



March 22, 1982

NATIONAL SOIL TAXONOMY HANDBOOK
430-VI-
ISSUE NO. 1

Purpose. This establishes the National Soil Taxonomy Handbook (NSTH) as a part of the SCS Directives System and transmits all current amendments to Soil Taxonomy, Agriculture Handbook 436.

Effective Date. This handbook is effective when received.

Background. This handbook is being established as a method of transmitting interim changes to Soil Taxonomy, Agriculture Handbook 436. These changes reflect changes in the soil classification system and are furnished in this form to provide a permanent and legible copy of all changes. Each change is to be marked by pen-and-ink in the bound volume of Soil Taxonomy, if possible. If the change is too long to be entered legibly, make a notation in the margin of the bound volume to refer the reader to the appropriate place in this handbook where the change appears. Amendments 1 through 4 were previously issued as National Soils Handbook Notices. Those amendments are being reissued in this issue of NSTH. Section numbers refer to the key, definition, or paragraph in Soil Taxonomy that is being amended. The index (615.00(b)) indicates which page(s) of Soil Taxonomy is affected by the change.

Directives Canceled. National Soils Handbook Notices 66, 67, 68, and 72 are canceled.

Filing Instructions. After marking changes in the bound volume of Soil Taxonomy, file this copy of the change in a 3-ring binder. It is suggested that you keep this binder with the Soil Taxonomy volume for easy reference. Special binders will not be provided.

Supplementation. States and NTCs may not supplement this handbook.

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Department of Agriculture

WO-AS-1
10-79

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Part 615 - Amendments to Soil Taxonomy

PART 615 - AMENDMENTS TO SOIL TAXONOMY

615.00(a)

§615.00 General.

(a) Introduction. This handbook contains amendments to the USDA soil classification system that is published in Agriculture Handbook

Part 615 - Amendments to Soil Taxonomy

615.00(b)

(b) Index to pages of Soil Taxonomy

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(430-VI-NSTH, Feb. 1982)

§615.01 Addition of particle-size classes.

(a) The following strongly contrasting particle-size classes have been approved.

- Fine-loamy over cindery.
- Cindery over medial.
- Cindery over medial-skeletal.
- Ashy over medial.

Assign number 29 to "Fine-loamy over cindery." and renumber items 29-40 on page 386 as "30-41." Assign numbers 42-44 to "Cindery over medial.", "Cindery over medial-skeletal.", and "Ashy over medial.", respectively.

(b) The justification for adding these classes is based mainly on interpretations that are influenced by differences in:

- (1) Water retention.
- (2) Water intake rates, hydraulic conductivity, and resultant runoff and erosion potential.
- (3) Crop production.
- (4) Trafficability and road maintenance.

§615.02 Deletion of temperature requirements of Vertisols.

(a) Approval has been given to drop the temperature requirements for Vertisols. The temperature requirement is dropped so that soils with high shrink-swell properties will be grouped together; these soils in frigid regions differ little in properties from those in warmer areas.

(b) The following changes are required in Soil Taxonomy to accommodate this amendment:

- Page 92, first column, item D. Delete "have a mean annual soil temperature of 8° C or higher and".
- Page 96, first column, lines 2 and 3. Delete "the temperature regime is frigid or colder, or".
- Page 96, second column, item 8. Delete "either a frigid or colder temperature regime, or".
- Page 156, first column, item 3. Delete "Meet one or more of the following requirements: a. Have a cryic or frigid soil temperature regime; b."

615.02(b)

- Page 156, first column, lines 9 and 10. Change "(1)" to "a." and "(2)" to "b."
- Page 157, first column, item 9.d. Delete "d. Have a frigid soil temperature regime."
- Page 179, second column, item 3. Delete "If the soil temperature regime is mesic, isomesic, or warmer and".
- Page 180, second column, item 9. Delete "must have a frigid or colder temperature regime or".
- Page 228, first column, item 1.e. Delete "the mean annual soil temperature is $<8^{\circ}$ C, or if it is $\geq 8^{\circ}$ C,".
- Page 229, second column, item 9. Delete "have a mean annual soil temperature $<8^{\circ}$ C or".
- Page 272, first column, item 5. Delete "If the mean soil temperature is 8° C or higher and".
- Page 272, second column, item 9. Delete "the mean annual soil temperature is 8° C or higher and".
- Page 376, second column, Definition. Delete "that have a mesic, isomesic, or warmer soil temperature regime;".
- Page 377, first column, item DA, line 1. Change to read "Vertisols that have a thermic, mesic, or frigid soil temperature.
- Page 381, first column, Xererts, third sentence. Change to read "Their temperature regime is thermic, mesic, or frigid."

§615.03 Redefinition of Arenic Albaqualfs.

(a) Approval has been given to allow Arenic Albaqualfs to have an Ap horizon that has color value, moist, of less than 4 and color value, dry, of less than 6; or to have, after the soil to a depth of 18 cm has been mixed, an upper layer that has these color values.

(b) Arenic Albaqualfs are redefined to allow them to have a dark-colored surface and thus to avoid the need to recognize the implied subgroup of Arenic Mollic Albaqualfs. This is done because the thick sandy surface horizon is much more important to interpretations than is the thin dark-colored surface.

(c) The following changes in Soil Taxonomy will accommodate this amendment:

- Page 110, second column. Change "Arenic Albaqualfs are like Typic Albaqualfs except for f, with or without a" to "Arenic Albaqualfs are like Typic Albaqualfs except for f, with or without a or d or both."

- Page 111, first column. Change the description of Arenic Albaqualfs to the following:

Arenic Albaqualfs - Arenic Albaqualfs have a sandy particle-size class to a depth between 50 cm and 1 m. They may have chroma of more than 2 in more than 40 percent of the mass between the A1 or Ap horizon and a depth of 75 cm. They may also either have an Ap horizon in which the color value, moist, is less than 4 and the value, dry, is less than 6 after the soil has been crushed and smoothed; or if not disturbed, the soil to a depth of 18 cm, after mixing, has these colors. These soils are not extensive except locally in Florida and Texas.

§615.04 Establishment of great group Fragixeralfs.

(a) Approval has been given to establish the great group Fragixeralfs, with subgroups of Typic, Mollic, and Ochreptic Fragixeralfs. In addition, the order in which the Plinthoxeralfs occur in the key to great groups of Xeralfs is changed so that they will segregate after the Fragixeralfs rather than after the Durixeralfs.

(b) Fragixeralfs were established to contain Xeralfs that have a fragipan. Hanloxeralfs had been allowed to have a fragipan, but Typic

615.04(d)(1)

(1) Accommodate the approved amendment of adding the great group Fragixeralfs and subgroups of Typic, Mollic, and Ochreptic Fragixeralfs.

(2) Rearrange the key to great groups of Xeralfs so that the Plinthoxeralfs occur after the Fragixeralfs.

(e) Page 147, first column. Make the following changes:

- Change "HDC." to "HDB."
- Add "HDC. Other Xeralfs that have a fragipan. Fragixeralfs, p. 148".
- Change "HDB. Other Xeralfs that have plinthite. . ." to "HDD. Other Xeralfs that have plinthite. . ." and insert it after "HDC. Other Xeralfs that have a fragipan. Fragixeralfs, p. 148".

- Change "HDD." to "HDE.." "HDE." to "HDF.." and "HDF." to "HDG."

add all of the following:

Fragixeralfs

Fragixeralfs are the Xeralfs that normally have a brown argillic or cambic horizon above a mottled fragipan that begins at a depth between about 50 cm and 1 m below the surface. Perched ground water is present seasonally above the pan, and there is usually a thin eluvial horizon, in which the peds have gray skeletons, just above the pan.

In the United States, most Fragixeralfs are on gentle or moderate

slopes and are formed, at least in part, in silty or loamy late Pleistocene deposits. Some are strongly sloping. Temperature regimes

Distinctions between Typic Fragixeralfs and other subgroups

Typic Fragixeralfs are the Fragixeralfs that

- a. 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;
- b. 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 1/3-bar water tension) of 0.95 g per cubic centimeter or less in the fine-earth fraction, and that has either (1) a ratio of measured clay to 15-bar water (percentages) of 1.25 or less or (2) a ratio of CEC (at pH near 8) to 15-bar water of 1.5 and more exchange acidity than the sum of bases plus KCl-extractable aluminum:

- c. 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 color values; and
- d. 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, which also may have low chroma.

Mollic Fragixeralfs are like Typic Fragixeralfs except for c, with or without d.

Ochreptic Fragixeralfs are like Typic Fragixeralfs except for a.

Description of subgroups

Typic Fragixeralfs.--The central concept or typical subgroup of Fragixeralfs is fixed on the soils of this great group that are the most nearly freely drained, that have an argillic horizon above the fragipan, and that have high color value in an Ap horizon or in comparable layers if the soil is undisturbed. In addition, they do not have a surface mantle showing strong evidence of amorphous clays that have high activity.

Typic Fragixeralfs are not the most extensive subgroup, but they furnish the best basis for definition of subgroups. No Fragixeralfs are

615.04(f)

An Ap horizon or subhorizons comparable in thickness that have the color of a mollic epipedon are considered abnormal and define the mollic subgroup.

In many Fragixeralfs the fragipan is in the argillic horizon; there is a cambic horizon above the fragipan that is separated from the pan by an eluvial horizon. These extra horizons form the basis for defining

Mollic Fragixeralfs.--These soils have an Ap horizon that has a color value, moist, darker than 4 and a color value, dry, darker than 6; or the soil to a depth of 18 cm, after mixing, has these color values. These soils are permitted but not required to have mottles that have chroma of 2 or less in the upper 25 cm of the argillic horizon or within 40 cm of the soil surface. The epipedon is mollic or approaches the properties of a mollic epipedon.

Ochreptic Fragixeralfs.--Soils in this subgroup are like Typic Fragixeralfs except that they do not have a distinct argillic horizon above the fragipan that has clay skins on some vertical and horizontal surfaces. They have, instead, a brown or strong brown unmottled horizon above the fragipan that seems more like a cambic horizon than an argillic horizon. Just above the fragipan there may be a thin eluvial horizon. The prism faces of the fragipan have thick (>1 mm) clay skins, or the fragipan itself is also an argillic horizon.

(g) Page 148, first column, item 1 of definition of Haploxeralfs. Rewrite item 1 as follows: "Have an argillic horizon but do not have a natric horizon or a fragipan and do not have a duripan within 1 m of the soil surface or a petrocalcic horizon within 1.5 m of the soil surface;"

(h) Pages 148-149, Distinctions between Typic Haploxeralfs and other subgroups. Delete item "b." and change "c." to "b.", "d." to "c.", . . . "k." to "j."

(i) Page 149, first column. Make changes as indicated in the following:

Aquic Haploxeralfs are like Typic Haploxeralfs except for a or for a and b.

Aquiltic Haploxeralfs are like Typic Haploxeralfs except for a and f with or without b.

Calcic Haploxeralfs are like Typic Haploxeralfs except for i.

Lithic Haploxeralfs are like Typic Haploxeralfs except for c.

Lithic Mollic Haploxeralfs are like Typic Haploxeralfs except for c and b.

Lithic Ruptic-Xerochreptic Haploxeralfs are like Typic Haploxeralfs

Mollic Haploxeralfs are like Typic Haploxeralfs except for b.
Natric Haploxeralfs are like Typic Haploxeralfs except for d.
Psammentic Haploxeralfs are like Typic Haploxeralfs except for h with or without b or f, or both.
Ultic Haploxeralfs are like Typic Haploxeralfs except for f or for f and b.
Vertic Haploxeralfs are like Typic Haploxeralfs except for g or for b and g.

(j) Page 151, second column, item 2. Rewrite as follows: "Do not have a duripan whose upper boundary is within 1 m of the soil surface or a fragipan;"

(k) Page 153, first column, Definition, fifth line. Add the word "fragipan" after "natric horizon," e.g., ". . . do not have a natric horizon, fragipan, or duripan."

§615.05 Changes in key to Mollisols and Inceptisols.

(a) Changes were approved in the keys to Mollisols and Inceptisols (items G and I on pages 92-93 of Soil Taxonomy). Explanations of changes made in the keys follow:

(1) In Soil Taxonomy all mineral soils that have histic epipedons composed of organic soil materials and no other diagnostic horizons were classified as Entisols. The soils with histic epipedons composed of mineral soil materials were included with Inceptisols, an arrangement that split similar soils between Inceptisols and Entisols. The intent in making the separation was to keep Hydraquents and Sulfaquents, most of which have a histic epipedon of organic soil materials, in classes of Entisols rather than Inceptisols. This amendment changes the key so the soils that meet the concepts of Hydraquents and Sulfaquents are excluded from Inceptisols at the beginning of item I, and other soils with histic epipedons, whether composed of organic or mineral soil materials, may be classed as Inceptisols.

(2) Extensive areas of soils with xeric and ustic moisture regimes in Europe and Asia have gypsic and petrogypsic horizons. As a result of deleting the conductivity requirement for Aridisols, these soils are excluded from Aridisols, and they were also excluded from Inceptisols. The key to Inceptisols and definition is changed to include these soils with gypsic and petrogypsic horizons in Inceptisols rather than allowing them to be "keyed out" as other soils, i.e., Entisols. It is believed that soils with gypsic and petrogypsic horizons should be treated similarly in Soil Taxonomy to those with calcic and petrocalcic horizons.

615.05(a)(3)

(3) When Soil Taxonomy was written, it was believed that soils in the tropics having mollic epipedons were of extremely limited extent, except for the Rendolls. The others known had vertic properties and were in Puerto Rico. With this in mind, specific classes for other kinds of soils in the tropics with mollic epipedons were not provided in Soil Taxonomy, and the ones with vertic properties were excluded from Mollisols. Since then, however, extensive areas of soils in the tropics with mollic epipedons have been described. Because extensive areas of Mollisols are now known to occur in the tropics, the definition of Mollisols is changed to include those with vertic properties.

(b) The following changes are required in Soil Taxonomy to accommodate these amendments:

- Page 92, second column, item E.1.b., 4th line. Delete the word "either" and substitute the phrase "have an aridic moisture regime, or". Delete all of items E.1.b.(1) and E.1.b.(2).

- Page 93, first column, item G.2.b., third line. Delete the words "a cambic" and substitute the words "no aridic or natric"

- Page 93, first column, item G.4. Delete entire item.

- Page 93, second column, item I. Replace entire item with the following:

- I. Other soils that have no sulfidic material within 50 cm of the mineral soil surface; and have between 20 and 50 cm below the mineral soil surface an \bar{n} value of 0.7 or less in one or more subhorizons or less than 8 percent clay in one or more subhorizons; and have one or more of the following:
 1. An umbric, mollic, histic (either mineral or organic) or plaggen epipedon;
 2. A cambic horizon or both an aquic moisture regime and permafrost;
 3. Within 1 m of the surface, a calcic, petrocalcic, gypsic, petrogypsic, or placic horizon or a duripan;
 4. A fragipan;
 5. A sulfuric horizon whose upper boundary is within 50 cm of the soil surface; or
 6. In half or more of the upper 50 cm, an SAR of $>13^4$ (or sodium saturation that is >15 percent) that decreases with depth below 50 cm and, within a depth of 1 m, have ground water at some period during the year when the soil is not frozen in any part.

Inceptisols, p. 227

- Page 96, first column, Limits between Alfisols and soils of other orders, item 4.b. Change to read "If there is a mollic epipedon, base saturation must be <50 percent (by NH_4OAc) in some subhorizon between the upper boundary of the argillic or natric horizon and a depth of 1.25 m below the soil surface, or a lithic or paralithic contact, whichever is least."
- Page 155, first column, fourth paragraph. Delete the last sentence.
- Page 155, second column, item 2.c. Delete "either (1)" in line 5. In line 6, place a semicolon after the word "regime" and add the word "and", then delete the remainder of the item.
- Page 156, second column, item 3. Rewrite as follows: "To distinguish Aridisols from Inceptisols, Aridisols must have either an aridic (torric) moisture regime or a salic horizon whose upper boundary is within 75 cm on the surface and is saturated with water within 1 m of the surface for 1 month or more in some years."
- Page 167, second column, Orthids, third paragraph. Rewrite as follows: "The moisture regime of Orthids is aridic, and the temperature regimes range from cryic to isohyperthermic."
- Pages 167-168, Definition, item 2. Rewrite as follows: "Have within 1 m of the soil surface the upper boundary of a calcic, petrocalcic, gypsic, petrogypsic, or cambic horizon or a duripan and have an aridic soil moisture regime."
- Page 179, first column, Definition, item 1, second and third lines. Delete "above a layer that is frozen about 2 months after the summer solstice, or".
- Page 179, Definition, item 2, lines 1 and 2 of second column. Delete "a histic epipedon consisting of organic materials,".
- Page 179, Definition, item 2, lines 2-4 of second column. Add the word "or" after "an albic horizon," change the comma after "2 m" to a semicolon, and delete "or amorphous material is not dominant in the exchange complex;".
- Page 179, second column, Definition, item 2.c., line 1. Change to read "A calcic, petrocalcic, gypsic, petrogypsic, or placic horizon or duripan if its. . .".
- Page 179, second column. Add item 2.g. as follows: "g. A histic epipedon if sulfidic material is present within 50 cm of the mineral soil surface or n value is more than 0.7 and there is more than 8 percent clay in all subhorizons between 20 and 50 cm below the mineral surface;".

615.05(b)

- Page 180, first column, item 3.b.(2). Change to read "A histic epipedon unless sulfidic material is present within 50 cm of the mineral soil surface or n value is more than 0.7 and there is more than 8 percent clay in all subhorizons between 20 and 50 cm below the mineral surface:".

- Page 180, first column, item 3.b.(3). Change to read "A calcic, petrocalcic, gypsic, or petrogypsic horizon or a duripan if the upper boundary of any of them is within 1 m of the soil surface unless it is a buried horizon;".

- Page 180, first column, item 3.b.(4). Change to read "A cambic horizon or a sulfuric horizon that has its upper boundary within 50 cm of the mineral soil surface unless sulfidic material is present within 50 cm of the soil surface;".

- Page 180, first column, item 3.b.(6). Delete.

- Page 180, first column, item 3.b.(7). Renumber as "3.b.(6)".

- Page 183, first column. Delete item "h." and "Histic Fluvaquents."

- Page 227, first column, second paragraph, line 3. Delete "gypsic, petrogypsic,".

- Page 227, second column, line 3. After the word "petrocalcic" add "gypsic, petrogypsic,".

- Page 227, second column, line 6. After the word "plaggen" add ", histic,".

- Page 227, second column, item 1.c. Rewrite to read "Do not have sulfidic materials within 50 cm of the soil surface;".

- Page 228, first column, item 2.a. Rewrite to read "One or more of the following: (1) A cambic, calcic, petrocalcic, gypsic, or petrogypsic horizon; (2) A fragipan that does not have any clay skins as thick as 1 mm; (3) A duripan that has its upper boundary within 1 m of the soil surface; or" .

- Page 228, first column, item 2.b., lines 6 and 7. Delete "(conductivity may exceed 2 mmho per centimeter);".

- Page 228, first column, item 3.a. and 3.b. Delete all of item 3.a. and delete "b. Or" of item 3.b. Item 3 then reads "3. Have a mollic epipedon. . .".

- Page 228, second column, item 3.b.(3). Delete.

- Page 228, second column, item 6. Change to read "Have an umbric or histic epipedon."

- Pages 228-229, Limits between Inceptisols and other orders, item 2. Rewrite to read "To distinguish Inceptisols from Aridisols, Inceptisols have neither an aridic (torric) moisture regime nor a salic horizon whose upper boundary is within 75 cm of the surface and are saturated with water within 1 m of the surface for 1 month or more in some years."
- Page 229, first column, item 3.a. Delete.
- Page 229, first column, item 3.d.(1). Rewrite to read "A histic, mollic, umbric, or plaggen epipedon;"
- Page 229, first column, item 3.d.(2). Rewrite to read "A calcic, petrocalcic, gypsic, or petrogypsic horizon;"
- Page 229, first column, item 3. Relabel item 3.b. as "3.a.", item 3.c. as "3.b.", and item 3.d. as "3.c."
- Page 229, second column, item 5.b.(3). Delete.
- Page 236, second column, Definition, item 2.a. Rewrite to read "A histic epipedon;"
- Page 236, second column, Definition, item 2.c. Delete "A histic epipedon composed of organic soil materials or" so that item 2.c. reads "An ochric epipedon. . ."
- Page 258, first column, item 4.c. Rewrite to read: "c. A mollic epipedon and an underlying cambic horizon that has base saturation of <50 percent (by NH₄OAc) in some part or that decreases to <50 percent at a depth of 1.8 m or less; and"
- Page 262, second column, Ustropepts, sixth sentence. Change to read: "They have an ochric epipedon."
- Pages 271-272, item 4. Delete.
- Page 272, first column, items 5, 6, and 7. Renumber items 5, 6, and 7 as "4", "5", and "6", respectively.
- Page 272, second column, item 5.(c). Delete.

§615.06 Change in definition of Arenic Ochraqualfs.

(a) A proposal to amend the definition of Arenic Ochraqualfs to allow them to be with or without the "mollic" feature has been approved.

(b) The following changes in Soil Taxonomy will accommodate this amendment:

615.06(b)

- Page 116, column 1. Change "Arenic Ochraqualfs are like Typic Ochraqualfs except for d, with or without a, and have a sandy epipedon between 50 cm and 1 m thick." to "Arenic Ochraqualfs are like Typic Ochraqualfs except for d, with or without a or c, or both, and have a sandy epipedon between 50 cm and 1 m thick."

- Page 116, column 2, change the description of Arenic Ochraqualfs to the following:

Arenic Ochraqualfs.--These soils have a sandy epipedon that is 50 cm or more thick but <100 cm thick overlying the argillic horizon. The upper part of the argillic horizon or the lower part of the epipedon is permitted to have chroma in more than 40 percent of the matrix that is too high for Typic Ochraqualfs. These soils may also have either an Ap horizon in which the color value, moist, is less than 4 and the value, dry, is less than 6 after the soil has been crushed and smoothed; or if not disturbed, the soil to a depth of 18 cm, after mixing, has these colors. These soils are otherwise like those of the typic subgroup in defined properties, but they mostly have a sandier argillic horizon than the Typic Ochraqualfs. In the United States, they occur principally in Florida, where they are extensive. Many have been cleared and drained and are being cultivated.

§615.07 Mollic Natraqualfs and Typic Natralbolls.

(a) This amendment provides for a subgroup of Mollic Natraqualfs. In addition, the pedon representing the central concept of Typic Natralbolls is deleted.

(b) The surface horizon meets all of the qualifications of a mollic epipedon except for thickness. It is more friable, less apt to crust, and a better medium for plant growth than the light-colored, low-organic-matter counterparts in the Typic subgroup. In the formative stages of Soil Taxonomy, the Mollic Natraqualfs subgroup was recognized. When Soil Taxonomy was published, the mechanism for recognizing Mollic Natraqualfs was still provided, but the subgroup was omitted.

(c) The following changes in Soil Taxonomy will accommodate this amendment:

- Page 114, column 2. After "Glossic Natraqualfs are like Typic Natraqualfs except for b.", add "Mollic Natraqualfs are like Typic Natraqualfs except for c, with or without d."

- Page 115, column 1. After the paragraph on Glossic Natraqualfs,