Bulletin 303 *February 2003*

Updated Taxonomic Classification of the Soils of Puerto Rico, 2002

University of Puerto Rico
Mayagüez Campus
College of Agricultural Sciences
Agricultural Experiment Station
San Juan, Puerto Rico

For information about this publication, write to:

Editor's Office
Agricultural Experiment Station
Jardín Botánico Sur
1193 Calle Guayacán
San Juan, P.R. 00926-1118

UPDATED TAXONOMIC CLASSIFICATION OF THE SOILS OF PUERTO RICO, 2002

Friedrich H. Beinroth[1], Robert J. Engel[2], Jorge L. Lugo[3], Carmen L. Santiago[4], Samuel Ríos[5] and Greg R. Brannon[6]

ABSTRACT

This publication presents the taxonomic classification of the 175 established and 12 tentative soil series of Puerto Rico according to Soil Taxonomy. [Soil Taxonomy (Soil Survey Staff, 1999) is the official system of soil classification of the United States National Cooperative Soil Survey, in which the University of Puerto Rico participates.] A similar report was published in 1995 (Lugo-López et al., 1995). It is now obsolete, however, because (1) subsequently Soil Taxonomy has undergone significant revisions that were incorporated in the second edition published in 1999; (2) additional laboratory characterization became available, which allowed more accurate placements; (3) new soil series were established and others deleted; and (4) some errors in former classifications needed correction. A comprehensive taxonomic re-examination of all series employing the current criteria and latest revisions of Soil Taxonomy thus became imperative. The updated classifications are presented in three differently structured tables that should conform to divergent user needs. No attempt has been made to discuss Soil Taxonomy in any depth, but general background is provided on the rationales, structure and taxa of the system. The nomenclature is explained in more detail in order to indicate what kind of information can be inferred from a soil name. Estimates of the areal extent and distributions of the soil orders of Puerto Rico are also provided. Although the classifications presented are current at this time, future revisions will inevitably be required to accommodate new knowledge emerging from current field and laboratory studies.

[1]Professor, Dept. of Agronomy and Soils, University of Puerto Rico, Mayagüez Campus, Mayagüez, PR 00681-9030
[2]Soil Scientist, USDA/NRCS/NSSC, Lincoln, NE
[3]Resource Soil Scientist, USDA/NRCS, Mayagüez, PR
[4]Staff Soil Scientist, USDA/NRCS, San Juan, PR
[5]Soil Scientist, USDA/NRCS, Mayagüez, PR
[6]Soil Data Quality Specialist, USDA/NRCS, Auburn, AL

RESUMEN

Esta publicación presenta la clasificación taxonómica de las 175 series de suelos establecidas y las 12 series tentativas de Puerto Rico, de acuerdo a *Soil Taxonomy*. [*Soil Taxonomy* (Soil Survey Staff, 1999) es el sistema oficial de clasificación de suelos del U.S. National Cooperative Soil Survey, en el cual participa la Universidad de Puerto Rico.] Un informe similar fue publicado en el 1995 (Lugo-López et al., 1995). Sin embargo, el mismo está actualmente obsoleto debido a: (1) cambios significativos en *Soil Taxonomy*, los cuales fueron incorporados en la segunda edición publicada en 1999; (2) disponibilidad de caracterización de laboratorio adicional que permite clasificaciones más precisas; (3) establecimiento de nuevas series de suelos y eliminación de otras; y (4) corrección de errores en clasificaciones previas. Como consecuencia, fue necesario hacer una re-evaluación taxonómica comprensiva de todas las series usando los criterios actuales y las últimas revisiones de *Soil Taxonomy*. Las clasificaciones actualizadas se presentan en tres Cuadros, diferentemente estructurados, que deben estar conformes con las necesidades divergentes de los usarios. No se ha intentado discutir *Soil Taxonomy* con profundidad, pero se provee información general sobre los fundamentos, estructura y taxa del sistema. La nomenclatura se explica en mayor detalle para indicar qué información se puede inferir del nombre taxonómico de un suelo. Además, se proveen estimados de extensión y distribución de las órdenes y subórdenes de suelo en Puerto Rico. Aunque las clasificaciones presentadas están actualizadas al momento, inevitablemente será necesario hacer revisiones futuras para acomodar nuevos conocimientos que surjan como resultado de estudios de campo y de laboratorio que están en progreso.

INTRODUCTION

The last update of the classification of the soils of Puerto Rico according to Soil Taxonomy (Soil Survey Staff, 1975) was published in 1995 (Lugo-López et al., 1995). Since then the second edition of Soil Taxonomy has been released (Soil Survey Staff, 1999), which incorporates significant changes that affect the classification of tropical soils. For example, the kind of Inceptisols formerly classified as Tropepts, which comprise the most extensive soils of the Island, are now

either Udepts or Ustepts. Some mineralogy classes have also been revised and cation-exchange activity classes introduced, all of which has caused changes in the classification of the soils of Puerto Rico.

In addition, new soil series were established and others deleted; more analytical characterization data became available that, in many cases, required classification changes; and errors were detected in the previously published placements. Consequently, a comprehensive and thorough review and revision of the classification of all soil series appears to be both necessary and timely.

No attempt is made here to discuss Soil Taxonomy in any detail, but some background is provided on the rationales, structure and nomenclature of the system. The essence of this publication, however, is presented in the classification tables. Although the taxonomic placements represent our best effort on the basis of currently available information, they are subject to change as new information materializes from the studies and soil surveys discussed later.

The updated classifications are the result of a joint endeavor in which soil scientists of the USDA Natural Resources Conservation Service (NRCS) in Puerto Rico, the NRCS National Soil Survey Center in Lincoln, NE, the NRCS Regional Office in Auburn, AL, and the University of Puerto Rico have collaborated exemplarily.

SOIL TAXONOMY

Background

Soil Taxonomy is the official system of soil classification of the National Cooperative Soil Survey of the United States, in which the University of Puerto Rico participates. It was developed over a period of 25 years under the leadership of soil scientists of the then USDA Soil Conservation Service in cooperation with pedologists from other countries. It was first published in 1975. Since then the system has undergone periodic changes to accommodate new knowledge, particularly about soils of the tropics. Two new soil orders, Andisols and Gelisols, were established for the soils derived from recent volcanic materials and for the soils with permafrost. The orders of Aridisols,

Inceptisols, Oxisols, Spodosols and Vertisols were revised completely. There were also numerous changes in the differentiating criteria, such as the introduction of the kandic horizon and aquic conditions. The second edition of Soil Taxonomy, which was published in 1999, contains all of the amendments and changes (Soil Survey Staff, 1999).

Categories of Soil Taxonomy

Soil Taxonomy has six categories: order, suborder, great group, subgroup, family and series. Classes, or taxa, in each category are defined at about the same level of abstraction. The level of generalization increases from series to order and the level of specificity increases from order to series.

The **order** category groups soils on the basis of the results of major soil-forming processes, for example, laterization or podsolization. However, in the order of Entisols the absence of major processes is diagnostic. At the **suborder** level, factors that control the major processes are considered, mainly the soil temperature and soil moisture regimes. **Great groups** reflect extreme expression of pedologic processes such as high degree of weathering or cementation of soil layers. **Subgroups** subdivide the great groups in one of three kind of subgroups: (1) soils representing the central concept of the great group, (2) soils that have properties of other soils, and (3) soils that have non-soil properties, such as rock at shallow depth. In the **family** category subgroups are differentiated on the basis of physical, chemical, mineralogical and climatic properties that affect the growth of plants. The **series** category is the lowest category in the system. The differentiae used for series are generally the same as those used for other taxa, but the range permitted for one or more properties is narrower than in higher categories.

Soil Orders of Puerto Rico

Soil Taxonomy has twelve orders: Alfisols, Andisols, Aridisols, Entisols, Gelisols, Histosols, Inceptisols, Mollisols, Oxisols, Spodosols, Ultisols, and Vertisols. Of these, nine have been established on the Island.

Andisols are absent because Puerto Rico, although largely volcanic in origin, lacks the recent volcanic materials that are a prerequisite for their formation as the volcanism ceased about 70 million years ago. The Island's tropical climate precludes the formation of Gelisols, which must have permafrost. Aridisols almost certainly occur along the south coast of Puerto Rico. Their presence has not been officially recognized, however.

The Andisols, Aridisols and Gelisols have, therefore, been excluded from the discussion that follows, which briefly describes, in alphabetical sequence, the main characteristics of the orders that occur on the Island.

Alfisols typically have a light-colored surface horizon, the ochric epipedon, and a diagnostic subsurface horizon, the argillic horizon, where silicate clay has accumulated. They also have a high base saturation in the subsoil. Alfisols are found mainly in the limestone region of northwestern Puerto Rico. The Tanamá series is a typical example.

Entisols have little or no evidence of pedogenic development and therefore have no diagnostic horizons other than an ochric epipedon. In Puerto Rico, they occur either on recent deposits along streams or in coastal floodplains, or on steep slopes undergoing active erosion. Some are associated with a parent material that is resistant to weathering, such as the quartz sand. The Cataño series is an example of a sandy Entisol of humid areas.

Histosols have formed in organic soil materials and are defined as soils in which half or more of the upper 80 cm contains at least 20 percent organic matter. In Puerto Rico, Histosols occur mainly in association with mangrove swamps, marshes and lagoons along the north coast. The Tiburones series is typical for the Histosols in the Caño Tiburones east of Arecibo, the largest area of organic soils on the Island.

Inceptisols include the soils that exhibit initial stages of soil development. There is no evidence of significant illuviation, leaching or advanced weathering. However, they have one or more of the diagnostic horizons that are thought to form rather quickly, such as the mollic epipedon and the cambic horizon. They are the most extensive soils of

Puerto Rico and occur on young geomorphic surfaces, predominantly on the steep slopes of the interior mountains, or on alluvial floodplains along the coasts. The Múcara series is typical example of an Inceptisol of the dissected humid uplands of the Island.

Mollisols comprise soils that have a mollic epipedon, which is usually a thick, dark-colored surface horizon that has a high organic carbon content, high base saturation, and a friable consistence. In Puerto Rico, there are two main areas of Mollisols: first, the Tertiary limestone belts to the north and south of the Cordillera Central, and, second, the alluvial floodplains mainly along the south coast of the Island. The San Antón series is an example of an alluvial Mollisol.

Oxisols, which are unique to the tropics, are considered the tropical soils *par excellence* as they represent the ultimate stages of soil development. Their main diagnostic feature is the oxic or kandic horizon, both mixtures of hydrated oxides of iron and aluminum, various 1:1 lattice clays, and nonweatherable minerals such as quartz and zircon. Oxisols generally occupy old, stable geomorphic surfaces. In Puerto Rico they are, in addition, also developed, however, in preweathered oxidic sediments and in ultrabasic rocks that weather rapidly. The series that represent the three scenarios are the Catalina, Coto and Nipe series. The Catalina series occurs on remnants of the Miocene St. John peneplain in central Puerto Rico, the Coto series on the blanket deposits along the northwestern coast, and the Nipe series on serpentinite near Mayagüez.

Spodosols are soils that have a spodic horizon, i.e., a subsurface horizon of illuvial accumulation of a mixture of amorphous organic matter and aluminum with or without iron. Small areas of Spodosols occur in quartz sands near Arecibo. However, the spodic horizon in these soils is weakly developed and further study may require a reclassification of these soils as Quartzipsamments.

Ultisols have either an argillic horizon or, less commonly, a kandic horizon and a low base saturation in the subsoil. Weathering in the solum is advanced and low pH values result in a high amount of exchangeable aluminum, which is a major productivity constraint. Ultisols are extensive on the Island, particularly in the western region. The Humatas series is a typical example.

Vertisols are dark-colored soils with appreciable amounts of silicate clays of the smectitic type, which swell and shrink with changing soil moisture content. This produces cracks in the dry season and slickensides in the subsoil. Vertisols occur in the subhumid and semiarid areas along the south coast of the Island. The Fraternidad series is a typical example.

Nomenclature of Soil Taxonomy

The innovative and unique nomenclature of Soil Taxonomy constitutes a marked departure from past practice. All names are new and were coined mainly from Greek and Latin roots on the following premises: a good name should be short, easy to pronounce, distinctive in meaning, connotative of the properties of the taxon, and indicate the position in the classification. A brief description of the names of taxa in the six categories of the system follows. This narrative is extracted from Soil Taxonomy (Soil Survey Staff, 1999) where further information may be obtained.

The names of **orders** always end in *sol* (L *solum*, soil), for example, Oxisol. The formative elements and their connotation are shown in Table 1. **Suborders** have exactly two syllables; the first connotes something about the diagnostic properties of the soils and the second is the formative element from the name of the order, e.g., Udox. Table 2 lists the 10 elements used in the names of suborders of Puerto Rico soils.

The name of a **great group** consists of the name of the suborder and a prefix that has one or two formative elements suggesting diagnostic properties, e.g., Acrudox. The formative elements in the names of great groups that occur in Puerto Rico are presented in Table 3. The name of a **subgroup** consists of the name of the great group modified by one or more adjectives. The adjectives indicate one of three different conditions: (1) *Typic* subgroups typify the subgroup, e.g., Typic Acrudox; (2) *intergrades* belong to one great group but have some properties of another order, suborder or great group, e.g., Eutric Acrudox; and (3) *extragrades* that have properties that are not representative of the great group but are not transitional to any other known kind of soil. The name of the modifying adjective indicates the nature of the aberrant property, e.g., Anionic. Table 4 shows the adjectives used in the names of extragrades of Puerto Rico soils.

The names of **families** are polynomial. Each consists of the name of the subgroup and three or more descriptive terms that indicate classes of particle-size, mineralogy, cation-exchange activity, reaction, temperature, depth, rupture resistance, coatings, and cracks. The names of most families have three to five modifiers, but a few have only one or two and a few have as many as six. An example is a very-fine, ferruginous, isohyperthermic family.

The names of **series** as a rule are abstract place names. The name is generally taken from a place near the one where the series was first recognized. The name of a series carries no meaning to people who have no other source of information about the soils in the series. However, the name of each taxon above the category of the series indicates its class in all categories of which it is a member. Because the assigned names are connotative and because most formative elements carry the same meaning in any combination, a name can convey a great deal of information about a soil.

Aggregation of the example terms in the preceding paragraphs yields a very-fine, ferruginous, isohyperthermic Anionic Acrudox. This is the classification of the Nipe series, one of the best known soils of the Island. In order to provide an idea of the kind of information contained, by definition, in a soil name, the meaning of each of the terms of the taxonomic name is briefly explained.

Very-fine means that from a depth of 25 to 100 cm there is no marked contrast in particle size and the clay content is 60 percent or higher. *Ferruginous* indicates an iron oxide content of 18 to 40 percent in the fine earth fraction. *Isohyperthermic* specifies a mean annual soil temperature of 22° C or higher and a difference between mean summer and mean winter temperatures of less than 6° C.

Anionic indicates a delta pH (KCl pH minus 1:1 water pH) with a zero or net positive charge in a layer 18 cm or more thick within 125 cm of the mineral surface. *Acr* means that the soil has, in one or more subhorizons of the oxic or kandic horizon within 100 cm of the mineral soil surface, an apparent effective cation exchange capacity (ECEC) of 1.50 cmol (+) per kg clay and a pH value (1N KCl) of 5.0 or more. *Ud* means that the soil occurs in a udic soil moisture regime and is not dry for as long as 90

cumulative days in normal years. The final syllable, *ox*, indicates that the soils are Oxisols. As such, they have an oxic or kandic horizon, which are characterized by a high degree of weathering and a correspondingly low clay activity with an apparent cation exchange capacity (CEC) of 16 cmol(+) or less per kg clay.

On the basis of the defined terms that describe these Anionic Acrudox and accessory characteristics, one can visualize deep soils on a stable geomorphic surface developed in an iron-rich parent material in a humid tropical climate. Such soils have a very low nutrient content and retention capacity, low water-holding capacity, and a net positive charge in some part. Although their texture is clay, their physical behavior resembles that of sand.

CLASSIFICATION OF THE SOIL SERIES OF PUERTO RICO AS OF SEPTEMBER 2002

The taxonomic classification of the 175 established and the 12 tentative soil series of Puerto Rico according to Soil Taxonomy (Soil Survey Staff, 1999) is presented in three tables. Table 5 groups the soil series in one of the nine soil orders officially recognized in Puerto Rico. Table 6 shows all categories of Soil Taxonomy to which a series of a given order belongs. For example, if the order of the series is determined from Table 5, Table 6 can be used to decide to which suborder, great group, subgroup and family that series belongs. Thus it can be determined that the Nipe series, for instance, belongs to the Oxisol order, the Udox suborder, the Acrudox great group, the Anionic Acrudox subgroup, and a very-fine, ferruginous, isohyperthermic family.

Table 7 provides an alphabetical listing of the established and tentative soil series and their classification at the family level. The table also identifies the 101 series for which detailed analytical characterization data produced by the NRCS National Soil Survey Laboratory in Lincoln, NE, are available. The laboratory data together with morphological and environmental data were used to place the series under consideration in the appropriate taxon. However, 42 series have laboratory data for more than one pedon and the classification based on the additional pedon data

frequently yielded a different classification. This reflects the fact that a map unit identified by specific series in the standard soil survey generally has inclusions of other soils. Short-distance variability is typical for the Island's soils but cannot be captured in the standard soil surveys at a scale of 1:20,000. Therefore, a pedon assumed to belong to a specific series may have been sampled from an inclusion thus having different properties that result in a different taxonomic placement. We have nevertheless included the multiple classifications in Table 7 in order to indicate soil diversity and the classification of other soils that may be included in a map unit of the soil survey reports of Puerto Rico.

It needs to be further emphasized that some of the classifications, although based on the best field and laboratory data presently available, are inevitably subject to change in the future. There are several reasons for this predicament.

1. Soil moisture regimes

The aridic soil moisture regime is currently not recognized in Puerto Rico. However, there are studies in progress that continuously monitor soil moisture at two locations on the south coast (Combate and Bosque Seco de Guánica). Preliminary results indicate that both locations have an aridic soil moisture regime. It is likely that these findings can be substantiated over a longer period of time. Consequently, many of the soils in the area along the southern coast from south of Boquerón to west of Arroyo will have to be reclassified as Aridisols.

Another meteorological station has been installed on the northwestern coast at the Federal Agricultural Experiment Station west of Isabela. The soil moisture data from that location will probably confirm the presence of an ustic soil moisture regime extending in a narrow band from Punta Borinquen north of Aguadilla to west of Arecibo. Soils in that region will then have to be placed in ustic suborders.

2. Soil temperature regimes

In addition to the two locations on the south coast, soil temperatures are now being recorded in the Maricao State Forest in an effort to determine the elevation at which the soil temperature regime changes from isohyperthermic to isothermic, i.e., from more than 22° C to between 15 and 22 °C. That boundary may be at about 700 m, but will likely vary with the soil moisture regime and leeward vs. windward aspect of the mountain ranges. Extensive studies have been conducted in Hawaii and the results can probably be extrapolated to Puerto Rico. In any event, soil series that occur in both lower and high elevations will have to be reclassified.

3. Soil survey updates

The update of the soil survey of the San Germán area, comprising the soil surveys of the Lajas area and part of the Mayagüez area, which is now in progress, has shown the need to establish several new soil series. The same is expected to result from the update of the soil surveys for the Mayagüez and Ponce areas, which are the next survey areas to be remapped. New soil series will likely have to be established and others may have to be deleted.

4. Laboratory characterization data

Additional laboratory data for soils that have not been analyzed in the past may show the need to revise the existing classifications. For example, analytical scrutiny of the Spodosols near Arecibo may show that they lack the spodic horizon and are actually Quartzipsamments.

It should thus be obvious that the classifications presented in this publication cannot be final and are subject to change as new field and laboratory information becomes available. Although we realize this tentative state of affairs, we thought it propitious to publish the classifications now in an interim report that can be updated periodically.

EXTENT AND DISTRIBUTION OF THE SOILS OF PUERTO RICO

Table 8 shows the approximate area and relative distribution of the 9 soil orders and 25 suborders currently recognized in Puerto Rico. (In the context of this report "Puerto Rico" and "Island" denote the territory of the Commonwealth of Puerto Rico, including the outlying islands of Culebra, Desecheo, Mona and Vieques, and numerous islets.)

The areas in Table 8 were determined by aggregating the areas of all soil series belonging to the same suborder. The areas of individual soil series, sorted by soil orders, are listed in Table 9.

The area estimates based on the revised classification agree, in general, with previous estimates. Inceptisols continue to be the most extensive soils of the Island (35.1%), followed by Ultisols (23.5%) and Mollisols (17.8%). The area of Oxisols increased significantly from 6.7 percent in 1995 to 9.4 percent at present, mostly at the expense of Ultisols.

It must be pointed out that the areas reported in Table 8 exclude (1) the areas of tentative series proposed in the course of the ongoing update of the Lajas Valley Area Soil Survey, and (2) the areas of new soil series that have been mapped in the El Yunque soil survey. This report has not been published, however, and the maps have not yet been digitized. Therefore, data from the Humacao Area Soil Survey were used for the area covered by the El Yunque soil survey. The tentative soil series as well as the new series established in the El Yunque soil survey are not included in Table 9.

Table 8 presents three columns of percentage values. The first column indicates the distribution of the different suborders within an order. The percentage values in the second column are based on the total soil area of the Island, and the percentages in the third column are based on the total land area of Puerto Rico. The latter includes urban and industrial land, infrastructure, miscellaneous land types, rock land, surface water, and other non-soil areas. Such areas cover about 138,240 hectares (341,334 acres) or 15.4 percent of Puerto Rico's total land area. These figures were extracted from the soil surveys of the Lajas, Mayagüez, Humacao, San Juan, Ponce, and Arecibo areas, which were published in 1965, 1975,

1977, 1978, 1979 and 1988, respectively. Many areas that were mapped as soils at the time of these soil surveys no longer have a soil cover. Consequently, the non-soil area has probably increased by several percentage points. The areas and percentages reported in Tables 8 and 9 are, therefore, subject to periodic revision. However, such adjustments can be made only once the update of all soil surveys of the Island has been completed.

LITERATURE CITED

Lugo-López, M. A., F. H. Beinroth, R. L. Vick, G. Acevedo, and M. A. Vázquez, 1995. Updated taxonomic classification of the soils of Puerto Rico, 1994. Bull. 294, Univ. Puerto Rico, Agric. Experiment Station, Río Piedras, PR, 37 pp.

Soil Survey Staff, 1975. Soil Taxonomy – A basic system of soil classification for making and interpreting soil surveys. USDA Soil Conservation Service, Agric. Handbook 436, US Govt. Printing Office, Washington, DC 20402, 754 pp.

Soil Survey Staff, 1999. Soil Taxonomy – A basic system of soil classification for making and interpreting soil surveys, 2nd ed. USDA Natural Resources Conservation Service, Agric. Handbook 436, US Govt. Printing Office, Washington, DC 20402, 869 pp.

Table 1. Formative elements in the names of soil orders.

Name of order	Formative element	Derivation
Alfisols	Alf	Meaningless syllable
Andisols	And	Modified from ando
Aridisols	Id	L. *aridus*, dry
Entisols	Ent	Meaningless syllable, recent
Gelisols	El	L. *gelare*, to freeze
Histosols	Ist	Gr. *histos*, tissue
Inceptisols	Ept	L. *inceptum*, beginning
Mollisols	Oll	L. *mollis*, soft
Oxisols	Ox	F. *oxide*, oxide
Spodosols	Od	Gr. *spodos*, wood ash
Ultisols	Ult	L. *ultimus*, last
Vertisols	Ert	L. *verto*, turn

Table 2. Formative elements in the names of suborders of Puerto Rico soils.

Formative Element	Derivation	Connotation
Aqu	L. *aqua*, water	Aquic conditions
Camb	L. *cambiare*, to exchange	Presence of a cambic horizon
Fluv	L. *fluvius*, river	Flood plain
Hum	L. *humus*, earth	Presence of organic matter
Orth	Gr. *orthos*, true	The common ones
Psamm	Gr. *psammos,* sand	Sandy texture
Rend	Modified from Rendzina	High carbonate content
Sapr	Gr. *sapros*e, rotten	Most decomposed stage
Ud	L. *udus*, humid	Udic soil moisture regime
Ust	L. *ustus*, burnt	Ustic soil moisture regime

Table 3. Formative elements in the names of great groups of Puerto Rico soils.

Formative element	Derivation	Connotation
Acr	Modified from Gr. *akros*, at the end	Extreme weathering
Al	Modified from aluminum	High aluminum, low iron
Alb	L. *albus*, white	Presence of an albic horizon
Aqu	L. *aqua*, water	Aquic conditions
Argi	Modified from argillic horizon L. *argilla*, white clay	Presence of argillic horizon
Calci, calc	L. *calcis*, lime	A calcic horizon
Dystr, dys	Modified from Gr. *dys*, ill;	Low base saturation dystrophic, infertile
Endo	Gr. *endon, endo*, within	Implying a ground water table
Epi	Gr. *epi*, on, above	Implying a perched water table
Eutr	Modified from Gr. *eu*, good; eutrophic, fertile	High base saturation
Fluv	L. *fluvius*, river	Flood plain
Hapl	Gr. *haplous*, simple	Minimum horizon development
Hum ter	L. *humus*, earth	Presence of organic mat-
Hydr	Gr. *hydor*, water	Presence of water
Kand, kan	Modified from kandite	1:1 layer silicate clays
Pale	Gr. *paleos*, old	Excessive development
Plinth	Gr. *plinthos*, brick	Presence of plinthite
Psamm	Gr. *psammos*, sand	Sandy texture
Quartz	Ger. *quarz*, quartz	High quartz content
Rhod	Gr. base of *rhodon*, rose	Dark red color

Table 4. Adjectives in the names of extragrades of Puerto Rico soils.

Formative element	Derivation	Connotation
Abruptic	L. *abruptum*, torn off	Abrupt textural change
Aeric	Gr. *aerios*, air	Aeration
Anionic	Gr. *anion*, anion	Positively charged colloid
Arenic	L. *arena*, sand	Sandy material between 50 and 100 cm thick
Eutric	Modified from Gr. *eu*, good	High base status
Grossarenic	L. *grossus*, thick and L. *arena*, sand	Thick sandy layer
Humic	L. *humus*, earth	Presence of organic matter
Hydric	Gr. *hydor*, water	Presence of water
Kandic	Modified from kandite	Presence of 1:1 layer silicate clays
Limnic	Modified from Gr. *limn*, lake	Presence of a limnic layer
Lithic	G. *lithos*, stone	Shallow lithic contact
Petrocalic	Gr. *petra*, rock, and *calcic* from calcium	Presence of a petrocalcic horizon
Plinthic	Modified from Gr. *plinthos*, brick	Presence of plinthite
Rhodic	Gr. base of *rhodon*, rose	Dark red color
Ruptic	L. *ruptum*, broken	Intermittent or broken horizon
Sodic	Modified from sodium	Presence of sodium salts
Terric	L. *terra*, earth	A mineral substratum
Thapto	G. *thapto*, buried	A buried soil
Umbric	L. base of *umbra*, shade	Presence of an umbric epipedon
Xanthic	Gr. *xanthos*, yellow	Yellow

Table 5. Classification of the soil series of Puerto Rico by orders of Soil Taxonomy.

Alfisols

Amelia
Bahía
Bejucos
Candelero
Cayagua
Guayabo
Guayama
Guerrero
Juncal
Junquitos
Machete
Maguayo
Parcelas
Río Lajas
Sosa
Tanamá
Vega Baja
Vía

Entisols

Aguadilla
Arenales
Carrizales
Cataño
Espinal
Jareales
Jaucas
Martín Peña
Meros
Reilly
Reparada
San Germán
Talante
Teja

Histosols

Garrochales
Palmar
Saladar
Tiburones
Vigía

Inceptisols

Alonso
Anones
Caguabo
Callabo
Ciales
Coloso
Córcega
Cuchilla
Dique
Fortuna
Guamaní
Guayabota
Icacos
Igualdad
Juana Díaz
Luquillo
Machuelo
Malaya
Maní
Maragüez
Maunabo
Mayo
Morado
Múcara
Palm
Pandura
Pellejas
Picacho
Piñones
Plata
Prieto
Quebrada
Sabana
Santa Clara
Serrano
Sonadora
Utuado
Vieques
Vives
Viví
Yunes

Mollisols

Aguilita
Annaberg
Bajura
Camp
Santiago
Caracoles
Cintrona
Coamo
Colinas
Constancia
Cortada
Cuyón
Descalabrado
Durados
Ensenada
Estación
Guánábano
Humacao
Jacaguas
Jácana
Maresúa
Naranjo
Pozo Blanco
San Antón
San Sebastián
Santoni
Soller
Toa
Tuque
Vayas
Yauco

Oxisols

Adjuntas
Almirante
Bayamón
Catalina
Consejo
Cotito
Coto
Cristal
Dagüey
Delicias
Dwarf
Limones
Los Guineos
Matanzas
Moteado
Nipe
Rosario
Sabana Seca
Yunque
Zarzal

Spodosols

Algarrobo
Arecibo
Corozo

Ultisols

Aceitunas
Aibonito
Cabo Rojo
Cidral
Consumo
Corozal
Daguao
Espinosa
Guanajibo
Humatas
Ingenio
Islote
Jagüeyes
Jobos
Lares
Lirios
Maleza
Mariana
Maricao
Moca
Naranjito
Palmarejo
Patillas
Río Arriba
Río Piedras
Santa Marta
Torres
Vega Alta
Voladora

Vertisols

Aguirre
Camagüey
Cartagena
Fajardo
Fe
Fraternidad
Guánica
Juncos
Llanos
Mabí
Montegrande
Paso Seco
Perchas
Ponceña
Santa Isabel
Teresa

Table 6. Classification of the soil series of Puerto Rico in all categories of Soil Taxonomy.

Order	Suborder	Great Group	Subgroup	Family	Series
Alfisols	Aqualfs	Albaqualfs	Aeric Albaqualfs	Fine, mixed, semiactive, isohyperthermic	Cayagua
			Typic Albaqualfs	Fine-loamy, mixed, active, isohyperthermic	Candelero
	Udalfs	Hapludalfs	Aquic Hapludalfs	Fine, mixed, active, isohyperthermic	Vega Baja
			Aquic Hapludalfs	Very-fine, mixed, active, isohyperthermic	Junquitos
			Lithic Hapludalfs	Clayey, mixed, active, isohyperthermic	Tanamá
			Typic Hapludalfs	Fine, mixed, active, isohyperthermic	Juncal
			Typic Hapludalfs	Fine-loamy, mixed, subactive, isohyperthermic	Bejucos
			Vertic Hapludalfs	Fine, mixed, superactive, isohyperthermic	Parcelas
		Paleudalfs	Arenic Paleudalfs	Clayey, kaolinitic, isohyperthermic	Guerrero
			Psammentic Paleudalfs	Mixed, isohyperthermic	Río Lajas
			Typic Paleudalfs	Fine-loamy, mixed, semiactive, isohyperthermic	Vía
	Ustalfs	Haplustalfs	Typic Haplustalfs	Fine, mixed, semiactive, isohyperthermic	Amelia
			Typic Haplustalfs	Clayey, mixed, active, isohyperthermic, shallow	Guayama

Order	Suborder	Great Group	Subgroup	Family	Series
			Vertic Haplustalfs	Fine, smectitic, isohyperthermic	Maguayo
		Paleustalfs	Aridic Paleustalfs	Fine, kaolinitic, isohyperthermic	Sosa
			Aridic Paleustalfs	Very-fine, mixed, active, isohyperthermic	Machete
			Psammentic Paleustalfs	Mixed, isohyperthermic	Bahía
			Psammentic Paleustalfs	Mixed, isohyperthermic	Guayabo
Entisols	Aquents	Fluvaquents	Aeric Fluvaquents	Coarse-loamy over sandy or sandy-skeletal, mixed, subactive, acid, isohyperthermic	Talante
			Humaqueptic Fluvaquents	Fine, mixed, superactive, nonacid, isohyperthermic	Martín Peña
			Mollic Fluvaquents	Fine, mixed, superactive, nonacid, isohyperthermic	Repárada
			Thapto-Histic Fluvaquents	Fine, mixed, nonacid, isohyperthermic	Jareales
	Fluvents	Udifluvents	Mollic Udifluvents	Sandy-skeletal, mixed, isohyperthermic	Reilly
	Orthents	Udorthents	Lithic Udorthents	Loamy-skeletal, mixed, subactive, acid, isohyperthermic	Teja
		Ustorthents	Typic Ustorthents	Clayey-skeletal, mixed, superactive, isohyperthermic, shallow	San Germán

Order	Suborder	Great Group	Subgroup	Family	Series
	Psamments	Quartzipsamments	Typic Quartzipsamments	Siliceous, isohyperthermic, uncoated	Carrizales
		Udipsamments	Typic Udipsamments	Carbonatic, isohyperthermic	Cataño
			Typic Udipsamments	Mixed, isohyperthermic	Aguadilla
			Typic Udipsamments	Mixed, isohyperthermic	Espinal
		Ustipsamments	Aridic Ustipsamments	Mixed, isohyperthermic	Arenales
			Typic Ustipsamments	Mixed, isohyperthermic	Meros
			Typic Ustipsamments	Carbonatic, isohyperthermic	Jaucas
Histosols	Saprists	Haplosaprists	Limnic Haplosaprists	Marly, euic, isohyperthermic	Garrochales
			Terric Haplosaprists	Fine, mixed, euic, isohyperthermic	Vigía
			Typic Haplosaprists	Euic, isohyperthermic	Saladar
			Typic Haplosaprists	Euic, isohyperthermic	Palmar
			Typic Haplosaprists	Euic, isohyperthermic	Tiburones
Inceptisols	Aquepts	Endoaquepts	Aeric Endoaquepts	Fine-loamy, mixed, semiactive, acid, isothermic	Icacos
			Fluvaquentic Endoaquepts	Fine-loamy over sandy or sandy-skeletal, mixed, nonacid, isohyperthermic	Córcega

Order	Suborder	Great Group	Subgroup	Family	Series
			Fluvaquentic Endoaquepts	Fine, mixed, active, acid, isohyperthermic	Fortuna
			Fluvaquentic Endoaquepts	Fine, mixed, superactive, acid, isohyperthermic	Piñones
			Fluvaquentic Endoaquepts	Fine, mixed, superactive, calcareous, isohyperthermic	Machuelo
			Typic Endoaquepts	Clayey over loamy, mixed, semiactive, acid, isohyperthermic	Maunabo
			Typic Endoaquepts	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, nonacid, isohyperthermic	Serrano
			Typic Endoaquepts	Clayey over sandy or sandy-skeletal, mixed, superactive, nonacid, isohyperthermic	Igualdad
			Vertic Endoaquepts	Very-fine, kaolinitic, acid, isohyperthermic	Coloso
		Epiaquepts	Vertic Epiaquepts	Very-fine, mixed, semiactive, nonacid, isohyperthermic	Prieto

Order	Suborder	Great Group	Subgroup	Family	Series
		Humaquepts	Aquandic Humaquepts	Clayey-skeletal, isotic, acid, isothermic	Palm
			Histic Humaquepts	Fine-loamy, isotic, acid, isothermic	Ciales
			Typic Humaquepts	Clayey, mixed, subactive, acid, isothermic, shallow	Guayabota
	Udepts	Dystrudepts	Lithic Dystrudepts	Clayey, mixed, active, isohyperthermic	Sabana
			Aquic Dystrudepts	Fine-loamy, kaolinitic, isothermic	Picacho
			Aquic Humic Dystrudepts	Coarse-loamy, mixed, active, isothermic	Utuado
			Fluventic Dystrudepts	Coarse-loamy over sandy or sandy-skeletal, mixed, subactive, isohyperthermic	Viví
			Humic Dystrudepts	Coarse-loamy, mixed, active, isohyperthermic	Mayo
			Humic Dystrudepts	Loamy-skeletal, mixed, superactive, isohyperthermic, shallow	Yunes
			Humic Dystrudepts	Fine, parasesquic, isohyperthermic	Anones
			Oxic Dystrudepts	Very-fine, parasesquic, isohyperthermic	Alonso

Order	Suborder	Great Group	Subgroup	Family	Series
			Typic Dystrudepts	Fine, mixed, superactive, isohyperthermic, shallow	Callabo
			Typic Dystrudepts	Loamy, mixed, active, isothermic, shallow	Cuchillas
			Typic Dystrudepts	Fine-loamy over sandy or sandy-skeletal, mixed, subactive, isohyperthermic	Pellejas
		Eutrudepts	Vertic Eutrudepts	Fine, smectitic, isohyperthermic	Sonadora
			Dystric Eutrudepts	Fine, mixed, superactive, isohyperthermic	Morado
			Dystric Eutrudepts	Fine-loamy, mixed, superactive, isohyperthermic	Múcaŕa
			Dystric Eutrudepts	Fine, mixed, active, isohyperthermic	Quebrada
			Dystric Eutrudepts	Coarse-loamy, mixed, active, isohyperthermic, shallow	Pandura
			Dystric Eutrudepts	Clayey-skeletal, smectitic, isohyperthermic	Plata

Order	Suborder	Great Group	Subgroup	Family	Series
			Fluvaquentic Eutrudepts	Fine, mixed, semiactive, isohyperthermic	Maní
			Fluventic Eutrudepts	Fine-loamy, mixed, active, isohyperthermic	Dique
			Typic Eutrudepts	Fine-loamy, mixed, superactive, isohyperthermic	Maragüez
			Typic Eutrudepts	Loamy, mixed, active, isohyperthermic, shallow	Caguabo
			Typic Eutrudepts	Clayey, mixed, superactive, isohyperthermic, shallow	Malaya
			Typic Eutrudepts	Fine, mixed, active, isohyperthermic	Santa Clara
			Typic Eutrudepts	Fine, mixed, semiactive, isohyperthermic	Luquillo
	Ustepts	Dystrustepts	Typic Dystrustepts	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, isohyperthermic	Vieques
		Haplustepts	Fluventic Haplustepts	Fine-loamy, mixed, superactive, isohyperthermic	Vives

Order	Suborder	Great Group	Subgroup	Family	Series
			Torrifluventic Haplustepts	Fine-loamy over sandy or sandy-skeletal, skeletal, mixed, superactive, isohyperthermic	Guamaní
			Typic Haplustepts	Loamy, mixed, superactive, isohyperthermic, shallow	Juana Díaz
Mollisols	Aquolls	Calciaquolls	Aeric Calciaquolls	Fine, smectitic, isohyperthermic	Constancia
			Typic Calciaquolls	Fine, mixed, superactive, isohyperthermic	Cintrona
		Endoaquolls	Vertic Endoaquolls	Fine, mixed, superactive, nonacid, isohyperthermic	Bajura
			Vertic Endoaquolls	Fine, smectitic, nonacid, isohyperthermic	Vayas
			Vertic Endoaquolls	Fine, mixed, superactive, isohyperthermic	Santoni
	Rendolls	Haprendolls	Typic Haprendolls	Coarse-loamy, carbonatic, isohyperthermic	Colinas
			Typic Haprendolls	Clayey, mixed, active, isohyperthermic, shallow	Soller

Order	Suborder	Great Group	Subgroup	Family	Series
			Inceptic Haprendolls	Fine, carbonatic, isohyperthermic	Naranjo
	Udolls	Argiudolls	Calcic Argiudolls	Clayey-skeletal, carbonatic, isohyperthermic	San Sebastián
			Typic Argiudolls	Fine-loamy, magnesic, isohyperthermic	Maresúa
		Hapludolls	Typic Hapludolls	Fine-loamy, mixed, superactive, isohyperthermic	Humacao
			Fluvaquentic Hapludolls	Fine, mixed, active, isohyperthermic	Toa
			Fluventic Hapludolls	Fine-loamy over sandy or sandy-skeletal, mixed, active, isohyperthermic	Estación
			Fluventic Hapludolls	Sandy, mixed, isohyperthermic	Durados
	Ustolls	Argiustolls	Calcidic Argiustolls	Clayey-skeletal, mixed, superactive, isohyperthermic	Ensenada
			Calcidic Argiustolls	Fine, smectitic, isohyperthermic	Guanábano
			Typic Argiustolls	Fine, mixed, superactive, isohyperthermic	Coamo
			Typic Argiustolls	Fine-loamy, mixed, superactive, isohyperthermic	Camp Santiago

Order	Suborder	Great Group	Subgroup	Family	Series
		Calciustolls	Aridic Calciustolls	Coarse-loamy, carbonatic, isohyperthermic	Aguilita
			Aridic Calciustolls	Fine-loamy, mixed, superactive, isohyperthermic	Pozo Blanco
			Lithic Petrocalcic Calciustolls	Clayey-skeletal, carbonatic, isohyperthermic	Tuque
			Typic Calciustolls	Fine-silty, carbonatic, isohyperthermic	Yauco
		Haplustolls	Cumulic Haplustolls	Fine, smectitic, isohyperthermic	Cortada
			Cumulic Haplustolls	Fine-loamy, mixed, superactive, isohyperthermic	San Antón
			Fluventic Haplustolls	Loamy-skeletal, mixed, superactive, isohyperthermic	Jacaguas
			Lithic Haplustolls	Loamy, mixed, superactive, isohyperthermic	Caracoles
			Torrifluventic Haplustolls	Sandy-skeletal, mixed, isohyperthermic	Cuyón
			Typic Haplustolls	Clayey, mixed, superactive, isohyperthermic, shallow	Descalabrado

Order	Suborder	Great Group	Subgroup	Family	Series
			Typic Haplustolls	Loamy-skeletal, mixed, superactive, isohyperthermic, shallow	Annaberg
			Vertic Haplustolls	Fine, mixed, superactive, isohyperthermic	Jácana
Oxisols	Aquox	Haplaquox	Humic Haplaquox	Very-fine, mixed, subactive, isomesic	Dwarf
			Humic Haplaquox	Very-fine, kaolinitic, isothermic	Moteado
			Plinthic Haplaquox	Very-fine, kaolinitic, isohyperthermic	Sabana Seca
	Udox	Acrudox	Anionic Acrudox	Very-fine, ferruginous, isohyperthermic	Nipe
		Kandiudox	Typic Kandiudox	Fine, kaolinitic, isohyperthermic	Limones
		Hapludox	Humic Hapludox	Very-fine, kaolinitic, isothermic	Yunque
			Humic Hapludox	Very-fine, kaolinitic, isothermic	Los Guineos
			Inceptic Hapludox	Very-fine, kaolinitic, isohyperthermic	Adjuntas
			Inceptic Hapludox	Very-fine, kaolinitic, isohyperthermic	Zarzal
			Inceptic Hapludox	Very-fine, kaolinitic, isohyperthermic	Dagüey
			Typic Hapludox	Clayey, ferruginous, isohyperthermic, shallow	Rosario
			Plinthic Hapludox	Very-fine, kaolinitic, isohyperthermic	Almirante

Order	Suborder	Great Group	Subgroup	Family	Series
			Rhodic Haplustox	Fine, ferruginous, isohyperthermic	Delicias
			Typic Hapludox	Very-fine, ferruginous, isohyperthermic	Catalina
			Typic Hapludox	Very-fine, kaolinitic, isohyperthermic	Bayamón
			Xanthic Hapludox	Fine, kaolinitic, isohyperthermic	Consejo
			Aquic Hapludox	Very-fine, kaolinitic, isohyperthermic	Cristal
	Ustox	Kandiustox	Lithic Kandiustox	Clayey, kaolinitic, isohyperthermic	Cotito
			Lithic Kandiustox	Clayey, kaolinitic, isohyperthermic	Matanzas
		Eutrustox	Typic Eutrustox	Very-fine, kaolinitic, isohyperthermic	Coto
Spodosols	Orthods	Alorthods	Entic Alorthods	Coarse-loamy over clayey, siliceous over mixed, subactive, isohyperthermic	Algarrobo
			Entic Grossarenic Alorthods	Sandy, siliceous, isohyperthermic	Arecibo
			Typic Alorthods	Sandy over clayey, aniso, siliceous over kaolinitic, isohyperthermic	Corozo
Ultisols	Humults	Haplohumults	Typic Haplohumults	Very-fine, mixed, semiactive, isohyperthermic	Aibonito

Order	Suborder	Great Group	Subgroup	Family	Series
			Typic Haplohumults	Fine, mixed, semiactive, isohyperthermic	Consumo
			Typic Haplohumults	Fine, mixed, semiactive, isohyperthermic	Daguao
			Typic Haplohumults	Very-fine, parasesquic, isohyperthermic	Humatas
			Typic Haplohumults	Fine, mixed, active, isohyperthermic	Mariana
			Typic Haplohumults	Fine, mixed, semiactive, isohyperthermic	Naranjito
		Palehumults	Plinthic Palehumults	Fine, kaolinitic, isohyperthermic	Torres
			Typic Palehumults	Very-fine, mixed, active, isohyperthermic	Voladora
	Udults	Hapludults	Humic Hapludults	Fine-loamy, mixed, superactive, isohyperthermic	Patillas
			Inceptic Hapludults	Fine, mixed, subactive, isohyperthermic	Maricao
			Typic Hapludults	Fine, kaolinitic, isohyperthermic	Ingenio

Order	Suborder	Great Group	Subgroup	Family	Series
			Typic Hapludults	Very-fine, parasesquic, isohyperthermic	Corozal
			Typic Hapludults	Fine, mixed, subactive, isohyperthermic	Lirios
			Typic Hapludults	Fine, kaolinitic, isohyperthermic	Río Piedras
			Typic Hapludults	Fine, kaolinitic, isohyperthermic	Vega Alta
		Kandiudults	Typic Kandiudults	Fine, parasesquic, isohyperthermic	Espinosa
		Kanhapludults	Typic Kanhapludults	Fine-loamy, kaolinitic, isohyperthermic	Jagüeyes
			Typic Kanhapludults	Fine, magnesic, isohyperthermic	Santa Marta
		Paleudults	Aquic Paleudults	Fine, mixed, semiactive, isohyperthermic	Cabo Rojo
			Aquic Paleudults	Very-fine, mixed, semiactive, isohyperthermic	Lares
			Plinthaquic Paleudults	Fine, kaolinitic, isohyperthermic	Jobos
			Plinthic Paleudults	Fine-loamy, parasesquic, isohyperthermic	Guanajibo
			Typic Paleudults	Fine, mixed, semiactive, isohyperthermic	Cidral

Order	Suborder	Great Group	Subgroup	Family	Series
			Typic Paleudults	Fine, kaolinitic, isohyperthermic	Aceitunas
			Typic Paleudults	Fine, parasesquic, isohyperthermic	Maleza
			Vertic Paleudults	Fine, mixed, subactive, isohyperthermic	Río Arriba
			Vertic Paleudults	Very-fine, mixed, semiactive, isohyperthermic	Moca
		Rhodudults	Typic Rhodudults	Fine, mixed, semiactive, isohyperthermic	Islote
	Ustults	Haplustults	Typic Haplustults	Fine, mixed, semiactive, isohyperthermic	Palmarejo
Vertisols	Aquerts	Dystraquerts	Chromic Dystraquerts	Fine, smectitic, isohyperthermic	Perchas
		Epiaquerts	Chromic Epiaquerts	Fine, mixed, active, isohyperthermic	Fajardo
			Sodic Epiaquerts	Very-fine, smectitic, isohyperthermic	Guánica
	Uderts	Hapluderts	Aquic Hapluderts	Very-fine, mixed, active, isohyperthermic	Mabí
			Aquic Hapluderts	Fine, smectitic, isohyperthermic	Camagüey
			Chromic Hapluderts	Fine, smectitic, isohyperthermic	Juncos

Order	Suborder	Great Group	Subgroup	Family	Series
			Chromic Hapluderts	Very-fine, mixed, superactive, isohyperthermic	Montegrande
	Usterts	Calciusterts	Typic Calciusterts	Fine, mixed, superactive, isohyperthermic	Ponceña
		Haplusterts	Entic Haplusterts	Fine, smectitic, isohyperthermic	Llanos
			Entic Udic Haplusterts	Fine, mixed, superactive, isohyperthermic	Paso Seco
			Sodic Haplusterts	Fine, mixed, superactive, isohyperthermic	Cartagena
			Sodic Haplusterts	Fine, smectitic, isohyperthermic	Fe
			Sodic Haplusterts	Very-fine, smectitic, isohyperthermic	Teresa
			Sodic Haplusterts	Very-fine, smectitic, isohyperthermic	Aguirre
			Typic Haplusterts	Fine, smectitic, isohyperthermic	Fraternidad
			Typic Haplusterts	Fine, smectitic, isohyperthermic	Santa Isabel

Table 7. Taxonomic classification of the established and tentative soil series of Puerto Rico.

Note: * .....indicates classification based on field and laboratory data for one or more pedons
(T) .... indicates tentative soil series

Soil Series	Classification
Aceitunas	Fine, kaolinitic, isohyperthermic Typic Paleudults
Adjuntas*	Very-fine, kaolinitic, isohyperthermic Inceptic Hapludox
Aguadilla	Mixed, isohyperthermic Typic Udipsamments
Agüeybaná (T)	Very-fine, kaolinitic, isothermic Typic Kandiudox
Aguilita*	Coarse-loamy, carbonatic, isohyperthermic Aridic Calciustolls
Aguirre*	Very-fine, smectitic, isohyperthermic Sodic Haplusterts *Aguirre map unit also includes:* *fine, smectitic, isohyperthermic Sodic Haplusterts*
Aibonito*	Very-fine, mixed, semiactive, isohyperthermic Typic Haplohumults

Soil Series	Classification
Algarrobo	Coarse-loamy over clayey, siliceous over mixed, subactive, isohyperthermic Entic Alorthods
Almirante*	Very-fine, kaolinitic, isohyperthermic Plinthic Hapludox
Alonso*	Very-fine, parasesquic, isohyperthermic Oxic Dystrudepts *Alonso map unit also includes:* *very-fine, mixed, isohyperthermic Typic Hapludox*
Amelia*	Fine, mixed, semiactive, isohyperthermic Typic Haplustalfs *Amelia map unit also includes:* *fine-loamy, mixed, active, isohyperthermic Typic Haplustalfs*
Annaberg	Loamy-skeletal, mixed, superactive, isohyperthermic, shallow Typic Haplustolls
Anones*	Fine, parasesquic, isohyperthermic Humic Dystrudepts
Arecibo*	Sandy, siliceous, isohyperthermic Entic Grossarenic Alorthods
Arenales	Mixed, isohyperthermic Aridic Ustipsamments

Soil Series	Classification
Bahía*	Mixed, isohyperthermic Psammentic Paleustalfs *Bahía map unit also includes:* *fine-loamy, mixed, active, isohyperthermic Rhodic Paleustalfs*
Bajura	Fine, mixed, superactive, nonacid, isohyperthermic Vertic Endoaquolls
Bayamón*	Very-fine, kaolinitic, isohyperthermic Typic Hapludox *Bayamón map unit also includes:* *fine, kaolinitic, isohyperthermic Typic Kandiudults, and* *very-fine, kaolinitic, isohyperthermic Kandiudalfic Eutrudox*
Bejucos*	Fine-loamy, mixed, subactive, isohyperthermic Typic Hapludalfs
Bermeja (T)	Loamy, mixed, active, isohyperthermic, shallow Aridic Haplustepts
Boquerón (T)	Fine, mixed, superactive, nonacid, isohyperthermic Vertic Fluvaquents
Cabo Rojo*	Fine, mixed, semiactive, isohyperthermic Aquic Paleudults *Cabo Rojo map unit also includes:* *very-fine, parasesquic, isohyperthermic Typic Paleudolls*
Caguabo	Loamy, mixed, active, isohyperthermic, shallow Typic Eutrudepts

Soil Series	Classification
Callabo	Fine, mixed, superactive, isohyperthermic, shallow Typic Dystrudepts
Camagüey	Fine, smectitic, isohyperthermic Aquic Hapluderts
Camp Santiago	Fine-loamy, mixed, superactive, isohyperthermic Typic Argiustolls
Candelero*	Fine-loamy, mixed, active, isohyperthermic Typic Albaqualfs
Caracoles	Loamy, mixed, superactive, isohyperthermic Lithic Haplustolls
Carrizales	Siliceous, isohyperthermic, uncoated Typic Quartzipsamments
Cartagena*	Fine, mixed, superactive, isohyperthermic Sodic Haplusterts *Cartagena map unit also includes:* *fine, mixed, superactive, isohyperthermic Sodic Calciusterts, and* *fine, mixed, superactive, isohyperthermic Vertic Haplustepts*
Catalina*	Very-fine, ferruginous, isohyperthermic Typic Hapludox *Catalina map unit also includes:* *fine, kaolinitic, isohyperthermic Typic Hapludox*
Cataño	Carbonatic, isohyperthermic Typic Udipsamments

Soil Series	Classification
Cayagua*	Fine, mixed, semiactive, isohyperthermic Aeric Albaqualfs *Cayagua map unit also includes:* *clayey over sandy or sandy-skeletal, mixed, active, isohyperthermic Albaquic Hapludalfs*
Ciales*	Fine-loamy, isotic, acid, isothermic Histic Humaquepts
Cidral	Fine, mixed, semiactive, isohyperthermic Typic Paleudults
Cintrona	Fine, mixed, superactive, isohyperthermic Typic Calciaquolls
Coamo	Fine, mixed, superactive, isohyperthermic Typic Argiustolls
Colinas*	Coarse-loamy, carbonatic, isohyperthermic Typic Haprendolls *Colinas map unit also includes:* *fine-loamy, carbonatic, isohyperthermic Typic Haprendolls*
Coloso*	Very-fine, kaolinitic, acid, isohyperthermic Vertic Endoaquepts *Coloso map unit also includes:* *very-fine, mixed, active, isohyperthermic Aquertic Eutrudepts*
Consejo*	Fine, kaolinitic, isohyperthermic Xanthic Hapludox

Soil Series	Classification
Constancia*	Fine, smectitic, isohyperthermic Aeric Calciaquolls *Constancia map unit also includes:* *fine, smectitic, isohyperthermic Typic Endoaquolls*
Consumo*	Fine, mixed, semiactive, isohyperthermic Typic Haplohumults *Consumo map unit also includes:* *fine, mixed, semiactive, isohyperthermic Typic Dystrudepts*
Córcega	Fine-loamy over sandy or sandy-skeletal, mixed, nonacid, isohyperthermic Fluvaquentic Endoaquepts
Corozal*	Very-fine, parasesquic, isohyperthermic Typic Hapludults *Corozal map unit also includes:* *fine, mixed, semiactive, isohyperthermic Aquic Hapludults, and* *very-fine, mixed, semiactive, isohyperthermic Typic Hapludults*
Corozo*	Sandy over clayey, aniso, siliceous over kaolinitic, isohyperthermic Typic Alorthods
Cortada*	Fine, smectitic, isohyperthermic Cumulic Haplustolls

Soil Series	Classification
Cotito*	Clayey, kaolinitic, isohyperthermic Lithic Kandiustox *Cotito map unit also includes:* *very-fine, kaolinitic, isohyperthermic Kandiustalfic Eutrustox*
Coto*	Very-fine, kaolinitic, isohyperthermic Typic Eutrustox *Coto map unit also includes:* *very-fine, kaolinitic, isohyperthermic Typic Haplustox, and* *very-fine, kaolinitic, isohyperthermic Kandiustalfic Eutrustox*
Cristal*	Very-fine, kaolinitic, isohyperthermic Aquic Hapludox *Cristal map unit also includes:* *very-fine, mixed, semiactive, isohyperthermic Aquic Dystric Eutrudepts,* *very-fine, isotic, isohyperthermic Aquandic Dystrudepts, and* *fine, mixed, active, isohyperthermic Aquic Dystric Eutrudepts*
Cuchillas	Loamy, mixed, active, isothermic, shallow Typic Dystrudepts
Cuyón	Sandy-skeletal, mixed, isohyperthermic Torrifluventic Haplustolls
Daguao	Fine, mixed, semiactive, isohyperthermic Typic Haplohumults

Soil Series	Classification
Dagüey*	Very-fine, kaolinitic, isohyperthermic Inceptic Hapludox *Dagüey map unit also includes:* *very-fine, mixed, subactive, isohyperthermic Typic Haplohumults, and* *very-fine, kaolinitic, isohyperthermic Typic Kandiudox*
Delicias*	Fine, ferruginous, isohyperthermic Rhodic Hapludox
Descalabrado*	Clayey, mixed, superactive, isohyperthermic, shallow Typic Haplustolls
Dique	Fine-loamy, mixed, active, isohyperthermic Fluventic Eutrudepts
Duey (T)*	Loamy, carbonatic, isohyperthermic, shallow Aridic Calciustolls
Durados	Sandy, mixed, isohyperthermic Fluventic Hapludolls
Dwarf*	Very-fine, mixed, subactive, isomesic Humic Haplaquox *Dwarf map unit also includes:* *loamy, mixed, dysic, isomesic Terric Haplosaprists*
El Cacique (T)	Clayey, magnesic, isohyperthermic, shallow Typic Argiudolls

Soil Series	Classification
Ensenada*	Clayey-skeletal, mixed, superactive, isohyperthermic Calcidic Argiustolls *Ensenada map unit also includes:* *clayey-skeletal, mixed, superactive, isohyperthermic Aridic Haplustepts*
Espinal	Mixed, isohyperthermic Typic Udipsamments
Espinosa*	Fine, parasesquic, isohyperthermic Typic Kandiudults
Estación	Fine-loamy over sandy or sandy-skeletal, mixed, active, isohyperthermic Fluventic Hapludolls
Fajardo	Fine, mixed, active, isohyperthermic Chromic Epiaquerts
Fe*	Fine, smectitic, isohyperthermic Sodic Haplusterts *Fe map unit also includes:* *very-fine, smectitic, isohyperthermic Sodic Haplusterts, and* *fine, smectitic, isohyperthermic Sodic Calciustolls*
Fortuna	Fine, mixed, active, acid, isohyperthermic Fluvaquentic Endoaquepts
Fraternidad*	Fine, smectitic, isohyperthermic Typic Haplusterts *Fraternidad map unit also includes:* *very-fine, smectitic, isohyperthermic Sodic Haplusterts, and* *very-fine, smectitic, isohyperthermic Typic Haplusterts*

Soil Series	Classification
Garrochales*	Marly, euic, isohyperthermic Limnic Haplosaprists
Guamaní	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, isohyperthermic Torrifluventic Haplustepts
Guanábano	Fine, smectitic, isohyperthermic Calcidic Argiustolls
Guanajibo	Fine-loamy, parasesquic, isohyperthermic Plinthic Paleudults
Guánica*	Very-fine, smectitic, isohyperthermic Sodic Epiaquerts
Guayabo*	Mixed, isohyperthermic Psammentic Paleustalfs
Guayabota*	Clayey, mixed, subactive, acid, isothermic, shallow Typic Humaquepts
Guayama*	Clayey, mixed, active, isohyperthermic, shallow Typic Haplustalfs *Guayama map unit also includes:* *clayey-skeletal, mixed, active, isohyperthermic, shallow Typic Haplustalfs, and* *clayey-skeletal, mixed, active, isohyperthermic, shallow Typic Ustorthents*
Guerrero*	Clayey, kaolinitic, isohyperthermic Arenic Paleudalfs
Humacao	Fine-loamy, mixed, superactive, isohyperthermic Typic Hapludolls

Soil Series	Classification
Humatas*	Very-fine, parasesquic, isohyperthermic Typic Haplohumults *Humatas map unit also includes:* *very-fine, parasesquic, isohyperthermic Typic Palehumults,* *very-fine, kaolinitic, isohyperthermic Typic Hapludox, and* *fine, kaolinitic, isohyperthermic Typic Hapludox*
Icacos	Fine-loamy, mixed, semiactive, acid, isothermic Aeric Endoaquepts
Igualdad	Clayey over sandy or sandy-skeletal, mixed, superactive, nonacid isohyperthermic Typic Endoaquepts
Ingenio*	Fine, kaolinitic, isohyperthermic Typic Hapludults *Ingenio map unit also includes:* *fine, mixed, semiactive, isohyperthermic Typic Hapludults*
Islote*	Fine, mixed, semiactive, isohyperthermic Typic Rhodudults *Islote map unit also includes:* *fine, mixed, active, isohyperthermic Abruptic Argiudolls*
Jacaguas	Loamy-skeletal, mixed, superactive, isohyperthermic Fluventic Haplustolls
Jácana*	Fine, mixed, superactive, isohyperthermic Vertic Haplustolls

Soil Series	Classification
Jagüeyes*	Fine-loamy, kaolinitic, isohyperthermic Typic Kanhapludults *Jagueyes map unit also includes:* *fine-loamy, kaolinitic, isohyperthermic Inceptic Hapludox*
Jareales	Fine, mixed, nonacid, isohyperthermic Thapto-Histic Fluvaquents
Jaucas	Carbonatic, isohyperthermic Typic Ustipsamments
Jobos*	Fine, kaolinitic, isohyperthermic Plinthaquic Paleudults *Jobos map unit also includes:* *fine, kaolinitic, isohyperthermic Plinthaquic Paleustalfs*
Juana Díaz*	Loamy, mixed, superactive, isohyperthermic, shallow Typic Haplustepts
Juncal	Fine, mixed, active, isohyperthermic Typic Hapludalfs
Juncos	Fine, smectitic, isohyperthermic Chromic Hapluderts
Junquitos*	Very-fine, mixed, active, isohyperthermic Aquic Hapludalfs
La Taína (T)	Clayey-skeletal, magnesic, isohyperthermic, shallow Typic Argiudolls
La Tea (T)	Clayey, smectitic, isohyperthermic, shallow Typic Argiudolls

Soil Series	Classification
Lares*	Very-fine, mixed, semiactive, isohyperthermic Aquic Paleudults
Limones*	Fine, kaolinitic, isohyperthermic Typic Kandiudox *Limones map unit also includes:* *very-fine, kaolinitic, isohyperthermic Humic Hapludox, and* *fine, kaolinitic, isohyperthermic Inceptic Hapludox*
Lirios	Fine, mixed, subactive, isohyperthermic Typic Hapludults
Llanos*	Fine, smectitic, isohyperthermic Entic Haplusterts
Luquillo*	Fine, mixed, semiactive, isohyperthermic Typic Eutrudepts
Los Guineos*	Very-fine, kaolinitic, isothermic Humic Hapludox *Los Guineos map unit also includes:* *very-fine, kaolinitic, isothermic Typic Kandiudox*
Mabí*	Very-fine, mixed, active, isohyperthermic Aquic Hapluderts
Machete*	Very-fine, mixed, active, isohyperthermic Aridic Paleustalfs
Machuelo	Fine, mixed, superactive, calcareous, isohyperthermic Fluvaquentic Endoaquepts

Soil Series	Classification
Maguayo	Fine, smectitic, isohyperthermic Vertic Haplustalfs
Malaya	Clayey, mixed, superactive, isohyperthermic, shallow Typic Eutrudepts
Maleza*	Fine, parasesquic, isohyperthermic Typic Paleudults *Maleza map unit also includes:* *fine-loamy, kaolinitic, isohyperthermic Rhodic Kandiudalfs*
Manglillo (T)	Euic, isohyperthermic Fluvaquentic Haplohemists
Maní*	Fine, mixed, semiactive, isohyperthermic Fluvaquentic Eutrudepts
Maragüez	Fine-loamy, mixed, superactive, isohyperthermic Typic Eutrudepts
Maresúa*	Fine-loamy, magnesic, isohyperthermic Typic Argiudolls
Mariana*	Fine, mixed, active, isohyperthermic Typic Haplohumults *Mariana map unit also includes:* *fine, mixed, active, isohyperthermic Typic Dystrustepts*
Maricao	Fine, mixed, subactive, isohyperthermic Inceptic Hapludults
Martín Peña	Fine, mixed, superactive, nonacid, isohyperthermic Humaqueptic Fluvaquents

Soil Series	Classification
Matanzas*	Clayey, kaolinitic, isohyperthermic Lithic Kandiustox *Matanzas map unit also includes:* *very-fine, kaolinitic, isohyperthermic Kandiustalfic Eutrustox*
Maunabo*	Clayey over loamy, mixed, semiactive, acid, isohyperthermic Typic Endoaquepts *Maunabo map unit also includes:* *fine, mixed, semiactive, acid, isohyperthermic Typic Endoaquepts*
Mayo*	Coarse-loamy, mixed, active, isohyperthermic Humic Dystrudepts
Melones (T)*	Fine, smectitic, isohyperthermic Vertic Paleustalfs
Meros	Mixed, isohyperthermic Typic Ustipsamments
Moca*	Very-fine, mixed, semiactive, isohyperthermic Vertic Paleudults
Montegrande*	Very-fine, mixed, superactive, isohyperthermic Chromic Hapluderts
Morado*	Fine, mixed, superactive, isohyperthermic Dystric Eutrudepts
Moteado*	Very-fine, kaolinitic, isothermic Humic Haplaquox

Soil Series	Classification
Múcara*	Fine-loamy, mixed, superactive, isohyperthermic Dystric Eutrudepts *Múcara map unit also includes:* *fine-loamy, smectitic, isohyperthermic Vertic Hapludolls, and* *fine-loamy, smectitic, isohyperthermic Dystric Eutrudepts*
Naranjito*	Fine, mixed, semiactive, isohyperthermic Typic Haplohumults
Naranjo*	Fine, carbonatic, isohyperthermic Inceptic Haprendolls
Nipe*	Very-fine, ferruginous, isohyperthermic Anionic Acrudox *Nipe map unit also includes:* *very-fine, mixed, isohyperthermic Anionic Acrudox*
Olivares (T)	Fine, mixed, superactive, nonacid, isohyperthermic Typic Endoaquents
Palm*	Clayey-skeletal, isotic, acid, isothermic Aquandic Humaquepts
Palmar	Euic, isohyperthermic Typic Haplosaprists
Palmarejo*	Fine, mixed, semiactive, isohyperthermic Typic Haplustults *Palmarejo map unit also includes:* *fine, mixed, active, isohyperthermic Typic Paleustults*
Pandura*	Coarse-loamy, mixed, active, isohyperthermic, shallow Dystric Eutrudepts

Soil Series	Classification
Parcelas*	Fine, mixed, superactive, isohyperthermic Vertic Hapludalfs
Parguera (T)*	Fine, mixed, superactive, isohyperthermic Aridic Calciustolls
Paso Seco	Fine, mixed, superactive, isohyperthermic Entic Udic Haplusterts
Patillas	Fine-loamy, mixed, superactive, isohyperthermic Humic Hapludults
Pellejas	Fine-loamy over sandy or sandy-skeletal, mixed, subactive, isohyperthermic Typic Dystrudepts
Perchas*	Fine, smectitic, isohyperthermic Chromic Dystraquerts
Picacho*	Fine-loamy, kaolinitic, isothermic Aquic Dystrudepts
Piñones	Fine, mixed, superactive, acid, isohyperthermic Fluvaquentic Endoaquepts
Plata*	Clayey-skeletal, smectitic, isohyperthermic Dystric Eutrudepts
Ponceña	Fine, mixed, superactive, isohyperthermic Typic Calciusterts
Pozo Blanco*	Fine-loamy, mixed, superactive, isohyperthermic Aridic Calciustolls

Soil Series	Classification
Prieto*	Very-fine, mixed, semiactive, nonacid, isohyperthermic Vertic Epiaquepts *Prieto map unit also includes:* *very-fine, kaolinitic, isohyperthermic Vertic Endoaquepts*
Quebrada	Fine, mixed, active, isohyperthermic Dystric Eutrudepts
Reilly	Sandy-skeletal, mixed, isohyperthermic Mollic Udifluvents
Reparada	Fine, mixed, superactive, nonacid, isohyperthermic Mollic Fluvaquents
Río Arriba*	Fine, mixed, subactive, isohyperthermic Vertic Paleudults
Río Lajas	Mixed, isohyperthermic Psammentic Paleudalfs
Río Piedras	Fine, kaolinitic, isohyperthermic Typic Hapludults
Rosario	Clayey, ferruginous, isohyperthermic shallow Typic Hapludox
Sabana	Clayey, mixed, active, isohyperthermic Lithic Dystrudepts
Sabana Seca*	Very-fine, kaolinitic, isohyperthermic Plinthic Haplaquox *Sabana Seca map unit also includes:* *fine, mixed, semiactive, isohyperthermic Udollic Endoaqualfs*

Soil Series	Classification
Saladar	Euic, isohyperthermic Typic Haplosaprists
San Antón*	Fine-loamy, mixed, superactive, isohyperthermic Cumulic Haplustolls *San Antón map unit also includes:* *fine, smectitic, isohyperthermic Vertic Haplustolls,* *fine-loamy, mixed, superactive Fluventic Haplustolls, and* *fine-loamy over sandy or sandy-skeletal, mixed, superactive, isohyperthermic Fluventic Haplustolls*
San Germán*	Clayey-skeletal, mixed, superactive, isohyperthermic, shallow Typic Ustorthents
San Sebastián	Clayey-skeletal, carbonatic, isohyperthermic Calcic Argiudolls
Santa Clara	Fine, mixed, active, isohyperthermic Typic Eutrudepts
Santa Isabel*	Fine, smectitic, isohyperthermic Typic Haplusterts *Santa Isabel map unit also includes:* *very-fine, smectitic, isohyperthermic Typic Haplusterts*
Santa Marta*	Fine, magnesic, isohyperthermic Typic Kanhapludults *Santa Marta map unit also includes:* *clayey, mixed, isohyperthermic Lithic Hapludox, and* *fine, magnesic, isohyperthermic Dystric Eutrudepts*

Soil Series	Classification
Santoni	Fine, mixed, superactive, isohyperthermic Vertic Endoaquolls
Seboruco (T)	Fine-loamy, mixed, superactive, isohyperthermic Calcidic Haplustalfs
Serrano	Fine-loamy over sandy or sandy skeletal, mixed, superactive, nonacid, isohyperthermic Typic Endoaquepts
Sonadora*	Fine, smectitic, isohyperthermic Vertic Eutrudepts
Soller	Clayey, mixed, active, isohyperthermic, shallow Typic Haprendolls
Sosa	Fine, kaolinitic, isohyperthermic Aridic Paleustalfs
Talante	Coarse-loamy over sandy or sandy-skeletal, mixed, subactive, acid, isohyperthermic Aeric Fluvaquents
Tanamá	Clayey, mixed, active, isohyperthermic Lithic Hapludalfs *Tanamá map unit also includes:* *clayey, mixed, active, isohyperthermic Lithic Haplustalfs*
Teja	Loamy-skeletal, mixed, subactive, acid, isohyperthermic Lithic Udorthents
Teresa*	Very-fine, smectitic, isohyperthermic Sodic Haplusterts

Soil Series	Classification
Tiburones*	Euic, isohyperthermic Typic Haplosaprists
Toa*	Fine, mixed, active, isohyperthermic Fluvaquentic Hapludolls
Torres	Fine, kaolinitic, isohyperthermic Plinthic Palehumults
Tuque	Clayey-skeletal, carbonatic, isohyperthermic Lithic Petrocalcic Calciustolls
Utuado*	Coarse-loamy, mixed, active, isothermic Aquic Humic Dystrudepts
Vayas*	Fine, smectitic, nonacid, isohyperthermic Vertic Endoaquolls
Vega Alta*	Fine, kaolinitic, isohyperthermic Typic Hapludults
Vega Baja*	Fine, mixed, active, isohyperthermic Aquic Hapludalfs
Vía	Fine-loamy, mixed, semiactive, isohyperthermic Typic Paleudalfs
Vieques	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, isohyperthermic Typic Dystrustepts
Vigía	Fine, mixed, euic, isohyperthermic Terric Haplosaprists
Vives	Fine-loamy, mixed, superactive, isohyperthermic Fluventic Haplustepts

Soil Series	Classification
Viví	Coarse-loamy over sandy or sandy-skeletal, mixed, subactive, isohyperthermic Fluventic Dystrudepts
Voladora*	Very-fine, mixed, active, isohyperthermic Typic Palehumults
Yauco*	Fine-silty, carbonatic, isohyperthermic Typic Calciustolls
Yunes	Loamy-skeletal, mixed, superactive, isohyperthermic, shallow Humic Dystrudepts
Yunque*	Very-fine, kaolinitic, isothermic Humic Hapludox *Yunque map unit also includes:* *fine, kaolinitic, isothermic Humic Hapludox*
Zarzal*	Very-fine, kaolinitic, isohyperthermic Inceptic Hapludox *Zarzal map unit also includes:* *very-fine, kaolinitic, isohyperthermic Humic Hapludox,* *very-fine, kaolinitic, isohyperthermic Typic Hapludox,* *very-fine, kaolinitic, isohyperthermic Typic Eutrudox,* *very-fine, kaolinitic, isohyperthermic Humic Eutrudox,* *very-fine, kaolinitic, isohyperthermic Humic Xanthic Eutrudox,* *very-fine, parasesquic, isohyperthermic Vertic Dystrudepts, and* *very-fine, kaolinitic, isohyperthermic Oxic Dystrudepts*

Table 8. Approximate area and distribution of the soil orders and suborders of Puerto Rico, sorted by area of orders.

Order/Suborder	Hectares	Acres	Percentage of order	Percentage of soil area	Percentage of total land area
Inceptisols	**266,079**	**656,985**		**35.1**	**29.6**
Aquepts	18,918	46,712	7.1		
Udepts	238,440	588,741	89.6		
Ustepts	8,721	21,532	3.3		
Ultisols	**179,154**	**442,355**		**23.5**	**19.9**
Humults	114,289	282,196	63.8		
Udults	64,381	158,964	35.9		
Ustults	484	1,195	0.3		
Mollisols	**135,558**	**334,710**		**17.8**	**15.1**
Aquolls	11,577	28,585	8.5		
Rendolls	36,121	89,188	26.7		
Udolls	25,077	61,919	18.5		
Ustolls	62,783	155,018	46.3		

Order/Suborder	Hectares	Acres	Percentage of order	Percentage of soil area	Percentage of total land area
Oxisols	**71,609**	**176,813**		**9.4**	**7.9**
Aquox	1,582	3,906	2.2		
Udox	62,693	154,798	87.5		
Ustox	7,334	18,109	10.3		
Vertisols	**38,369**	**94,739**		**5.0**	**4.3**
Aquerts	3,035	7,495	7.9		
Uderts	9,796	24,187	25.5		
Usterts	25,538	63,057	66.6		
Alfisols	**38,339**	**94,665**		**5.0**	**4.3**
Aqualfs	4,590	11,334	12.0		
Udalfs	22,488	55,527	58.6		
Ustalfs	11,261	27,804	29.4		
Entisols	**26,287**	**64,907**		**3.5**	**2.9**
Aquents	3,547	8,757	13.5		
Fluvents	3,699	9,134	14.1		
Orthents	11,798	29,131	44.9		
Psamments	7,243	17,885	27.5		

Order/Suborder	Hectares	Acres	Percentage of order	Percentage of soil area	Percentage of total land area
Histosols	**3,638**	**8,982**		**0.5**	**0.4**
Saprists	3,638	8,982	100.0		
Spodosols	**1,749**	**4,318**		**0.2**	**0.2**
Orthods	1,749	4,318	100.0		
Total soil area	760,782	1,878,474		100.0	84.6
Total non-soil area	138,240	341,334			15.4
Total land area	899,022	2,219,808			100.0

Table 9. Area of the established soil series of Puerto Rico by soil orders, excluding the new series of the El Yunque soil survey.

Series	Hectares	Acres	Taxonomic Classification
Alfisols			
Amelia	2,978	7,352	Fine, mixed, semiactive, isohyperthermic Typic Haplustalfs
Bahía	372	918	Mixed, isohyperthermic Psammentic Paleustalfs
Bejucos	1,269	3,134	Fine-loamy, mixed, subactive, isohyperthermic Typic Hapludalfs
Candelero	2,004	4,949	Fine-loamy, mixed, active, isohyperthermic Typic Albaqualfs
Cayagua	2,586	6,385	Fine, mixed, semiactive, isohyperthermic Aeric Albaqualfs
Guayabo	128	316	Mixed, isohyperthermic Psammentic Paleustalfs
Guayama	5,754	14,208	Clayey, mixed, active, isohyperthermic, shallow Typic Haplustalfs
Guerrero	1,878	4,637	Clayey, kaolinitic, isohyperthermic Arenic Paleudalfs
Juncal	1,538	3,797	Fine, mixed, active, isohyperthermic Typic Hapludalfs
Junquitos	555	1,370	Very-fine, mixed, active, isohyperthermic Aquic Hapludalfs
Machete	965	2,382	Very-fine, mixed, active, isohyperthermic Aridic Paleustalfs
Maguayo	243	600	Fine, smectitic, isohyperthermic Vertic Haplustalfs
Parcelas	456	1,125	Fine, mixed, superactive, isohyperthermic Vertic Hapludalfs

Series	Hectares	Acres	Taxonomic Classification
Río Lajas	876	2,163	Mixed, isohyperthermic Psammentic Paleudalfs
Sosa	821	2,028	Fine, kaolinitic, isohyperthermic Aridic Paleustalfs
Tanamá	14,301	35,312	Clayey, mixed, active, isohyperthermic Lithic Hapludalfs
Vega Baja	853	2,106	Fine, mixed, active, isohyperthermic Aquic Hapludalfs
Vía	763	1,883	Fine-loamy, mixed, semiactive, isohyperthermic Typic Paleudalfs
Total Area	**38,339**	**94,665**	
Entisols			
Aguadilla	1,151	2,843	Mixed, isohyperthermic Typic Udipsamments
Arenales	305	752	Mixed, isohyperthermic Aridic Ustipsamments
Carrizales	1,076	2,657	Siliceous, isohyperthermic, uncoated Typic Quartzipsamments
Catafio	3,617	8,931	Carbonatic, isohyperthermic Typic Udipsamments
Espinal	243	599	Mixed, isohyperthermic Typic Udipsamments
Jareales	749	1,850	Fine, mixed, nonacid, isohyperthermic Thapto-Histic Fluvaquents
Jaucas	56	138	Carbonatic, isohyperthermic Typic Ustipsamments
Martín Peña	947	2,339	Fine, mixed, superactive, nonacid, isohyperthermic Humaqueptic Fluvaquents
Meros	796	1,965	Mixed, isohyperthermic Typic Ustipsamments

Series	Hectares	Acres	Taxonomic Classification
Reilly	3,699	9,134	Sandy-skeletal, mixed, isohyperthermic Mollic Udifluvents
Reparada	90	222	Fine, mixed, superactive, nonacid, isohyperthermic Mollic Fluvaquents
San Germán	9,057	22,363	Clayey-skeletal, mixed, superactive, isohyperthermic, shallow Typic Ustorthents
Talante	1,760	4,346	Coarse-loamy over sandy or sandy-skeletal, mixed, subactive, acid, isohyperthermic Aeric Fluvaquents
Teja	2,741	6,768	Loamy-skeletal, mixed, subactive, acid, isohyperthermic Lithic Udorthents
Total Area	**26,287**	**64,907**	
Histosols			
Garrochales	163	402	Marly, euic, isohyperthermic Limnic Haplosaprists
Palmar	391	966	Euic, isohyperthermic Typic Haplosaprists
Saladar	1,101	2,719	Euic, isohyperthermic Typic Haplosaprists
Tiburones	1,354	3,344	Euic, isohyperthermic Typic Haplosaprists
Vigía	628	1,551	Fine, mixed, euic, isohyperthermic Terric Haplosaprists
Total Area	**3,475**	**8,580**	

Series	Hectares	Acres	Taxonomic Classification
Inceptisols			
Alonso	2,957	7,302	Very-fine, parasesquic, isohyperthermic Oxic Dystrudepts
Anones	2,482	6,129	Fine, parasesquic, isohyperthermic Humic Dystrudepts
Caguabo	64,315	158,802	Loamy, mixed, active, isohyperthermic, shallow Typic Eutrudepts
Callabo	17,287	42,683	Fine, mixed, superactive, isohyperthermic, shallow Typic Dystrudepts
Ciales	556	1,373	Fine-loamy, isotic, acid, isothermic Histic Humaquepts
Coloso	11,818	29,181	Very-fine, kaolinitic, acid, isohyperthermic Vertic Endoaquepts
Córcega	639	1,579	Fine-loamy over sandy or sandy-skeletal, mixed, nonacid, isohyperthermic Fluvaquentic Endoaquepts
Cuchillas	912	2,252	Loamy, mixed, active, isothermic, shallow Typic Dystrudepts
Dique	642	1,586	Fine-loamy, mixed, active, isohyperthermic Fluventic Eutrudepts
Fortuna	828	2,044	Fine, mixed, active, acid, isohyperthermic Fluvaquentic Endoaquepts
Guamaní	1,964	4,849	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, isohyperthermic Torrifluventic Haplustepts
Guayabota	1,626	4,016	Clayey, mixed, subactive, acid, isothermic, shallow Typic Humaquepts
Igualdad	149	369	Clayey over sandy or sandy-skeletal, mixed, superactive, nonacid, isohyperthermic Typic Endoaquepts

Series	Hectares	Acres	Taxonomic Classification
Juana Díaz	292	720	Loamy, mixed, superactive, isohyperthermic, shallow Typic Haplustepts
Machuelo	717	1,770	Fine, mixed, superactive, calcareous, isohyperthermic Fluvaquentic Endoaquepts
Malaya	6,297	15,549	Clayey, mixed, superactive, isohyperthermic, shallow Typic Eutrudepts
Maní	691	1,705	Fine, mixed, semiactive, isohyperthermic Fluvaquentic Eutrudepts
Maragüez	5,132	12,672	Fine-loamy, mixed, superactive, isohyperthermic Typic Eutrudepts
Maunabo	1,707	4,215	Clayey over loamy, mixed, semiactive, acid, isohyperthermic Typic Endoaquepts
Mayo	234	578	Coarse-loamy, mixed, active, isohyperthermic Humic Dystrudepts
Morado	13,524	33,393	Fine, mixed, superactive, isohyperthermic Dystric Eutrudepts
Múcara	73,280	180,939	Fine-loamy, mixed, superactive, isohyperthermic Dystric Eutrudepts
Pandura	20,499	50,615	Coarse-loamy, mixed, active, isohyperthermic, shallow Dystric Eutrudepts
Pellejas	9,979	24,639	Fine-loamy over sandy or sandy-skeletal, mixed, subactive, isohyperthermic Typic Dystrudepts
Picacho	839	2,072	Fine-loamy, kaolinitic, isothermic Aquic Dystrudepts
Piñones	492	1,215	Fine, mixed, superactive, acid, isohyperthermic Fluvaquentic Endoaquepts
Plata	877	2,166	Clayey-skeletal, smectitic, isohyperthermic Dystric Eutrudepts
Quebrada	8,638	21,328	Fine, mixed, active, isohyperthermic Dystric Eutrudepts
Sabana	5,185	12,802	Clayey, mixed, active, isohyperthermic Lithic Dystrudepts

Series	Hectares	Acres	Taxonomic Classification
Santa Clara	721	1,780	Fine, mixed, active, isohyperthermic Typic Eutrudepts
Serrano	385	950	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, nonacid, isohyperthermic Typic Endoaquepts
Utuado	563	1,390	Coarse-loamy, mixed, active, isothermic Aquic Humic Dystrudepts
Vieques	3,515	8,680	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, isohyperthermic Typic Dystrustepts
Vives	2,950	7,283	Fine-loamy, mixed, superactive, isohyperthermic Fluventic Haplustepts
Viví	1,691	4,176	Coarse-loamy over sandy or sandy-skeletal, mixed, subactive, isohyperthermic Fluventic Dystrudepts
Yunes	1,694	4,183	Loamy-skeletal, mixed, superactive, isohyperthermic, shallow Humic Dystrudepts
Total Area	**266,079**	**656,985**	
Mollisols			
Aguilita	11,274	27,836	Coarse-loamy, carbonatic, isohyperthermic Aridic Calciustolls
Bajura	6,409	15,824	Fine, mixed, superactive, nonacid, isohyperthermic Vertic Endoaquolls
Caracoles	419	1,035	Loamy, mixed, superactive, isohyperthermic Lithic Haplustolls
Cintrona	563	1,390	Fine, mixed, superactive, isohyperthermic Typic Calciaquolls

Series	Hectares	Acres	Taxonomic Classification
Coamo	3,023	7,464	Fine, mixed, superactive, isohyperthermic Typic Argiustolls
Colinas	14,107	34,833	Coarse-loamy, carbonatic, isohyperthermic Typic Haprendolls
Constancia	2,912	7,190	Fine, smectitic, isohyperthermic Aeric Calciaquolls
Cortada	1,523	3,760	Fine, smectitic, isohyperthermic Cumulic Haplustolls
Cuyón	774	1,910	Sandy-skeletal, mixed, isohyperthermic Torrifluventic Haplustolls
Descalabrado	25,419	62,764	Clayey, mixed, superactive, isohyperthermic, shallow Typic Haplustolls
Durados	602	1,486	Sandy, mixed, isohyperthermic Fluventic Hapludolls
Ensenada	158	390	Clayey-skeletal, mixed, superactive, isohyperthermic Calcidic Argiustolls
Estación	660	1,630	Fine-loamy over sandy or sandy-skeletal, mixed, active, isohyperthermic Fluventic Hapludolls
Guanábano	373	920	Fine, smectitic, isohyperthermic Calcidic Argiustolls
Humacao	390	963	Fine-loamy, mixed, superactive, isohyperthermic Typic Hapludolls
Jacaguas	2,471	6,100	Loamy-skeletal, mixed, superactive, isohyperthermic Fluventic Haplustolls
Jácana	7,171	17,707	Fine, mixed, superactive, isohyperthermic Vertic Haplustolls
Maresúa	635	1,567	Fine-loamy, magnesic, isohyperthermic Typic Argiudolls
Naranjo	1,958	4,835	Fine, carbonatic, isohyperthermic Inceptic Haprendolls
Pozo Blanco	1,886	4,656	Fine-loamy, mixed, superactive, isohyperthermic Aridic Calciustolls

Series	Hectares	Acres	Taxonomic Classification
San Antón	3,777	9,326	Fine-loamy, mixed, superactive, isohyperthermic Cumulic Haplustolls
San Sebastián	12,246	30,238	Clayey-skeletal, carbonatic, isohyperthermic Calcic Argiudolls
Santoni	317	783	Fine, mixed, superactive, isohyperthermic Vertic Endoaquolls
Soller	20,056	49,520	Clayey, mixed, active, isohyperthermic, shallow Typic Haprendolls
Toa	10,544	26,035	Fine, mixed, active, isohyperthermic Fluvaquentic Hapludolls
Tuque	3,139	7,750	Clayey-skeletal, carbonatic, isohyperthermic Lithic Petrocalcic Calciustolls
Vayas	1,376	3,398	Fine, smectitic, nonacid, isohyperthermic Vertic Endoaquolls
Yauco	1,377	3,400	Fine-silty, carbonatic, isohyperthermic Typic Calciustolls
Total Area	**135,558**	**334,710**	

Oxisols

Adjuntas	885	2,186	Very-fine, kaolinitic, isohyperthermic Inceptic Hapludox
Almirante	8,034	19,838	Very-fine, kaolinitic, isohyperthermic Plinthic Hapludox
Bayamón	9,336	23,052	Very-fine, kaolinitic, isohyperthermic Typic Hapludox
Catalina	108	267	Very-fine, ferruginous, isohyperthermic Typic Hapludox
Consejo	964	2,381	Fine, kaolinitic, isohyperthermic Xanthic Hapludox
Cotito	280	691	Clayey, kaolinitic, isohyperthermic Lithic Kandiustox

Series	Hectares	Acres	Taxonomic Classification
Coto	5,262	12,993	Very-fine, kaolinitic, isohyperthermic Typic Eutrustox
Dagüey	5,952	14,696	Very-fine, kaolinitic, isohyperthermic Inceptic Hapludox
Delicias	280	691	Fine, ferruginous, isohyperthermic Rhodic Hapludox
Limones	993	2,452	Fine, kaolinitic, isohyperthermic Typic Kandiudox
Los Guineos	31,852	78,647	Very-fine, kaolinitic, isothermic Humic Hapludox
Matanzas	1,792	4,425	Clayey, kaolinitic, isohyperthermic Lithic Kandiustox
Nipe	896	2,212	Very-fine, ferruginous, isohyperthermic Anionic Acrudox
Rosario	1,157	2,858	Clayey, ferruginous, isohyperthermic, shallow Typic Hapludox
Sabana Seca	1,582	3,906	Very-fine, kaolinitic, isohyperthermic Plinthic Haplaquox
Yunque	2,235	5,518	Very-fine, kaolinitic, isothermic Humic Hapludox
Total Area	**71,609**	**176,813**	

Spodosols

Algarrobo	808	1,996	Coarse-loamy over clayey, siliceous over mixed, subactive, isohyperthermic Entic Alorthods
Arecibo	205	507	Sandy, siliceous, isohyperthermic Entic Grossarenic Alorthods

Series	Hectares	Acres	Taxonomic Classification
Corozo	735	1,815	Sandy over clayey, aniso, siliceous over kaolinitic, isohyperthermic Typic Alorthods
Total Area	**940**	**2,322**	
Ultisols			
Aceitunas	4,619	11,405	Fine, kaolinitic, isohyperthermic Typic Paleudults
Aibonito	493	1,217	Very-fine, mixed, semiactive, isohyperthermic Typic Haplohumults
Cabo Rojo	541	1,336	Fine, mixed, semiactive, isohyperthermic Aquic Paleudults
Cidral	691	1,705	Fine, mixed, semiactive, isohyperthermic Typic Paleudults
Consumo	36,599	90,369	Fine, mixed, semiactive, isohyperthermic Typic Haplohumults
Corozal	318	784	Very-fine, parasesquic, isohyperthermic Typic Hapludults
Daguao	431	1,063	Fine, mixed, semiactive, isohyperthermic Typic Haplohumults
Espinosa	3,213	7,934	Fine, parasesquic, isohyperthermic Typic Kandiudults
Guanajibo	616	1,521	Fine-loamy, parasesquic, isohyperthermic Plinthic Paleudults
Humatas	54,662	134,967	Very-fine, parasesquic, isohyperthermic Typic Haplohumults
Ingenio	1,504	3,714	Fine, kaolinitic, isohyperthermic Typic Hapludults
Islote	347	857	Fine, mixed, semiactive, isohyperthermic Typic Rhodudults

Series	Hectares	Acres	Taxonomic Classification
Jagüeyes	416	1,028	Fine-loamy, kaolinitic, isohyperthermic Typic Kanhapludults
Jobos	2,244	5,540	Fine, kaolinitic, isohyperthermic Plinthaquic Paleudults
Lares	2,946	7,275	Very-fine, mixed, semiactive, isohyperthermic Aquic Paleudults
Lirios	11,491	28,374	Fine, mixed, subactive, isohyperthermic Typic Hapludults
Maleza	261	645	Fine, parasesquic, isohyperthermic Typic Paleudults
Mariana	432	1,066	Fine, mixed, active, isohyperthermic Typic Haplohumults
Maricao	16,614	41,021	Fine, mixed, subactive, isohyperthermic Inceptic Hapludults
Moca	3,090	7,629	Very-fine, mixed, semiactive, isohyperthermic Vertic Paleudults
Naranjito	18,112	44,721	Fine, mixed, semiactive, isohyperthermic Typic Haplohumults
Palmarejo	484	1,195	Fine, mixed, semiactive, isohyperthermic Typic Haplustults
Patillas	1,512	3,734	Fine-loamy, mixed, superactive, isohyperthermic Humic Hapludults
Río Arriba	4,439	10,960	Fine, mixed, subactive, isohyperthermic Vertic Paleudults
Río Piedras	2,012	4,967	Fine, kaolinitic, isohyperthermic Typic Hapludults
Santa Marta	224	553	Fine, magnesic, isohyperthermic Typic Kanhapludults
Torres	281	694	Fine, kaolinitic, isohyperthermic Plinthic Palehumults
Vega Alta	7,283	17,982	Fine, kaolinitic, isohyperthermic Typic Hapludults

Series	Hectares	Acres	Taxonomic Classification
Voladora	3,280	8,099	Very-fine, mixed, active, isohyperthermic Typic Palehumults
Total Area	**179,154**	**442,355**	
Vertisols			
Aguirre	2,728	6,737	Very-fine, smectitic, isohyperthermic Sodic Haplusterts
Camagüey	149	369	Fine, smectitic, isohyperthermic Aquic Hapluderts
Cartagena	2,290	5,655	Fine, mixed, superactive, isohyperthermic Sodic Haplusterts
Fajardo	282	697	Fine, mixed, active, isohyperthermic Chromic Epiaquerts
Fe	1,107	2,733	Fine, smectitic, isohyperthermic Sodic Haplusterts
Fraternidad	10,563	26,081	Fine, smectitic, isohyperthermic Typic Haplusterts
Guánica	663	1,637	Very-fine, smectitic, isohyperthermic Sodic Epiaquerts
Juncos	821	2,026	Fine, smectitic, isohyperthermic Chromic Hapluderts
Llanos	3,876	9,570	Fine, smectitic, isohyperthermic Entic Haplusterts
Mabí	5,879	14,515	Very-fine, mixed, active, isohyperthermic Aquic Hapluderts
Montegrande	2,947	7,277	Very-fine, mixed, superactive, isohyperthermic Chromic Hapluderts
Paso Seco	1,611	3,977	Fine, mixed, superactive, isohyperthermic Entic Udic Haplusterts
Perchas	2,090	5,161	Fine, smectitic, isohyperthermic Chromic Dystraquerts

Series	Hectares	Acres	Taxonomic Classification
Ponceña	1,500	3,704	Fine, mixed, superactive, isohyperthermic Typic Calciusterts
Santa Isabel	161	397	Fine, smectitic, isohyperthermic Typic Haplusterts
Teresa	1,702	4,203	Very-fine, smectitic, isohyperthermic Sodic Haplusterts
Total Area	**38,369**	**94,739**	