International Committee for the Classification of Anthropogenic Soils (ICOMANTH)
Circular Letter No. 4 released January 31, 2003

Responses due July 1, 2003

This is the fourth circular letter of the International Committee on Anthropogenic Soils (ICOMANTH), following Circular Letter #3 issued Jan. 15, 1998. The purposes of this letter are to distribute Version 1.0 of the Anthropogenic Soils CD-ROM in Part 1, announce rejuvenation of committee activities in part 2, propose additions and changes to Soil Taxonomy in Part 3, answer commonly-asked questions in Part 4, and solicit reader feedback in Part 5.

Anthropogenic soils are defined here as those soils that form in anthropogenic materials or have major properties and behavior that have been significantly altered by human activities and tools. The committee is open to all who wish to become involved. The new permanent web site for ICOMANTH at http://clic.cses.vt.edu/icomanth/ contains committee registration information along with committee charges and vision statement. All previous circular letters and responses are found in Chapters 3 and 4 of the AS_Articles folder on Version 1.0 of the Anthropogenic Soils CD-ROM. The committee operates cooperatively through the chairman and the USDA-NRCS Soil Survey Division and the National Soil Survey Center (NSSC) in Lincoln, Nebraska, USA. ICOMANTH began in 1995 under the direction of Dr. Ray B. Bryant of Cornell University, Ithaca, New York, USA. In July 2002 Dr. John M. Galbraith from Virginia Polytechnic Institute and State University (also known as Virginia Tech) in Blacksburg, Virginia, USA assumed leadership after former chairman Dr. Ray B. Bryant accepted a new job as Research Leader at the USDA-ARS Pasture Systems and Watershed Management Research Unit in University Park, Pennsylvania, USA.

Part 1. Version 1.0 of the Anthropogenic Soils CD-ROM

The USDA-NRCS Soil Survey Division and the National Soil Survey Center (NSSC) has actively pursued the collection of data for Anthropogenic Soils since the early 1970s when Horace Smith published his soil survey for Washington D.C. Twenty years later, the Soil Survey of LaTourette Park on Staten Island, New York was published. Both of these surveys collected profile descriptions, characterization analyses, and urban inventory data for anthropogenic soils.

The data and information on CD-ROM Version 1.0 represent a compilation of published materials and data from the Internet and from USDA-NRCS archives concerning anthropogenic soils from around the world. These soil profiles can be used to propose new horizon nomenclature, terms for describing anthropogenic soil properties, and to document and describe human-influenced features for these soils. The authors and their referenced works are cited. Material for future versions is invited and should be submitted to the USDA-NRCS staff through the contact on the permanent web site for ICOMANTH at http://clic.cses.vt.edu/icomanth/.

Part 2. ICOMANTH Plan of Action

ICOMANTH has a current plan of action (Table 1, updated September 4, 2002). ICOMANTH will develop a collection of soil descriptions representing an array of anthropogenic soil morphologies and publish that information. The committee will work closely with the USDA-NRCS Soil Classification and Standards Staff, and the Urban Soils and Interpretations Program to insure that proposed classes are useful for mapping and interpretation of soil surveys and fit into established plans and operating procedures, but ICOMANTH will not lead the development of the interpretations themselves. Definitions of materials and new horizon designations will allow urban soil surveys the tools they need to set up new series and speed correlation of surveys in progress.

The committee will continue in existence until at least the 2006 IUSS meeting in Philadelphia, PA, USA. Two short field tours will be used for testing of the additions to Soil Taxonomy and for collection of opinion of the attendees. Further revisions will then be proposed if needed. Publication of field tour data, meeting symposia (if held), and related talks and posters will take place through NRCS, the International Union of Soil Scientists, or the Soil Science Society of America. ICOMANTH will then dissolve at a point where enough additions to Soil Taxonomy have been made to allow for preliminary use for mapping and correlation of series in urban and other human altered landscapes. Further revisions to Soil Taxonomy and the National Soil Survey Handbook and the Soil Survey Manual will continue to take place through normal channels and standard operating procedures.

Table 1. ICOMANTH plan of action 2002-2007.

#	Item	Date
1.	Compile existing pedon data, pictures, and classification systems of Anthropogenic soils on CD-ROM for distribution.	September 2002
2.	Send out 4th circular letter	January 2003
3.	Publish CD-ROM with data collected Ver. 1.0 (available through the web site)	January 2003
4.	Begin to plan for a tour in conjunction with the 2006 International Union of Soil Scientists meetings in Philadelphia, PA USA.	Summer 2004
5.	Host a special topics section at the Annual American Society of Agronomy Meeting in Denver, Colorado, USA entitled "Interpretation and Management of Anthropogenic Soils."	Fall 2004
6.	Publish CD-ROM with data collected Ver. 2.0 (available through the web site)	Summer 2005
7.	Send out 5th circular letter for comments about proposed changes	Summer 2005
8.	Attend and assist with tours of Anthropogenic soils in conjunction with the 2006 International Union of Soil Scientists meetings	Summer 2006
9.	Symposium or workshop at IUSS meeting in Philadelphia, PA USA.	Summer 2006
10.	Publish CD-ROM with data collected Ver. 3.0 (available through the web site)	Summer 2007
11.	Send out 6th circular letter for additional proposed changes	Fall 2006
12.	Submit proposed changes to Soil Taxonomy	January 2007

Part 3. Proposal for Definitions and Horizon Designations

The following definitions and horizon designations are presented for comment until July 1, 2003. Please use the information and data on the Anthropogenic Soils CD-ROM Version 1.0 to supplement acquired knowledge of anthropogenic soils, then review the proposed changes to Soil Taxonomy and respond with written comments to the Chairman or the USDA-NRCS at the address below. Additional references include:

Fanning, D.S., and M.C.B. Fanning. 1989. Soil – Morphology, genesis, and classification. John Wiley and Sons, New York, NY, USA.

Kimble, J.M, R.J. Ahrens, and R.B. Bryant. 1999. Classification, correlation, and management of anthropogenic soils, Proceedings-Nevada and California, September 21-October 2, 1998. USDA-NRCS, National Soil Survey Center, Lincoln, Nebraska, USA.

Lal, R. 2002. Encyclopedia of Soil Science. Marcel Dekker, Inc. New York, New York, USA.

Reference list posted at the ICOMANTH web site http://clic.cses.vt.edu/icomanth/ and on the Anthropogenic Soils CD-ROM Version 1.0.

Rice, T.J., and H. Eswaran. 2002. Soil classification: A global desk reference. CRC Press, Boca Raton, FL.

Sencindiver, J.C., and J.T. Ammons. 2000. Minesoil Genesis and Classification. Ch. 23. *In:* R.I. Barnhisel, R.G. Darmody, and W.L. Daniels (Eds.) Reclamation of drastically disturbed lands. Agronomy Series #41. American Society of Agronomy, Madison, Wisconsin, USA.

Section I. Proposed Definitions:

A. Artifacts – (from the online version of Merriam-Webster Collegiate Dictionary (2002) Latin *arte* by skill + *factum* to do. Something created (or modified) by humans usually for a practical purpose, including both organic and inorganic materials. Artifacts may be deposited within or on top of the soil and become part of the soil unless they are mobile or transient. From a practical purpose, artifacts that become part of the soil should be split into categories that relate how readily they persist in the soil and then to human safety concerns and to their behavior as part of the soil. The following categories are proposed:

1. Degradable artifacts (garbic)
    a. Innocuous degradable artifacts
    b. Noxious degradable artifacts (these soils should not be described, sampled, or classified to a low level by soil surveyors. Areas known to contain noxious artifacts could be delineated if certainty exists).
2. Recalcitrant artifacts (urbic)
    a. Innocuous recalcitrant artifacts
    b. Noxious recalcitrant artifacts (these soils should not be described, sampled, or classified to a low level by soil surveyors. Areas known to contain noxious artifacts could be delineated if certainty exists).

<u>Component terms:</u>

1. Degradable – (from Latin *de-* + *gradus* away from + step. Capable of being degraded or worn down by erosion or reduced in complexity. Also capable of decomposing or being separated into constituent parts or elements or into simpler compounds). Degradation is the chemical, physical, or biological breakdown of a complex material into simpler components. Biodegradation is the metabolic breakdown of complex materials into simpler components. The time scale implied is within several generations or a few centuries of time. Examples would include: food and human waste, paper, wood, carbohydrates, biodegradable plastics and chemicals, certain heavy metals, asphalt, and steel products in warm, humid, acidic environments.

3. Innocuous - (from Latin *innocuus*, from *in-* + *nocEre*. Harmless, producing no injury.

4. Noxious - (from Latin *innocuus*, from *noxa*. Harm). Potentially harmful or destructive to living beings unless dealt with carefully. Also dangerous, exposing to or involving danger, able to or likely to inflict injury or harm. There is a range of risk from simple danger to known risk. The magnitude of danger ranges from artifacts that cause harm from long-term or indirect exposure to those that cause harm from single-exposure or immediate contact.
5. Recalcitrant – (from Latin *recalcitrare* to be stubbornly disobedient). Artifacts that are not responsive to treatment and resistant to degradation. Materials or substances that are degraded at an extremely slow rate if at all when released into the environment. Examples would be: Concrete and steel in dry, cold, or alkaline environments, bricks, nondegradable plastics and chemicals, radioactive fallout, certain heavy metals, glass, galvanized steel, aluminum cans, and polyester fabric.
6. Garbic artifacts – (proposed by Delvin Fanning. There is no single word of origin to describe these materials, but the word derives from Middle English *offal,* food waste. Waste comes from Latin *vastus and then* Middle English *waste*, refuse from places of human or animal habitation such as worthless or useless part of something, rubbish, leftovers, scraps, trash, excrement, and sewage). Garbage includes largely organic material such as food and household cooking waste, sewage, sludge, and raw human waste products. The intent was to describe degradable materials that would normally be deposited in landfills but also to include materials that would degrade in-situ in their climate or site of deposition and might cause problems with subsidence or methane gas production as they decompose.
7. Urbic artifacts – (proposed by Delvin Fanning. From Latin *urbanus*, of, relating to, characteristic of, or constituting a city and Middle English waste, from Latin *vastus*, damaged, defective, or superfluous material produced by a manufacturing process). This includes materials used commonly in association with human living, construction, and activity. It includes largely inorganic material such as iron ore slag, metal objects, chemicals, and human manufactured material such as fiberglass, brick, cinder block, concrete, metals and alloys, and other building debris. Also included are manufactured or altered materials derived from hydrocarbons such as coal ash, asphalt, synthetic fabrics, and plastics. Organic types of urbic materials include organic compounds and chemicals, human processed natural materials such as cotton and wool clothing, and lumber products. The intent was to describe materials deposited in landfills or buried in landform construction and would include materials that would not degrade within a few hundred years in their climate or site of deposition and would not pose danger of subsidence or methane gas production.

B. Human transported materials – any material (artifacts, soil, rock, or sediment) moved horizontally from a source area outside of the pedon by direct intent human activity, usually with the aid of machinery. This excludes vertical mixing within the pedon. The resulting transportation or deposition results in the creation of an anthropogenic-altered landform. These materials may be used in the keys to Soil Taxonomy to define classes. Major types are:
    1. Human transported soil materials (Garbic, spolic, or dredgic materials)
    2. Impervious liners (Asphalt, concrete, recalcitrant plastic, or geotextile layers)

Component terms:

1. Garbic materials – (proposed by Delvin Fanning. Garbic materials are mixtures of > 35% by volume garbic artifacts with inorganic and/or organic materials such as soil, regolith, and rock transported and deposited on the landscape or in pits through human activity such as landfill operations, construction, and other earth excavations. The redistribution of material is of such extent that original soil horizonation and geologic stratification have been destroyed or are unrecognizable in the altered layers. Spolic materials occur on anthropogenic landforms and lie unconformably upon the soil or regolith material below that was not transported by humans. Garbic materials have less than 3% by volume recognizable fragments of diagnostic soil horizons that are arranged in discernible order. Garbic materials are likely to have danger associated with their use because of high likelihood of subsidence or methane gas production if set in anaerobic conditions.

2. Spolic materials - (proposed by John Sencindiver. From Latin *spoliare*, earth and rock waste materials) are mixtures of inorganic and/or organic materials such as soil, regolith, and rock transported and deposited on the landscape or in pits through human activity such as mining, quarrying, road construction, and other earth excavations. These materials may include up to 35% by volume garbic materials and up to 100% by volume urbic materials. The redistribution of material is of such extent that original soil horizonation and geologic stratification have been destroyed or are unrecognizable in the altered layers. Spolic materials occur on anthropogenic landforms and lie unconformably upon the soil or regolith material below that was not transported by humans. Spolic materials have less than 3% by volume recognizable fragments of diagnostic soil horizons that are arranged in discernible order. Spolic materials associated with mining may qualify as sulfidic materials.

5. Dredgic materials – (proposed by W. Lee Daniels. From Latin excavatus, past participle of excavare, from ex- + cavare to make hollow, to dig out and remove; and Old English *drecge or dragan* to draw, to dig, gather, or pull out with a dredge, to deepen a waterway with a dredging machine). This includes sediment, rock, and soil materials removed from subaqueous sources and artificially redeposited. The redeposition may occur either behind dikes or in pits isolated from fluvial processes, or it may occur in subaqueous environments without constraining structures. These materials may include up to 35% by volume garbic materials and up to 100% by volume urbic materials. Dredgic materials typically have low bulk density and high *n* value when they are deposited. This can lead to a high degree of cracking when they dry out and the soils in them are then likely to qualify for "cracked" families as that term is defined in Soil Taxonomy. Dredgic materials occur on anthropogenic landforms and lie unconformably upon the soil, sediment, or regolith material below that was not transported by humans. Dredgic materials have less than 3% by volume recognizable fragments of diagnostic soil horizons that are arranged in discernible order. Also many dredged materials, but certainly not all, qualify as *sulfidic materials* as that term is defined in Soil Taxonomy.

Spolic materials have two or more of the following properties: (Proposed by John Sencindiver and others)

a. Artifacts; or
b. Easily weatherable minerals or rock fragments, or masses of soft, secondary minerals that have abrupt contact edges with dissimilar soil material; or

c. Easily weathered masses of soft, secondary minerals rock fragments that occur in common or greater abundance in near-surface horizons; or
d. Freshly fractured rock fragments with splintered or sharp edges; or
e. Mechanically abraded mineral grain faces; or
f. Bridging voids between rock fragments; or
g. Randomly oriented rock fragments; or
h. Random lithochromic mottling; or
i. Masses of contrasting parent materials in the same horizon or layer that have differences in texture, and/or type and percent of rock fragments; or
j. Dark colored (value and chroma 3 or less), high carbon rock fragments such as coal or carbonaceous shale; or
k. Abrupt layer boundary or boundaries (excluding the lower boundary of a plow layer) not associated with processes that produce diagnostic horizons such as natric, kandic, argillic, fragipan, duripan, petrocalcic, petroferric contact, petrogypsic, placic, or spodic horizons; or
l. A layer of anthropogenically-compacted densic materials or isolated fragments of densic materials; or
m. Random magnetic orientation within the soil matrix of a single horizon or layer; or
n. Irregular distribution of organic carbon not associated with depositional vertical stratification, leaching or podzolization; or
o. Scars or scrape marks left by mechanical tools during excavation or deposition events; or
p. Anthropogenic stratification or disoriented bedding.

Dredgic materials have two or more of the following properties:

a. Artifacts; or
b. Easily weatherable minerals or rock fragments, or masses of soft, secondary minerals that have abrupt contact edges with dissimilar soil material; or
c. Easily weathered masses of soft, secondary minerals rock fragments that occur in common or greater abundance in near-surface horizons; or
d. Freshly fractured rock fragments with splintered or sharp edges; or
e. Random lithochromic mottling; or
f. Masses of contrasting parent materials in the same horizon or layer that have differences in texture, and/or type and percent of rock fragments; or
g. Abrupt layer boundary or boundaries (excluding the lower boundary of a plow layer) not associated with processes that produce diagnostic horizons such as natric, kandic, argillic, fragipan, duripan, petrocalcic, petroferric contact, petrogypsic, placic, or spodic horizons; or
h. A layer of anthropogenically compacted densic materials or isolated fragments of densic materials; or
i. Random magnetic orientation within the soil matrix of a single horizon or layer; or
j. Irregular distribution of organic carbon not associated with depositional vertical stratification, leaching or podzolization; or
k. Scars or scrape marks left by mechanical tools during excavation or deposition events; or
l. Anthropogenic stratification or disoriented bedding.

Garbic materials have ≥ 35% by volume garbic artifacts one or more of the following properties:

a. Easily weatherable minerals or rock fragments, or masses of soft, secondary minerals that have abrupt contact edges with dissimilar soil material; or
b. Easily weathered masses of soft, secondary minerals rock fragments that occur in common or greater abundance in near-surface horizons; or
c. Freshly fractured rock fragments with splintered or sharp edges; or
d. Mechanically abraded mineral grain faces; or
e. Bridging voids between rock fragments; or
f. Randomly oriented rock fragments; or
g. Random lithochromic mottling; or
h. Masses of contrasting parent materials in the same horizon or layer that have differences in texture, and/or type and percent of rock fragments; or
i. Dark colored (value and chroma 3 or less), high carbon rock fragments such as coal or carbonaceous shale; or
j. Abrupt layer boundary or boundaries (excluding the lower boundary of a plow layer) not associated with processes that produce diagnostic horizons such as natric, kandic, argillic, fragipan, duripan, petrocalcic, petroferric contact, petrogypsic, placic, or spodic horizons; or
k. A layer of anthropogenically compacted densic materials or isolated fragments of densic materials; or
l. Random magnetic orientation within the soil matrix of a single horizon or layer; or
m. Irregular distribution of organic carbon not associated with depositional vertical stratification, leaching or podzolization; or
n. Scars or scrape marks left by mechanical tools during excavation or deposition events; or
o. Anthropogenic stratification or disoriented bedding.

Section II. Proposed Uses in Pedon Descriptions and Soil Taxonomy:

A. Description of Artifacts

Artifacts should be described by percent volume or concentration, average size (cm diameter in largest direction), and also as degradable or recalcitrant and as innocuous or noxious artifacts.

1. Texture modifiers for "H" horizons

% volume	Degradable materials	Recalcitrant materials
< 2%	puric	puric
2 to < 15%	slightly garbic	slightly urbic
≥ 15 to 35%	garbic	urbic
> 35% to 60%	†	very urbic
≥ 60%	†	extremely urbic

† Materials with this amount of garbic artifacts are defined as garbic materials. If both urbic and garbic material occur in the same horizon or layer, garbic takes precedence if it makes up more than half of the total volume of artifacts. Puric – (from Latin *purus* pure, fresh, new, unmixed with any other matter, containing nothing that does not properly belong. This human-transported soil or altered rock material contains less than 2% by volume or concentration of any artifact type.

2. Degradable artifacts would be described as coarse fragments similar to how buried logs are treated in organic soils. These artifacts may allow roots to grow into them and they may decompose within a person's lifetime if soil moisture and conditions for microbial growth are present. Recalcitrant artifacts would be described similar to rock and pararock fragments.

3. The percent by volume or concentration of innocuous and noxious artifacts would be estimated.

For example, a sandy loam "H" horizon with 5% by volume of concrete fragments, aluminum, plastic, and bricks would be called an "slightly urbic sandy loam". If that horizon also contained 20% gravel (pararocks or rock fragments) then it would be a "gravelly slightly urbic sandy loam".

B. Family particle-size class

For consideration of family particle-size class, all artifacts that act like coarse or rock fragments plus all natural coarse and rock fragments would be added together to determine if the soil is "skeletal" or not, regardless of which type made up more the majority.

Section III. Proposed Horizon Designations:

Table 2. Comparison between seven different hypothetical natural and anthropogenic soil types, with proposed changes in master letters and suffix designations. Each horizon is 25 cm thick. Human-transported material (HTM) thickness indicated. Changes from the conventional system are shown in bold text. Terms in parenthesis are comments for this letter to indicate > 2% by volume of urbic or garbic materials and are not part of the current system.

Profile 1	Profile 2	Profile 3	Profile 4	Profile 5	Profile 6	Profile 7
"Cropland soil"	"Cut and Fill" urban lawn soil with similar material sources	Urban soil buried by HTM from different material sources	Mine soil with similar spoil material sources	Mine soil with different spoil material sources	Urban soil with asphalt, gravel base, and concrete layers over an excavated soil	Dredged HTM soil mantle over "urbic" and "garbic" materials in a landfill
0 cm HTM	25 cm HTM	75 cm HTM	100 cm HTM	> 150 cm HTM	100 cm HTM	> 150 cm HTM
Example profiles using conventional designations:						
Ap	Ap	A	A	A	A	A
E	Bw1	Bw	AC	AC	Cd1 (asphalt)	Bw
Bt1	Bw2	C (urbic)	Cd1	Cd	Cd2 (gravel bed)	C1
2Bt2	BC	2Ab	Cd2	C1	Ckm (concrete)	2C2 (urbic)
2R	C	2Btb	Cr (or R)	2C2	2Bt	3C3 (garbic)
		3Cr		2C3	2BC	3C4 (garbic)
Master horizon changes: Same example profiles but with "H" master horizon to identify human-transported materials and "M" master horizon to identify root-limiting layers of nearly pure human-manufactured materials.						
Ap	**HA †**	**HA**	**HA**	**HA**	**HA**	**HA**
E	Bw1	**HBw**	**HAC**	**HAC**	**HMd ‡**	**HBw**
Bt1	Bw2	**HC** (urbic)	**HCd1**	**HCd**	**HCd**	**HC1**
2Bt2	BC	A	**HCd2**	**HC1**	**HMm ‡**	**HC2** (urbic)
2R	C	Bt	Cr (or R)	**HC2**	Bt	**HC3** (garbic)
		2Cr		**HC3**	BC	**HC4** (garbic)
Suffix changes: Same example profiles but with the suffix "+" to identify > 2% by volume urbic material content and the suffix "^" to identify > 2% by volume garbic material content.						
Ap	**HA**	**HA**	**HA**	**HA**	**HA**	**HA**
E	Bw1	**HBw**	**HAC**	**HAC**	**HMd**	**HBw**
Bt1	Bw2	**HC+**	**HCd1**	**HCd**	**HCd**	**HC1**
2Bt2	BC	A	**HCd2**	**HC1**	**HMm**	**HC2+**
2R	C	Bt	Cr (or R)	**HC2**	Bt	**HC3^**
		2Cr		**HC3**	BC	**HC4^**

Comments and footnotes: Use of "p" suffix would be redundant in recent deposits of human-transported materials and need not be used with "H" prefix, but would be used in all deeply-mixed (but not transported) horizons such as those in the Arents suborder. Use of "b" would be redundant under human transported materials, so it need not be used under "H" prefix. High content of coarse fragment materials other than artifacts are indicated in the texture name and not by suffixes. The Arabic numeral prefixes are used to indicate significantly different geologic sources or deposition processes within natural soils but would not be needed between different types of HTM materials or between HTM and natural soil horizons or layers. (continued below)

Table 2 Comments and footnotes: (continued)

† The master letter "H" would be used to identify human-transported materials as defined earlier.

\+ Used to identify > 2% by volume urbic material content. An alternative symbol could be the undercase letter "u". Proposed by Stan Buol.

^ Used to identify > 2% by volume garbic material content. An alternative symbol could be the symbol "@" or "~". Proposed by Stan Buol.

‡ Master letter "M" would be used to identify physically root-limiting layers of nearly pure human-manufactured materials such as asphalt, concrete, and geotextile liners. These layers are completely root-limiting as deposited but that property may be lost over time as they weather or are broken, and they may eventually develop into C, B, or A horizons with "+" to indicate any remnant urbic material content. Proposed by Steve Fisher and Luis Hernandez. The "d" and "m" suffix are used to identify the degree of compaction or type of adherence of the particles.

Part 4. Questions and Answers About the Proposals in Part 3

1. Why not describe strongly different types of urbic and garbic materials with different suffix letters or symbols? The intent of this proposal is to keep the existing system in place and to provide simple new identifications for anthropogenic materials, layers, and horizons. Once a layer or horizon has identified as human-transported material with the master letter "H" or that it has undergone extreme mixing from anthropogenic tools with a suffix of "p", the reader should be alerted to refer to the full layer or horizon description and databases carefully to identify its materials and properties. Impervious, physically root-limiting layers and liners would be labeled as M layers.
2. Some anthropogenic soils undergo rapid soil genesis. How does this proposal address the possible reclassification of layers, horizons, and taxa over time? Once they are left in place, anthropogenic soils undergo natural soil genesis and change over time until they reach a dynamic equilibrium. Others are excavated, covered, or mixed and then the processes start again. They may need a new description as would any other transported soil such as a floodplain deposit or a landslide.
3. Concrete and steel weather under different rates in different climates. Thus they may be degradable in one area but recalcitrant in another. How can that be resolved? Some artifacts would be degradable within a few generations or a few hundred years given the proper climate and soil conditions, such as concrete or asphalt in a warm, humid, acid environment. Concrete and asphalt may last a very long time in the desert. Therefore, they could be classified as degradable or recalcitrant by the soil scientist based on professional judgment.
4. Why not use Arabic numerals with "H" horizons to represent discontinuity? The use of Arabic numerals is optional, but all "H" layers and horizons are transported by definition, making it is easily understandable that each layer could be from a different source. The materials and properties are described and documented in full detail elsewhere.
5. Are all suffixes and prefixes allowed with H and M? Yes, but many times they are redundant. For instance, the use of Arabic numeral prefixes and "b" suffixes in natural soil horizons covered by "H" layers is unnecessary.

6. Why not use Greek letters as suffixes instead of symbols? Stan Buol pointed out that most modern correspondence is by computer keyboard, so we used logical choices available on a standard keyboard.
7. Why not use the "p" in all anthropogenic layers and horizons? The use of the "p" suffix is not needed with "H" master horizons because transported material is "mixed" during movement. The "p" is more of a description of a management process rather than of a property or material. It seems more appropriate to use the "p" to identify layers that have been mixed in place as in Arents suborders (see Chapter 11 on the CD-ROM) and use the "H" to identify transportation from an outside source.
8. Why use such a small number like 2 % to indicate presence of artifacts? Artifacts are important in small concentrations because of the potential pollution or health risks involved with many types and because they are used as evidence of anthropogenic processes and materials. Most soil scientists can see 2% by volume easily, and the break already exists in the system to indicate "common" abundance in many descriptions of other features. Concentrations higher than 15% are described as texture modifiers.
9. Why are inorganic and organic artifacts grouped together in urbic materials? This proposal is a simple approach to begin to differentiate soils with artifacts. There may be a need in the future to identify inorganic and organic artifacts separately, but the primary concern was stability of the artifacts in the system and then the potential dangers and risks they impart if deposited in urban areas. The system should be tested in some simple form and then modified as needed to prevent it from becoming so complicated that no attempt is made to use it at all.
10. Why are spolic and dredgic materials separated? They are both moved by humans. (from Delvin Fanning "Things that are important to consider in regard to dredged materials is that they typically have low bulk density and high *n* value when they are deposited. This can lead to a high degree of cracking when they dry out and the soils in them are then likely to qualify for "cracked" families as that term is defined in Soil Taxonomy. Also many dredged materials, but certainly not all, qualify as *sulfidic materials* as that term is defined in Soil Taxonomy"). Thus there are major management and interpretive implications between spolic and dredgic materials because of the nature of their deposition process and inherent properties.

Part 5. Questions for Readers about the Proposals in Part 3

Please respond to the following questions by email with electronic file responses attached or written response (with a copy of the file on disk if possible) to the following questions:

1. Is the highest division of artifacts into degradable and recalcitrant in section I the most logical, objective, and feasible for field surveyors?
2. Would an alternative division at the highest level of organic versus inorganic artifacts be more logical, objective, and feasible for field surveyors? If so, how would you define organic artifacts? Please keep in mind that plastics are made from hydrocarbons and may be considered organic.
3. Would an alternative division at the highest level of innocuous versus noxious artifacts be most logical, objective, and feasible for field surveyors? If so, how would you define innocuous artifacts? Should this separation be made by soil scientists? Please keep in mind that length of exposure, type of exposure, age and type of organism exposed, and quantity of material exposed to have a bearing on the health danger involved.
4. Are the horizon and layer designations in section II logical, objective, and feasible for field surveyors?

5. Can you suggest alternative section II designations that are more logical, objective, and feasible for field surveyors?
6. Are the terms for describing artifact content and kind in section III logical, objective, and feasible for field surveyors?
7. Can you suggest alternative section III Description terms that are more logical, objective, and feasible for field surveyors?
8. Are there other pieces of evidence that can be used to distinguish human-transported materials?
9. Should there be an upper limit on content of artifacts? For example, what texture would you call a horizon with 95% concrete rubble, twisted steel, and bricks?
10. Do you have other comments and suggestions for the proposals in this letter?

Contact Information is found on the web site at http://clic.cses.vt.edu/icomanth and below:

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