do not have an argillic horizon above the duripan.

Entic Durustolls

HFAE. Other Durustolls that have a duripan that is not massive or platy or that has less than half of its upper boundary coated or indurated with opal and silica with or without sesquioxides and that is not indurated in some subhorizon below its upper boundary.

Haplic Durustolls

Page 303, first column (also see NSTH issue No. 4, page 615-29). Delete the section, Distinctions between Typic Durustolls and other subgroups, and replace with the following key to subgroups and definition of Typic Durustolls:

HFAF. Other Durustolls.

Typic Durustolls

Definition of Typic Durustolls

Typic Durustolls are the Durustolls that:

"Key to subgroups

HFAA. Durustolls that have a natric horizon above the duripan.

Natric Durustolls

HFAB. Other Durustolls that do not have an argillic horizon above the duripan and, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during the period when the soil temperature at a depth of 50 cm exceeds 5° C, or

1. Have an argillic horizon above the duripan;

2. Have a duripan that is massive and platy and that has half or more of its upper boundary coated or indurated with opal and silica with or without sesquioxides or that is indurated in some subhorizon below its upper boundary;

3. Do not have a natric horizon above the duripan;

4. When neither irrigated nor fallowed to store moisture:

2. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during the period when the soil temperature at a depth of 50 cm exceeds 8° C; and

a. If the soil temperature regime is mesic or thermic, are dry less than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

b. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for 90 consecutive days or more during a period when the soil temperature at a depth of 50 cm exceeds 8° C."

3. Have an aridic moisture regime that borders on ustic.

Orthidic Durustolls

HFAC. Other Durustolls that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

Page 303, first column and extending to page 304, second column. Delete the section, Distinctions between Typic Haplustolls and other subgroups, and replace with the following key to subgroups and definition of Typic Haplustolls:

"Key to subgroups

HFGA. Haplustolls that have a salic horizon that has its upper boundary within 75 cm of the surface.

Salorthidic Haplustolls

HFGB. Other Haplustolls that:

1. have a lithic contact within 50 cm of the surface; and

2. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil

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2. Have a cambic horizon in some part but less than half of each pedon.
Lithic Ruptic-Entic Haplustolls
- HFGC.** Other Haplustolls that have a lithic contact within 50 cm of the surface in a part of each pedon.
Ruptic-Lithic Haplustolls
- HFGD.** Other Haplustolls that have a lithic contact within 50 cm of the surface.
Lithic Haplustolls
- HFGE.** Other Haplustolls that:
1. Have the following combination of characteristics:
 - a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;
 - b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; or
 - c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and
 2. The cracks are open more than 6 months in most years.
Torrtic Haplustolls
- HFGF.** Other Haplustolls that:
1. When neither irrigated nor fallowed to store moisture:
 - a. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or
 - b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and
 2. Have the following combination of characteristics:
 - a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;
 - b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; or
 - c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and
- HFGG.** Other Haplustolls that have the following combination of characteristics:
1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;
 2. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; or
 3. More than 35 percent clay in horizons that total more than 50 cm in thickness.
Vertic Haplustolls
- HFGH.** Other Haplustolls that:
1. When neither irrigated nor fallowed to store moisture:
 - a. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or
 - b. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and
 2. Have CEC (by 1N NH₄OAc pH7) of less than 24 cmol(+) per kg clay in the major part of the soil below a depth of 25 cm but above 100 cm or a lithic or paralithic contact if one is shallower than 100 cm.
Torroxic Haplustolls
- HFGI.** Other Haplustolls that have CEC (by 1N NH₄OAc pH7) of less than 24 cmol(+) per kg clay in the major part of the soil below a depth of 25 cm but above 100 cm or a lithic or

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paralithic contact if one is shallower than 100 cm.

Oxic Haplustolls

HFGJ. Other Haplustolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Haplustolls

HFGK. Other Haplustolls that:

1. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

b. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

2. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitritorrandic Haplustolls

HFGL. Other Haplustolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Haplustolls

HFGM. Other Haplustolls that:

1. Have a mollic epipedon that is 50 cm or more thick and its texture is finer than loamy fine sand; and

2. Have an irregular decrease in organic-carbon content with increasing depth or have more than 0.3 percent at a depth of 125 cm of the surface; and

3. Have a slope of 25 percent or less.

Cumulic Haplustolls

HFGN. Other Haplustolls that have a mollic epipedon that is 50 cm or more thick and its texture is finer than loamy fine sand.

Pachic Haplustolls

HFGO. Other Haplustolls that:

1. Have mottles that have chroma of 2 or less within 100 cm of the surface if artificially drained or, if undrained, are continuously saturated with water within 100 cm of the soil surface for 90 days or more in most years; and

2. Have an irregular decrease in organic-carbon content with increasing depth or have more than 0.3 percent at a depth of 125 cm of the surface; and

3. Have a slope of less than 25 percent.

Fluvaquentic Haplustolls

HFGP. Other Haplustolls that have mottles that have chroma of 2 or less within 100 cm of the surface if artificially drained or, if undrained, are continuously saturated with water within 100 cm of the soil surface for 90 days or more in most years.

Aquic Haplustolls

HFGQ. Other Haplustolls that:

1. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

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b. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

2. Have an irregular decrease in organic-carbon content with increasing depth or have more than 0.3 percent at a depth of 125 cm of the surface; and

3. Have a slope of less than 25 percent.

Torrifluventic Haplustolls

HFGR. Other Haplustolls that:

1. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

b. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

2. Do not have a cambic horizon, and the lower part of the mollic epipedon does not meet the requirements of a cambic horizon except for color and for organic-carbon content, or either the cambic horizon or the lower part of the mollic epipedon has carbonates throughout.

Torriorthentic Haplustolls

GEGS. Other Haplustolls that when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

2. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Aridic Haplustolls

GEGT. Other Haplustolls that:

1. Have an irregular decrease in organic-carbon content with increasing depth or have more than 0.3 percent at a depth of 125 cm of the surface; and

2. Have a slope of less than 25 percent.

Fluventic Haplustolls

GEGU. Other Haplustolls that have a brittle horizon 15 cm or more thick within 100 cm of the surface that contains some opal coatings or 20 percent or more by volume durinodes.

Duric Haplustolls

GEGV. Other Haplustolls that:

1. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

2. Do not have a cambic horizon, and the lower part of the mollic epipedon does not meet the requirements of a cambic horizon except for color; or the cambic horizon and any part of the mollic epipedon below a depth of 25 cm has carbonates throughout.

Udorthentic Haplustolls

GEGW. Other Haplustolls that When neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udic Haplustolls

GEGX. Other Haplustolls that Do not have a cambic horizon, and the lower part of the mollic epipedon does not meet the requirements of a cambic horizon except for color and for organic-carbon content, or either the cambic horizon or the lower part of the mollic epipedon has carbonates throughout.

Entic Haplustolls

GEGY. Other Haplustolls.

Typic Haplustolls

Definition of Typic Haplustolls

Typic Haplustolls (plate 12B) are the Haplustolls that

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1. Do not have mottles that have chroma of 2 or less within 100 cm of the surface if artificially drained or, if undrained, are not continuously saturated with water within 100 cm of the soil surface for 90 days or more in most years;
2. Have a mollic epipedon that is less than 50 cm thick, or the texture is loamy fine sand or coarser if the mollic epipedon is 50 cm or more thick;
3. Do not have a brittle horizon 15 cm or more thick within 100 cm of the surface that contains some opal coatings or some durinodes (less than 20 percent by volume);
4. Have a cambic horizon, or the lower part of the mollic epipedon meets the requirements of a cambic horizon except for color and for organic-carbon content, and either the cambic horizon or the lower part of the mollic epipedon is free of carbonates in some part;
5. Have a regular decrease in organic-carbon content with increasing depth to a level of 0.3 percent or less within 125 cm of the surface unless a lithic or paralithic contact occurs at a shallower depth or the slope is 25 percent or more;
6. Do not have a lithic contact within 50 cm of the surface in any part of each pedon;
7. Do not have a salic horizon that has its upper boundary within 75 cm of the surface;
8. Do not have the following combination of characteristics:
 - a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;
 - b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm; or
 - c. More than 35 percent clay in horizons that total more than 50 cm in thickness;
9. When neither irrigated nor fallowed to store moisture:
 - a. If the soil temperature regime is mesic or thermic, are dry for more than four-tenths of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or
 - b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C;
10. When neither irrigated nor fallowed to store moisture,
 - a. If the soil temperature regime is mesic or thermic, are dry less than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or
 - b. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for 90 consecutive days or more during a period when the soil temperature at a depth of 50 cm exceeds 8° C;
11. Have CEC (by 1N NH₄OAc pH7) of 24 or more cmol(+) per kg clay in the major part of the soil below a depth of 25 cm but above 100 cm or a lithic or paralithic contact if one is shallower than 100 cm; and
12. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:
 - a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or
 - b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
 - c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:
 - (1) More than 30 percent volcanic glass: or
 - (2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 306, second column. Delete the section, Distinctions between Typic Natrustolls and other subgroups, and replace with the following key to subgroups and definition of Typic Natrustolls:

"Key to subgroups

HFBA. Natrustolls that have visible crystals or nests of gypsum or more soluble salts within 40 cm of the surface.

Leptic Natrustolls

HFBB. Other Natrustolls that have one or more of the following characteristics within 100 cm of the surface:

1. Dominant chroma of 1 or less throughout and hue as yellow or yellower than 2.5 Y in some part;

2. Dominant chroma of 2 or less and mottles that are not due to segregated lime; or

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3. Dominant chroma of 2 or less and a decrease in the percentage of exchangeable sodium from the upper 25-centimeter layer to the underlying layer.

Aquic Natrustolls

HFBC. Other Natrustolls that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

2. If the soil temperature regime is hyperthermic, or isomesic or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Aridic Natrustolls

HFBD. Other Natrustolls that have a brittle horizon 15 cm or more thick that is within 100 cm of the surface and that contains some opal coatings or 20 percent or more by volume durinodes.

Duric Natrustolls

HFBE. Other Natrustolls that have tonguing or interfingering of an albic horizon more than 2.5 cm into a natric horizon.

Glossic Natrustolls

HFBF. Other Natrustolls.

Typic Natrustolls

Definition of Typic Natrustolls

Typic Natrustolls are the Natrustolls that

1. Do not have any of the following characteristics within 100 cm of the surface:

a. Dominant chroma of 1 or less throughout and hue as yellow or yellower than 2.5 Y in some part;

b. Dominant chroma of 2 or less and mottles that are not due to segregated lime; or

c. Dominant chroma of 2 or less and a decrease in the percentage of exchangeable sodium from the upper 25-centimeter layer to the underlying layer;

2. Do not have a brittle horizon 15 cm or more thick that is within 100 cm of the surface and that contains some opal coatings or 20 percent or more durinodes by volume;

3. Do not have tonguing or interfingering of an albic horizon more than 2.5 cm into a natric horizon;

4. When neither irrigated nor fallowed to store moisture

a. If the soil temperature regime is mesic or thermic, are dry less than six-tenths of the time in half or more years in some part of the

moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

b. If the soil temperature regime is hyperthermic, or isomesic or warmer, are moist in some or all parts of the moisture control section for 90 consecutive days or more during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

5. Do not have visible crystals or nests of gypsum or more soluble salts within 40 cm of the surface."

Page 308, first column and extending to second column.

Delete the section, Distinctions between Typic Paleustolls and other subgroups, and replace with the following key to subgroups and definition of Typic Paleustolls:

"Key to subgroups

HFCA. Paleustolls that:

1. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

c. More than 35 percent clay in horizons that have total thickness of more than 50 cm; and

2. The cracks are open for more than 180 days, cumulative in most years.

Torrertic Paleustolls

HFCE. Other Paleustolls that:

1. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C;

2. Have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

c. More than 35 percent clay in horizons that have total thickness of more than 50 cm; and

3. The cracks are open less than 135 days, cumulative, in most years.

Udertic Paleustolls

HFCC. Other Paleustolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

2. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

3. More than 35 percent clay in horizons that have total thickness of more than 50 cm.

Vertic Paleustolls

HFCD. Other Paleustolls that have a mollic epipedon that is 50 cm or more thick and its texture is finer than loamy fine sand.

Pachic Paleustolls

HFCE. Other Paleustolls that have a petrocalcic horizon within 150 cm of the surface.

Petrocalcic Paleustolls

HFCF. Other Paleustolls that have mottles that have chroma of 2 or less within 100 cm of the surface if artificially drained or, if undrained in most years, are continuously saturated with water in the mottled horizon for 90 days or more.

Aquic Paleustolls

HFCG. Other Paleustolls that:

1. Are calcareous throughout after the upper soil to a depth of 18 cm has been mixed and have a calcic horizon within a depth of 100 cm

if the particle-size class of the upper 50 cm of the argillic horizon is sandy, 60 cm if loamy, and 50 cm if clayey; and

2. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

b. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Calcic Paleustolls

HFCB. Other Paleustolls that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry six-tenths or more of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

2. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for less than 90 consecutive days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Aridic Paleustolls

HFCI. Other Paleustolls that, when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry for four-tenths or less of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udic Paleustolls

HFCJ. Other Paleustolls that are calcareous throughout after the upper soil to a depth of 18 cm has been mixed and have a calcic horizon within a depth of 100 cm if the particle-size class of the upper 50 cm of the argillic horizon is sandy, 80 cm if it is loamy, and 50 cm if it is clayey.

Calcic Paleustolls

HFCB. Other Paleustolls that are calcareous throughout after the upper soil to a depth of 18 cm has been mixed.

Entic Paleustolls

HFCL. Other Paleustolls.

Typic Paleustolls

Definition of Typic Paleustolls

Typic Paleustolls are the Paleustolls that

1. Are noncalcareous in some horizons after the upper soil to a depth of 18 cm has been mixed or do not have a calcic horizon within a depth of 100 cm if the particle-size class of the upper 50 cm of the argillic horizon is sandy, 60 cm if it is loamy, and 50 cm if it is clayey;

2. Do not have mottles that have chroma of 2 or less within 100 cm of the surface if artificially drained or, if undrained in most years, are not continuously saturated with water in the mottled horizon for as long as 90 days;

3. Have a mollic epipedon that is less than 50 cm thick or have texture that is loamy fine sand or coarser if the mollic epipedon is 50 cm or more thick;

4. Do not have a petrocalcic horizon within 150 cm of the surface;

5. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for more than four-tenths of the cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C;

6. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon,

b. A coefficient of linear extensibility (COLE) of 0.07 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 125 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 125 cm, and

c. More than 35 percent clay in horizons that have total thickness of more than 50 cm; and

7. When neither irrigated nor fallowed to store moisture,

a. If the soil temperature regime is mesic or thermic, are dry less than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) during a period when the soil temperature at a depth of 50 cm exceeds 5° C, or

b. If the soil temperature regime is hyperthermic or isomesic, or warmer, are moist in some or all parts of the moisture control section for 90 consecutive days or more during a period when the soil temperature at a depth of 50 cm exceeds 8° C."

Page 309, first column and extending to page 310, first column. Delete the section, Distinctions between Typic Vermustolls and other subgroups, and replace with the following key to subgroups and definition of Typic Vermustolls:

"Key to subgroups

HFFA. Vermustolls that have a lithic contact within 50 cm of the surface.

Lithic Vermustolls

HFFB. Other Vermustolls that have a mollic epipedon that is 75 cm or more thick.

Pachic Vermustolls

HFFC. Other Vermustolls that have mottles that have chroma of 2 or less within 100 cm of the surface.

Aquic Vermustolls

HFFD. Other Vermustolls that have a cambic horizon.

Haplic Vermustolls

HFFE. Other Vermustolls that have a mollic epipedon less than 50 cm thick.

Entic Vermustolls

HFFF. Other Vermustolls.

Typic Vermustolls

Definition of Typic Vermustolls

Typic Vermustolls are the Vermustolls that

1. Have a mollic epipedon that is 50 cm or more thick but is less than 75 cm thick;

2. Do not have a cambic horizon;

3. Do not have a lithic contact within 50 cm of the surface;

4. Do not have mottles that have chroma of 2 or less within 100 cm of the surface."

Page 311, first column and extending to page 312, first column. Delete the section, Distinctions between Typic Argixerolls and other subgroups, and replace with the following key to subgroups and definition of Typic Argixerolls:

"Key to subgroups

HDEA. Argixerolls that have a lithic contact within 50 cm of the soil surface and have base saturation (by sum of cations) of 75 percent or less in some part of the soil above the lithic contact.

Lithic Ultic Argixerolls

HDEB. Other Argixerolls that have a lithic contact within 50 cm of the soil surface.

Lithic Argixerolls

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HDEC. Other Argixerolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon, and

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm, and

3. More than 35 percent clay in horizons that have a total thickness of more than 50 cm.

Vertic Argixerolls

HDED. Other Argixerolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Argixerolls

HDEE. Other Argixerolls that:

1. Have an aridic moisture regime; and

2. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitritorrandic Argixerolls

HDEF. Other Argixerolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments

make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Argixerolls

HDEG. Other Argixerolls that have an albic horizon above the argillic horizon and the mean annual soil temperature is lower than 10° C.

Boralfic Argixerolls

HDEH. Other Argixerolls that:

1. Have a calcic horizon or soft, powdery secondary lime within a depth of 150 cm if the weighted average particle-size class of the upper 50 cm of the argillic horizon is sandy, 110 cm if it is loamy, and 90 cm if it is clayey, or above a lithic contact that is shallower than these depths; and

2. Have a mollic epipedon that is 50 cm or more thick with a texture finer than loamy fine sand.

Calcic Pachic Argixerolls

HDEI. Other Argixerolls that:

1. Have a mollic epipedon that is 50 cm or more thick with a texture finer than loamy fine sand; and

2. Have base saturation (by sum of cations) of 75 percent or less in some part in the upper 75 cm or above a lithic or paralithic contact, whichever is shallower.

Pachic Ultic Argixerolls

HDEJ. Other Argixerolls that have a mollic epipedon that is 50 cm or more thick with a texture finer than loamy fine sand.

Pachic Argixerolls

HDEK. Other Argixerolls that:

1. Have mottles that have chroma of 2 or less within 75 cm of the surface and are continuously saturated with water within 100 cm of the soil surface for 90 days or more in most years, unless artificially drained; and

2. Have base saturation (by sum of cations) of 75 percent or less in some part in the upper 75 cm or above a lithic or paralithic contact, whichever is shallower.

Aquultic Argixerolls

HDEL. Other Argixerolls that have mottles that have chroma of 2 or less within 75 cm of the surface and are continuously saturated with water

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within 100 cm of the soil surface for 90 days or more in most years, unless artificially drained.

Aquic Argixerolls

HDEM. Other Argixerolls that:

1. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains at least 20 percent durinodes or is brittle and has firm consistence when moist; and

2. Have an aridic moisture regime.

Durargidic Argixerolls

HDEN. Other Argixerolls that have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains at least 20 percent durinodes or is brittle and has firm consistence when moist.

Duric Argixerolls

HDEO. Other Argixerolls that:

1. Have an aridic moisture regime; and

2. Have a calcic horizon or soft, powdery secondary lime within a depth of 150 cm if the weighted average particle-size class of the upper 50 cm of the argillic horizon is sandy, 110 cm if it is loamy, and 90 cm if it is clayey, or above a lithic contact that is shallower than these depths.

Aridic Calcic Argixerolls

HDEP. Other Argixerolls that have an aridic moisture regime.

Aridic Argixerolls

HDEQ. Other Argixerolls that have a calcic horizon or soft, powdery secondary lime within a depth of 150 cm if the weighted average particle-size class of the upper 50 cm of the argillic horizon is sandy, 110 cm if it is loamy, and 90 cm if it is clayey, or above a lithic contact that is shallower than these depths.

Calcic Argixerolls

HDER. Other Argixerolls that have base saturation (by sum of cations) of 75 percent or less in some part in the upper 75 cm or above a lithic or paralithic contact, whichever is shallower.

Ultic Argixerolls

HDES. Other Argixerolls that have an albic horizon above the argillic horizon.

Albic Argixerolls

HDET. Other Argixerolls.

Typic Argixerolls

Definition of Typic Argixerolls

Typic Argixerolls are the Argixerolls that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the surface if artificially drained or if undrained are not continuously saturated with water within 100 cm of the soil surface for 90 days or more in most years;

2. Do not have an albic horizon above the argillic horizon;

3. Do not have a calcic horizon or soft, powdery secondary lime within a depth of 150 cm if the weighted average particle-size class of the upper 50 cm of the argillic horizon is sandy, 110 cm if it is loamy, and 90 cm if it is clayey, or above a lithic contact that is shallower than these depths;

4. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains at least 20 percent durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist;

5. Do not have a lithic contact within 50 cm of the soil surface;

6. Have a xeric moisture regime;

7. Have a mollic epipedon that is less than 50 cm thick or the texture is loamy fine sand or coarser if the mollic epipedon is 50 cm or more thick;

8. Have base saturation (by sum of cations) of more than 75 percent throughout the upper 75 cm or above a lithic or paralithic contact, whichever is shallower;

9. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon, and

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm, and

c. More than 35 percent clay in horizons that have a total thickness of more than 50 cm; and

10. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; or

b. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

c. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

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(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 313, second column and extending to page 314, first column. Delete the section, Distinctions between Typic Calcixerolls and other subgroups, and replace with the following key to subgroups and definition of Typic Calcixerolls:

"Key to subgroups

HDDA. Calcixerolls that have a lithic contact within 50 cm of the soil surface.

Lithic Calcixerolls

HDDB. Other Calcixerolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

3. More than 35 percent clay in horizons that have a total thickness of more than 50 cm.

Vertic Calcixerolls

HDDC. Other Calcixerolls that have a mollic epipedon that is 50 cm or more thick and its texture is finer than loamy fine sand.

Pachic Calcixerolls

HDDD. Other Calcixerolls that have mottles within 75 cm of the surface that are due to segregation of iron or manganese and the soils are continuously saturated with water within 100 cm of the soil surface for 90 days or more in most years, unless artificially drained.

Aquic Calcixerolls

HDDE. Other Calcixerolls that have an aridic moisture regime.

Aridic Calcixerolls

HDDF. Other Calcixerolls that have a mollic epipedon that below any Ap horizon has 50 percent or more by volume wormholes, wormcasts, or filled animal burrows.

Vermic Calcixerolls

HDDG. Other Calcixerolls.

Typic Calcixerolls

Definition of Typic Calcixerolls

Typic Calcixerolls are the Calcixerolls that

1. Do not have mottles within 75 cm of the surface that are due to segregation of iron or manganese if artificially

drained, and if undrained are not continuously saturated with water within 100 cm of the soil surface for as long as 90 days in most years;

2. Have a mollic epipedon that is less than 50 cm thick, or the texture is loamy fine sand or coarser if the mollic epipedon is 50 cm or more thick;

3. Have a xeric moisture regime;

4. Do not have a lithic contact within 50 cm of the soil surface;

5. Do not have a mollic epipedon that below any Ap horizon has 50 percent or more by volume wormholes, wormcasts, or filled animal burrows; and

6. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

c. More than 35 percent clay in horizons that have a total thickness of more than 50 cm."

Page 314, second column and extending to page 315, first column. Delete the section, Distinctions between Typic Durixerolls and other subgroups, and replace with the following key to subgroups and definition of Typic Durixerolls:

"Key to subgroups

HDAA. Durixerolls that:

1. Have an aridic moisture regime; and

2. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass: or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-

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aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.
Vitritorrandic Durixerolls

HDAB. Other Durixerolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or
2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

a. More than 30 percent volcanic glass; or

b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Durixerolls

HDAC. Other Durixerolls that have mottles that have chroma of 2 or less above the duripan.

Aquic Durixerolls

HDAD. Other Durixerolls that:

1. Have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm or an increase of 15 percent or more (absolute) within a distance of 2.5 cm at the upper boundary; and
2. Have an aridic moisture regime.

Abruptic Aridic Durixerolls

HDAE. Other Durixerolls that:

1. Do not have an argillic horizon above the duripan; and
2. Have an aridic moisture regime.

Orthidic Durixerolls

HDAF. Other Durixerolls that have an aridic moisture regime.

Aridic Durixerolls

HDAG. Other Durixerolls that have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm or an increase of 15 percent or more (absolute) within a distance of 2.5 cm at the upper boundary.

Abruptic Durixerolls

HDAH. Other Durixerolls that:

1. Do not have a duripan that is massive, platy, or prismatic and that has half or more of its upper boundary indurated or coated with opal or opal and sesquioxides or that is

indurated in some subhorizon below its upper boundary; and

2. Do not have an argillic horizon above the duripan.

Entic Durixerolls

HDAI. Other Durixerolls that do not have an argillic horizon above the duripan.

Haplic Durixerolls

HDAJ. Other Durixerolls that do not have a duripan that is massive, platy, or prismatic and that has half or more of its upper boundary indurated or coated with opal or opal and sesquioxides or that is indurated in some subhorizon below its upper boundary.

Argic Durixerolls

HDAK. Other Durixerolls.

Typic Durixerolls

Definition of Typic Durixerolls

Typic Durixerolls are the Durixerolls that

1. Do not have an argillic horizon that has an increase in clay content of 20 percent (absolute) or more within a vertical distance of 7.5 cm or an increase of 15 percent or more (absolute) within a distance of 2.5 cm at the upper boundary;
2. Have a duripan that is massive, platy, or prismatic and that has half or more of its upper boundary indurated or coated with opal or opal and sesquioxides or that is indurated in some subhorizon below its upper boundary;
3. Have an argillic horizon above the duripan;
4. Have a xeric moisture regime;
5. Do not have mottles that have chroma of 2 or less above the duripan; and
6. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 316, first column and extending to page 317, first column. Delete the section, Distinctions between Typic Haploxerolls and other subgroups, and replace with the following key

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to subgroups and definition of Typic Haploxerolls:

"Key to subgroups

HDFA. Haploxerolls that:

1. Have a lithic contact within 50 cm of the soil surface; and
2. Have base saturation (by sum of cations) of 75 percent or less in some part of the soil above the lithic contact.

Lithic Ultic Haploxerolls

HDFB. Other Haploxerolls that have a lithic contact within 50 cm of the soil surface.

Lithic Haploxerolls

HDFC. Other Haploxerolls that:

1. Have an aridic moisture regime; and
2. Have the following combination of characteristics:

- a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

- b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

- c. More than 35 percent clay in horizons that have a total thickness of more than 50 cm.

Torrertic Haploxerolls

HDFD. Other Haploxerolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

3. More than 35 percent clay in horizons that have a total thickness of more than 50 cm.

Vertic Haploxerolls

HDFE. Other Haploxerolls that:

1. Have an aridic moisture regime; and

2. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

- a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

- b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- (1) More than 30 percent volcanic glass: or

- (2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitritorrantic Haploxerolls

HDFF. Other Haploxerolls that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

1. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

2. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

- a. More than 30 percent volcanic glass: or

- b. At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more.

Vitrandic Haploxerolls

HDFG. Other Haploxerolls that:

1. Have a mollic epipedon that is 50 cm or more thick and its texture is finer than loamy fine sand; and

2. Have an irregular decrease in organic carbon content with increasing depth, or have an organic carbon content of more than 0.3 percent throughout to a depth of 125 cm of the surface; and

3. Have a slope of 25 percent or less; and

4. Have base saturation (by sum of cations) of 75 percent or less in some part within a depth of 75 cm from the soil surface or above a lithic or paralithic contact, whichever is shallower.

Cumulic Ultic Haploxerolls

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HDFH. Other Haploxerolls that:

1. Have a mollic epipedon that is 50 cm or more thick and its texture is finer than loamy fine sand; and
2. Have an irregular decrease in organic carbon content with increasing depth, or have an organic carbon content of more than 0.3 percent throughout to a depth of 125 cm of the surface; and
3. Have a slope of 25 percent or less.

Cumulic Haploxerolls

HDFI. Other Haploxerolls that:

1. Have a calcic horizon or soft, powdery secondary lime within a depth of 150 cm if the weighted average particle-size class between a depth of 25 and 100 cm, or between a depth of 25 cm and a lithic or paralithic contact that is shallower than 100 cm, is sandy; within 110 cm if the average particle-size class is loamy; or within 90 cm if it is clayey; and
2. Have a mollic epipedon that is 50 cm or more thick and its texture is finer than loamy fine sand.

Calcic Pachic Haploxerolls

HDFJ. Other Haploxerolls that:

1. Have a mollic epipedon that is 50 cm or more thick and its texture is finer than loamy fine sand; and
2. Have base saturation (by sum of cations) of 75 percent or less in some part within a depth of 75 cm from the soil surface or above a lithic or paralithic contact, whichever is shallower.

Pachic Ultic Haploxerolls

HDFK. Other Haploxerolls that have a mollic epipedon that is 50 cm or more thick and its texture is finer than loamy fine sand.

Pachic Haploxerolls

HDFL. Other Haploxerolls that:

1. Have mottles that have chroma of 2 or less within 75 cm of the surface and the soils are continuously saturated with water within 100 cm of the soil surface for 90 days or more in most years, unless artificially drained; and
2. Have an irregular decrease in organic carbon content with increasing depth, or have an organic carbon content of more than 0.3 percent throughout to a depth of 125 cm of the surface; and
3. Have a slope of less than 25 percent.

Fluvaquentic Haploxerolls

HDFM. Other Haploxerolls that:

1. Have mottles that have chroma of 2 or less within 75 cm of the surface and the soils are continuously saturated with water within 100

cm of the soil surface for 90 days or more in most years, unless artificially drained; and

2. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains at least 20 percent durinodes or is brittle and has firm consistence when moist.

Aquic Duric Haploxerolls

HDFN. Other Haploxerolls that:

1. Have mottles that have chroma of 2 or less within 75 cm of the surface and the soils are continuously saturated with water within 100 cm of the soil surface for 90 days or more in most years, unless artificially drained; and

2. Have base saturation (by sum of cations) of 75 percent or less in some part within a depth of 75 cm from the soil surface or above a lithic or paralithic contact, whichever is shallower.

Aquultic Haploxerolls

HDFO. Other Haploxerolls that have mottles that have chroma of 2 or less within 75 cm of the surface and the soils are continuously saturated with water within 100 cm of the soil surface for 90 days or more in most years, unless artificially drained.

Aquic Haploxerolls

HDFP. Other Haploxerolls that:

1. Have an aridic moisture regime; and
2. Have an irregular decrease in organic carbon content with increasing depth, or have an organic carbon content of more than 0.3 percent throughout to a depth of 125 cm of the surface; and
3. Have a slope of less than 25 percent.

Torrifluventic Haploxerolls

HDFQ. Other Haploxerolls that:

1. Have an aridic moisture regime; and
2. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains at least 20 percent durinodes or is brittle and has firm consistence when moist.

Aridic Duric Haploxerolls

HDFR. Other Haploxerolls that:

1. Have an aridic moisture regime; and
2. Have a calcic horizon or soft, powdery secondary lime within a depth of 150 cm if the weighted average particle-size class between a depth of 25 and 100 cm, or between a depth of 25 cm and a lithic or paralithic contact that is shallower than 100 cm, is sandy; within 110 cm if the average particle-size class is loamy; or within 90 cm if it is clayey.

Calciorthidic Haploxerolls

HDFS. Other Haploxerolls that:

1. Have an aridic moisture regime; and

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2. Have a sandy particle-size class in all subhorizons to a depth of 100 cm or more.
Torripsammentic Haploxerolls

soil surface or above a lithic or paralithic contact, whichever is shallower.
Ultic Haploxerolls

HDFt. Other Haploxerolls that:

1. Have an aridic moisture regime; and
2. Do not have a cambic horizon, and the lower part of the mollic epipedon does not meet the requirements of a cambic horizon except for color, or either the cambic horizon or the lower part of the epipedon has carbonates throughout.

Torriorthentic Haploxerolls

HDFzb. Other Haploxerolls that do not have a cambic horizon, and the lower part of the epipedon does not meet the requirements of a cambic horizon except for color, or either the cambic horizon or the lower part of the epipedon has carbonates throughout.

Entic Haploxerolls

HDFu. Other Haploxerolls that have an aridic moisture regime.

Aridic Haploxerolls

HDFzc. Other Haploxerolls.

Typic Haploxerolls

HDFv. Other Haploxerolls that have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains at least 20 percent durinodes or is brittle and has firm consistence when moist.

Duric Haploxerolls

Definition of Typic Haploxerolls

Typic Haploxerolls are the Haploxerolls that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the surface if artificially drained and if undrained, are not continuously saturated with water within 100 cm of the soil surface for 90 days or more in most years;

2. Do not have a calcic horizon or soft, powdery secondary lime within a depth of 150 cm if the weighted average particle-size class of all horizons between a depth of 25 cm and 100 cm, or between a depth of 25 cm and a lithic or paralithic contact that is shallower than 100 cm, is sandy; within 110 cm if the average particle-size class is loamy; or within 90 cm if it is clayey;

3. Have a mollic epipedon that is less than 50 cm thick or texture that is loamy fine sand or coarser if the mollic epipedon is 50 cm or more thick;

4. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains at least 20 percent durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist;

5. Have a cambic horizon, or the lower part of the epipedon meets the requirements of a cambic horizon except for color, and either the cambic horizon or the lower part of the epipedon is free of carbonates in some part;

6. Have a regular decrease in organic carbon content with increasing depth and unless a lithic or a paralithic contact is at some depth between 50 cm and 125 cm below the soil surface, have an organic carbon content of 0.3 percent or less at a depth within 125 cm of the surface; or the slope is 25 percent or more;

7. Do not have a lithic contact within 50 cm of the soil surface;

8. Have base saturation (by sum of cations) of more than 75 percent throughout the upper soil to a depth of 75 cm or above a lithic or paralithic contact, whichever is shallower;

9. Do not have a mollic epipedon that has granular structure and that, below any Ap horizon, has 50 percent or more by volume or wormholes, wormcasts, or filled animal burrows;

10. Do not have the following combination of characteristics:

HDFw. Other Haploxerolls that:

1. Have an irregular decrease in organic carbon content with increasing depth, or have an organic carbon content of more than 0.3 percent throughout to a depth of 125 cm of the surface; and
2. Have a slope of less than 25 percent.

Fluventic Haploxerolls

HDFx. Other Haploxerolls that have a mollic epipedon that has granular structure and that, below any Ap horizon, has 50 percent or more by volume or wormholes, wormcasts, or filled animal burrows.

Vermic Haploxerolls

HDFy. Other Haploxerolls that have a calcic horizon or soft, powdery secondary lime within a depth of 150 cm if the weighted average particle-size class between a depth of 25 and 100 cm, or between a depth of 25 cm and a lithic or paralithic contact that is shallower than 100 cm, is sandy; within 110 cm if the average particle-size class is loamy; or within 90 cm if it is clayey.

Calcic Haploxerolls

HDFz. Other Haploxerolls that:

1. Do not have a cambic horizon, and the lower part of the epipedon does not meet the requirements of a cambic horizon except for color; and
2. Have base saturation (by sum of cations) of 75 percent or less in some part within a depth of 75 cm from the soil surface or above a lithic or paralithic contact, whichever is shallower.

Entic Ultic Haploxerolls

HDFza. Other Haploxerolls that have base saturation (by sum of cations) of 75 percent or less in some part within a depth of 75 cm from the

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a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface or to the base of an Ap horizon;

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 150 cm; and

c. More than 35 percent clay in horizons that have a total thickness of more than 50 cm;

11. Have a xeric moisture regime; and

12. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, one or more of the following:

a. Fragments coarser than 2.0 mm constitute more than 35 percent of the whole soil and cinders, pumice, and pumice-like fragments make up more than 66 percent of these fragments; or

b. The 0.02 to 2.0 mm fraction constitutes at least 30 percent of the less than 2.0 mm fraction and contains either:

(1) More than 30 percent volcanic glass; or

(2) At least 5 percent volcanic glass and acid-oxalate-extractable-aluminum plus 1/2 acid-oxalate-extractable iron of 0.40 percent or more."

Page 319, second column. Delete the section, Distinctions between Typic Natrixerolls and other subgroups, and replace with the following key to subgroups and definition of Typic Natrixerolls:

"Key to subgroups

HDBA. Natrixerolls that:

1. Have mottles that have chroma of 2 or less within 75 cm of the soil surface; and

2. Have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains at least 20 percent durinodes or is brittle and has firm consistence when moist.

Aquic Duric Natrixerolls

HDBB. Other Natrixerolls that have mottles that have chroma of 2 or less within 75 cm of the soil surface.

Aquic Natrixerolls

HDBC. Other Natrixerolls that have an aridic moisture regime.

Aridic Natrixerolls

HDDB. Other Natrixerolls that have a horizon within 100 cm of the surface that is more than 15 cm

thick that either contains at least 20 percent durinodes or is brittle and has firm consistence when moist.

Duric Natrixerolls

HDBE. Other Natrixerolls.

Typic Natrixerolls

Definition of Typic Natrixerolls

Typic Natrixerolls are the Natrixerolls that

1. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface;

2. Do not have a horizon within 100 cm of the surface that is more than 15 cm thick that either contains at least 20 percent durinodes in a nonbrittle matrix or is brittle and has firm consistence when moist; and

3. Have a xeric moisture regime."

Page 320, second column and extending to page 321, first column. Delete the section, Distinctions between Typic Palaxerolls and other subgroups, and replace with the following key to subgroups and definition of Typic Palaxerolls:

"Key to subgroups

HDCA. Palaxerolls that have a natric horizon.

Natric Palaxerolls

HDCB. Other Palaxerolls that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;

2. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or a paralithic contact is deeper than 50 cm but shallower than 150 cm; and

3. More than 35 percent clay in horizons that have a total thickness of more than 50 cm.

Vertic Palaxerolls

HDCC. Other Palaxerolls that have a mollic epipedon that is 50 cm or more thick, and its texture is finer than loamy fine sand.

Pachic Palaxerolls

HDCD. Other Palaxerolls that have mottles that have chroma of 2 or less within 75 cm of the soil surface.

Aquic Palaxerolls

HDCE. Other Palaxerolls that:

1. Have an aridic moisture regime; and

2. Have a petrocalcic horizon that has its upper boundary within 150 cm of the soil surface.

Aridic Petrocalcic Palaxerolls

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HDCF. Other Palexerolls that have an aridic moisture regime.
Aridic Palexerolls

a paralthic contact is deeper than 50 cm but shallower than 150 cm; and

HDCG. Other Palexerolls that have a petrocalcic horizon that has its upper boundary within 150 cm of the soil surface.
Petrocalcic Palexerolls

c. More than 35 percent clay in horizons that have a total thickness of more than 50 cm; and

8. Have a xeric moisture regime."

HDCI. Other Palexerolls that have base saturation of 75 percent or less in some part of the argillic horizon or in the upper 50 cm of the argillic horizon, whichever is thinner.
Ultic Palexerolls

Page 615-125 (NSTH issue No. 11). Following Typic Acraquox, insert the definition of Typic Acraquox:

"Definition of Typic Acraquox

Typic Acraquox are the Acraquox that

HDCI. Other Palexerolls that have an argillic horizon that either does not have a clayey particle-size class in the upper part or has an increase in clay content of less than 20 percent clay (absolute) within a vertical distance of 7.5 cm or of less than 15 percent clay (absolute) within a distance of 2.5 cm at the upper boundary.
Haplic Palexerolls

1. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume; and

2. Have mottles with chroma of 2 or less in 50 percent or more of the horizon immediately below the epipedon."

HDCJ. Other Palexerolls.
Typic Palexerolls

Page 615-126 (NSTH issue No. 11). Following Typic Eutraquox, insert the definition of Typic Eutraquox:

"Definition of Typic Eutraquox

Typic Eutraquox are the Eutraquox that

Definition of Typic Palexerolls

Typic Palexerolls are Palexerolls that

1. Have an argillic horizon that has a clayey particle-size class in the upper part and an increase in clay content of 20 percent clay (absolute) or more within a vertical distance of 7.5 cm or of 15 percent clay (absolute) within a distance of 2.5 cm at the upper boundary;

1. Do not have a histic epipedon;

2. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;

2. Do not have mottles that have chroma of 2 or less within 75 cm of the soil surface;

3. Have mottles with chroma of 2 or less in 50 percent or more of the horizon immediately below the epipedon; and

3. Do not have a petrocalcic horizon that has its upper boundary within 150 cm of the soil surface;

4. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter."

4. Have a mollic epipedon that is less than 50 cm thick, or the texture is loamy fine sand or coarser if the mollic epipedon is more than 50 cm thick;

Page 615-126 (NSTH issue No. 11). Following Typic Haplaquox, insert the definition of Typic Haplaquox:

"Definition of Typic Haplaquox

Typic Haplaquox are the Haplaquox that

5. Do not have a natric horizon;

6. Have base saturation of more than 75 percent throughout the argillic horizon or in the upper 50 cm of the argillic horizon, whichever is thinner;

1. Do not have a histic epipedon;

7. Do not have the following combination of characteristics:

a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the surface or to the base of an Ap horizon;

2. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;

b. A coefficient of linear extensibility (COLE) of 0.05 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 150 cm of the soil or in the whole soil if a lithic or

3. Have mottles with chroma of 2 or less in 50 percent or more of the horizon immediately below the epipedon; and

4. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter."

Page 615-127 (NSTH issue No. 11). Following Typic Plinthaquox, insert the definition of Typic Plinthaquox:

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"Definition of Typic Plinthaquox

Typic Plinthaquox are the Plinthaquox that have mottles with chroma of 2 or less in 50 percent or more of the horizon immediately below the epipedon."

Page 615-129 (NSTH issue No. 11). Following Typic Acroperox, insert the definition of Typic Acroperox:

"Definition of Typic Acroperox

Typic Acroperox are the Acroperox that have

1. Do not have either a petroferic or lithic contact within 125 cm of the soil surface;
2. Have a delta pH (KCl pH - 1:1 water pH) with a net negative charge in all parts within a depth of 125 cm of the soil surface;
3. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;
4. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;
5. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter; and
6. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-131 (NSTH issue No. 11). Following Typic Eutroperox, insert the definition of Typic Eutroperox:

"Definition of Typic Eutroperox

Typic Eutroperox are the Eutroperox that

1. Do not have either a petroferic or lithic contact within 125 cm of the soil surface;
2. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;
3. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;
4. Have 40 percent or less clay in the surface 18 cm after mixing or do not have a kandic horizon with its upper boundary within a depth of 150 cm of the soil surface;
5. The lower boundary of the oxic or kandic horizon is 125 cm or deeper from the soil surface;
6. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter; and
7. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-133 (NSTH issue No. 11). Change DDEH. to read as follows:

"DDEH. Other Haploperox that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.
Andic Haploperox"

Page 615-133 (NSTH issue No. 11). Following Typic Haploperox, insert the definition of Typic Haploperox:

"Definition of Typic Haploperox

Typic Haploperox are the Haploperox that

1. Do not have either a petroferic or lithic contact within 125 cm of the soil surface;
2. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;
3. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;
4. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent;
5. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter; and
6. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-135 (NSTH issue No. 11). Change DDDH. to read as follows:

"DDDH. Other Kandiperiox that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent
Andic Kandiperiox"

Page 615-135 (NSTH issue No. 11). Following Typic Kandiperiox, insert the definition of Typic Kandiperiox:

"Definition of Typic Kandiperiox

Typic Kandiperiox are the Kandiperiox that

1. Do not have either a petroferic or lithic contact within 125 cm of the soil surface;

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2. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;

3. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;

4. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent;

5. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter; and

6. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-136 (NSTH issue No. 11). Following Typic Sombriperox, insert the definition of Typic Sombriperox:

"Definition of Typic Sombriperox

Typic Sombriperox are the Sombriperox that

1. Do not have either a petroferic or lithic contact within 125 cm of the soil surface; and

2. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter."

Page 615-137 (NSTH issue No. 11). Following Typic Acrotorrox, insert the definition of Typic Acrotorrox:

"Definition of Typic Acrotorrox

Typic Acrotorrox are the Acrotorrox that do not have either a petroferic or lithic contact within 125 cm of the soil surface."

Page 615-137 (NSTH issue No. 11). Following Typic Eutrotorrox, insert the definition of Typic Eutrotorrox:

"Definition of Typic Eutrotorrox

Typic Eutrotorrox are the Eutrotorrox that do not have either a petroferic or lithic contact within 125 cm of the soil surface."

Page 615-138 (NSTH issue No. 11). Following Typic Haplotorrox, insert the definition of Typic Haplotorrox:

"Definition of Typic Haplotorrox

Typic Haplotorrox are the Haplotorrox that do not have either a petroferic or lithic contact within 125 cm of the soil surface."

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Page 615-141 (NSTH issue No. 11). Following Typic Acrudox, insert the definition of Typic Acrudox:

"Definition of Typic Acrudox

Typic Acrudox are the Acrudox that

1. Do not have either a petroferic or lithic contact within 125 cm of the soil surface;

2. Have a delta pH (KCl pH - 1:1 water pH) with a net negative charge in all parts within a depth of 125 cm of the soil surface;

3. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;

4. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;

5. Have 35 percent or less base saturation (NH₄OAc) in some subhorizon within a depth of 125 cm of the soil surface;

6. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter; and

7. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-142 (NSTH issue No. 11). Following Typic Eutrudox, insert the definition of Typic Eutrudox:

"Definition of Typic Eutrudox

Typic Eutrudox are the Eutrudox that

1. Do not have either a petroferic or lithic contact within 125 cm of the soil surface;

2. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;

3. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;

4. Have 40 percent or less clay in the surface 18 cm after mixing or do not have a kandic horizon with its upper boundary within a depth of 150 cm of the soil surface;

5. The lower boundary of the oxic or kandic horizon is 125 cm or deeper from the soil surface;

6. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter; and

7. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-144 (NSTH issue No. 11). Change DEEI. to read as follows:

"DEEI. Other Hapludox that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.
Andic Hapludox"

Page 615-144 (NSTH issue No. 11). Following Typic Hapludox, insert the definition of Typic Hapludox:

"Definition of Typic Hapludox

Typic Hapludox are the Hapludox that

1. Do not have either a petroferic or lithic contact within 125 cm of the soil surface;
2. Do not have either a petroferic or lithic contact within 125 cm of the soil surface;
3. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;
4. The lower boundary of the oxic or kandic horizon is 125 cm or deeper from the soil surface;
5. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mg fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent;
6. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter; and
7. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-146 (NSTH issue No. 11). Change DEDH. to read as follows:

"DEDH. Other Kandiudox that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.
Andic Kandiudox"

Page 615-146 (NSTH issue No. 11). Following Typic Kandiudox, insert the definition of Typic Kandiudox:

"Definition of Typic Kandiudox

Typic Kandiudox are the Kandiudox that

1. Do not have either a petroferic or lithic contact within 125 cm of the soil surface;
2. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;
3. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;
4. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mg fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent;
5. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter; and
6. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-147 (NSTH issue No. 11). Following Typic Sombrudox, insert the definition of Typic Sombrudox:

"Definition of Typic Sombrudox

Typic Sombrudox are the Sombrudox that

1. Do not have either a petroferic or lithic contact within 125 cm of the soil surface; and
2. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter."

Page 615-150 (NSTH issue No. 11). Following Typic Acrustox, insert the definition of Typic Acrustox:

"Definition of Typic Acrustox

Typic Acrustox are the Acrustox that

1. Do not have either a petroferic or lithic contact within 125 cm of the soil surface;
2. Have a delta pH (KCl pH - 1:1 water pH) with a net negative charge in all parts within a depth of 125 cm of the soil surface;
3. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;
4. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;
5. Have 35 percent or less base saturation (NH₄OAc) in some subhorizon within a depth of 125 cm of the soil surface;

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6. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter; and

7. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-152 (NSTH issue No. 11). Following Typic Eustrustox, insert the definition of Typic Eustrustox:

"Definition of Typic Eustrustox

Typic Eustrustox are the Eustrustox that

1. Do not have either a petroferric or lithic contact within 125 cm of the soil surface;
2. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;
3. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;
4. Have 40 percent or less clay in the surface 18 cm after mixing or do not have a kandic horizon with its upper boundary within a depth of 150 cm of the soil surface;
5. The lower boundary of the oxic or kandic horizon is 125 cm or deeper from the soil surface;
6. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter; and
7. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-154 (NSTH issue No. 11). Following Typic Haplustox, insert the definition of Typic Haplustox:

"Definition of Typic Haplustox

Typic Haplustox are the Haplustox that

1. Do not have either a petroferric or lithic contact within 125 cm of the soil surface;
2. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;
3. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;
4. The lower boundary of the oxic or kandic horizon is 125 cm or deeper from the soil surface;
5. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface; and

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6. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-156 (NSTH issue No. 11). Following Typic Kandustox, insert the definition of Typic Kandustox:

"Definition of Typic Kandustox

Typic Kandustox are the Kandustox that

1. Do not have either a petroferric or lithic contact within 125 cm of the soil surface;
2. Do not have a horizon within a depth of 125 cm of the soil surface that has more than 5 percent plinthite by volume;
3. Do not have mottles of 4 or more value moist and 2 or less chroma within a depth of 25 cm of the soil surface;
4. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter; and
5. In most of the 25 to 125 cm depth from the soil surface, have a color hue of 5YR and moist values of 4 or 5, or have a color hue of 2.5YR or redder and moist values of 4 or more, or have a color hue of 7.5YR or yellower and moist values of 5 or less."

Page 615-156 (NSTH issue No. 11). Following Typic Sombriustox, insert the definition of Typic Sombriustox:

"Definition of Typic Sombriustox

Typic Sombriustox are the Sombriustox that

1. Do not have either a petroferric or lithic contact within 125 cm of the soil surface; and
2. Have less than 16 Kg of organic carbon per square meter to a depth of one meter, exclusive of surface litter."

Page 335, first column. Delete the section, Distinctions between Typic Cryaquods and other subgroups, and replace with the following key to subgroups and definition of Typic Cryaquods:

"Key to subgroups

CABA. Cryaquods that have a lithic contact within 50 cm of the surface of the mineral soil.
Lithic Cryaquods

CABB. Other Cryaquods that:

1. Have a mean annual soil temperature of 0o C or less; and
2. Have a ratio of free iron to carbon (elemental) of 0.2 or more throughout.
Pergelic Sideric Cryaquods

CABC. Other Cryaquods that have a mean annual soil temperature of 0° C or less.
Pergelic Cryaquods

CABD. Other Cryaquods that have a ratio of free iron to carbon (elemental) of 0.2 or more throughout.
Sideric Cryaquods

CABE. Other Cryaquods that have an argillic or kandic horizon.
Alfic Cryaquods

CABF. Other Cryaquods that do not have a continuous spodic horizon that is 10 cm or more thick or that is very firm when moist.
Entic Cryaquods

CABG. Other Cryaquods.
Typic Cryaquods

Definition of Typic Cryaquods

Typic Cryaquods are the Cryaquods that

1. Do not have a lithic contact within 50 cm of the surface of the mineral soil;
2. Have a mean annual soil temperature higher than 0° C;
3. Have a ratio of free iron to carbon (elemental) of less than 0.2 in some subhorizon;
4. Do not have an argillic horizon underlying the spodic horizon; and
5. Have a continuous spodic horizon that is 10 cm or more thick or that is very firm when moist."

Page 336, first column. Delete the section, Distinctions between Typic Fragiaquods and other subgroups, and replace with the following key to subgroups and definition of Typic Fragiaquods:

"Key to subgroups

CAAA. Fragiaquods that cryic or colder temperature regime.
Cryic Fragiaquods

CAAB. Other Fragiaquods that have a histic epipedon.
Histic Fragiaquods

CAAC. Other Fragiaquods that have 5 percent or more by volume of iron-cemented nodules 2.5 to 30 cm in diameter throughout the spodic horizon.
Sideric Fragiaquods

CAAD. Other Fragiaquods that have a surface horizon more than 30 cm thick that meets all requirements of a plaggen epipedon except thickness.
Plaggeptic Fragiaquods

CAAE. Other Fragiaquods that have an intermittent upper black subhorizon of the spodic horizon that has a ratio of free iron (elemental) to carbon that is less than 0.2; or if plowed and the Ap horizon rests directly on the spodic horizon, have tongues of such a subhorizon.
Humic Fragiaquods

CAAF. Other Fragiaquods that have an argillic or kandic horizon.
Alfic Fragiaquods

CAAG. Other Fragiaquods.
Typic Fragiaquods

Definition of Typic Fragiaquods

Typic Fragiaquods are the Fragiaquods that

1. Have a frigid or warmer temperature regime;
2. Do not have a histic epipedon;
3. Have less than 5 percent by volume of iron-cemented nodules 2.5 to 30 cm in diameter in any subhorizon of the spodic horizon;
4. Do not have a surface horizon more than 30 cm thick that meets all requirements of a plaggen epipedon except thickness;
5. Do not have an intermittent upper black subhorizon of the spodic horizon that has a ratio of free iron (elemental) to carbon that is less than 0.2; or if plowed and the Ap horizon rests directly on the spodic horizon, do not have tongues of such a subhorizon; and
6. Do not have an argillic or kandic horizon."

Page 336, second column and extending to page 337, first column. Delete the section, Distinctions between Typic Haplaquods and other subgroups, and replace with the following key to subgroups and definition of Typic Haplaquods:

"Key to subgroups

CAFA. Haplaquods that have a lithic contact within 50 cm of the mineral soil surface.
Lithic Haplaquods

CAFB. Other Haplaquods that have a placic horizon in or below the spodic horizon.
Placic Haplaquods

CAFC. Other Haplaquods that have a histic epipedon.
Histic Haplaquods

CAFD. Other Haplaquods that

1. Have an umbric epipedon or the surface layer would meet the requirements for an umbric epipedon if it were plowed to a depth of 25 cm; and
2. Have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is deeper than 75 cm below the soil surface.
Arenic Umbric Haplaquods

CAFE. Other Haplaquods that:

1. Have an argillic or kandic horizon underlying the spodic horizon and have either

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base saturation of 35 percent or more (by sum of cations) in some part of the argillic or kandic horizon or have a mean annual soil temperature lower than 8° C; and

2. Have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is between 75 and 125 cm below the soil surface.

Alfic Arenic Haplaquods

CAFF. Other Haplaquods that:

1. Have an argillic or kandic horizon underlying the spodic horizon; and

2. Have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is between 75 and 125 cm below the soil surface.

Arenic Ultic Haplaquods

CAFG. Other Haplaquods that have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is between 75 and 125 cm below the soil surface.

Arenic Haplaquods

CAFH. Other Haplaquods that have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is between 125 and 200 cm below the soil surface.

Grossarenic Haplaquods

CAFI. Other Haplaquods that:

1. Have an argillic or kandic horizon underlying the spodic horizon; and

2. Have 5 percent or more by volume of iron-cemented nodules 2.5 to 30 cm in diameter throughout the spodic horizon.

Ferrudalfic Haplaquods

CAFJ. Other Haplaquods that have 5 percent or more by volume of iron-cemented nodules 2.5 to 30 cm in diameter throughout the spodic horizon.

Sideric Haplaquods

CAFK. Other Haplaquods that have an argillic or kandic horizon underlying the spodic horizon and have either base saturation of 35 percent or more (by sum of cations) in some part of the argillic or kandic horizon or have a mean annual soil temperature lower than 8° C.

Alfic Haplaquods

CAFL. Other Haplaquods that have an argillic or kandic horizon underlying the spodic horizon.

Ultic Haplaquods

CAFM. Other Haplaquods that:

1. Have an ochric epipedon and the surface layer would not meet the requirements for an umbric epipedon if it were plowed to a depth of 25 cm; and

2. Have a spodic horizon that has a weighted average of less than 0.6 percent organic carbon in the matrix of the upper 30 cm of the spodic horizon and the upper subhorizon of the spodic horizon:

a. Has less than 2.3 percent organic carbon in the upper 2 cm; or

b. The subhorizon with 2.3 percent or more organic carbon is present in 90 percent or less of each pedon.

Entic Haplaquods

CAFN. Other Haplaquods that do not have an umbric epipedon or one that would meet the requirements for an umbric epipedon if it were plowed to a depth of 25 to 30 cm.

Aeric Haplaquods

CAFO. Other Haplaquods.

Typic Haplaquods

Definition of Typic Haplaquods

Typic Haplaquods are the Haplaquods that

1. Have an umbric epipedon or one that would meet the requirements for an umbric epipedon if it were plowed to a depth of 25 to 30 cm;

2. Do not have an argillic or kandic horizon underlying the spodic horizon;

3. Do not have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is deeper than 75 cm below the mineral soil surface;

4. Have an umbric epipedon or have a spodic horizon that has a weighted average of 0.6 percent or more organic carbon in the matrix of the upper 30 cm of the spodic horizon or have an upper subhorizon of the spodic horizon that

a. Has 2.3 percent or more organic carbon in the upper 2 cm; and

b. Is continuous or is present in more than 90 percent of each pedon;

5. Have less than 5 percent by volume of iron-cemented nodules 2.5 to 30 cm in diameter in any subhorizon of the spodic horizon;

6. Do not have a lithic contact within 50 cm of the mineral soil surface;

7. Do not have a surface horizon more than 30 cm thick that meets all requirements of a plaggen epipedon except thickness;

8. Do not have a histic epipedon; and

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9. Do not have a placic horizon in or below the spodic horizon."

Page 338, first column. After Definition (Placaquods) insert the following key to subgroups:

"Key to subgroups

CADA. All Placaquods (provisional).

Typic Placaquods"

Page 338, second column and extending to page 339, first column. Delete the section, Distinctions between Typic Sideraquods and other subgroups, and replace with the following key to subgroups and definition of Typic Sideraquods:

"Key to subgroups

CAGA. Sideraquods that have a histic epipedon.

Histic Sideraquods

CAGB. Other Sideraquods that have an argillic or kandic horizon and they have base saturation of 35 percent or more (by sum of cations) in some part of the argillic or kandic horizon or they have a mean annual soil temperature lower than 8° C.

Alfic Sideraquods

CAGC. Other Sideraquods that have an argillic or kandic horizon.

Ultic Sideraquods

CAGD. Other Sideraquods that have a spodic horizon that either:

1. Is not very firm or firmer in any subhorizon when moist; or
2. Is 10 cm or less thick or contains less than 1.2 percent organic carbon in the upper 10 cm.

Entic Sideraquods

CAGE. Other Sideraquods.

Typic Sideraquods

Definition of Typic Sideraquods

Typic Sideraquods are the Sideraquods that

1. Have a spodic horizon that either

- a. Is at least very firm in some subhorizon when moist; or
- b. Is more than 10 cm thick and contains 1.2 percent or more organic carbon in the upper 10 cm;

2. Do not have a histic epipedon; and

3. Do not have an argillic or kandic horizon."

Page 339, first column and extending to second column. Delete the section, Distinctions between Typic Tropaquods and other subgroups, and replace with the following key to subgroups and definition of Typic Tropaquods:

"Key to subgroups

CAEA. Tropaquods that:

1. Have a histic epipedon; and
2. Have a lithic contact within 50 cm of the surface.

Histic Lithic Tropaquods

CAEB. Other Tropaquods that have a lithic contact within 50 cm of the surface.

Lithic Tropaquods

CAEC. Other Tropaquods that have a histic epipedon.

Histic Tropaquods

CAED. Other Tropaquods that

1. Have an umbric epipedon; and
2. Have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is deeper than 75 cm below the soil surface.

Arenic Umbric Tropaquods

CAEE. Other Tropaquods that have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is between 75 and 125 cm below the soil surface.

Aeric Arenic Tropaquods

CAEF. Other Tropaquods that have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is between 125 and 200 cm below the soil surface.

Aeric Grossarenic Tropaquods

CAEG. Other Tropaquods that have either

1. 5 percent or more by volume of iron-cemented nodules, 2.5 to 30 cm in diameter, throughout the spodic horizon; or
2. Have in less than 50 percent of each pedon a spodic horizon in which some subhorizon has a ratio of free iron (by dithionite-citrate) to carbon (both elemental) of less than 0.2.

Sideric Tropaquods

CAEH. Other Tropaquods that have an argillic or kandic horizon underlying the spodic horizon.

Ultic Tropaquods

CAEI. Other Tropaquods that Have a spodic horizon that has a weighted average of less than 0.6 percent organic carbon in the matrix of the upper 30 cm of the spodic horizon and the upper subhorizon of the spodic horizon:

1. Has less than 2.3 percent organic carbon in the upper 2 cm; or

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2. The horizon with 2.3 percent or more organic carbon is present in 90 percent or less of each pedon.

Entic Tropaquods

CAEJ. Other Tropaquods that have an ochric epipedon and the surface layer would not meet the requirements for an umbric epipedon if plowed to a depth of 25 cm.

Aeric Tropaquods

CAEK. Other Tropaquods.

Typic Tropaquods

Definition of Typic Tropaquods

Typic Tropaquods are the Tropaquods that

1. Do not have a histic epipedon;
2. Have less than 5 percent by volume of iron-cemented nodules, 2.5 to 30 cm in diameter, in any subhorizon of the spodic horizon;
3. Do not have an argillic or kandic horizon underlying the spodic horizon;
4. Do not have a lithic contact within 50 cm of the surface;
5. Have an umbric epipedon or one that would meet the requirements for an umbric epipedon if plowed to a depth of 25 to 30 cm;
6. Do not have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is deeper than 75 cm below the mineral soil surface;
7. Have a spodic horizon that has a weighted average of 0.6 percent or more organic carbon in the matrix of the upper 30 cm of the spodic horizon or have an upper subhorizon of the spodic horizon that
 - a. Has 2.3 percent or more organic carbon in the upper 2 cm; and
 - b. Is continuous or is present in more than 90 percent of each pedon; and
8. Have in 50 percent or more of each pedon a spodic horizon in which some subhorizon has a ratio of free iron (by dithionite-citrate) to carbon (both elemental) of less than 0.2."

Page 341, first column. Delete the section, Distinctions between Typic Cryohumods and other subgroups, and replace with the following key to subgroups and definition of Typic Cryohumods:

"Key to subgroups

CCDA. Cryohumods that have a lithic contact within 50 cm of the mineral soil surface.
Lithic Cryohumods

CCDB. Other Cryohumods that have a mean annual soil temperature of 0°C or lower.
Pergelic Cryohumods

CCDC. Other Cryohumods that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.
Andic Cryohumods

CCDD. Other Cryohumods that have an intermittent placic horizon in the spodic horizon.
Placic Cryohumods

CCDE. Other Cryohumods that have an argillic or kandic horizon below the spodic horizon.
Alfic Cryohumods

CCDF. Other Cryohumods that have less than 6 percent organic carbon (weighted average) in the matrix of the upper 30 cm of the spodic horizon or, if the spodic horizon is less than 30 cm thick, in the 30 cm directly below the top of the spodic horizon.
Haplic Cryohumods

CCDG. Other Cryohumods.
Typic Cryohumods

Definition of Typic Cryohumods

Typic Cryohumods are the Humods that

1. Have 6 percent or more organic carbon (weighted average) in the matrix of the upper 30 cm of the spodic horizon or, if the spodic horizon is less than 30 cm thick, in the 30 cm directly below the top of the spodic horizon;
2. Do not have a lithic contact within 50 cm of the mineral soil surface;
3. Do not have an intermittent placic horizon in the spodic horizon;
4. Do not have an argillic or kandic horizon below the spodic horizon;
5. Have a mean annual soil temperature higher than 0°C; and
6. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent."

Page 341, second column and extending to page 342, first column. Delete the section, Distinctions between Typic Haplohumods and other subgroups, and replace with the following key to subgroups and definition of Typic Haplohumods:

"Key to subgroups

CCEA. Haplohumods that have a lithic contact within 50 cm of the soil surface.
Lithic Haplohumods

CCEB. Other Haplohumods that:

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1. Have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is between 75 and 125 cm below the soil surface; and
2. Have an argillic or kandic horizon below the spodic horizon.
Arenic Ultic Haplohumods
- CCEC.** Other Haplohumods that have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is between 75 and 125 cm below the soil surface.
Arenic Haplohumods
- CCED.** Other Haplohumods that:
1. Have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is between 125 and 200 cm below the soil surface; and
 2. Have both:
 - a. A spodic horizon that has a weighted average of less than 0.6 percent organic carbon in the matrix of the upper 30 cm of the spodic horizon or below any Ap horizon; and
 - b. Any black upper subhorizon of the spodic horizon that has 3 percent or more organic carbon in the upper 2 cm is present in 90 percent or less of the area of each pedon.
Grossarenic Entic Haplohumods
- CCEE.** Other Haplohumods that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.
Andic Haplohumods
- CCEF.** Other Haplohumods that have the following combination of characteristics:
1. A spodic horizon that has a weighted average of less than 0.6 percent organic carbon in the matrix of the upper 30 cm of the spodic horizon or below any Ap horizon; and
 2. Any black upper subhorizon of the spodic horizon that has 3 percent or more organic carbon in the upper 2 cm is present in 90 percent or less of the area of each pedon.
Entic Haplohumods
- CCEG.** Other Haplohumods that have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is between 125 and 200 cm below the soil surface.
Grossarenic Haplohumods
- CCEH.** Other Haplohumods that have 5 percent or more by volume of iron-cemented nodules, 2.5 to 30 cm in diameter, throughout the spodic horizon.
Ferrudalfic Haplohumods
- CCEI.** Other Haplohumods that have a surface horizon more than 30 cm thick that meets all the requirements for a plaggen epipedon except thickness.
Plaggeptic Haplohumods
- CCEJ.** Other Haplohumods that have an argillic or kandic horizon below the spodic horizon.
Ultic Haplohumods
- CCEK.** Other Haplohumods that have less than 3 percent organic carbon in the upper 2 cm of the spodic horizon or any black upper subhorizon of the spodic horizon that has 3 percent or more organic carbon in the upper 2 cm is present in less than 90 percent of the area of each pedon.
Orthic Haplohumods
- CCEL.** Other Haplohumods that have a xeric moisture regime.
Xeric Haplohumods
- CCEM.** Other Haplohumods.
Typic Haplohumods
- Definition of Typic Haplohumods**
- Typic Haplohumods are the Haplohumods that
1. Have either
 - a. A spodic horizon that has a weighted average of 0.6 percent or more organic carbon in the matrix of the upper 30 cm of the spodic horizon or below any Ap horizon; or
 - b. A black upper subhorizon of the spodic horizon that has 3 percent or more organic carbon in the upper 2 cm and that is continuous or is present in more than 90 percent of the area of each pedon;
 2. Have less than 5 percent by volume of iron-cemented nodules, 2.5 to 30 cm in diameter, in any subhorizon of the spodic horizon;
 3. Do not have a lithic contact within 50 cm of the soil surface;
 4. Do not have an argillic or kandic horizon below the spodic horizon;
 5. Do not have a surface horizon more than 30 cm thick that meets all the requirements for a plaggen epipedon except thickness;
 6. Do not have a xeric moisture regime;

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7. Do not have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic horizon and the upper boundary of the spodic horizon is deeper than 75 cm below the mineral soil surface; and

8. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent."

Page 342, second column. Delete the section, Distinctions between Typic Placohumods and other subgroups, and replace with the following key to subgroups and definition of Typic Placohumods:

"Key to subgroups

CCAA. Placohumods that have a cryic or colder temperature regime. Cryic Placohumods

CCAB. Other Placohumods. Typic Placohumods

Definition of Typic Placohumods

Typic Placohumods are the Placohumods that have a frigid or warmer temperature regime."

Pedon 27 (plate 8C) is an example of a Cryic Placohumod."

Page 343, second column. Delete the section, Distinctions between Typic Cryorthods and other subgroups, and replace with the following key to subgroups and definition of Typic Cryorthods:

"Key to subgroups

CDCA. Cryorthods that:

1. Have more than 6 percent organic carbon in the upper 10 cm of the spodic horizon; and
2. Have a lithic contact within 50 cm of the soil surface. Humic Lithic Cryorthods

CDCB. Other Cryorthods that have a lithic contact within 50 cm of the soil surface. Lithic Cryorthods

CDCC. Other Cryorthods that have a mean annual soil temperature of 0° C or less. Pergelic Cryorthods

CDCD. Other Cryorthods that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent. Andic Cryorthods

CDCE. Other Cryorthods that have an argillic or kandic horizon below the spodic horizon. Boralfic Cryorthods

CDCE. Other Cryorthods that do not have a cemented or indurated spodic horizon and have less than 1.2 percent organic carbon in the upper 10 cm of the spodic horizon. Entic Cryorthods

CDCF. Other Cryorthods that have more than 6 percent organic carbon in the upper 10 cm of the spodic horizon. Humic Cryorthods

CDCG. Other Cryorthods. Typic Cryorthods

Definition of Typic Cryorthods

Typic Cryorthods are the Cryorthods that

1. Do not have an argillic or kandic horizon below the spodic horizon;
2. Have a cemented or indurated spodic horizon or have 1.2 to 6 percent organic carbon in the upper 10 cm of the spodic horizon;
3. Do not have a lithic contact within 50 cm of the soil surface;
4. Have a mean annual soil temperature higher than 0° C; and
5. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent."

Page 344, second column and extending to page 345, first column. Delete the section, Distinctions between Typic Fragiorthods and other subgroups, and replace with the following key to subgroups and definition of Typic Fragiorthods:

"Key to subgroups

CDBA. Fragiorthods that have a cryic or pergelic temperature regime. Cryic Fragiorthods

CDBB. Other Fragiorthods that:

1. Have distinct or prominent mottles in the spodic horizon; and
2. Have a spodic horizon that does not have any of the following:
 - a. A continuous horizon that is at least 2.5 cm thick and is very firm or extremely firm when moist (ortstein);
 - b. A texture of very fine sand or finer and is more than 10 cm thick and has at least 1.2 percent organic carbon (weighted average) in the upper 10 cm; or

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c. A coarse-loamy, loamy-skeletal, sandy-skeletal, or sandy particle-size class and has color value and chroma of 3 or less in at least the upper 7.5 cm.

Aqueptic Fragiorhods

CDBC. Other Fragiorhods that have distinct or prominent mottles in the spodic horizon.

Aquic Fragiorhods

CDBD. Other Fragiorhods that have a surface horizon more than 30 cm thick that meets all the requirements for a plaggen epipedon except thickness.

Plaggeptic Fragiorhods

CDBE. Other Fragiorhods that have an argillic or kandic horizon below the spodic horizon and have base saturation of 35 percent or more in some part of the argillic or kandic horizon or have a mean annual soil temperature less than 8° C.

Alfic Fragiorhods

CDBF. Other Fragiorhods that have an argillic or kandic horizon below the spodic horizon.

Ultic Fragiorhods

CDBG. Other Fragiorhods that have a spodic horizon that does not have any of the following:

1. A continuous horizon that is at least 2.5 cm thick and is very firm or extremely firm when moist (ortstein);

2. A texture of very fine sand or finer and is more than 10 cm thick and has at least 1.2 percent organic carbon (weighted average) in the upper 10 cm; or

3. A coarse-loamy, loamy-skeletal, sandy-skeletal, or sandy particle-size class and has color value and chroma of 3 or less in at least the upper 7.5 cm.

Entic Fragiorhods

CDBH. Other Fragiorhods.

Typic Fragiorhods

Definition of Typic Fragiorhods

Typic Fragiorhods are the Fragiorhods that

1. Do not have an argillic or kandic horizon below the spodic horizon;

2. Do not have distinct or prominent mottles in the spodic horizon;

3. Have a spodic horizon that has one or more of the following:

a. A continuous horizon that is at least 2.5 cm thick and is very firm or extremely firm when moist (ortstein);

b. A texture of very fine sand or finer and is more than 10 cm thick and has at least 1.2 percent organic carbon (weighted average) in the upper 10 cm;

c. A coarse-loamy, loamy-skeletal, sandy-skeletal, or sandy particle-size class and has color value and chroma of 3 or less in at least the upper 7.5 cm;

4. Have a temperature regime warmer than that of Cryorhods;

5. Do not have an intermittent upper black subhorizon of the spodic horizon that has a ratio of free iron (elemental) to carbon that is less than 0.2; or, if plowed and the Ap horizon rests directly on the spodic horizon, do not have tongues of such a subhorizon; and

6. Do not have a surface horizon more than 30 cm thick that meets all the requirements for a plaggen epipedon except thickness."

Page 346, first column and extending to second column.

Delete the section, Distinctions between Typic Haplorthods and other subgroups, and replace with the following key to subgroups and definition of Typic Haplorthods:

"Key to subgroups

CDEA. Haplorthods that:

1. Have a spodic horizon that does not have any of the following:

a. A continuous horizon at least 2.5 cm thick that is very firm or extremely firm when moist (ortstein);

b. A texture of very fine sand or finer and is more than 10 cm thick and has a weighted average of at least 1.2 percent organic carbon in the upper 10 cm; or

c. A coarse-loamy, loamy-skeletal, sandy-skeletal, or sandy particle-size class and color value and chroma, moist, of 3 or less in at least the upper 7.5 cm of the spodic horizon; and

2. Have a lithic contact within 50 cm of the surface.

Entic Lithic Haplorthods

CDEB. Other Haplorthods that have a lithic contact within 50 cm of the surface.

Lithic Haplorthods

CDEC. Other Haplorthods that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Haplorthods

CDED. Other Haplorthods that have a horizon 15 cm or more thick below the spodic horizon and within 100 cm of the surface that has a brittle matrix when wet or contains some durinodes.

Duric Haplorthods

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CDEE. Other Haplorthods that:

1. Have distinct or prominent mottles of approximate spherical shape in the spodic horizon and the variability in color is not associated with differences in consistence in such a manner that the redder or darker parts are extremely firm or very firm, and, if the color is due to uncoated sand grains, have a water table within 100 cm of the soil surface for 60 days or more, cumulative, in most years; or

2. Have chroma of 2 or less if mottled or chroma less than 2 if not mottled, that is dominant in the matrix within 15 cm below the base of the spodic horizon and within 100 cm of the surface of the soil; and

3. Have an argillic or kandic horizon below the spodic horizon and the argillic or kandic horizon either has base saturation of 35 percent or more in some part or has a mean annual soil temperature lower than 8° C.

Aqualfic Haplorthods

CDEF. Other Haplorthods that:

1. Have distinct or prominent mottles of approximate spherical shape in the spodic horizon and the variability in color is not associated with differences in consistence in such a manner that the redder or darker parts are extremely firm or very firm, and, if the color is due to uncoated sand grains, have a water table within 100 cm of the soil surface for 60 days or more, cumulative, in most years; and

2. Have a spodic horizon that does not have any of the following:

a. A continuous horizon at least 2.5 cm thick that is very firm or extremely firm when moist (ortstein);

b. A texture of very fine sand or finer and is more than 10 cm thick and has a weighted average of at least 1.2 percent organic carbon in the upper 10 cm; or

c. A coarse-loamy, loamy-skeletal, sandy-skeletal, or sandy particle-size class and color value and chroma, moist, of 3 or less in at least the upper 7.5 cm of the spodic horizon.

Aquentic Haplorthods

CDEG. Other Haplorthods that:

1. Have distinct or prominent mottles of approximate spherical shape in the spodic horizon and the variability in color is not associated with differences in consistence in such a manner that the redder or darker parts are extremely firm or very firm, and, if the color is due to uncoated sand grains, have a water table within 100 cm of the soil surface for 60 days or more, cumulative, in most years; or

2. Have chroma of 2 or less if mottled or chroma less than 2 if not mottled, that is dominant in the matrix within 15 cm below the base of the spodic horizon and within 100 cm of the surface of the soil.

Aquic Haplorthods

CDEH. Other Haplorthods that have an argillic or kandic horizon below the spodic horizon and the argillic or kandic horizon either has base saturation of 35 percent or more in some part or has a mean annual soil temperature lower than 8° C.

Alfic Haplorthods

CDEI. Other Haplorthods that have an argillic or kandic horizon below the spodic horizon.

Ultic Haplorthods

CDEJ. Other Haplorthods that:

1. Have a black intermittent upper subhorizon that has a ratio of free iron (elemental) to carbon that is less than 0.2; or

2. Have 6 percent or more organic carbon in the upper 10 cm of the spodic horizon.

Humic Haplorthods

CDEK. Other Haplorthods that have a spodic horizon that does not have any of the following:

1. A continuous horizon at least 2.5 cm thick that is very firm or extremely firm when moist (ortstein);

2. A texture of very fine sand or finer and is more than 10 cm thick and has a weighted average of at least 1.2 percent organic carbon in the upper 10 cm; or

3. A coarse-loamy, loamy-skeletal, sandy-skeletal, or sandy particle-size class and color value and chroma, moist, of 3 or less in at least the upper 7.5 cm of the spodic horizon.

Entic Haplorthods

CDEL. Other Haplorthods.

Typic Haplorthods

Definition of Typic Haplorthods

Typic Haplorthods are the Haplorthods that

1. Do not have an argillic or kandic horizon below the spodic horizon;

2. Have a spodic horizon that has one or more of the following:

a. A continuous horizon at least 2.5 cm thick that is very firm or extremely firm when moist (ortstein);

b. A texture of very fine sand or finer and is more than 10 cm thick and has a weighted average of at least 1.2 percent organic carbon in the upper 10 cm; or

c. A coarse-loamy, loamy-skeletal, sandy-skeletal, or sandy particle-size class and color

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value and chroma, moist, of 3 or less in at least the upper 7.5 cm of the spodic horizon;

3. Do not have distinct or prominent mottles of approximate spherical shape in the spodic horizon unless the variability in color is associated with differences in consistence in such a manner that the redder or darker parts are extremely firm or very firm, or, if the color is due to uncoated sand grains, do not have the water table within 100 cm of the soil surface for as many as 60 days, cumulative, in most years;
4. Do not have chroma of 2 or less if mottled or chroma less than 2 if not mottled, that is dominant in the matrix within 15 cm below the base of the spodic horizon and within 100 cm of the surface of the soil;
5. Do not have a horizon 15 cm or more thick below the spodic horizon and within 100 cm of the surface that has a brittle matrix when wet or contains some durinodes;
6. Do not have a lithic contact within 50 cm of the surface;
7. Do not have a black intermittent upper subhorizon that has a ratio of free iron (elemental) to carbon that is less than 0.2;
8. Have less than 6 percent organic carbon in the upper 10 cm of the spodic horizon; and
9. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mg fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent."

Page 357, first column. Delete the section, Descriptions of subgroups (Albaquults), and replace with the following key to subgroups and definition of Typic Albaquults:

"Key to subgroups

GACA. Albaquults that:

1. Have one or more of the following characteristics in more than 40 percent of the matrix between the Ap horizon and a depth of 75 cm:

- a. Dominant chroma, moist, of 3 or more if mottles of higher chroma are present; or
- b. Chroma, moist, of 2 or more if mottles are absent; or
- c. Dominant hue of 10YR or redder if distinct or prominent mottles are present and there is also a thermic, isothermic, or warmer soil temperature regime; or

2. Have an ochric epipedon that has higher chroma or redder hue, or both than the underlying argillic or kandic horizon.

Aeric Albaquults

GACB. Other Albaquults.

Typic Albaquults

Definition of Typic Albaquults

Typic Albaquults are the Albaquults that

1. Have one or more of the following characteristics in 60 percent or more of the matrix between the Ap horizon and a depth of 75 cm:

- a. Dominant chroma, moist, of 2 or less in coatings on the surface of peds and mottles within the peds, or dominant chroma of 2 or less in the matrix of the argillic or kandic horizon and mottles of higher chroma (if the hue is redder than 10YR because of parent materials that remain red after citrate-dithionite extraction, the requirement for low chroma is waived);
- b. Chroma, moist, of 1 or less on surfaces of peds or in the matrix of the argillic or kandic horizon; or
- c. Dominant hue of 2.5Y or 5Y in the matrix of the argillic or kandic horizon and distinct or prominent mottles and also a thermic or isothermic or warmer soil temperature regime; and

2. Do not have an ochric epipedon that has higher chroma or redder hue, or both than the underlying argillic or kandic horizon."

Page 352, first column and extending to second column. Delete the section, Distinctions between Typic Fragiaquults and other subgroups, and replace with the following key to subgroups and definition of Typic Fragiaquults:

"Key to subgroups

GABA. Fragiaquults that:

1. Either do not have mottles or have dominant chroma of 3 or more in some subhorizon between the A or Ap horizon and the fragipan; and
2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthudic Fragiaquults

GABB. Other Fragiaquults that either do not have mottles or have dominant chroma of 3 or more in some subhorizon between the A or Ap horizon and the fragipan.

Aeric Fragiaquults

GABC. Other Fragiaquults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Fragiaquults

GABD. Other Fragiaquults that do not have an ochric epipedon.

Umbric Fragiaquults

GABE. Other Fragiaquults.

Typic Fragiaquults

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Definition of Typic Fragiaquults

Typic Fragiaquults are the Fragiaquults that

1. Have an ochric epipedon;
2. Have mottles and have dominant chroma of 2 or less in all horizons between the A or Ap horizon and the fragipan; and
3. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface."

Page 352, second column (also see NSTH issue No. 11, page 615-78). Delete the section, Distinctions between Typic Kandiaquults and other subgroups, and replace with the following key to subgroups and definition of Typic Kandiaquults:

"Key to subgroups

GADA. Kandiaquults that have an ECEC (sum of bases plus 1N KCL extractable AL) of 1.5 cmol(+) or less per kg clay in one or more subhorizons to a depth of 150 cm below the soil surface.
Aeric Kandiaquults

GADB. Other Kandiaquults that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface; and
2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Arenic Plinthic Kandiaquults

GADC. Other Kandiaquults that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface; and
2. Do not have an ochric epipedon.

Arenic Umbric Kandiaquults

GADD. Other Kandiaquults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface.

Arenic Kandiaquults

GADE. Other Kandiaquults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is more than 100 cm below the soil surface.

Grossarenic Kandiaquults

GADF. Other Kandiaquults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Kandiaquults

GADG. Other Kandiaquults that have a subhorizon that has dominant chroma of 3 or more within 75 cm of the soil surface.

Aeric Kandiaquults

GADH. Other Kandiaquults that do not have an ochric epipedon.

Umbric Kandiaquults

GADI. Other Kandiaquults.

Typic Kandiaquults

Definition of Typic Kandiaquults

Typic Kandiaquults are the Kandiaquults that

1. Do not have a subhorizon that has dominant chroma of 3 or more within 75 cm of the soil surface;
2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;
3. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface;
4. Have an ochric epipedon; and
5. Have an ECEC (sum of bases plus 1N KCL extractable AL) of more than 1.5 cmol(+) per kg clay in all subhorizons to a depth of 150 cm below the soil surface."

Page 352, second column (also see NSTH issue No. 11, page 615-78). Delete the section, Distinctions between Typic Kanhapaquults and other subgroups, and replace with the following key to subgroups and definition of Typic Kanhapaquults:

"Key to subgroups

GAEA. Kanhapaquults that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Aquandic Kanhapaquults

GAEB. Other Kanhapaquults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Kanhapaquults

GAEC. Other Kanhapaquults that:

1. Have a subhorizon that has dominant chroma of 3 or more within 75 cm of the soil surface; and

2. Have a mollic or histic epipedon.

Aeric Umbric Kanhapaquults

GAED. Other Kanhapaquults that have a subhorizon that has dominant chroma of 3 or more within 75 cm of the soil surface.

Aeric Kanhapaquults

GAEE. Other Kanhapaquults that have a mollic or histic epipedon.

Umbric Kanhapaquults

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GAEF. Other Kanhaplaquits.**Typic Kanhaplaquits****Definition of Typic Kanhaplaquits**

Typic Kanhaplaquits are the Kanhaplaquits that

1. Have an ochric epipedon;
2. Do not have a subhorizon that has dominant chroma of 3 or more within 75 cm of the soil surface;
3. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface; and
4. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent."

Page 353, second column (also see NSTH issue No. 4, page 615-37). Delete the section, Distinctions between Typic Ochraquits and other subgroups, and replace with the following key to subgroups and definition of Typic Ochraquits:

"Key to subgroups

GAGA. Ochraquits that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Ochraquits

GAGB. Other Ochraquits that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 100 cm below the soil surface.

Grossarenic Ochraquits

GAGC. Other Ochraquits that have dominant chroma of 3 or more in one or more subhorizons between the A or Ap horizon and a depth of 75 cm.

Aeric Ochraquits

GAGD. Other Ochraquits.

Typic Ochraquits

Definition of Typic Ochraquits

Typic Ochraquits are the Ochraquits that:

1. Have dominant chroma of 3 or less in all subhorizons between the A or Ap horizon and a depth of 75 cm.
2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface."

Page 353, second column and extending to page 354, first column. Delete the section, Distinctions between Typic Paleaquits and other subgroups, and replace with the following key

to subgroups and definition of Typic Paleaquits:

"Key to subgroups

GAGA. Paleaquits that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface; and
2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Arenic Plinthic Paleaquits

GAGB. Other Paleaquits that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface; and

2. Do not have an ochric epipedon.

Arenic Umbric Paleaquits

GAGC. Other Paleaquits that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Paleaquits

GAGD. Other Paleaquits that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 100 cm below the soil surface.

Grossarenic Paleaquits

GAGE. Other Paleaquits that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Paleaquits

GAGF. Other Paleaquits that have a subhorizon that has dominant chroma of 3 or more within 75 cm of the soil surface.

Aeric Paleaquits

GAGG. Other Paleaquits that do not have an ochric epipedon.

Umbric Paleaquits

GAGH. Other Paleaquits.

Typic Paleaquits

Definition of Typic Paleaquits

Typic Paleaquits are the Paleaquits that

1. Do not have a horizon that has dominant chroma of 3 or more within 75 cm of the soil surface;
2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;
3. Have less than 5 percent plinthite (by volume) in all horizons within 150 cm of the soil surface; and

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4. Have an ochric epipedon."

Page 354, second column and extending to page 356, first column. Delete the section, Distinctions between Typic Plinthaquults and other subgroups, and replace with the following key to subgroups and definition of Typic Plinthaquults:

"Key to subgroups

GAOA. Plinthaquults that have a CEC of less than 24 cmol(+) per kg of clay (by 1N NH₄OAc pH7) in the major part of the argillic or kandic horizon or the major part of the upper 100 cm of the argillic or kandic horizon if these horizons are thicker than 100 cm.

Kandic Plinthaquults

GAAB. Other Plinthaquults.

Typic Plinthaquults

Definition of Typic Plinthaquults

Typic Plinthaquults are the Plinthaquults that have a CEC of 24 cmol(+) or more per kg of clay (by 1N NH₄OAc pH7) in the major part of the argillic or kandic horizon or the major part of the upper 100 cm of the argillic or kandic horizon if these horizons are thicker than 100 cm."

Page 355, second column. Following Definition (Umbracquults), add the following key to subgroups and definition of Typic Umbracquults:

"Key to subgroups

GAHA. Umbracquults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Umbracquults

GAHB. Other Umbracquults.

Typic Umbracquults

Definition of Typic Umbracquults

Typic Umbracquults are the Umbracquults that have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface."

Page 356, second column. Delete the section, Distinctions between Typic Haplohumults and other subgroups, and replace with the following key to subgroups and definition of Typic Haplohumults:

"Key to subgroups

GBEA. Haplohumults that have a lithic contact within 50 cm of the mineral soil surface.

Lithic Haplohumults

GBEB. Other Haplohumults that have the following combination of characteristics in the upper 25 cm or more of the argillic horizon:

1. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

2. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or more or they are artificially drained.

Aquic Haplohumults

GBEC. Other Haplohumults that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Haplohumults

GBED. Other Haplohumults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Haplohumults

GBEE. Other Haplohumults that have an ustic soil moisture regime.

Ustic Haplohumults

GBEF. Other Haplohumults that have a xeric soil moisture regime.

Xeric Haplohumults

GBEG. Other Haplohumults.

Typic Haplohumults

Definition of Typic Haplohumults

Typic Haplohumults are the Haplohumults that

1. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent;

2. Have a udic moisture regime;

3. Do not have the following combination of characteristics in the upper 25 cm or more of the argillic horizon:

- a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

- b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or more or artificial drainage;

4. Do not have a lithic contact within 50 cm of the mineral soil surface; and

5. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface."

Page 357, first column (also see NSTH issue No. 8, pages 615-82 to 83). Delete the section, Distinctions between Typic Kandihumults and other subgroups, and replace with the following key to subgroups and definition of Typic Kandihumults:

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"Key to subgroups**GBCA. Kandihumults that:**

1. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of more than 1.0 percent; and

2. Have, in the upper 75 cm of the soil, a hue of 10YR or yellower in one or more subhorizons that have a color value, moist, of 4 or more and mottles with chroma of 3 or more and the hue becomes redder with depth within 100 cm of the soil surface.

Andic Epiaquic Kandihumults

GBCB. Other Kandihumults that:

1. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of more than 1.0 percent; and

2. Have an ustic soil moisture regime.

Ustandic Kandihumults

GBCD. Other Kandihumults that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of more than 1.0 percent.

Andic Kandihumults

GBCD. Other Kandihumults that have the following combination of characteristics in the upper 25 cm or more of the argillic or kandic horizon:

1. Mottles that have a color value, moist, of 4 or more, and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

2. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5°C or more or there is artificial drainage.

Aquic Kandihumults

GBCE. Other Kandihumults that have, in the upper 75 cm of the soil, a hue of 10YR or yellower in one or more subhorizons that have a color value, moist, of 4 or more and mottles with chroma of 3 or more and the hue becomes redder with depth within 100 cm of the soil surface.

Epiaquic Kandihumults

GBCF. Other Kandihumults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Kandihumults

GBCG. Other Kandihumults that have an ustic soil moisture regime.

Ustic Kandihumults

GBCH. Other Kandihumults that have a xeric soil moisture regime.

Xeric Kandihumults

GBCI. Other Kandihumults that have an anthropic epipedon.

Anthropic Kandihumults

GBCJ. Other Kandihumults.

Typic Kandihumults

Definition of Typic Kandihumults

Typic Kandihumults are the Kandihumults that

1. Do not have the following combination of characteristics in the upper 25 cm or more of the argillic or kandic horizon:

a. Mottles that have a color value, moist, of 4 or more, and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5°C or more or there is artificial drainage;

2. Have an udic moisture regime;

3. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or less and acid-oxalate-extractable aluminum plus $1/2$ acid-oxalate-extractable iron of more than 1.0 percent;

4. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface;

5. Have a hue redder than 10YR in all parts of the soil above a depth of 75 cm that have a color value, moist, of 4 or more if there are mottles of high chroma within that depth and if the hue becomes redder with depth within 100 cm of the soil surface; and

6. Do not have an anthropic epipedon."

Page 357, first column (also see NSTH issue No. 8, page 615-84). Delete the section, Distinctions between Typic Kanhaplohumults and other subgroups, and replace with the following key to subgroups and definition of Typic Kanhaplohumults:

"Key to subgroups

GBDA. Kanhaplohumults that have a lithic contact within 50 cm of the mineral soil surface.

Lithic Kanhaplohumults

GBDB. Other Kanhaplohumults that

1. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm^{-3} or

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less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; and

2. Have an ustic soil moisture regime.

Ustancic Kanhaplohumults

GBDC. Other Kanhaplohumults that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Kanhaplohumults

GBDD. Other Kanhaplohumults that have the following combination of characteristics in the upper 25 cm or more of the argillic or kandic horizon:

1. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

2. Saturation with water in the mottled zone at some time of the year when the soil temperature in that zone is 5°C or higher or there is artificial drainage.

Aquic Kanhaplohumults

GBDE. Other Kanhaplohumults that have, in the upper 75 cm of the soil, a hue of 10YR or yellow in one or more subhorizons that have a color value, moist, of 4 or more and mottles with chroma of 3 or more and the hue becomes redder with depth within 100 cm of the soil surface.

Epiaquic Kanhaplohumults

GBDF. Other Kanhaplohumults that have an ustic soil moisture regime.

Ustic Kanhaplohumults

GBDG. Other Kanhaplohumults that have a xeric soil moisture regime.

Xeric Kanhaplohumults

GBDH. Other Kanhaplohumults that have an anthropic epipedon.

Anthropic Kanhaplohumults

GBDI. Other Kanhaplohumults.

Typic Kanhaplohumults

Definition of Typic Kanhaplohumults

Typic Kanhaplohumults are the Kanhaplohumults that

1. Do not have the following combination of characteristics in the upper 25 cm or more of the argillic or kandic horizon;

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5°C or higher or there is artificial drainage;

2. Do not have a lithic contact within 50 cm or the mineral soil surface;

3. Have an udic moisture regime;

4. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent;

5. Have a hue redder than 10YR in all parts of the soil above a depth of 75 cm that have a color value, moist, of 4 or more if there are mottles of high chroma above that depth and if the hue becomes redder with depth within 100 cm of the soil surface; and

6. Do not have an anthropic epipedon."

Page 358, second column (also see NSTH issue No. 12, pages 615-171 to 173). Delete the section, Distinctions between Typic Palehumults and other subgroups, and replace with the following key to subgroups and definition of Typic Palehumults:

"Key to subgroups

GBEA. Palehumults that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Palehumults

GBEB. Other Palehumults that have the following combination of characteristics in the upper 25 cm or more of the argillic horizon:

1. Mottles that have a color value, moist, of 4 or more, and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

2. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5°C or more or there is artificial drainage.

Aquic Palehumults

GBEC. Other Palehumults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Palehumults

GBED. Other Palehumults that have an ustic moisture regime.

Ustic Palehumults

GBEF. Other Palehumults that have a xeric moisture regime.

Xeric Palehumults

GBEG. Other Palehumults.

Typic Palehumults

Definition of Typic Palehumults

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Typic Palehumults are the Palehumults that

1. Do not have the following combination of characteristics in the upper 25 cm or more of the argillic horizon:

a. Mottles that have a color value, moist, of 4 or more, and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or more or there is artificial drainage;

2. Have an udic moisture regime;

3. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface; and

4. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent."

Page 361, first column and extending to second column.

Delete the section, Distinctions between Typic Fragiudults and other subgroups, and replace with the following key to subgroups and definition of Typic Fragiudults:

"Key to subgroups

GCBA. Fragiudults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Fragiudults

GCBB. Other Fragiudults that:

1. Meet either of the following:

a. Do not have an argillic or kandic horizon above the fragipan that has some clay skins on both vertical and horizontal surfaces of some structural aggregates; or

b. Have an intervening horizon (one or more) between the argillic or kandic horizon and the fragipan that has dominant chroma of 3 or less and that has as much as 3 percent less clay (absolute) than both the overlying argillic or kandic horizon and the underlying fragipan; and

2. Have mottles that have chroma of 2 or less within 40 cm of the soil surface; and

3. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthaquic Fragiudults

GCBC. Other Fragiudults that:

1. Meet either of the following:

a. Do not have an argillic or kandic horizon above the fragipan that has some clay skins on both vertical and horizontal surfaces of some structural aggregates; or

b. Have an intervening horizon (one or more) between the argillic or kandic horizon and the fragipan that has dominant chroma of 3 or less and that has as much as 3 percent less clay (absolute) than both the overlying argillic or kandic horizon and the underlying fragipan; and

2. Have mottles that have chroma of 2 or less within 40 cm of the soil surface.

Glossaquic Fragiudults

GCBD. Other Fragiudults that have mottles that have chroma of 2 or less above the top of the fragipan and within the upper 25 cm of the argillic or kandic horizon.

Aquic Fragiudults

GCBE. Other Fragiudults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Fragiudults

GCBF. Other Fragiudults that meet either of the following:

1. Do not have an argillic or kandic horizon above the fragipan that has some clay skins on both vertical and horizontal surfaces of some structural aggregates; or

2. Have an intervening horizon (one or more) between the argillic or kandic horizon and the fragipan that has dominant chroma of 3 or less and that has as much as 3 percent less clay (absolute) than both the overlying argillic or kandic horizon and the underlying fragipan.

Glossic Fragiudults

GCBG. Other Fragiudults that have an Ap horizon that has a color value, moist, of 3 or less and has a value, dry, of 5 or less when crushed and smoothed (smoothed with a knife to eliminate shadows), or the A horizon is 15 cm or more thick and its color value, moist, is 3 or less.

Humic Fragiudults

GCBH. Other Fragiudults.

Typic Fragiudults

Definition of Typic Fragiudults

Typic Fragiudults are the Fragiudults that

1. Meet these two requirements:

a. Have an argillic or kandic horizon above the fragipan that has some clay skins on both vertical and horizontal surfaces of some structural aggregates; and

b. Do not have an intervening horizon (one or more) between the argillic or kandic horizon

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and the fragipan that has dominant chroma of 3 or less and that has as much as 3 percent less clay (absolute) than both the overlying argillic or kandic horizon and the underlying fragipan;

2. Do not have mottles that have chroma of 2 or less:

a. Above the top of the fragipan and within the upper 25 cm of the argillic or kandic horizon; or

b. Within 40 cm of the surface of the soil if the argillic or kandic horizon is lacking above the fragipan or there is an intervening horizon between the argillic or kandic horizon and the fragipan that has as much as 3 percent less clay (absolute) than both the overlying argillic or kandic horizon and the underlying fragipan;

3. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

4. Have less than 5 percent plinthite (by volume) in all horizons within 150 cm of the soil surface; and

5. Have an Ap horizon that has a color value, moist, of 4 or more or has a value, dry, of 6 or more when crushed and smoothed (smoothed with a knife to eliminate shadows), or the A horizon is less than 15 cm thick if its color value, moist, is 3 or less."

Page 362, second column and extending to page 363, first column. Delete the section, Distinctions between Typic Hapludults and other subgroups, and replace with the following key to subgroups and definition of Typic Hapludults:

*Key to subgroups

GCGA. Hapludults that:

1. Have a lithic contact within 50 cm of the surface of the mineral soil; and

2. Have a discontinuous argillic horizon in each pedon, that is interrupted by ledges of bedrock.

Ruptic-Lithic-Entic Hapludults

GCOB. Other Hapludults that have a lithic contact within 50 cm of the surface of the mineral soil.

Lithic Hapludults

GCGC. Other Hapludults that have the following combination of characteristics:

1. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface, to the base of an Ap horizon, or to a depth within 25 cm of the soil surface; and

2. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or

paralithic contact is deeper than 50 cm but shallower than 100 cm; and

3. More than 35 percent clay in horizons that total more than 50 cm in thickness.

Vertic Hapludults

GCGD. Other Hapludults that have a texture that is loamy fine sand or coarser throughout the argillic horizon or have an argillic horizon that has lamellae within the upper 25 cm.

Psammentic Hapludults

GCGE. Other Hapludults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Hapludults

GCGF. Other Hapludults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 100 cm below the soil surface.

Grossarenic Hapludults

GCGG. Other Hapludults that have the following combination of characteristics in the upper 60 cm of the argillic horizon:

1. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less, and also mottles of higher chroma that are due to segregation of iron; and

2. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher, or artificial drainage.

Aquic Hapludults

GCGH. Other Hapludults that have an Ap horizon that has a color value, moist, of 3 or less and has a value, dry, of 5 or less when crushed and smoothed; or the A horizon is 15 cm or thicker and its color value, moist, is 3 or less.

Humic Hapludults

GCGI. Other Hapludults that have an argillic horizon 25 cm or less thick.

Ochreptic Hapludults

GCGJ. Other Hapludults.

Typic Hapludults

Definition of Typic Hapludults

Typic Hapludults are the Hapludults that

1. Do not have the following combination of characteristics in the upper 60 cm of the argillic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less, and also mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher, or artificial drainage;

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2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;
3. Have an argillic horizon more than 25 cm thick;
4. Have an Ap horizon that has a color value, moist, of 4 or more or has a value, dry, of 6 or more when crushed and smoothed; or the A horizon is less than 15 cm thick if its color value, moist, is 3 or less;
5. Do not have a lithic contact within 50 cm of the surface of the mineral soil;
6. Have texture finer than loamy fine sand in some part of the argillic horizon and have an argillic horizon that, in at least its upper 25 cm, does not have lamellae;
7. Do not have the following combination of characteristics:
 - a. Cracks at some period in most years that are 1 cm or more wide at a depth of 50 cm, that are at least 30 cm long in some part, and that extend upward to the soil surface, to the base of an Ap horizon, or to a depth within 25 cm of the soil surface; and
 - b. A coefficient of linear extensibility (COLE) of 0.09 or more in a horizon or horizons at least 50 cm thick and a potential linear extensibility of 6 cm or more in the upper 100 cm of the soil or in the whole soil if a lithic or paralithic contact is deeper than 50 cm but shallower than 100 cm; and
 - c. More than 35 percent clay in horizons that total more than 50 cm in thickness; and

8. Have a continuous argillic horizon throughout each pedon, not interrupted by ledges of bedrock."

Page 364, first column (also see NSTH issue No. 8, pages 615-87 to 89). Delete the section, Distinctions between Typic Kandiodults and other subgroups, and replace with the following key to subgroups and definition of Typic Kandiodults:

*Key to subgroups

GCCA. Kandiodults that:

1. Have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:
 - a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and
 - b. Saturation with water in the mottled zone at some time of year

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year

when the soil temperature in that zone is 5°C or higher, or there is artificial drainage; and

2. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface; and

3. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Arenic Plinthaquic Kandiodults

GCCB. Other Kandiodults that:

1. Have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:
 - a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and
 - b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5°C or higher, or there is artificial drainage; and

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5°C or higher, or there is artificial drainage; and

2. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface.

Aquic Arenic Kandiodults

GCCC. Other Kandiodults that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface; and

2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Arenic Plinthic Kandiodults

GCCD. Other Kandiodults that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface; and

2. Have, throughout the argillic or kandic horizon, colors with a hue of 2.5YR or redder, a value, moist, of 3 or less, and a value, dry, that is 1 unit or less higher than the value, moist.

Arenic Rhodic Kandiodults

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GCCE. Other Kandiuults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface.

Arenic Kandiuults

GCCF. Other Kandiuults that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is more than 100 cm below the soil surface; and

2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Grossarenic Plinthic Kandiuults

GCCG. Other Kandiuults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is more than 100 cm below the soil surface.

Grossarenic Kandiuults

GCCH. Other Kandiuults that:

1. Have an ECEC (sum of bases plus 1N KCL extractable Al) of 1.5 cmol(+) or less per kg clay in one or more subhorizons within a depth of 150 cm below the soil surface; and

2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Acrudoxic Plinthic Kandiuults

GCCI. Other Kandiuults that have an ECEC (sum of bases plus 1N KCL extractable Al) of 1.5 cmol(+) or less per kg clay in one or more subhorizons within a depth of 150 cm below the soil surface.

Acrudoxic Kandiuults

GCCJ. Other Kandiuults that:

1. Have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher, or there is artificial drainage; and

2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Kandiuults

GCCK. Other Kandiuults that:

1. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; and

2. Have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher, or there is artificial drainage.

Aquandic Kandiuults

GCCL. Other Kandiuults that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Kandiuults

GCCM. Other Kandiuults that have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:

1. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

2. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher, or there is artificial drainage.

Aquic Kandiuults

GCCN. Other Kandiuults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Kandiuults

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GCCO. Other Kandiodults that have, in the upper 75 cm of the soil, a hue of 10YR or yellow in one or more subhorizons that have a color value, moist, of 4 or more and mottles with chroma of 3 or more and the hue becomes redder with depth within 100 cm of the soil surface.

Epiaquic Kandiodults

GCCP. Other Kandiodults that have a sombric horizon within 150 cm of the soil surface.

Sombric Kandiodults

GCCQ. Other Kandiodults that have, throughout the argillic or kandic horizon, colors with a hue of 2.5YR or redder, a value, moist, of 3 or less, and a value, dry, that is 1 unit or less higher than the value, moist.

Rhodic Kandiodults

GCCR. Other Kandiodults.

Typic Kandiodults

Definition of Typic Kandiodults

Typic Kandiodults are the Kandiodults that

1. Do not have the following combination of characteristics in the upper 75 cm of the soil if the chroma throughout the upper 75 cm is not controlled by uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, do not have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5°C or higher, or there is artificial drainage;

2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

3. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface;

4. Have an argillic or kandic horizon that has a color hue of 5YR or yellow in some part, or has a value, moist, of 4 or more or has a value, dry, that is more than 1 unit higher than the value, moist;

5. Do not that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent;

6. Have a hue redder than 10YR in all parts of the soil above a depth of 75 cm that have color value, moist, of 4 or more if there are mottles of high chroma within that depth and if the hue becomes redder with depth within 100 cm of the soil surface;

7. Have an ECEC (sum of bases plus 1N KCL extractable Al) of more than 1.5 cmol(+) per kg clay in all subhorizons to a depth of 150 cm below the soil surface; and

8. Do not have a sombric horizon within 150 cm of the soil surface."

Page 364, first column (also see NSTH issue No. 8, pages 615-89 to 90). Delete the section, Distinctions between Typic Kanhapludults and other subgroups, and replace with the following key to subgroups and definition of Typic Kanhapludults:

"Key to subgroups

GCDA. Kanhapludults that have a lithic contact within 50 cm of the soil surface.

Lithic Kanhapludults

GCDB. Other Kanhapludults that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface; and

2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Arenic Plinthic Kanhapludults

GCDC. Other Kanhapludults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface.

Arenic Kanhapludults

GCDD. Other Kanhapludults that have an ECEC (sum of bases plus 1N KCL extractable Al) of 1.5 cmol(+) or less per kg clay in one or more subhorizons within a depth of 150 cm below the soil surface.

Acrudoxic Kanhapludults

GCDE. Other Kanhapludults that:

1. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface; and

2. Have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by the uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation or iron; and

b. Saturation with water in the mottled zone at some time of year

when the soil temperature in that zone is 5° C or higher or there is artificial drainage.

Plinthic Kanhapludults

GCDF. Other Kanhapludults that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Kanhapludults

GCDG. Other Kanhapludults that have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by the uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:

1. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation or iron; and

2. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher or there is artificial drainage.

Aquic Kanhapludults

GCDH. Other Kanhapludults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Kanhapludults

GCDI. Other Kanhapludults that have, in the upper 75 cm of the soil, a hue of 10YR or yellow in one or more subhorizons that have a color value, moist, of 4 or more and mottles with chroma of 3 or more and the hue becomes redder with depth within 100 cm of the soil surface.

Epiaquic Kanhapludults

GCDJ. Other Kanhapludults that have, throughout the argillic or kandic horizon, colors with a hue of 2.5YR or redder, a value, moist, of 3 or less, and a value, dry, that is one unit or less higher than the value, moist.

Rhodic Kanhapludults

GCDK. Other Kanhapludults.

Typic Kanhapludults

Definition of Typic Kanhapludults

Typic Kanhapludults are the Kanhapludults that

1. Do not have the following combination of characteristics in the upper 75 cm of the soil if the chroma throughout the upper 75 cm is not controlled by the uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, do not have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation or iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher or there is artificial drainage;

2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

3. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface;

4. Do not have a lithic contact within 50 cm of the soil surface;

5. Have a hue redder than 10YR in all parts of the soil above a depth of 75 cm that have color value, moist, of 4 or more if there are mottles of high chroma within that depth and if the hue becomes redder with depth within 100 cm of the soil surface;

6. Have an argillic or kandic horizon that has a color hue of 5YR or yellow in some part, or has a value, moist, of 4 or more in some part, or has a value, dry, that is more than one unit higher than the value, moist;

7. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; and

8. Have an ECEC (sum of bases plus 1N KCl extractable Al) of more than 1.5 cmol(+) per kg clay in all subhorizons to a depth of 150 cm below the soil surface."

Page 384, second column and extending to page 385, first column. Delete the section, Distinctions between Typic Paleudults and other subgroups, and replace with the following key to subgroups and definition of Typic Paleudults:

"Key to subgroups

GCEA. Paleudults that have a horizon that is above the argillic horizon whose lower boundary is deeper than 18 cm and that meets all requirements for a spodic horizon except the horizon is intermittent.

Spodic Paleudults

GCEB. Other Paleudults that:

1. Have texture that is loamy fine sand or coarser in all parts of the argillic horizon or the argillic horizon has lamellae in some or all parts of the upper 100 cm; and

2. Have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by the uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the

following combination of characteristics throughout the upper 12.5 cm of the argillic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less and mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C higher, or artificial drainage.

Psammaquentic Paleudults

GCEC. Other Paleudults that have texture that is loamy fine sand or coarser in all parts of the argillic horizon or the argillic horizon has lamellae in some or all parts of the upper 100 cm.

Psammentic Paleudults

GCED. Other Paleudults that:

1. Have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher, or there is artificial drainage; or

2. Have mottles that have chroma of 2 or less and also have mottles with chroma of 3 or more in the sandy epipedon and in the upper 12.5 cm of the argillic horizon; and

3. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface; and

4. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Arenic Plinthaquic Paleudults

GCEE. Other Paleudults that:

1. Have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by the uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics

throughout the upper 12.5 cm of the argillic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less and mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C higher, or artificial drainage; and

2. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Aquic Arenic Paleudults

GCEF. Other Paleudults that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface; and

2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Arenic Plinthic Paleudults

GCEG. Other Paleudults that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface; and

2. Have an argillic horizon that has a color value, moist, of 3 or less and do not have mottles of 3 or more within 100 cm of the top of the argillic horizon, and have a color value, dry, 1 unit or less higher than the value, moist, throughout the soil within that depth.

Arenic Rhodic Paleudults

GCEH. Other Paleudults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Paleudults

GCEI. Other Paleudults that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more 100 cm below the soil surface; and

2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Grossarenic Plinthic Paleudults

GCEJ. Other Paleudults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 100 cm below the soil surface.

Grossarenic Paleudults

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GCEK. Other Paleudults that:

1. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface; and

2. Have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by the uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less and mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C higher, or they are artificially drained.

Plinthaquic Paleudults

GCEL. Other Paleudults that:

1. Have one or more subhorizons in the argillic horizon and within 125 cm of the soil surface that has all the properties of a fragipan except that it is brittle in 40 to 60 percent of the volume; and

2. Have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by the uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less and mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C higher, or artificial drainage.

Fragiaquic Paleudults

GCEM. Other Paleudults that have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by the uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic horizon:

1. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less and mottles of higher chroma that are due to segregation of iron; and

2. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C higher, or artificial drainage.

Aquic Paleudults

GCEN. Other Paleudults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.
Plinthic Paleudults

GCEO. Other Paleudults that have one or more subhorizons in the argillic horizon and within 125 cm of the soil surface that has all the properties of a fragipan except that it is brittle in 40 to 60 percent of the volume.

Fragic Paleudults

GCEP. Other Paleudults that have, throughout the upper 100 cm of the argillic horizon, a color value, moist, of 3 or less and a color value, dry, 1 unit or less higher than the value, moist, and do not have mottles with chroma of 3 or more.

Rhodic Paleudults

GCEQ. Other Paleudults.

Typic Paleudults

Definition of Typic Paleudults

Typic Paleudults are the Paleudults that

1. Do not have the following combination of characteristics in the upper 75 cm of the soil if the chroma throughout the upper 75 cm is not controlled by the uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, do not have the following combination of characteristics throughout the upper 12.5 cm of the argillic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less and mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C higher, or artificial drainage;

2. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

3. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface;

4. Have an argillic horizon that has a color value, moist, of 4 or more or that has mottles of high chroma in some subhorizon within 100 cm of the top of the argillic horizon, or have a color value, dry, more than 1 unit higher than the value, moist, in some part of the soil within that depth;

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5. Have texture finer than loamy fine sand in some part of the argillic horizon and do not have lamellae in at least the upper 100 cm of the argillic horizon;

6. Do not have a horizon that is above the argillic horizon whose lower boundary is deeper than 18 cm and that meets all requirements for a spodic horizon except the horizon is intermittent; and

7. Do not have a subhorizon in the argillic horizon and within 125 cm of the soil surface that has all the properties of a fragipan except that it is brittle in 40 to 60 percent of the volume."

Page 367, first column and extending to second column. Delete the section, Distinctions between Typic Rhodudults and other subgroups (through item "c." in second column), and replace with the following key to subgroups and definition of Typic Rhodudults:

"Key to subgroups

GCFA. Rhodudults that have a lithic contact within 50 cm of the soil surface.

Lithic Rhodudults

GCFB. Other Rhodudults that have texture that is loamy fine sand or coarser throughout the argillic horizon.

Psammentic Rhodudults

GCFC. Other Rhodudults.

Typic Rhodudults

Definition of Typic Rhodudults

Typic Rhodudults are the Rhodudults that

1. Have texture finer than loamy fine sand in some part of the argillic horizon; and

2. Do not have a lithic contact within 50 cm of the soil surface."

Page 367, second column. Preceding the paragraph "Typic Rhodudults are the only Rhodudults . . .", insert the heading: "Description of subgroups".

Page 370, first column and extending to second column. Delete the section, Distinctions between Typic Haplustults and other subgroups, and replace with the following key to subgroups and definition of Typic Haplustults:

"Key to subgroups

G DFA. Haplustults that have a lithic contact within 50 cm of the mineral soil surface.

Lithic Haplustults

G DFB. Other Haplustults that have a petroferric contact within 100 cm of the soil surface.

Petroferric Haplustults

G DFC. Other Haplustults that have the following combination of characteristics in the upper 75 cm of the soil and in the upper 12.5 cm of the argillic horizon:

1. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less and mottles of higher chroma that are due to segregation of iron; and

2. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher or artificial drainage.

Aquic Haplustults

G DFD. Other Haplustults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Haplustults

G DFE. Other Haplustults that have, in the upper 75 cm of the soil, a hue of 10YR or yellow in one or more subhorizons that have a color value, moist, of 4 or more and mottles with chroma of 3 or more and the hue becomes redder with depth within 100 cm of the soil surface.

Epiaquic Haplustults

G DFF. Other Haplustults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Haplustults

G DFG. Other Haplustults that have CEC of less than 24 cmol(+) per kg clay (by 1N NH₄OAc pH7) in the major part of the argillic horizon or the major part of the upper 100 cm of the argillic horizon if the argillic horizon is thicker than 100 cm.

Kanhaplic Haplustults

G DFH. Other Haplustults.

Typic Haplustults

Definition of Typic Haplustults

Typic Haplustults are the Haplustults that

1. Do not have a lithic contact within 50 cm of the mineral soil surface;
2. Have texture finer than loamy fine sand in some part of the argillic horizon and have an argillic horizon that does not have lamellae in at least its upper 25 cm;

3. Do not have the following combination of characteristics in the upper 75 cm of the soil and in the upper 12.5 cm of the argillic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less and mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher or artificial drainage;

4. Have a hue redder than 10YR in all parts of the upper 75 cm of soil that have a color value, moist, of 4 or more if there are mottles of high chroma within that depth and if the hue becomes redder with depth within 100 cm of the soil surface;

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5. Do not have a petroferic contact within 100 cm of the soil surface;
6. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface;
7. Have CEC of 24 cmol(+) or more per kg clay (by 1N NH₄OAc pH7) in the major part of the argillic horizon or the major part of the upper 100 cm of the argillic horizon if the argillic horizon is thicker than 100 cm; and
8. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface."

Page 371, first column (also see NSTH issue No. 8, pages 615-93 to 95). Delete the section, Distinctions between Typic Kandiuults and other subgroups, and replace with the following key to subgroups and definition of Typic Kandiuults:

"Key to subgroups

GDBA. Kandiuults that have an ECEC (sum of bases plus KCl extractable Al) of 1.5 cmol(+) or less per kg clay in one or more subhorizons within a depth of 150 cm below the soil surface.

Acrustoxic Kandiuults

GDBB. Other Kandiuults that have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:

1. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

2. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher or there is artificial drainage.

Aquic Kandiuults

GDBC. Other Kandiuults that:

1. Have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface; and

2. Have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Arenic Plinthic Kandiuults

GDBD. Other Kandiuults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface.

Arenic Kandiuults

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GDBE. Other Kandiuults that:

1. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; and

2. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for 135 cumulative days or less in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udanic Kandiuults

GDBF. Other Kandiuults that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Kandiuults

GDBG. Other Kandiuults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Kandiuults

GDBH. Other Kandiuults that when neither irrigated nor fallowed to store moisture have either:

1. If the soil temperature regime is mesic or thermic, are moist six-tenths or less of the time in half or more years in some part of the moisture control section (not necessarily the same part) when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for less than 180 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Aridic Kandiuults

GDBI. Other Kandiuults that when neither irrigated nor fallowed to store moisture have either:

1. If the soil temperature regime is mesic or thermic, are dry for 135 cumulative days or less in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils

are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udic Kandiuults

GDBJ. Other Kandiuults that have, throughout the argillic or kandic horizon, colors with a hue of 2.5YR or redder, a value, moist, of 3 or less, and a value, dry, that is one unit or less higher than the value, moist.

Rhodic Kandiuults

GDBK. Other Kandiuults.

Typic Kandiuults

Definition of Typic Kandiuults

Typic Kandiuults are the Kandiuults that

1. Do not have the following combination of characteristics in the upper 75 cm of the soil if the chroma throughout the upper 75 cm is not controlled by uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, do not have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher or there is artificial drainage;

2. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface;

3. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

4. Have an argillic or kandic horizon that has a color hue of 5YR or yellower in some part, or has a value, moist, of 4 or more in some part, or has a value, dry, that is more than one unit higher than the value, moist;

5. Do not that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent;

6. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are moist more than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for 180 or more days

during a period when the soil temperature at a depth of 50 cm exceeds 8° C;

7. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for more than 135 cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

8. Have an ECEC (sum of bases plus KCl extractable Al) of more than 1.5 cmol(+) per kg clay in all subhorizons to a depth of 150 cm below the soil surface."

Page 371, first column (also see NSTH issue No. 8, pages 615-95 to 97). Delete the section, Distinctions between Typic Kanhaplustults and other subgroups, and replace with the following key to subgroups and definition of Typic Kanhaplustults:

"Key to subgroups

GDCA. Kanhaplustults that have a lithic contact within 50 cm of the mineral soil surface.

Lithic Kanhaplustults

GDCE. Other Kanhaplustults that have an ECEC (sum of bases KCl-extractable Al) of 1.5 cmol(+) or less per kg clay in one or more subhorizons within a depth of 150 cm below the soil surface.

Acrostoxic Kanhaplustults

GDCC. Other Kanhaplustults that have the following combination of characteristics in the upper 75 cm of the soil if the chroma in all or part of the upper 75 cm is not controlled by uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:

1. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

2. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher or there is artificial drainage.

Aquic Kanhaplustults

GDCE. Other Kanhaplustults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic or kandic horizon that is 50 to 100 cm below the soil surface.

Arenic Kanhaplustults

GDCE. Other Kanhaplustults that:

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1. Have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent; and

2. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for 135 cumulative days or less in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udandic Kanhaplustults

GDCF. Other Kanhaplustults that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Kanhaplustults

GDCG. Other Kanhaplustults that have 5 percent or more plinthite (by volume) in one or more subhorizons within 150 cm of the soil surface.

Plinthic Kanhaplustults

GDCH. Other Kanhaplustults that have, in the upper 75 cm of the soil, a hue of 10YR or yellower in one or more subhorizons that have a color value, moist, of 4 or more and mottles with chroma of 3 or more and the hue becomes redder with depth within 100 cm of the soil surface.

Episauic Kanhaplustults

GDCI. Other Kanhaplustults that when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are moist six-tenths or less of the time in half or more years in some part of the moisture control section (not necessarily the same part) when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for less than 180 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Aridic Kanhaplustults

GDCJ. Other Kanhaplustults that when neither irrigated nor fallowed to store moisture:

1. If the soil temperature regime is mesic or thermic, are dry for 135 cumulative days or less in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

2. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for 90 days or less during a period when the soil temperature at a depth of 50 cm exceeds 8° C.

Udic Kanhaplustults

GDCK. Other Kanhaplustults that have, throughout the argillic or kandic horizon, colors with a hue of 2.5YR or redder, a value, moist, of 3 or less, and a value, dry, that is one unit or less higher than the value, moist.

Rhodic Kanhaplustults

GDCD. Other Kanhaplustults.

Typic Kanhaplustults

Definition of Typic Kanhaplustults

Typic Kanhaplustults are the Kanhaplustults that

1. Do not have a lithic contact within 50 cm of the mineral soil surface;

2. Do not have the following combination of characteristics in the upper 75 cm of the soil if the chroma throughout the upper 75 cm is not controlled by uncoated sand grains; or if the chroma throughout the upper 75 cm is controlled by uncoated sand grains, do not have the following combination of characteristics throughout the upper 12.5 cm of the argillic or kandic horizon:

a. Mottles that have a color value, moist, of 4 or more and chroma, moist, of 2 or less accompanied by mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher or there is artificial drainage;

3. Have a hue redder than 10YR in all parts of the soil above a depth of 75 cm that have a color value, moist, of 4 or more if there are mottles of high chroma above that depth and if the hue becomes redder with depth within 100 cm of the soil surface;

4. Have less than 5 percent plinthite (by volume) in all subhorizons within 150 cm of the soil surface;

5. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface;

6. Have an argillic or kandic horizon that has a color hue of 5YR or yellower in some part, or has a value, moist, of 4 or more in some part, or has a value, dry, that is more than one unit higher than the value, moist;

7. Do not have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-

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extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent;

8. Have an ECEC (sum of bases KCl-extractable Al) of more than 1.5 cmol(+) per kg clay in all subhorizons to a depth of 150 cm below the soil surface;

9. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are moist more than six-tenths of the time in half or more years in some part of the moisture control section (not necessarily the same part) when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, are moist in most years in some or all parts of the moisture control section for 180 or more days during a period when the soil temperature at a depth of 50 cm exceeds 8° C; and

10. When neither irrigated nor fallowed to store moisture:

a. If the soil temperature regime is mesic or thermic, are dry for more than 135 cumulative days in some part of the moisture control section when the soil temperature at a depth of 50 cm exceeds 5° C; or

b. If the soil temperature regime is hyperthermic, isomesic, or warmer, the soils are dry in some or all parts of the moisture control section for more than 90 days during a period when the soil temperature at a depth of 50 cm exceeds 8° C."

Page 372, first column and extending to second column. Delete the section, Definition of Typic Rhodustults, and replace with the following key to subgroups and definition of Typic Rhodustults:

"Key to subgroups

GDEA. Rhodustults that have a lithic contact within 50 cm of the soil surface.

Lithic Rhodustults

GDEB. Other Rhodustults that have texture that is loamy fine sand or coarser in all parts of the argillic horizon.

Psammentic Rhodustults

GDEC. Other Rhodustults.

Typic Rhodustults

Definition of Typic Rhodustults

Typic Rhodustults are the Rhodustults that

1. Have texture finer than loamy fine sand in some part of the argillic horizon; and

2. Do not have a lithic contact within 50 cm of the soil surface."

Page 373, first column and extending to second column. Delete the section, Distinctions between Typic Haploxerults and other subgroups, and replace

with the following key to subgroups and definition of Typic Haploxerults:

"Key to subgroups

GEBA. Haploxerults that:

1. Have a lithic contact within 50 cm of the mineral soil surface; and

2. Have a discontinuous argillic horizon in each pedon that is interrupted by ledges of bedrock.

Ruptic-Lithic-Xerochreptic Haploxerults

GEBB. Other Haploxerults that have a lithic contact within 50 cm of the mineral soil surface.

Lithic Haploxerults

GEBC. Other Haploxerults that have the following combination of characteristics in the upper 25 cm or more of the argillic horizon:

1. Mottles that have a color value, moist, or 4 or more and chroma, moist, of 2 or less and also mottles of higher chroma that are due to segregation of iron; and

2. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5° C or higher, or the soil is artificially drained.

Aquic Haploxerults

GEBD. Other Haploxerults that have texture that is loamy fine sand or coarser in all parts of the argillic horizon or have an argillic horizon that have lamellae in the upper 25 cm.

Psammentic Haploxerults

GEBE. Other Haploxerults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is 50 to 100 cm below the soil surface.

Arenic Haploxerults

GEBF. Other Haploxerults that have a layer, starting at the mineral soil surface, that has a sandy particle-size class and extends to the top of the argillic horizon that is more than 100 cm below the soil surface.

Grossarenic Haploxerults

GEBG. Other Haploxerults that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent.

Andic Haploxerults

GEBH. Other Haploxerults.

Typic Haploxerults

Definition of Typic Haploxerults

Typic Haploxerults are the Haploxerults that

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1. Do not have the following combination of characteristics in the upper 25 cm or more of the argillic horizon:

a. Mottles that have a color value, moist, or 4 or more and chroma, moist, of 2 or less and also mottles of higher chroma that are due to segregation of iron; and

b. Saturation with water in the mottled zone at some time of year when the soil temperature in that zone is 5°C or higher, or the soil is artificially drained;

2. Do not have a lithic contact within 50 cm of the mineral soil surface;

3. Have texture finer than loamy fine sand in some part of the argillic horizon and have an argillic horizon that does not have lamellae in at least its upper 25 cm;

4. Do not that have, throughout a cumulative thickness of 18 cm or more and within a depth of 75 cm, bulk density of the less than 2.0 mm fraction, measured at 33 kPa water, of 1.0 g cm⁻³ or less and acid-oxalate-extractable aluminum plus 1/2 acid-oxalate-extractable iron of more than 1.0 percent;

5. Have a continuous argillic horizon throughout each pedon, not interrupted by ledges of bedrock; and

6. Have a texture finer than loamy fine sand in one or more subhorizons within a depth of 50 cm below the mineral soil surface."

Page 377, first column and extending to second column. Delete the section, Distinctions between Typic Torrerts and other subgroups, and replace with the following key to subgroups and definition of Typic Torrerts:

"Key to subgroups

EBAA. Torrerts that:

1. Have a surface horizon 30 cm or more thick with a color value of 3 or less, moist, in half or more of each pedon; and

2. Have prismatic or blocky structure accompanied by clay skins on ped faces that have a color value lower than that in the matrix within 100 cm of the soil surface.
Paleustollic Torrerts

EBAB. Other Torrerts that have a surface horizon 30 cm or more thick with a color value of 3 or less, moist, in half or more of each pedon.
Mollic Torrerts

EBAC. Other Torrerts that have prismatic or blocky structure accompanied by clay skins on ped faces that have a color value lower than that in the matrix within 100 cm of the soil surface.
Argidic Torrerts

EBAD. Other Torrerts.
Typic Torrerts

Definition of Typic Torrerts

Typic Torrerts are the Torrerts that

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1. Have a color value, moist, or 4 or more in the surface horizon in more than half of each pedon, or the upper horizon that has a color value (moist) less than 4 is less than 30 cm thick; and

2. Do not have prismatic or blocky structure accompanied by clay skins on ped faces that have a color value lower than that in the matrix within 100 cm of the soil surface."

Page 378, first column and extending to second column. Delete the section, Distinctions between Typic Chromuderts and other subgroups, and replace with the following key to subgroups and definition of Typic Chromuderts:

"Key to subgroups

ECAA. Chromuderts that:

1. Have distinct or prominent mottles within 50 cm of the soil surface in more than half of each pedon (the terms refer to contrast, not to size of the mottles); and

2. Have a color value, moist, of 4 or more or a value, dry, of 6 or more in the surface horizon or the horizon with color value or 3 or less, moist, and 5 or less, dry, is less than 30 cm thick in half or more of each pedon.

Aqueptic Chromuderts

ECAB. Other Chromuderts that have distinct or prominent mottles within 50 cm of the soil surface in more than half of each pedon (the terms refer to contrast, not to size of the mottles).

Aquic Chromuderts

ECAC. Other Chromuderts that have a color value, moist, of 4 or more or a value, dry, of 6 or more in the surface horizon or the horizon with color value or 3 or less, moist, and 5 or less, dry, is less than 30 cm thick in half or more of each pedon.

Entic Chromuderts

ECAD. Other Chromuderts.

Typic Chromuderts

Definition of Typic Chromuderts

Typic Chromuderts are the Chromuderts that

1. Do not have distinct or prominent mottles within 50 cm of the soil surface in more than half of each pedon (the terms refer to contrast, not to size of the mottles); and

2. Have a color value, moist, of 3 or less and a value, dry, of 5 or less throughout the upper 30 cm in more than half of each pedon."

Page 379, first column. Delete the section, Definition of Typic Pelluderts, and replace with the following key to subgroups and definition of Typic Pelluderts:

"Key to subgroups

ECBA. Pelluderts that have a color value, moist, of 4 or more or a value, dry, of 6 or more in the surface horizon or the horizon with color value or 3 or less, moist, and 5 or less, dry, is less than 30 cm thick in half or more of each pedon.

Entic Pelluderts

ECBB. Other Pelluderts.

Typic Pelluderts

Definition of Typic Pelluderts

Typic Pelluderts are the Pelluderts that have a color value, moist, of 3 or less and a value, dry, of 5 or less throughout the upper 30 cm in more than half of each pedon."

Page 379, second column. Delete the section, Distinctions between Typic Chromusterts and other subgroups, and replace with the following key to subgroups and definition of Typic Chromusterts:

"Key to subgroups

EDAA. Chromusterts that

1. Have cracks that remain open from 90 to 150 cumulative days in most years and have a mean annual soil temperature that is less than 15° C; and

2. Have a color value, moist, of 4 or more or a value, dry, of 6 or more in the surface horizon or the horizon with color value or 3 or less, moist, and 5 or less, dry, is less than 30 cm thick in half or more of each pedon.

Udorthetic Chromusterts

EDAB. Other Chromusterts that have cracks that remain open from 90 to 150 cumulative days in most years and have a mean annual soil temperature that is less than 15° C.

Udic Chromusterts

EDAC. Other Chromusterts that have, within 100 cm of the soil surface, prismatic or blocky structure accompanied by clay skins on ped faces that have a color value lower than that in the matrix.

Paleustollic Chromusterts

EDAD. Other Chromusterts that have a color value, moist, of 4 or more or a value, dry, of 6 or more in the surface horizon or the horizon with color value or 3 or less, moist, and 5 or less, dry, is less than 30 cm thick in half or more of each pedon.

Entic Chromusterts

EDAE. Other Chromusterts.

Typic Chromusterts

Definition of Typic Chromusterts

Typic Chromusterts are the Chromusterts that

1. Have a color value, moist, of 3 or less and a value, dry, of 5 or less throughout the upper 30 cm or more in more than half of each pedon;

2. Do not have, within 100 cm of the soil surface, prismatic or blocky structure accompanied by clay skins on ped faces that have a color value lower than that in the matrix; and

3. Have cracks that remain open more than 150 cumulative days in most years and have a mean annual soil temperature that is 15° C or higher."

Page 380, second column. Delete the section, Distinctions between Typic Pellusterts and other subgroups, and replace with the following key to subgroups and definition of Typic Pellusterts:

"Key to subgroups

EDBA. Pellusterts that

1. Have cracks that remain open for 150 or less cumulative days during each year or have a mean annual soil temperature that is less than 15° C; and

2. Have a color value, moist, of 4 or more or a value, dry, of 6 or more in the surface horizon or the horizon with color value or 3 or less, moist, and 5 or less, dry, is less than 30 cm thick in half or more of each pedon.

Udorthetic Pellusterts

EDBB. Other Pellusterts that have cracks that remain open for 150 or less cumulative days during each year or have a mean annual soil temperature that is less than 15° C.

Udic Pellusterts

EDBC. Other Pellusterts that have a color value, moist, of 4 or more or a value, dry, of 6 or more in the surface horizon or the horizon with color value or 3 or less, moist, and 5 or less, dry, is less than 30 cm thick in half or more of each pedon.

Entic Pellusterts

EDBD. Other Pellusterts that have within 100 cm of the soil surface prismatic or blocky structure accompanied by clay skins on ped faces that have a color value lower than that in the matrix.

Paleustollic Pellusterts

EDBE. Other Pellusterts.

Typic Pellusterts

Definition of Typic Pellusterts

Typic Pellusterts are the Pellusterts that

1. Have a color value, moist, of 3 or less and a value, dry, of 5 or less throughout the upper 30 cm in more than half of each pedon;

2. Have cracks that remain open for more than 150 cumulative days during each year and have a mean annual soil temperature that is 15° C or higher; and

3. Do not have within 100 cm of the soil surface prismatic or blocky structure accompanied by clay skins on ped faces that have a color value lower than that in the matrix."

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Page 381, second column. Delete the section, Distinctions between Typic Chromoxererts and other subgroups, and replace with the following key to subgroups and definition of Typic Chromoxererts:

"Key to subgroups

EAAA. Chromoxererts that have distinct or prominent mottles (these terms refer to contrast, not size) within 50 cm of the soil surface in more than half of each pedon.

Aquic Chromoxererts

EAAE. Other Chromoxererts that have a color value, moist, of 4 or more or a value, dry, of 6 or more in the surface horizon or the horizon with color value or 3 or less, moist, and 5 or less, dry, is less than 30 cm thick in half or more of each pedon.

Entic Chromoxererts

EAAE. Other Chromoxererts that have, within 100 cm of the soil surface, prismatic or blocky structure accompanied by clay skins on ped faces that have a color value lower than that in the matrix.

Palexerollic Chromoxererts

EAAE. Other Chromoxererts.

Typic Chromoxererts

Definition of Typic Chromoxererts

Typic Chromoxererts are the Chromoxererts that

1. Do not have distinct or prominent mottles (these terms refer to contrast, not size) within 50 cm of the soil surface in more than half of each pedon;

2. Have a color value, moist, of 3 or less and a value, dry, of 5 or less throughout the upper soil to a depth of 30 cm in more than half of each pedon; and

3. Do not have, within 100 cm of the soil surface, prismatic or blocky structure accompanied by clay skins on ped faces that have a color value lower than that in the matrix."

Page 382, first column and extending to second column. Delete the section, Distinctions between Typic Pelloxererts and other subgroups, and replace with the following key to subgroups and definition of Typic Pelloxererts:

"Key to subgroups

EABA. Pelloxererts that have in one or more subhorizons within a depth of 100 cm a chroma, either dry or moist, of 2 or more or have between 30 cm and 100 cm neither distinct or prominent mottles, nor concretions that are due to segregated iron or manganese.

Chromic Pelloxererts

EABB. Other Pelloxererts that have a color value, moist, of 4 or more or a value, dry, of 6 or more in the surface horizon or the horizon with color value or 3 or less, moist, and 5 or less, dry, is less than 30 cm thick in half or more of each pedon.

Entic Pelloxererts

EABC. Other Pelloxererts.

Typic Pelloxererts

Definition of Typic Pelloxererts

Typic Pelloxererts are the Pelloxererts that

1. Have in all subhorizons to a depth of 100 cm a chroma, both dry and moist, of 1 or less or, if the chroma is 2 or higher, there are in some subhorizon between 30 and 100 cm distinct or prominent mottles, or concretions that are due to segregated iron or manganese; and

2. Have a color value, moist, of 3 or less and a value, dry, of 5 or less throughout the upper 30 cm in more than half of each pedon."

List of new (implied) subgroups which are provided names and added to Soil Taxonomy by this amendment:

Durorthidic Albaqualfs
 Plinthic Fragaqualfs
 Grossarenic Glossaqualfs
 Ferrudalfic Umbraqualfs
 Abruptic Paleboralfs
 Mollic Natrudalfs
 Aeroc Natrudalfs
 Plinthic Kandistalfs
 Vertic Paleustalfs
 Plinthic Paleustalfs
 Aquic Durixeralfs
 Aquic Fragixeralfs
 Plinthic Haploxeralfs
 Arenic Palexeralfs
 Plinthic Palexeralfs
 Haplic Palexeralfs
 Ochreptic Rhodoxeralfs
 Aquic Durargids
 Ustic Durargids
 Aquic Nadurargids
 Glossic Natrargids
 Vertic Paleargids
 Duric Paleargids
 Ustalfic Paleargids
 Duric Calciorrhiza
 Xerochreptic Calciorrhiza
 Xerochreptic Camborrhiza
 Haplustollic Durorrhiza
 Xerochreptic Durorrhiza
 Ustollic Durorrhiza
 Ustochreptic Durorrhiza
 Borollic Paleorrhiza
 Xerochreptic Paleorrhiza
 Lithic Haplaquents
 Haplic Sulfaquents
 Durorthidic Xerofluvents
 Durorthidic Ustorthents
 Plinthic Quartsipsamments
 Ustic Quartsipsamments
 Xeric Quartsipsamments
 Durorthidic Torripsamments
 Ultic Ustipsamments
 Durorthidic Xeropsamments
 Ultic Xeropsamments
 Hydraquentic Humaquepts
 Aeroc Humaquepts
 Haplic Placaquepts
 Aquic Durochrepts
 Ustic Durochrepts

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Dystric Durochrepts
 Umbric Fragiocrepts
 Aquic Ustocrepts
 Petroferric Dystropepts
 Aquic Humitropepts
 Aquic Ustropepts
 Psammentic Haplumbrepts
 Aquic Haplumbrepts
 Aquic Xerumbrepts
 Thapto-Histic Haplaquolls
 Albollic Argiborolls
 Aquic Calciborolls
 Fluvaquentic Cryoborolls
 Fluventic Cryoborolls
 Albic Cryoborolls
 Salorthidic Haploborolls
 Abruptic Paleborolls
 Aquic Paleborolls
 Lithic Vermiborolls
 Aridic Vermiborolls
 Udic Vermiborolls
 Haplic Vermiborolls
 Duric Argiustolls
 Salorthidic Calcistolls
 Natric Durustolls
 Entic Durustolls
 Haplic Durustolls
 Duric Haplustolls
 Aquic Natrustolls
 Duric Natrustolls
 Entic Paleustolls
 Aquic Vermustolls
 Albic Argixerolls
 Aquic Durixerolls
 Abruptic Durixerolls
 Duric Haploxerolls
 Natric Palexerolls
 Vertic Palexerolls
 Aquic Palexerolls
 Haplic Palexerolls
 Alfic Cryaquods
 Entic Cryaquods
 Histic Fragiaquods
 Sideric Fragiaquods
 Plaggeptic Fragiaquods
 Humic Fragiaquods
 Histic Haplaquods
 Arenic Umbric Haplaquods
 Sideric Haplaquods
 Histic Sideraquods
 Ultic Sideraquods
 Lithic Tropaquods
 Arenic Umbric Tropaquods
 Sideric Tropaquods
 Placic Cryohumods
 Alfic Cryohumods
 Grossarenic Haplohumoda
 Ultic Fragiorthoda
 Umbric Fragiaquults
 Grossarenic Ochraqults
 Plinthic Umbraquults
 Lithic Haplohumults
 Aquic Kandihumults
 Xeric Kandihumults
 Xeric Kanhaplohumults
 Humic Fragiudults
 Grossarenic Hapludults
 Lithic Rhodudults
 Psammentic Rhodudults
 Lithic Rhodustults
 Psammentic Rhodustults
 Aquic Haploxerults

Psammentic Haploxerults
 Arenic Haploxerults
 Grossarenic Haploxerults
 Argidic Torrerts
 Paleustollic Pellusterts

615.63 Additions and corrections

Page 27, Kandic horizon (See NSTH issue No. 8, page 615-52). Reference "Kandic horizon" with the following footnote: "The kandic horizon, and the kandi and kanhapli great groups in following chapters, represents the work of the International Committee on the Classification of Low Activity Clays (ICOMLAG), chaired by Dr. Frank R. Moormann."

Page 36, first column, (Summary of properties), item 4. Change to read:

"4. Evidence of alteration in one of the following forms:

a. Have an aquic moisture regime or artificial drainage and, beginning at a depth of less than 50 cm, colors with a hue no bluer than 10Y if the hue changes on exposure to air and dominant chroma on faces of peds if peds are present or in the matrix if peds are absent as follows:

(1) If there is mottling, the chroma is 2 or less;

(2) If there is no mottling and the value is less than 4, the chroma is less than 1; if the value is 4 or more, the chroma is 1 or less; and one or more of the following properties:

(a) A regular decrease in the amount of organic carbon with depth and a content of less than 0.2 percent organic carbon at a depth of 125 cm below the surface or immediately above a sandy-skeletal substratum that is at a depth of less than 125 cm;

(b) Cracks that open and close in most years and are 1 cm or more wide at a depth 50 cm below the surface;

(c) Permafrost at some depth; or

(d) A histic epipedon consisting of mineral soil materials or a mollic or umbric epipedon; or

b. Do not have an aquic moisture regime or artificial drainage and colors as defined in "a." and have one or more of the following properties:

(1) Stronger chroma, redder hue, or higher clay content than the underlying horizon;

(2) Evidences of removal of carbonates. Particularly, the cambic horizon has less carbonate than the

underlying k horizon. If all coarse fragments in the k horizon are completely coated with lime, some in the cambic horizon are partly free of coatings. If coarse fragments in the k horizon are coated only on the under side, those in the cambic horizon should be free of coatings; or

(3) If carbonates are absent in the parent material and in the dust that falls on the soil, the required evidence of alteration is satisfied by the presence of soil structure and the absence of rock structure;"

Page 258, first column, Key to great groups, item JDC. (old IDC.), lines 1 and 2 (Ref. NSTH issue No. 10). Delete "or have soft powdery lime within 1.5 m of the soil surface".

Page 260, first column, Definition, item 3 (Ref. NSTH issue No. 10). Delete item 3.

Page 262, second column, definition, item 1 (Ref. NSTH issue No. 10). Change item 1 to read: "1. Have an ustic moisture regime; and"

Page 323, Oxisols. Reference the chapter heading "Oxisols" with the following footnote: "This chapter on Oxisols was rewritten in 1987 following the recommendations of the International Committee on the Classification of Oxisols (ICOMOX), chaired by Dr. Hari Eswaran from 1978 to 1981 and then by Dr. Stan Buol until its completion in 1987."

Page 385, first column, Control section for particle-size classes or their substitutes, new item "C" (see this NSTH issue, section 615.60, reference Soil Taxonomy page number 385, which changed item "B" to "C") (Reference NSTH issue No. 11). Change first 4 lines of item B. to read as follows: "C. In great groups of Spodosols, Alfisols, and Ultisols that have a spodic horizon or a fragipan in or above an argillic or kandic horizon; in Oxisols; and in other soils that do not have an argillic, kandic, or natric horizon:"