3 ICOMANTH Circulars I (1995) to III (1999)

Circular Letter No. 1, August 1995

This is the first circular letter of the International Committee on Anthropogenic Soils (ICOMANTH). Included in this letter are the charges for this committee, summaries of reports from various regional and National Cooperative Soil Survey committees charged with addressing aspects of anthropogenic or disturbed soils, and comments from the chairman soliciting your thoughts and ideas in reaction to several issues that are fundamental to the classification of anthropogenic soils in Soil Taxonomy. The summaries of reports serve as background for work done to date. The issues for discussion define our immediate agenda as we begin developing the classification. I invite your response in reaction to these issues or others that you may identify as critical to the initial stages of developing the classification. I would also appreciate your assistance in identifying names and addresses of others who you think may be interested in participating in the actions of this committee. For now, please direct all responses to me. In the future, Dr. Tom Ammons, of the University of Tennessee in Knoxville TN USA, will be coordinating committee activities related to the classification of soils that have been drastically altered by human activities and Professor Gong Zitong, of the Soil Science Institute in Nanjing CHINA, has agreed to coordinate activities related to the classification of soils that have been altered by long-term agricultural use.

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COMMITTEE CHARGES

ICOMANTH is charged with defining appropriate classes in Soil Taxonomy for soils that have their major properties derived from human activities. The committee should establish which criteria significantly reflect human activities, or when a soil's properties are dominantly the result of human activities. If new classes are to be defined, they should serve a useful purpose.

CHAIRMAN'S COMMENTS

As we begin the process of modifying Soil Taxonomy to better classify Anthropogenic soils, there are some issues related to the fundamental principles of Soil Taxonomy which must be addressed. Since Soil Taxonomy was designed primarily with naturally occurring soils in mind and with a strong agricultural bias, these underlying principles do not always seem consistent with the goals of classifying anthropogenic soils. However, any attempt to modify Soil Taxonomy must adhere as closely as possible to the existing principles in order to maintain the integrity of the system. Any departure must be carefully considered, and the logic for modifying the system must be carefully and completely documented. Discussion of the following issues is proposed as a prelude to constructing classes.

Our Concept of Anthropogenic Soils and Appropriate Categorical Level(s)

Some discussions about anthropogenic soils treat man as a natural part of the ecosystem (the biota factor) and man's activities as soil forming processes. However, many of man's activities are destructive with respect to the ordering of horizon's, i.e. - soil is drastically disturbed and horizonation is set back to (or near) time zero. In many cases the "parent material" is not earthy material that could be observed in landscapes not disturbed by human activity (landfills with garbage near the surface, urban fills containing construction debris, etc.). In one sense, the anthropogenic activity is constructive in that the "parent materials" could not derive from natural processes other than anthropogenic. It has been proposed that these processes are "anthropogeomorphic" processes, whereas human processes that modify existing soil characteristics (such as puddling paddy rice soils) are "anthropogenic" processes. Conceptually, it is

helpful to keep this distinction in mind. However, I believe we are expected to address the classification of soils derived by either of these processes. In any case, the logic of Soil Taxonomy is that the dominant factors (and processes) of soil formation that explain the existing gross morphology are recognized at the highest levels of Soil Taxonomy. In the cases of Andisols and Vertisols, it is parent material that is the dominant factor explaining the gross morphology. There is much debate about whether or not we can adequately classify anthropogenic soils by modifying the existing soil orders or whether a new soil order is needed. The answer would seemingly need to be consistent with the existing logic of Soil Taxonomy, and also allow for an adequate degree of flexibility for showing differences and relationships among anthropogenic soils.

Questions:

1. What is our concept of anthropogenic soils? Does it include soils derived by anthropogeomorphic as well as anthropogenic processes, and how might these different processes be reflected in the classification?
2. What are the major "anthropogeomorphic" and "anthropogenic" processes acting on the land surface, what is their relative significance compared to other processes recognized in Soil Taxonomy, and what are the resultant implications for selecting the categorical levels to be used in classification?
3. How many of the 6 categorical levels in Soil Taxonomy are needed to show relationships and differences among anthropogenic soils?
4. What characteristics of anthropogenic soils or parent materials are of greater or lesser significance than others?

The Soil that We Classify

The pedon and polypedon are defined in Chapter 1 of Soil Taxonomy, and all soil scientists have a working understanding of these concepts. The polypedon is the landscape unit to be classified and the pedon is the unit of sampling that supposedly is representative of the range of characteristics within the polypedon. Natural breaks in the landscape are the more desirable limits of the polypedon as we strive for a system that is most useful for soil survey, but class limits of soil series (including higher class limits, such as family particle size classes, which are also limits for series in a categorical system) may also determine a boundary of a polypedon. In spite of diligent efforts to tailor Soil Taxonomy to fit naturally occurring soil landscapes, we frequently encounter landscapes that cannot be mapped as simple consociations. The dominant characteristic of some anthropogenic soils may well be their variability. Can the concepts of pedons and polypedons be directly applied to anthropogenic soils or should we revisit the definitions in Soil Taxonomy to determine their applicability?

Case example:

Urban fill may or may not be extremely variable in terms of the nature and arrangement of materials. In some cases, layers of materials such as bricks, concrete and rebar, asphalt, coal ash, etc. may be very predictable and mappable. It is conceivable that we may wish to establish series with very limited ranges in characteristics. But we are also certain to find areas of urban fill which are characteristically unpredictable. Must we continue to handle these situations at the mapping level by treating them as complexes, or might higher classes be established specifically for these soils where the nature and arrangement of materials are virtually unpredictable? Such classes might then be further differentiated on the basis of other important properties such as wetness, presence or absence of certain types of materials, etc.

Questions:

1. How do we deal with the variability of anthropogenic soils in our classification scheme? Is variability in and of itself a highly significant characteristic that can be used as criteria for a class?
2. What is our unit of classification? Are we concerned in all cases with the mappability of our classes where accommodating variability is of major concern, or will the system also be used on a site-by-site basis where specificity of information is most desirable?

The 2 Meter Rule

In some cases, the reason for wanting to differentiate among anthropogenic soils derives more from the nature of the substratum that it does from the nature of the material in the "soil zone", and we commonly have knowledge of the substratum that would allow classification based on the nature of those deeper materials. In recent years there has been a move to expand our lower depth of mapping (and classification?) of naturally occurring soils and geological deposits in response to the acknowledged need for more information. Our best chance for success in classifying to lower depths would seem to be in anthropogenic soils where we have historical knowledge of the nature of the substratum. Can we really form desired groupings of soils without taking into consideration the nature of the substratum?

Case example:

An unregulated landfill on Staten Island, New York has a thin cap of "soil" cover over urban garbage. Over most of the landfill, one can readily observe urban waste within the 2 meter zone. The major limitations to use and management are the evolution of methane gas and settling as a result of waste decomposition. The long range plan for use of the landfill is as a city park. In one area, an additional 2 meters or more thickness of clean fill has been added and a ball field was constructed. Assuming that we had classes designed to differentiate between landfills containing garbage and soils forming in clean fill (i.e. - fill derived from soil or geologic material not containing trash and which may be suitable for home construction), how would we handle this case?

Questions:

1. To what depth do we classify anthropogenic soils when the main reason for differentiating soils may be the nature of the substratum?
2. How would we implement different rules for classifying anthropogenic soils to greater depths without affecting additional changes in Soil Taxonomy?

Knowledge of Genesis vs. Morphology-based Criteria

At the higher categories in Soil Taxonomy, classes are formed to group soils in order to reflect their genesis. Our theories of genesis govern the groupings and reflect our current state of knowledge about soils and the factors and processes of formation. Since our state of knowledge is never complete, we guard against biasing our classification by requiring that criteria for classification be based on morphological characteristics that can be observed or measured by laboratory or field techniques. In following the strict rules for classifying soils according to their morphology, we frequently discover that some soils make odd bedfellows. That may lead us to conclude that our current concepts of genesis may be flawed. Hence, Soil Taxonomy becomes a valuable research tool to assist us in improving our knowledge of soils and their genesis. It would not be so if we allowed our current bias with respect to mode of genesis to enter into the classification process. Grouping soils according to theories of genesis at the higher categories and using morphology-based criteria are fundamental principles that guided the construct of Soil Taxonomy.

In the vast majority of cases of anthropogenic soils, the anthropogenic processes resulting in the present expression of morphology are a matter of historical record. There may be absolutely no uncertainty with respect to the anthropogenic processes of development or modification which led to the

current soil morphology. Why then should we constrain ourselves from using that knowledge to form groups of soils with similar genesis? What rationale would there be for ignoring historical record? This becomes especially relevant when there may be no reliable morphological indicators that can be consistently applied to identify the genetic processes. There are many soils for which this is the case.

Case example:

In China, there are soils that have formed by deposition of sediments as a result of long-term irrigation. The morphology (and in a sense the process of formation) of these soils is identical to that of a Fluvent. But these soils may occur on a terrace or upland position where their presence in clearly "not natural" (i.e. - anthropogenic). They do not conform to the ecology of the landscape. In natural landscapes, the presence of Entisols may be due to recent deposition by geologic processes indicating a geologically active environment, resistance of the parent material to weathering and soil development, etc., but they occur in predictable landscape positions. To the Chinese, this anthropogenic "Fluvent" is not the same as a naturally occurring Fluvent. Yet there are no morphological clues as to the difference.

Questions:

1. Do we want to alter the principles of Soil Taxonomy to allow the use of historical knowledge as criteria for classifying anthropogenic soils?
2. If not, what is our rationale for ignoring historical knowledge of anthropogenic processes?
3. If so, how can this be accomplished with a minimum disruption of the rest of the system?

Properties of Anthropogenic Soils with High Levels of Significance:

Any subdivisions of anthropogenic soils within Soil Taxonomy should be based on properties of greatest significance to their genesis in the higher categories and on properties of greatest significance to use and management in the lower categories. Most current and evolving systems differentiate on the basis of the nature of the "parent material" as one of the properties of highest significance. But what other properties of anthropogenic soils are highly significant? An aquic moisture regime (and its modifications, i.e. -- aeric, epi, endo, etc.) is a highly significant property to both genesis and use and management in existing soil orders, but how important is it in anthropogenic soils? How should anoxic conditions due to methane gas be treated? How important is bulk density (and/or porosity)? For all of these properties and others, are there morphological properties that can be used to consistently and reliably identify the condition, and can they be used in mapping?

Questions:

1. What are the properties of anthropogenic soils that are of greatest significance to genesis and use and management?
2. What are the morphological characteristics that identify these conditions, and can they be consistently identified in the field during mapping?

Constructive vs. Destructive Anthropogenic Processes

It is relatively easy to envision classes of anthropogenic soils forming in anthropogenic parent materials. Criteria can be based at least in part on morphology. But how do we address anthropogenic processes that result in the removal of soil material? By some of the logic above, what is not there due to the activities of man may be as important (at least conceptually) as what is put there by the activities of man. A borrow pit formed by the removal of gravel or caliche is as readily identified as a landfill and is as much "out of place" in the ecology of the landscape. If we allow the use of historical knowledge, it would not be difficult to construct classes for these situations. But the difficulty may lie in determining how much soil must be lost before we begin to recognize the effects of anthropogenic processes. A recent DRAFT of a revised definition of a buried soil is appended. Classification of anthropogenic soils may begin when the thickness of a surface mantle of new material (of anthropogenic origin) effectively buries

the underlying soil. But how much soil must be lost before the rules of classifying anthropogenic soils are invoked? It has been proposed that this committee address the issue of eroded Mollisols. Is accelerated erosion an intergrade to soils where removal was affected by other anthropogenic processes? If so, how do we treat it within the context of Soil Taxonomy?

Questions:

1. Do we treat the loss of soil by anthropogenic processes similarly to the way we treat the accumulation of soil materials by anthropogenic processes?
2. If so, how do we define the degree of anthropogenic modification based on what is not there?

Intergrades to Other Classes

The previous discussion touched on the issue of defining intergrades between anthropogenic soils and other classes. There are other situations in which anthropogenic processes affect changes in classification within Soil Taxonomy. How do we address the agricultural liming of an Ultisol to the point that it classifies as an Alfisol? What about the Mollisol that no longer meets the color requirements of a Mollic epipedon due to the incorporation of carbonates by deep plowing? I believe we are expected to address soils in California that are drastically disturbed by "deep" plowing. How deep is deep? Are salinization and desalinization, due to irrigation, anthropogenic processes that should be addressed by this committee? The point here is that Soil Taxonomy was designed so that "normal agricultural practices" would not change the classification of a soil. But "normal agricultural practices" of the day have changed, and they do in fact cause changes in taxonomic classification. By expressly recognizing anthropogenic processes in Soil Taxonomy, we will be forced to define degrees of anthropogenic modification which are expected to grade into other classes of soils having insignificant anthropogenic modification.

Questions:

1. How do we define significant modification due to anthropogenic processes to distinguish anthropogenic soils from other soils that have been modified by "normal agricultural practices", and how do we form intergrades to soils less affected by anthropogenic processes?
2. How do we apply rules that we may design for specific use in classifying anthropogenic soils (e.g., use of historical knowledge) within the context of other classes of Soil Taxonomy in order to form intergrades?

Closing Statement

After reading and contemplating these comments, I invite you to comment on any or all of these issues. A good first step would be to compile case examples of soils modified by or derived from human processes, and I would appreciate brief descriptions of human activities that result in altered soils which you feel should be included in our deliberations. I would also like your suggestions or proposals for specific classes of anthropogenic soils complete with definitions of the classes similar to what appears in Soil Taxonomy in the introduction of every class at any categorical level.

Appended Items

Draft definition of "buried soils"
Summary report of Drastically Altered Soil Committee, Midwestern/Western Regional Cooperative Soil Survey Conference, 1994
Summary report of Drastically Altered Soils Committee, Northeastern/Southern Regional Cooperative Soil Survey Conference, 1994

SUMMARY OF RESPONSES TO CIRCULAR LETTER NO. 1

There were only two responses to the questions posed in Circular Letter #1. Several people sent in publications and minutes of meeting (see Reference list), rather than responding to the questions in the circular. Copies of those references are available upon request through Dr. Bryant.

Our concept of Anthropogenic and appropriate categorical levels

Question 1. What is our concept of Anthropogenic soils?

DICK CLINE - Exclude eroded soils because this can happen without human influence, even though in some cases human may be the primary cause. A soil is Anthropogenic if the subsoil is dominated by properties directly or indirectly related to human activity. Geomorphic disturbances are striking examples of human activity, and warrant inclusion. Considering Anthropogenic and Anthropogeomorphic soils at the order level would follow the current use of organisms and parent material to define orders.

STAN BUOL - Paddy soils should be extragrades at the subgroup level after the appropriate great group has been identified.

Question 2. What are the major "Anthropogenic" and "Anthropogeomorphic" processes acting on the land surface, what is their relative significance compared to other processes recognized in Soil Taxonomy, and what are the resultant implications for selecting the categorical levels to be used in classification?

DICK CLINE - The same groups of processes used in natural soils apply to Anthropogenic soils (additions, losses, transformations, and translocations). In Anthropogenic soils, additions would be the most frequent processes for defining subsoil horizons, rather than translocations and transformations.

Question 3. How many of the six categorical levels in Soil Taxonomy are needed to show relationships and differences among Anthropogenic soils?

DICK CLINE - They should be brought in at low enough levels to show Anthropogenic influence but retain the gross genetic development at higher levels. The great group level is not sufficient to allow enough "information spaces" for soil survey users. Recognition at the order level would separate these soils from the Entisols, whose major distinction is an absence of distinctive characteristics.

Question 4. What characteristics of Anthropogenic soils or parent materials are of greater or lesser significance than others?

DICK CLINE - The characteristics that carry interpretive value are of greater importance. The significance of these being Anthropogenic soils is of lesser importance. In addition to traditional properties, Anthropogenic soils should include more intensive focus on hazardous materials and conditions, plant-soil relationships, and ecosystem relationships such as nutrient/cycling and microbial activities. It would be important to characterize transient properties such as herbicide/organic compounds, levels of toxins, soil gases, and organism content. Radioactivity and artifact content should be described.

STAN BUOL - Our users care more about "what it is" rather than "how it got there."

The soil that we classify

Question 1. How do we deal with the variability of Anthropogenic soils in our classification scheme? Is variability in itself a highly significant characteristic that can be used as criteria for a class?

DICK CLINE -Variability among the major types of disturbance could possibly be used at the suborder level.

Question 2. What is our unit of classification? Are we concerned in all cases with the mapability of our classes -.?

DICK CLINE - The unit of classification will need to be reevaluated, and should be mapable in some fashion at several scales of mapping.

The 2 meter rule

Question 1. To what depth do we classify Anthropogenic soils when the main reason for differentiating soils may be the nature of the substratum?

DICK CLINE - A greater depth should be addressed for all soils.

STAN BUOL - Let's leave the 2-meter soil as a strata and add information on the lower material as a separate layer in all soils.

Question 2. How would we implement different rules for classifying Anthropogenic soils to greater depths without affecting additional changes in ST? No responses.

Knowledge of genesis vs. morphology-based criteria

Question 1. Do we want to alter the principals of Soil Taxonomy to allow use of historical knowledge as criteria for classifying Anthropogenic soils?

DICK CLINE - It does not make sense to discard historical knowledge in any scientific investigation. Recognition of historical information is essential in providing maps and interpretations for Anthropogenic soils. Soil Taxonomy is explicitly designed for developing maps and interpretations, so we are not "altering" Soil Taxonomy principals to allow use of historical knowledge.

Question 2. If not, what is the rationale for ignoring historical knowledge of Anthropogenic activities?

DICK CLINE - Historical knowledge is independent and we have no way to apply the scientific method to testing our taxonomic concepts.

STAN BUOL - Historical kno0wledge should not shape our classes unless we can clearly identify properties in the field to support the classification. Historical records are hard to apply uniformly.

Question 3. If so, how can this be accomplished with a minimum disruption of the rest of the system?

STAN BUOL - Consider morphological and/or chemically defined subgroup extragrades.

Properties of Anthropogenic soils with higher levels of significance

Question 1. What are the properties of Anthropogenic soils that are of greatest significance to genesis and use and management?

DICK CLINE - See earlier answers.

STAN BUOL - Ranges of aquic conditions, gas production potential, heavy metal content.

Question 2. What are the morphological characteristics that identify these conditions, and can they be consistently identified in the field during mapping?

DICK CLINE - Unusually high Phosphorous levels is already in Soil Taxonomy. High P levels seem to be difficult to apply with any reliability. Seems to require prior knowledge from independent differentia. See earlier answers for more information.

Constructive vs. destructive Anthropogenic activities

Question 1. Is accelerated erosion an intergrade to soils where removal was affected by other Anthropogenic activities? Do we treat the loss of soil by Anthropogenic activities similarly to the way we treat the accumulation of soil materials by Anthropogenic activities?

DICK CLINE - Relational properties of soils determined by comparative study should be used at a high level because these properties will be our first indication of human disturbance.

STAN BUOL - Yes, because both constructive and destructive processes produce a "new" 2-meter volume.

Question 2. If so, how do we define the degree of Anthropogenic modification based on what is not there?

DICK CLINE - The degree of modification should be based on comparative study of adjacent natural soils.

STAN BUOL - We can never be sure about the properties of soil that is no longer in place.

Intergrades to other classes

Question 1. How do we define significant modification due to Anthropogenic activities to distinguish Anthropogenic soils from other soils that have been mod by "normal agricultural practices", and how do we form intergrades to soils less affected by Anthropogenic activities?

STAN BUOL - If a 2-meter volume is replaced, identify the new material.

Question 2. How do we apply rules that we may design for specific use in classifying Anthropogenic soils within the context of other classes of Soil Taxonomy in order to form intergrades?

DICK CLINE - Require that 60% or more of pertinent subsoil properties have been created by human disturbance in order to be placed into a new order. Lower levels of disturbance would form intergrades. We also could expand the definition of Anthropic epipedon and Anthric saturation to form intergrades at Great Group and Subgroup levels.

STAN BUOL - Use broadly defined extragrades in existing orders.

International Committee on Anthropogenic Soils (ICOMANTH)

Circular Letter No. 2

Aug. 1, 1997

CHARGES: ICOMANTH is charged with defining appropriate classes in Soil Taxonomy for soils that have their major properties derived from human activities. The committee should establish which criteria significantly reflect human activities, or when a soil's properties are dominantly the result of human activities.

NOTE: There is a new ICOMANTH Web site at the following WWW URL address: http://wwwscas.cit.cornell.edu/icomanth[1]

In August 1995, ICOMANTH chairman Dr. Ray B. Bryant of Cornell University mailed out Circular Letter No. 1. The circular contained some background material concerning ICOMANTH and the study of soils where humans have profoundly affected formation or existing morphology. Dr. Bryant posed seven conceptual questions concerning Anthropogenic soils. Included in this 2nd Circular Letter are:

Responses to the question areas from Circular Letter No. 1
Examples of effects of humans on soils
Terms to describe human activities and human-modified materials
A brief history of the ways that human modified or transported soils have been recognized in Soil Taxonomy
Conceptual questions for the committee members.

Committee members and other interested persons are asked to do the following:

1. Carefully review the questions and proposals and submit comment by 9/31/97.
2. Persons interested in serving on a subcommittee proposing diagnostic horizons and definitions should reply to Dr. Bryant by 12/1/97.
3. Please submit copies (electronic if possible, hardcopy if not) of lab and description data of Anthropogenic soils and soil materials to Dr. Bryant beginning 8/1/97.
4. Please submit copies of slides (electronic if possible) or prints of Anthropogenic soils and soil materials to Dr. Bryant beginning 8/1/97.

Dr. John M. Galbraith
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Members may forward this letter to others who would like to be placed on the ICOMANTH mailing list.

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HUMAN MODIFIED AND HUMAN TRANSPORTED SOILS

(1) Some Anthropogenic activities that have profound affect on soils, soil formation, and landform creation or removal. There are fewer and fewer places on earth where humans have not disturbed, transported, or modified the soil in some manner. The soil and landform modifications by humans that are

[1] This is the old address. The new address is **http://clic.cses.vt.edu/icomanth/**.

not practically reversed and produce long-lasting effects that can be consistently identified by different scientists are distinguished in Table 1. Other activities either have unknown effect, cannot be easily quantified or distinguished, or can be easily reversed to restore previous soil properties.

Table 1. The effects of some Anthropogenic activities on soils

Long-term effects
deposition of dredged sulfidic material in oxidizing landform positions
exposure of sulfidic material to oxidation by excavation or deposition
accelerated erosion of cropland by wind and water
accelerated erosion of rangeland by wind and water
land filling with transported soil and/or rock
land filling with debris, refuse, waste, scrap, and ash
land filling with dredged sediments
land leveling of soils
land leveling for irrigation
removal and filling of soil and rock during excavation
mass movement (slippage, landslides) after human landscape modification
surface removal (removing topsoil or organic material such as peat)
changing surface texture by conventional plowing
changing surface reaction by conventional plowing (calcification)
destroying shallow (<18cm) diagnostic horizons by conventional plowing
contamination by airborne heavy metals
contamination by heavy metal or radioactive additives and spills
contamination by inorganic chemicals or organic pollutants or toxins
deep plowing that destroys diagnostic horizons
deep mixing of shallow diagnostic horizons during logging operations
addition of asphalt layers or synthetic water barriers and landfill liners
severe compaction by machinery during filling
severe surface compaction by machinery or human traffic
sedimentation in fields by soil material from human caused accelerated erosion
sedimentation in floodplains by material from human caused accelerated erosion
eolian deposition of soil material from human caused accelerated erosion
sedimentation in fields from frequent irrigation
reduction/illuviation/oxidation of Fe and Mn by artificial saturation (paddy soil)

Site and soil-dependent effects

liming by chemical or mineral additives to offset natural acidification
addition of chemicals or minerals that acidify soils
addition of air pollutants that result in acid rain
artificial drainage of sulfidic material that results in extreme acidification
prevention of frequent flooding
artificial flooding or raising of shallow water tables by water impoundment
creation of sodic or natric soils by alteration of natural drainage or irrigation

Short-term or reversible effects

recycling of soil fertility by slash/burn rotational farming
changing surface compaction, structure by conventional plowing
loss of surface organic matter (increased oxidation, loss by erosion)

loss of soil fertility (exportation in crops, loss by erosion)
changing soil fertility by fertilizing
artificial drainage of soil
creation of saline seeps
alteration of runoff by ditching or terracing

(2) Proposed Terms to Describe Human Activities and Products

Anthropogenic (also appears as Anthrogenic in some papers) **activities** - Human actions that control soil forming processes. Examples are: excavation and deposition of soil and rock, contamination with pollutants, long term alteration of soil reaction by liming, artificial flooding, long term drainage alteration, long term protection from natural flooding, mechanical mixing and soil compaction, and accelerated erosion.

Excavation – the removal of rock and earthy material. Removal of more than 50 cm by human activity or machinery constitutes creation of an artificial landform.

Anthropic deposition – the deposition, reclamation, or replacement of artifacts, rock, organic and mineral soil material. Deposition of more than 50cm constitutes
creation of an artificial landform.

Artificial landform - an area in the landscape as large or larger than a polypedon that has evidence of mining or reclamation, excavation more than 50cm deep, or Anthropic deposition more than 50cm thick. Evidence may be morphological, chemical, mineralogical, historical, or comparative polypedon/landform study.

Anthropogeomorphic (appears as Anthrogeomorphic in some papers) **activities** - Excavation and Anthropic deposition (cutting, filling, and leveling) that results in alteration of the shape of a natural landform or creation of an artificial landform.

Anthropoturbation - mixing of different horizons or mixing within a horizon that occurs because of human activity or machinery. (a type of Anthropopedogenesis).

Anthropoturbated material - organic material, artifacts, soils, or rocks with evidence of being mixed by human activity or machinery.

Artifacts - human altered material such as coal ash, iron ore slag, asphalt, human refuse such as garbage or sewage sludge, human processed natural materials such as lumber, and human manufactured material such as plastic, fiberglass, brick, cinder block, concrete, iron and steel, organic byproducts, and other building debris. Garbage or refuse fragments include: food and household cooking waste, soiled rags and paper cleaning products, broken household objects, empty glass, paper, and plastic containers and bags, mail, magazines, and newspapers, and simple household construction materials normally disposed of by homeowners and transported to dumps and landfills.

Anthropotransported material - Artifacts deposited on the landscape; and manure, soil, and rock with evidence of being transported by human activity or machinery, including dredged sediment and sediment in irrigation water.

Anthric (Anthropic) saturation - (already in Soil Taxonomy) episaturation by human-controlled flooding or irrigation which results in reduction and oxidation of iron and manganese compounds and long term changes in soil properties (Anthraquic conditions), a type of Anthropopedogenesis.

Artificial drainage - lowering of a ground water table.

Anthropic compaction – the reduction in the volume of pores per unit mass of soil by human activity or machinery. (a type of Anthropopedogenesis)

Anthropocompacted material - material with reduced volume of pores per unit mass of soil as a result of human activity.

(3) Current Diagnostic Horizons, Properties, And Characteristics in Soil Taxonomy That Describe the Effects of Anthropopedogenesis and Anthropogeomorphogenesis

Soil Taxonomy recognizes human effects on the soil with Anthropic and Plaggen epipedons, the Agric diagnostic horizon, and the Anthraquic conditions diagnostic characteristic. Cambic horizons develop within decades in some transported soils, Sulfuric horizons and sulfidic material occur in mine spoil and dredged sediment, and humanly compacted material may qualify as densic material, although these differentiae are not restricted to human-affected soils (Engel and Ahrens, 1997). The "Verm" (wormholes) great groups also may represent the affect of long term human cultivation. Soil material recently transported by humans may be described as a mantle of new material above buried soils.

The classes that exist in the 8th Ed. of Soil Taxonomy and those officially proposed occur in Table 2. In addition, USDA-NRCS Soil Taxonomy Staff (Engel, 1997 unpublished data) has suggested modification of the Plaggepts suborder.

Table 2. Classes In Soil Taxonomy That Identify Anthropogenic Soils

Page	Intergrade/Extragrade	Order	Suborder	Great Group	Subgroup
101	-	Alfisols		Agrudalfs	Typic (provisional)
120	E	Alfisols		Paleudalfs	Anthraquic
181	E	Andisols		Hapludands	Anthraquic
187	E	Andisols		Melanudands	Anthraquic
229	-	Aridisols		Anthracambids	Typic
269	-	Entisols		Torriarents	-
269	I	Entisols		Udarents	Alfic
269	I	Entisols		Udarents	Ultic
269	I	Entisols		Udarents	Mollic
269	-	Entisols		Udarents	-
269	-	Entisols		Ustarents	-
269	I	Entisols		Xerarents	Alfic
270	-	Entisols		Xerarents	-
(proposed)	I	Entisols		Torriarents	Sodic
(proposed)	I	Entisols		Torriarents	Duric
(proposed)	-	Entisols		Torriarents	Haplic
(proposed)	-	Entisols		Udarents	Haplic
(proposed)	-	Entisols		Ustarents	Haplic
(proposed)	I	Entisols		Xerarents	Sodic
(proposed)	I	Entisols		Xerarents	Duric
(proposed)	-	Entisols		Xerarents	Haplic
275	E	Entisols		Torrifluvents	Anthropic
279	E	Entisols		Ustifluvents	Anthraquic
290	E	Entisols		Ustorthents	Anthraquic
301	I	Entisols		Udipsamments	Plaggeptic
347	E	Inceptisols		Eutrochrepts	Anthraquic
353	E	Inceptisols		Ustochrepts	Anthraquic
361	-	Inceptisols	Plaggepts	-	Typic (provisional)
441	E	Mollisols		Haplustolls	Anthraquic
507	I	Spodosols		Fragiaquods	Plaggeptic
512	I	Spodosols		Haplohumods	Plaggeptic
513	I	Spodosols		Alorthods	Plaggeptic
514	I	Spodosols		Fragiorthods	Plaggeptic
534	E	Ultisols		Kandihumults	Anthropic
535	E	Ultisols		Kanhaplohumults	Anthropic
550	E	Ultisols		Paleudults	Anthraquic

(4) The Major Types of Anthropogenic Soils

Several major types of Anthropogenic soils have become apparent. Deeply mixed or plowed soils have mechanical disturbance that has destroyed all or most of the diagnostic horizons. Paddy soils have artificial saturation and have been puddled with profoundly accelerated natural eluviation and illuviation processes (Anthraquic conditions). Long-term cultivation, improper logging practices, and overgrazing

produce soils with accelerated erosion and nearby deposition. Long term cultivated and irrigated soils in arid areas have uncharacteristically dark surface horizons. In humid areas, long-term cultivated soils may have subsoils with profoundly accelerated natural eluviation (Agric horizons) or uncharacteristically high reaction, Phosphorous, and wormhole content. Soils with buried artifacts, thick mantles of human transported material and deeply excavated surfaces occur in many urban and intensively cultivated regions. Polluted soils have unnatural concentrations of heavy metals, organic compounds, or radioactivity.

The major soil-forming factors associated with all Anthropogenic soils are human activity and parent material. In mixed soils, genetic horizons are combined, thus undoing the work of previous soil genesis. In heavily amended soils, the effects of previous leaching and weathering are reversed. For many transported soils, the genetic time clock is reset by exposure of unweathered natural and manufactured material at or closer to the surface.

Anthropogenic soils may have physical evidence of their transportation or excavation, or they occur on artificial landforms. Many Anthropogenic soils in urban environments contain artifacts, garbage, building debris, natural genetic soil fragments in unnatural arrangement, irregular Carbon distribution, buried genetic horizons, or lithologic discontinuities that mark the depth of their alteration or deposition. Deeply mixed soils on natural landforms in agricultural environments retain fragments of natural genetic horizons arranged in unnatural patterns or positions. Chemically modified or limed soils show uncharacteristic reaction, fertility, high radioactivity, chemical toxicity to humans or organisms, heavy metal concentration, or base saturation compared to nearby soils. Some continuously plowed soils show accumulations of illuviated material directly below the plow layer. Paddy soils and some irrigated soils show Anthraquic conditions (uncharacteristic accumulations of illuviated Fe and Mn directly below the saturated or puddled layer).

Several other recent papers have suggested major types of Anthropogenic soils and Anthropopedogenetic activities (Fanning and Fanning, 1989; Eswaran, 1997, unpublished data; Zitong, 1994; Kosse, 1995, unpublished data). Copies of these papers may be obtained from the ICOMANTH Web page or by request to Dr. Bryant.

Questionnaire #2 for the Members of ICOMANTH

Please mark an answer to the following questions and return by mail to Dr. Bryant at the address below. Additional comments for any of these questions may be submitted by Email or in a word-processor computer file to Dr. Bryant. Please use the same numbering system as the questions below.

Dr. Ray B. Bryant, ICOMANTH Chair
Dept. Soil, Crop, & Atm. Sciences
Rm 709 Bradfield Hall, Tower Road
Cornell University
Ithaca, NY 14853-1901 USA

1. In reference to the ICOMANTH committee charges as stated at the beginning of this circular letter, do you agree that Soil Taxonomy needs to be modified by the addition of new classes for recognizing soils modified by human activities? ___Yes ___No

2. If you answered "yes" to question #1, at what categorical level should the following profoundly modified soils be recognized? (Fill in the blank with O for order, SO for suborder, GG for Great Group, SG for Subgroup, F for family, and SE for series)
   mine spoil (reclaimed) ____
   mine spoil (unreclaimed) ____
   andfill cover over garbage ____
   paddy rice soils ____
   clean fill (no artifacts) ____
   urban spoil (coal ash, rubble, etc.) ____

radioactive or metal contaminated ____
severely eroded from cultivation ____
sulfidic fill (mine spoil or dredged) ____
deeply mixed soils (> 50 cm) ____
highly enriched subsoils (liming) ____
excavated areas and pits ____
Agric elluviated subsoil horizons ____

3. If you answered "yes" to question #1, please indicate whether the following criteria are important reasons for defining new classes:
   a. Natural geomorphic processes do not result in the soil being where it is. ___ Yes ___No
   b. There is pressure from users for more detailed soil information. ___Yes ___No
   c. There are a significant number of acres. ___Yes ___No
   d. The soil has a significant content of manufactured/processed materials. ___Yes ___No
   e. The soil is drastically polluted and is potentially toxic to humans. ___Yes ___No
   f. The soil occurs in a deeply excavated or thickly filled area. ___Yes ___No
   g. Historical evidence proves recent deposition or drastic alteration. ___Yes ___No
   h. To provide a basis for collection and analysis of data for research. ___Yes ___No
   i. To provide a language for educational purposes. ___Yes ___No
   j. The soil properties have archaeological significance. ___Yes ___No

4. Do we have enough data and representative pedons to propose classes? ___Yes ___No

5. Must we have a representative soil before adding classes? ___Yes ___No

6. A technical classification involves classes defined primarily on important use and management criteria. The most similar example in Soil Taxonomy is the family level classes and some soil series criteria (Phase criteria are similar, although not a part of Soil Taxonomy). For example, in reclaimed mine soils, density of the material, pH, electrical conductivity, and organic carbon content are very important to restoration of vegetation. A technical classification would set up classes based on specific limits derived from practical experience of mine reclamation specialists. A morpho/genetic system is more similar to the classes above the family level in Soil Taxonomy, based on genetic properties and use and management considerations. If you think ICOMANTH should propose new classes for Soil Taxonomy, should they propose
   ____A technical classification or a ____ A morpho/genetic system?

7. Must all diagnostic evidence for Anthropopedogenesis come from within the pedon or can we use other evidence to classify and identify pedons? __Yes ___No

8. If you answered "no" to question #7, which of these may be used as evidence?
   a) written/published historical evidence? ___Yes ___No
   b) geomorphology (Identification of distinct artificial landforms)? ___Yes ___No
   c) comparative landform/soils study? ___Yes ___No

9. Can we agree on which human activities are significant soil-forming factors?
   (Mark your additions/deletions on Table 1 and return them to Dr. Bryant)

10. Soil horizons and layers formed in Anthropotransported material should have a separate designation to notify the users of soil information.
   a) Should it be a prefix, such as used to separate different geologic deposits? ___Yes ___No
      What prefix should it be? _____

b) Should it be a suffix, such as used to separate different horizon features?___Yes ___No
What suffix should it be? _____

c) Should it be a master horizon, such as used to separate water or rock?___Yes ___No
What letter should it be? _____

11. If you answered "yes" to question #1, which of these epipedons may we allow to form in artifact free, uncontaminated Anthropotransported material?
___ Histic? ___ Mollic? ___ Melanic? ___ Ochric? ___ Umbric?

12. If you answered "yes" to question #1, which of these epipedons may we allow to form in Anthropotransported material with artifacts or contaminated?
___Histic? ___ Mollic? ___ Melanic? ___ Ochric? ___ Umbric?

13. Should all Anthropotransported material be considered part of a "mantle of new material" in the definition of buried soils? ___Yes ___No

14. Should rarely but deeply mixed soil (> 50 cm) be treated like a mantle of new material?
___Yes ___No

15. Should the definition of buried soils be simplified so that the minimum depth for identification of new material mantles is standardized to 50 cm, rather than the "sliding scale" of 30 to 50 cm as it is now? ___Yes ___No

16. A mantle of new material is diagnostic to identification of a buried soil. Should the mantle be moved up in status from within the definition of buried soil to be a recognized diagnostic surface layer, separate from the epipedons? ___Yes ___No

17. Should a key to identify buried soils be formally included in the Key to Soil Orders, since it is used to determine the material to be identified? ___Yes ___No

18. Can we agree on the following changes to family classes?
a. Coal ash and Iron-ore slag will be similar to volcanic cinders for determining substitute particle-size classes. Can we add coal ash and Iron-ore slag in the lists with cinders?
___Yes ___No
b. Can we define the following as rock fragments: concrete, brick, iron, steel, bronze, copper, other metals, carpet (synthetic organic-based clothing and building materials), asphalt, gypsum board, Styrofoam, cinder blocks, glass, plastic, etc. ___Yes ___No (Edit the list)
c. Where soil moisture is available, these materials will quickly fall under the attack of fungi and microorganisms and will allow root penetration and will hold some amount of moisture, just like wood fragments in a Histosol. (NOTE: these may act more like rock fragments in arid moisture regime and pergelic temperature regime). Should we define the following as coarse fragments or pararock fragments: wood, cardboard, paper, cotton clothing, etc. ___Yes ___No

Responses to ICOMANTH Questionnaire #2
Compiled 12/18/97 by Dr. John M. Galbraith, Cornell University

1. It was agreed upon that Soil Taxonomy needs to be modified by the addition of new classes for recognizing soils modified by human activities.
2. The following criteria were voted important reasons for defining new classes:
a. There is pressure from users for more detailed soil information
b. There are a significant number of acres

c. The soil has a significant content of manufactured/processed materials
d. The soil is drastically polluted and is potentially toxic to humans
e. The soil occurs in a deeply excavated or thickly filled area
f. Historical evidence proves recent deposition or drastic alteration
g. To provide a basis for collection and analysis of data for research
h. To provide a language for educational purposes

Comment: To provide correct interpretations was also mentioned.
The following criteria received divided opinion:
a. Natural geomorphic processes do not result in the soil being where it is
b. The soil properties have archaeological significance

3. We do not have enough data and representative pedons to propose classes. Comments: We have solicited lab and descriptive data from all sources in order to build a database for Anthropogenic soils.
4. We must have a representative soil before adding classes.
5. A technical classification that would set up classes based on specific limits derived from practical experience of specialists was suggested by half the respondents. A morpho/genetic system based on morphologic or genetic soil properties were suggested by half the respondents.
   Comments: A technical system may be more appropriate for soils with artifacts, contamination, or garbage. A morpho/genetic system may be better for the other types of Anthropogenic soils.
6. Must all diagnostic evidence for Anthropopedogenesis come from within the pedon? Half the respondents said Yes.
7. Can we use other evidence to classify and identify pedons? Half the respondents said Yes. They thought written/published historical evidence and comparative landform/soils study could be used as evidence, but not geomorphology (Identification of distinct artificial landforms).
8. The following tables separate the significance of human effects on soil formation or soil parent material formation:

Significant effects and actions

- Deposition of dredged sulfidic material in oxidizing landform positions
- Exposure of sulfidic material to oxidation by excavation or deposition
- Accelerated erosion of cropland by wind and water
- Land filling with transported soil and/or rock
- Land filling with debris, refuse, waste, scrap, and ash
- Land filling with dredged sediments
- Land leveling of soils
- Land leveling for irrigation
- Removal and filling of soil and rock during excavation
- Changing surface reaction by conventional plowing (calcification)
- Deep plowing that destroys some or all diagnostic horizons
- Severe compaction by machinery during filling
- Sedimentation in fields by soil material from human caused accelerated erosion
- Eolian deposition of soil material from human caused accelerated erosion
- Sedimentation in fields from frequent irrigation
- Reduction/illuviation/oxidation of iron and manganese by artificial saturation (paddy soil)

Effects and Actions with Uncertain Significance

- Contamination by airborne heavy metals
- Contamination by heavy metal or radioactive additives and spills

- Contamination by inorganic chemicals or organic pollutants or toxins
- Deep mixing of shallow diagnostic horizons during logging operations
- Addition of asphalt layers or synthetic water barriers and landfill liners
- Severe surface compaction by machinery or human traffic
- Sedimentation in floodplains by material from human caused accelerated erosion
- Accelerated erosion of rangeland by wind and water
- Liming by chemical or mineral additives to offset natural acidification
- Mass movement (slippage, landslides) after human landscape modification
- Surface removal (removing topsoil or organic material such as peat)
- Artificial drainage of sulfidic material that results in extreme acidification
- Prevention of frequent flooding
- Artificial flooding or raising of shallow water tables by water impoundment
- Creation of sodic or natric soils by alteration of natural drainage or irrigation

Insignificant or easily-reversible effects and actions

- Changing surface texture by conventional plowing
- Destroying shallow (<18cm) diagnostic horizons by conventional plowing
- Addition of chemicals or minerals that acidify soils
- Addition of air pollutants that result in acid rain
- Redoximorphism by reduct gasses or water-soluble organic compounds
- Recycling of soil fertility by slash/burn rotational farming
- Changing surface compaction, structure by conventional plowing
- Loss of surface organic matter (increased oxidation, loss by erosion)
- Loss of soil fertility (exportation in crops, loss by erosion)
- Changing soil fertility by fertilizing
- Artificial drainage of soil
- Creation of saline seeps
- Alteration of runoff by ditching or terracing

9. It was agreed that soil horizons and layers formed in Anthropotransported material should have a separate designation to notify the users of soil information. Opinion was divided between using a prefix or a new master horizon. Several said it should be the same (Arabic numeral) prefix as is currently used. The current convention has not been applied, and would not separate transported material from other soil of similar geology. It was suggested that a master letter of H, F, or Ctf "transported fill" be used. The change to a different master horizon would cause the loss of much information supplied by the current master letters. If a new letter was added to the old system, we could not recognize transitional horizons or they would become very long and lose their functionality. Another suggestion was to use a "superscript" instead of a subscript, "a" for soil with contamination or artifacts, and "n" for soil without. One suggestion was to use a subscript of "u" for "human".

10. All of the current epipedons may form in artifact free, uncontaminated Anthropotransported material.
11. All of the current epipedons may form in material with artifacts or contaminated Anthropotransported material.
12. There was indecision whether all types of Anthropotransported material should be considered part of a "mantle of new material" in the definition of buried soils.
13. There was indecision whether rarely but deeply mixed soil (> 50 cm) should be treated like a mantle of new material. We did not define “rarely.”

14. The definition of buried soils should be simplified so that the minimum depth for identification of new material mantles is standardized to 50 cm, rather than the "sliding scale" of 30 to 50 cm as it is now.
15. There was indecision whether the "mantle" should be moved up in status from within the definition of buried soil to be a recognized diagnostic surface layer, separate from the epipedons.
16. A key to identify buried soils should not be formally included in the Key to Soil Orders.
17. Concerning the following changes to family classes:
    a. Coal ash and Iron-ore slag should be mentioned in the lists with cinders for determining substitute particle-size classes.
    b. We should define the following as rock fragments: concrete, brick, iron, steel, bronze, copper, other metals, cinder blocks, glass, hard plastic, and possibly asphalt.
    c. We should not define the following as coarse fragments or pararock fragments: wood, cardboard, paper, cotton clothing, carpet, styrofoam, gypsum board.

International Committee on Anthropogenic Soils (ICOMANTH)

Circular Letter No. 3
Jan. 15, 1998

CHARGES

ICOMANTH is charged with defining appropriate classes in Soil Taxonomy for soils that have their major properties derived from human activities. The committee should establish which criteria significantly reflect human activities, or when a soil's properties are dominantly the result of human activities.

Items included in this 3rd Circular Letter:

· Activities report and announcements
· Action items
· Responses to the questions from Circular Letter No. 2
· Questionnaire #3

ACTIVITIES AND ANNOUNCEMENTS

In August and September, 1997, the USDA-NRCS staff at the National Soil Survey Center mailed out Circular Letter No. 2. The circular contained some background material concerning ICOMANTH and the clarification of soils where humans have profoundly affected formation or existing morphology. A questionnaire posed seventeen conceptual questions concerning Anthropogenic soils. A Web site was established at the following WWW URL address: "http://wwwscas.cit.cornell.edu/icomanth"

A tour is being planned to view Anthropogenetic soils in Nevada and California in September, 1998. See enclosed flier. Interested persons should contact: Terry Cook at email: ICOMANTH@aol.com or Robert Ahrens at the USDA - NRCS @ 402-437-5389 or by email: bahrens@nssc.nrcs.usda.gov

ACTION ITEMS

Committee members and other interested persons are asked to do the following:

Carefully review the questions and proposals in the current questionnaire and submit comments by 4/30/98.

Volunteer for one of the following subcommittees by 4/30/98: a) data and photo gathering; or b) diagnostic horizons and definitions.

Please submit copies (electronic if possible, hardcopy if not) of lab and description data of Anthropogenic soils and soil materials to Dr. Bryant beginning 8/1/97.

Please submit copies of slides (electronic if possible) or prints of Anthropogenic soils and soil materials to Dr. Bryant beginning 8/1/97.

Dr. Ray B. Bryant, ICOMANTH Chair
Dept. Soil, Crop, & Atm. Sciences
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wwwscas.cit.cornell.edu/rbb1/index.html

RESPONSES TO CIRCULAR 2 QUESTIONNAIRES (2/1/98)

1. It was agreed upon that Soil Taxonomy needs to be modified by the addition of new classes for recognizing soils modified by human activities.

2. No clear consensus was reached as to the appropriate categorical level for new classes.
3. The following criteria were identified as important reasons for defining new classes:
    a. There is pressure from users for more detailed soil information
    b. There are a significant number of acres
    c. The soil has a significant content of manufactured/processed materials
    d. The soil is drastically polluted and is potentially toxic to humans
    e. The soil occurs in a deeply excavated or thickly filled area
    f. Historical evidence proves recent deposition or drastic alteration
    g. To provide a basis for collection and analysis of data for research
    h. To provide a language for educational purposes

Comment: To provide correct interpretations was also mentioned.

The following criteria received divided opinion:
    a. Natural geomorphic processes do not result in the soil being where it is
    b. The soil properties have archaeological significance

4. No, we do not have enough data and representative pedons to propose classes. Comments: Lab and descriptive data have been solicited from all sources in order to build a database for Anthropogenic soils.
5. Yes, we must have a representative soil before adding classes.
6. Half the respondents felt that a technical classification that would set up classes based on specific limits derived from practical experience of specialists is needed. Half the respondents felt that a morpho/genetic system based on morphologic or genetic soil properties is needed. Comments: A technical system may be more appropriate for soils with artifacts, contamination, or garbage. A morpho/genetic system may be better for the other types of Anthropogenic soils.
7. Mixed -- Half the respondents said "yes," all diagnostic evidence for Anthropopedogenesis must come from within the pedon.
8. Mixed -- Half the respondents said "yes," we can use other evidence to classify and identify pedons. They thought written/published historical evidence and comparative landform/soils study could be used as evidence, but not geomorphology (Identification of distinct artificial landforms).
9. Human effects and actions of major significance to soil formation or soil parent material accumulation include the following:

1. Deposition of dredged sulfidic material in oxidizing landform positions
2. Exposure of sulfidic material to oxidation by excavation or deposition
3. Accelerated erosion of cropland by wind and water
4. Land filling with transported soil and/or rock
5. Land filling with debris, refuse, waste, scrap, and ash
6. Land filling with dredged sediments
7. Land leveling of soils
8. Land leveling for irrigation
9. Removal and filling of soil and rock during excavation
10. Changing surface reaction by conventional plowing (calcification)
11. Deep plowing that destroys some or all diagnostic horizons
12. Severe compaction by machinery during filling
13. Sedimentation in fields by soil material from human caused accelerated erosion
14. Eolian deposition of soil material from human caused accelerated erosion
15. Sedimentation in fields from frequent irrigation
16. Reduction/illuviation/oxidation of Fe and Mn by artificial saturation (paddy soil)

Human effects and actions of lesser or uncertain significance to soil formation or soil parent material accumulation includes the following:

1. Contamination by airborne heavy metals
2. Contamination by heavy metal or radioactive additives and spills

3. Contamination by inorganic chemicals or organic pollutants or toxins
4. Deep mixing of shallow diagnostic horizons during logging operations
5. Addition of asphalt layers or synthetic water barriers and landfill liners
6. Severe surface compaction by machinery or human traffic
7. Sedimentation in floodplains by material from human caused accelerated erosion
8. Accelerated erosion of rangeland by wind and water
9. Liming by chemical or mineral additives to offset natural acidification
10. Mass movement (slippage, landslides) after human landscape modification
11. Surface removal (removing topsoil or organic material such as peat)
12. Artificial drainage of sulfidic material that results in extreme acidification
13. Prevention of frequent flooding
14. Artificial flooding or raising of shallow water tables by water impoundment
15. Creation of sodic or natric soils by alteration of natural drainage or irrigation
16. Insignificant or easily-reversible effects and actions
17. Changing surface texture by conventional plowing
18. Destroying shallow (<18cm) diagnostic horizons by conventional plowing
19. Addition of chemicals or minerals that acidify soils
20. Addition of air pollutants that result in acid rain
21. Redoximorphism by reduct gasses or water-soluble organic compounds
22. Recycling of soil fertility by slash/burn rotational farming
23. Changing surface compaction, structure by conventional plowing
24. Loss of surface organic matter (increased oxidation, loss by erosion)
25. Loss of soil fertility (exportation in crops, loss by erosion)
26. Changing soil fertility by fertilizing
27. Artificial drainage of soil
28. Creation of saline seeps
29. Alteration of runoff by ditching or terracing

10. It was agreed that soil horizons and layers formed in Anthropotransported material should have a separate designation to notify the users of soil information. Opinion was divided between using a prefix or a new master horizon. Several said it should be the same (Arabic numeral) prefix as is currently used. The current convention has not been applied, and would not separate transported material from other soil of similar geology. It was suggested that a master letter of H, F, or Ctf "transported fill" be used. The change to a different master horizon would cause the loss of much information supplied by the current master letters. If a new letter was added to the old system, we could not recognize transitional horizons or they would become very long and lose their functionality. Another suggestion was to use a "superscript" instead of a subscript, "a" for soil with contamination or artifacts, and "n" for soil without. One suggestion was to use a subscript of "u" for "human".
11. All of the current epipedons may form in artifact free, uncontaminated Anthropotransported material.
12. All of the current epipedons may form in material with artifacts or contaminated Anthropotransported material.
13. Undecided --There was no consensus on whether all types of Anthropotransported material should be considered part of a "mantle of new material" in the definition of buried soils.
14. Undecided -- There was no consensus on whether rarely but deeply mixed soil (>50 cm) should be treated like a mantle of new material. “Rarely” was not defined.
15. Yes - Respondents agreed that the definition of buried soils should be simplified so that the minimum depth for identification of new material mantles is standardized to 50 cm, rather than the "sliding scale" of 30 to 50 cm as it is now.

16. Undecided -- There was no consensus on whether the "mantle" should be moved up in status from within the definition of buried soil to be a recognized diagnostic surface layer, separate from the epipedons.
17. No -- A key to identify buried soils should not be formally included in the Key to Soil Orders.
18. Concerning the following changes to family classes:
    a. Coal ash and Iron-ore slag should be mentioned in the lists with cinders for determining substitute particle-size classes.
    b. We should define the following as rock fragments: concrete, brick, iron, steel, bronze, copper, other metals, cinder blocks, glass, hard plastic, and possibly asphalt.
    c. We should not define the following as coarse fragments or pararock fragments: wood, cardboard, paper, cotton clothing, carpet, Styrofoam, gypsum board.

QUESTIONNAIRE 3

The third questionnaire is designed to stimulate thought and discussion on topics that will emerge during the scheduled field trip in September (see Action Items and Announcements). We will have an opportunity to see examples of some of the types of disturbances listed in question 9 of questionnaire 2. We also need to come to grips with the issue of what kind of evidence of human alteration will be used as criteria for classification of human altered soils or transported parent materials (questions 7 and 8).

Please answer the following questions and return by mail or email to Dr. Bryant. We encourage additional comments about these questions by email or word-processor computer file. Please use the same numbering system as the questions.

NOTE: To print out a copy of this part of the circular, follow this link first, next print out the document.

1. Please list any morphological indicators of human alteration or transportation which occur in the pedons of such soils with which you are familiar.

_____

_____

2. Please list any micromorphological indicators of human alteration or transportation which occur in the pedons of such soils with which you are familiar.

_____

_____

3. Please list any chemical, radioactive, or mineralogical indicators of human alteration or transportation which occur in the pedons of such soils with which you are familiar.

_____

_____

4. Should soil material that is known to be transported and deposited by human labor/machinery occur in separate classes in Soil Taxonomy, even if there are no artifacts left in the transported soil? ___ Yes ___No

If you answered yes, what evidence would you use to prove they were transported?

_____

_____

5. In areas where near-surface excavation mining has taken place, the area may be restored to its original landform shape. If this is done without leaving artifacts in the soil as evidence, should these soils be put into a separate class for Anthropogenic soils or identified by their properties into natural genetic soil classes?
_____Anthropogenic classes _____ Natural genetic classes

If you answered Anthropogenic, what evidence would you use to prove they were transported?

_____

_____

6. Should sulfuric horizons that form in dredged material or mine spoil be put into a different class than other sulfuric horizons? _____Yes _____No

If you answered yes, what evidence would you use to prove they were transported?

_____

_____

7. Some surface horizons of "soils" constructed by reclamation of near-surface excavation mining meet all the criteria of a Mollic epipedon. Should the epipedon be identified as Mollic, or be put into a separate class?
____Mollic ____Separate

Should the soil be classified as a Mollisol if it meets all other requirements, such as base saturation, or be put into a separate class? ____Mollisol ____Separate

8. Soils polluted with petroleum and hydrocarbon products, radioactivity, or high heavy metal concentrations pose a threat to humans and animals that live on/in them or eat food grown on/in them. Should Soil Taxonomy include separate classes for these soils based on these characteristics? ____ Yes ____ No

9. Dredging and long-term irrigation with sediment-laden water has produced soils with thick mantles and morphology that resemble floodplain deposits, but they may or may not occur in natural floodplains. Should these soils be put in the same class as Fluvents and Fluvaquents? ____Yes ____ No

If you answered "No", what evidence would you use to prove humans transported them?

_____

_____

10. Terracing, ditching, land leveling, levee and diversion building, mechanical excavations, and slumping within excavated areas also produce soils with morphology that resemble floodplain deposits, but they do not occur in floodplains. Should these soils be put in the same class as Fluvents and Fluvaquents? ____Yes ____ No

If you answered "Yes", this would allow inclusion in the "Fluv" classes of soil with a variety of processes that cause the irregular carbon distribution with depth.
Should the name of the classes be changed to reflect the fact that "Fluvial" processes are not the only source of the diagnostic morphology? ____Yes ____ No

Submitted by Dr. John M. Galbraith, Cornell University. Members may forward this letter to others who would like to be placed on the ICOMANTH mailing list.