

**LOCATION ACEITUNAS PR**

**Established Series  
Rev. RER  
06/2002**

**ACEITUNAS SERIES**

**The Aceitunas series consists of deep, well drained, moderately permeable soils. They formed in fine textured alluvial and colluvial sediments. These soils are on footslopes, alluvial fans and valleys in coastal plains. Slopes range from 2 to 12 percent. Mean annual precipitation is 66 inches and the mean annual temperature is 77 degrees F.**

**TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Typic Paleudults**

**TYPICAL PEDON: Aceitunas clay in a sugarcane field.  
(Colors are for moist soil)**

**Ap--0 to 7 inches; dark reddish brown (5YR 3/4) clay; moderate medium granular structure; firm, slightly sticky, plastic; many fine roots; many fine quartz grains; very strongly acid; abrupt smooth boundary. (5 to 10 inches thick.)**

**Bt1--7 to 15 inches; yellowish red (5YR 4/6) clay; moderate fine and medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; thin patchy clay films; many fine quartz grains; very strongly acid; clear smooth boundary. (6 to 10 inches thick)**

**Bt2--15 to 23 inches; yellowish red (5YR 4/8) clay; weak fine and medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; thin patchy clay films; common fine quartz grains; common root channels; very strongly acid; clear wavy boundary. (6 to 10 inches thick)**

**Bt3--23 to 36 inches; yellowish red (5YR 4/8) clay; weak fine subangular blocky structure breaking to weak fine granular structure; friable slightly sticky, plastic; few fine roots; common fine quartz grains; common root channels; very strongly acid; clear wavy boundary. (10 to 15 inches thick)**

**Bt4--36 to 60 inches; red (2.5YR 4/8) clay; weak fine subangular blocky structure with shiny ped surfaces; firm, slightly**

**sticky, plastic; few fine roots; many fine quartz grains; very strongly acid.**

**TYPE LOCATION:** Noroeste SCD, Puerto Rico; 2.5 miles southeast of the town of Aquadilla. 2.3 kilometers on unnumbered paved road south of kilometer marker 123.5 of highway 2. 25 feet west of highway.

**RANGE IN CHARACTERISTICS:** The solum is more than 60 inches thick and the argillic horizon is more than 50 inches.

The A horizon has hue of 5YR or 2.5YR and value and chroma of 2 through 4.

The Bt horizon has hue of 5YR or 2.5YR values of 4 to 6 and chromas of 6 to 8. Structure ranges from weak, fine and medium to moderate fine and medium subangular blocky.

**COMPETING SERIES:** There are no other series in this family.

**GEOGRAPHIC SETTING:** The Aceitunas soils occur on gently to moderately sloping footslopes, alluvial fans and valleys associated with limestone hills with slope gradient from 2 to 12 percent. The regolith consists of fine textured sediments washed from the surrounding limestone hills. The climate is humid tropical. The average annual precipitation is 66 inches and the mean annual temperature is 77 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Tanama, Coto, and Matanzas series and the land type Limestone Outcrop, all of which are nonacid. The Tanama soils are neutral and shallow to hard limestone. The Coto soils are yellower and have oxic horizon that extends to more than 50 inches below the surface. The Matanzas soils are redder, shallower and have oxic horizons. Limestone Outcrop is a land type that consists of outcrops covering 75 percent or more of the surface area.

**DRAINAGE AND PERMEABILITY:** Well drained, medium runoff, moderate permeability.

**USE AND VEGETATION:** Most of the acreage is in sugarcane.

**DISTRIBUTION AND EXTENT:** Northwestern coastal plains of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED: Noroeste SCD, Puerto Rico, 1963.**

**REMARKS: These soils were formerly included in the Coto series.**

**Diagnostic horizons and features recognized in this pedon are:**

**Ochric epipedon - 0 to 7 inches (Ap)**

**Argillic horizon - 7 to 60 inches (Bt1, Bt2, Bt3, and Bt4)**

**ADDITIONAL DATA: S72PR-16-1, NSSL**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION AGUILITA      PR**

**Established Series  
Rev. JLL:GRB  
7/98**

## **AGUILITA SERIES**

**The Aguilita series consists of deep, well drained, moderately permeable soils on ridgetops, summits, and side slopes in uplands of the limestone hills and mountains of the Semiarid Mountains and Valley MLRA. They formed in material weathered from soft limestone bedrock. Near the type location, the mean annual precipitation is about 35 inches, and the mean annual temperature is about 79 degrees F. Slopes range from 2 to 60 percent.**

**TAXONOMIC CLASS: Coarse-loamy, carbonatic, isohyperthermic Aridic Calciustolls**

**TYPICAL PEDON: Aguilita very gravelly clay loam - in pastureland. (Colors are for moist soil unless otherwise indicated.)**

**Ap--0 to 8 inches; very dark brown (10YR 2/2) gravelly clay, very dark grayish brown (10YR 3/2) dry; moderate medium granular structure; firm, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many very fine and fine interstitial pores; about 25 percent, by volume, pebbles; moderately alkaline; strongly effervescent; clear smooth boundary. (3 to 8 inches thick).**

**Bk--8 to 14 inches; dark brown (10YR 4/3) clay, brown (10YR 5/3) dry; weak medium subangular blocky structure; firm; sticky, plastic; many very fine and fine roots; many very fine and fine tubular and vesicular pores; many prominent nodules and soft masses of calcium carbonate; moderately alkaline; strongly effervescent; clear smooth boundary. (3 to 6 inches thick).**

**C1--14 to 21 inches; very pale brown (10YR 8/3) clay loam, white (10YR 8/2) dry; massive; friable; slightly sticky, slightly plastic; many very fine, common fine roots; many very fine, common fine tubular and vesicular pores; many prominent soft masses of calcium carbonate; moderately alkaline; strongly effervescent; clear smooth boundary.**

**C2--21 to 33 inches; very pale brown (10YR 8/3) clay loam, white (10YR 8/2) dry; massive; friable; slightly sticky,**

slightly plastic; common very fine and fine roots; many very fine, common fine tubular and vesicular pores; many prominent soft masses of calcium carbonate; moderately alkaline; strongly effervescent; gradual smooth boundary.

C3--33 to 43 inches; pale brown (10YR 6/3) clay loam, light gray (10YR 7/2) dry; massive; friable; slightly sticky, slightly plastic; common very fine and fine roots; many very fine, common fine tubular and vesicular pores; many prominent soft masses of calcium carbonate; moderately alkaline; strongly effervescent; gradual smooth boundary.

C4--43 to 54 inches; light olive brown (2.5Y 5/3) loam, light yellowish brown (2.5Y 6/3) dry; massive; friable; slightly sticky, slightly plastic; many very fine, common fine roots; many very fine tubular and vesicular pores; many prominent soft masses of calcium carbonate; moderately alkaline; strongly effervescent; clear smooth boundary.

Cr--54 to 80 inches; 50 percent light olive brown (2.5Y 5/3) and 50 percent very pale brown (10YR 8/3) stratified soft limestone bedrock, 50 percent light yellowish brown (2.5Y 6/3) and 50 percent very pale brown (10YR 8/3) dry; moderate medium and thick platy rock structure; few fine roots in fractures; stratified layers 8 to 12 inches thick; moderately alkaline; strongly effervescent.

**TYPE LOCATION:** Cabo Rojo Municipio, Puerto Rico. Approximately 3.7 miles northeast of El Combate; southeast from the intersection of P.R. Hwy. 301 and P.R. Hwy. 303, about 0.1 mile south on P.R. Hwy 303, about 200 feet east of highway; USGS Cabo Rojo topographic quadrangle; lat. 17 degrees 59 minutes 24 seconds N. and long. 67 degrees 9 minutes 21 seconds W.; PRD 1940.

**RANGE IN CHARACTERISTICS:** Depth to soft limestone bedrock ranges from 40 to 60 inches. Reaction is moderately alkaline throughout. Rock fragments include pebbles and cobbles composed of limestone.

The A or Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is loam, clay loam, or clay in the fine-earth fraction. Content of rock fragments range from 5 to 60 percent, by volume.

The Bk horizon has hue of 7.5YR to 2.5Y, value of 3 to 8, and chroma of 1 to 6. Texture is loam, silt loam, silty clay, clay loam, or clay in the fine-earth fraction. Nodules and soft masses of calcium carbonate concretions and other features such as filaments of calcium carbonate range from common to many. Content of rock fragments range from 0 to 25 percent, by volume.

The BCk horizon, where present, has hue of 7.5YR to 2.5Y, value of 4 to 8, and chroma of 4 or 6. Textures are similar

to the Bk horizon. Nodules and soft masses of calcium carbonate concretions and other features such as filaments of calcium carbonate range from common to many. Content of rock fragments range from 0 to 25 percent, by volume.

The C horizon has hue of 7.5YR to 2.5Y, value of 6 to 8, and chroma of 1 to 6. Texture is loam, silt loam, or clay loam in the fine-earth fraction. Content of rock fragments range from 0 to 15 percent, by volume.

The Cr horizon is composed of soft limestone bedrock. It has hue of 7.5YR to 2.5Y, value of 6 to 8, and chroma of 1 to 6. It can be excavated with difficulty with hand tools, and is rippable by mechanized equipment.

**COMPETING SERIES:** There are no competing series in the same family.

**GEOGRAPHIC SETTING:** Aguilita soils are on ridgetops, summits, and side slopes in uplands and limestone hills and mountains of the Semiarid Mountains and Valleys MLRA. They formed in material weathered from soft limestone bedrock. Slopes range from 2 to 60 percent. The climate is tropical semiarid. The average annual temperature ranges from 78 to 80 degrees F., and the average annual precipitation ranges from 30 to 40 inches.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Duey, San German, Tuque, and Yauco soils. Duey and San German soils are on similar positions, but are shallow to soft limestone bedrock. In addition, San German soils do not have a Mollic epipedon. Tuque soils are on similar positions and have a petrocalcic horizon. Yauco soils are on lower positions, and are moderately deep to soft limestone bedrock.

**DRAINAGE AND PERMEABILITY:** Well drained; moderate permeability.

**USE AND VEGETATION:** Most of the acreage is used for pastureland. Vegetation consists of Mesquite, Huracan, and other xerophytic grasses and shrubs.

**DISTRIBUTION AND EXTENT:** Uplands of the Semiarid Mountains and Valleys of southern Puerto Rico. The series is of small extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Puerto Rico; 1936.

**REMARKS:**

**The Aguilita soils were correlated as Loamy-skeletal, carbonatic, isohyperthermic Typic Rendolls in the 1970 Soil Survey of the Virgin Islands of the United States. The change from Typic Rendolls to Typic Calciustolls took place when Soil Taxonomy did not allow Rendolls to have an Ustic Soil Moisture Regime.**

**The type location was moved to Puerto Rico from the U.S. Virgin Islands in 1998 and the series reclassified based on soil lab data and observations in the field.**

**Diagnostic horizons and features recognized in this pedon are:**

**Mollic epipedon - zone from 0 to 8 inches (Ap horizon)**

**Calcic horizon - zone from 8 to 14 inches (Bk horizon)**

**ADDITIONAL DATA: Characterization pedon - Cabo Rojo Municipio, Puerto Rico; S97PR-023-002. Sample by the NSSL, Lincoln NE., 6/97.**

**MLRA: 271.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION AIBONITO      PR**

**Established Series  
Rev. BCD  
06/2002**

## **AIBONITO SERIES**

**The Aibonito series consists of very deep well drained, moderately permeable soils. They formed in material weathered from basic volcanic rocks. These moderately steep to steep soils are on ridgetops, and sideslopes in volcanic uplands. Slopes range from 12 to 40 percent. Mean annual precipitation is about 90 inches and the mean annual temperature is about 75 degrees F.**

**TAXONOMIC CLASS: Very-fine, mixed, semiactive, isohyperthermic Typic Haplohumults**

**TYPICAL PEDON: Aibonito clay in a native pasture. (Colors are for moist soil)**

**Ap--0 to 7 inches, dark grayish brown (10YR 4/2) clay; moderate fine subangular blocky structure; very hard, friable, slightly sticky, plastic; many fine roots; very strongly acid; abrupt irregular boundary. (6 to 10 inches thick)**

**Bt1--7 to 11 inches, strong brown (7.5YR 5/6) clay; common fine distinct yellowish red (5YR 4/6) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; extremely firm, sticky, plastic; brown (10YR 4/3) coatings on surfaces of peds; common fine roots; extremely acid; gradual smooth boundary. (3 to 6 inches thick)**

**Bt2--11 to 22 inches, strong brown (7.5YR 5/6) clay; common fine distinct yellowish red (5YR 4/6) mottles; strong coarse prismatic structure parting to moderate medium subangular blocky; extremely firm, sticky, plastic; brown (10YR 4/3) coatings on surfaces of peds; few fine roots restricted to surfaces of peds; few sand size grains; extremely acid; gradual wavy boundary. (8 to 14 inches)**

**Bt3--22 to 32 inches, strong brown (7.5YR 5/6) clay; common fine distinct red (2.5YR 4/6) mottles; strong coarse prismatic structure parting to moderate medium subangular blocky; extremely firm, sticky, plastic; brown (10YR 4/3) coatings on surfaces of peds; few fine roots; few sand size grains; extremely acid; gradual wavy boundary. (8 to 12 inches thick)**

**Bt4--32 to 43 inches, strong brown (7.5YR 5/6) clay; many medium prominent yellowish brown (10YR 5/6) and red (2.5YR 4/6) mottles and few medium prominent white (10YR 8/1) mottles; weak medium subangular blocky structure; friable, slightly sticky, plastic; very few fine roots; thin patchy clay films; 30 percent of this horizon consists of saprolite; extremely acid; gradual wavy boundary. (8 to 14 inches thick)**

**C1--43 to 65 inches, red (2.5YR 4/6), strong brown (7.5YR 5/6) and white (10YR 8/1) clay; massive; friable, slightly sticky, plastic; saprolite; extremely acid; gradual wavy boundary. (15 to 30 inches thick)**

**C2--65 to 110 inches, red (2.5YR 4/6), strong brown (7.5YR 5/6) and white (10YR 8/1) silty clay; massive; friable, slightly sticky, slightly plastic; saprolite; extremely acid.**

**TYPE LOCATION: Torrecillas SCD, Puerto Rico; 6.2 kilometers south of town of Aibonito; 5 feet east of kilometer marker 6.2 of highway 162.**

**RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 33 to 56 inches. Thickness of the B horizons ranges from 27 to 46 inches. The soil is strongly to extremely acid. Organic carbon content in the upper inches of the argillic horizon ranges from 1.5 to 3.0 percent. Base saturation (by sum) is from 3 to 10 percent at 50 inches below the top of the argillic horizon. Cation exchange capacity ranges from 20 to 24 meg/100 grams of clay in the major part of the argillic horizon.**

**The A horizon has hue of 10YR or 7.5YR, value of 3 and 4, and chroma of 2 to 4. It has slightly sticky and plastic consistence.**

**The Bt horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 6 of 8. It is clay and has slightly sticky consistence.**

**The C horizon is variable in color and has slightly plastic to plastic consistence.**

**COMPETING SERIES: The Alonso and Daguey series are in the same family. The Alonso and Daguey soils have hue redder than 5YR.**

**GEOGRAPHIC SETTING: The Aibonito soils are sloping to steep soils on ridgetops and sideslopes of the dissected volcanic uplands with slope gradients from 12 to 40 percent. The soils formed in fine highly weathered residuum of**

**volcanic rocks. The climate is humid tropical. The average annual precipitation is 90 inches. The mean annual temperature is 75 degrees F.**

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Catalina, Comerio and Humatas, Los Guineos and Mucara series in addition to the competing Daguey series. The Catalina and Comerio soils are more highly weathered and occur in flatter, more stable surfaces. The Humatas and Los Guineos have higher CEC. The Mucara soils are shallow to the semiconsolidated basic volcanic rocks.

**DRAINAGE AND PERMEABILITY:** Well drained, runoff medium to rapid, permeability is moderate.

**USE AND VEGETATION:** Most of the acreage is in native grasses and shrubs and used for pasture. Small acreage is cultivated and used for growing of subsistence crops.

**DISTRIBUTION AND EXTENT:** Humid uplands of Puerto Rico. The series is of minor content.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Puerto Rico (San Jual Soil Survey); 1972.

**REMARKS:** The classification was updated with the 4/91 draft from Clayey, oxidic, isohyperthermic Orthoxic Tropohumults to Clayey, mixed, isohyperthermic Typic Haplohumults. The previous OSED date was 4/87.

**Diagnostic horizons and features recognized in this pedon are:**

**Ochric epipedon - 0 to 7 inches (Ap horizon)**

**Argillic horizon - 7 to 43 inches (Bt horizons)**

**ADDITIONAL DATA.** Characterization data are available for the typical pedon, S59PR10-10, SSIR No. 12.

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION ANONES            PR**

**Established Series  
Rev. RER  
07/2001**

## **ANONES SERIES**

**The Anones series consists of shallow, well drained, moderately permeable soils on sideslopes of strongly dissected uplands. They formed in material derived from volcanic rocks. Slopes range from 12 to 60 percent. Mean annual precipitation is 90 inches and the mean annual temperature is 75 degrees F.**

**TAXONOMIC CLASS: Fine, parasesquic, isohyperthermic Humic Dystrudepts**

**TYPICAL PEDON: Anones clay--Elephant grass  
(Colors are for moist soil unless otherwise stated.)**

**Ap--0 to 6 inches; dusky red (2.5YR 3/2) clay; weak fine granular structure; firm, nonsticky, slightly plastic; many fine roots; strongly acid; clear smooth boundary. (4 to 8 inches thick)**

**Bw1--6 to 13 inches; dusky red (2.5YR 3/2), silty clay loam; weak medium subangular blocky structure; firm, nonsticky, slightly plastic; thin patchy clay films on ped surfaces and root channels; common fine roots; very fine pores; strongly acid; gradual wavy boundary. (6 to 10 inches thick)**

**Bw2--13 to 27 inches; weak red (10R 4/2) loam; massive; very friable, nonsticky, nonplastic; common fine roots; strongly acid; 40 percent saprolite; gradual wavy boundary. (10 to 18 inches thick)**

**CR--27 to 40 inches; saprolite-highly weathered volcanic rock with original rock structure visible. Rock fragments are easily broken between fingers; strongly acid.**

**TYPE LOCATION: Oeste SCD, Puerto Rico; 5 miles east of the town of Maricao; 3 kilometers on dirt road from kilometer marker 33.2 of Highway 105. 50 feet west of dirt road.**

**RANGE IN CHARACTERISTICS:** Thickness of the solum and depth to the highly weathered saprolite ranges from 20 to 40 inches.

The A horizon has hue of 10R or 2.5YR, value of 3 and 4 and chroma of 2 to 4. It is silty clay or clay.

The Bw horizon has hue of 10R or 2.5YR, value of 3 or 4 and chroma of 2 to 4. It is silty clay loam or loam.

**COMPETING SERIES:** Santa Marta is the only series in the same family. The Santa Marta soils are less acid and have colors in chromas of 4 or more.

**GEOGRAPHIC SETTING:** The Anones soils are on side slopes of strongly dissected uplands with slope gradients from 12 to 60 percent. The regolith consists of medium textured residuum derived from very highly weathered basic volcanic rocks. The climate is humid tropical. The average annual precipitation is 90 inches and the mean annual temperature is 75 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F. with less than 9 degrees F. difference between mean summer and mean winter temperatures.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Consumo, Humatas, Caguabo, and Mucara series. The Consumo and Humatas soils are redder and have thicker and better developed argillic horizons. The Caguabo and Mucara soils are darker and shallower to the semi-consolidated basic volcanic rock.

**DRAINAGE AND PERMEABILITY:** Well drained, rapid runoff and moderate permeability.

**USE AND VEGETATION:** Coffee and subsistence crops.

**DISTRIBUTION AND EXTENT:** Humid uplands of Puerto Rico. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Oeste SCD, Puerto Rico; 1963.

**REMARKS:** These soils were formerly included and mapped with the Alonso series from which they differ in being shallower to the saprolite and in lacking a well developed B horizon.

**Diagnostic horizons and features recognized in this pedon are:**

**Umbric epipedon - zone from 0 to 6 inches (Ap horizon)**

**Cambic horizon - zone from 6 to 27 inches (Bw1, Bw2 horizon)**

**Paralithic contact - at 27 inches**

**National Cooperative Soil Survey**

**U. S. A.**

**LOCATION BAJURA            PR**

**Established Series  
Rev. RER  
06/2002**

## **BAJURA SERIES**

**The Bajura series consists of deep poorly drained, slowly permeable soils on river flood plains. They formed in sediments of mixed origin. Slopes range from 0 to 2 percent. Mean annual precipitation is 84 inches and the mean annual temperature is 78 degrees F.**

**TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Vertic Endoaquolls**

**TYPICAL PEDON: Bajura clay - sugarcane  
(Colors are for moist soil)**

**Ap--0 to 6 inches, very dark grayish brown (10YR 3/2) clay; massive; hard, firm, slightly sticky, plastic; many fine roots; common fine black concretions; few pressure faces; medium acid; clear smooth boundary. (4 to 8 inches thick)**

**Bw--6 to 12 inches, very dark grayish brown (2.5Y 3/2) clay, many medium distinct gray (N 6/ ) and few medium distinct reddish brown (5YR 4/4) mottles; weak fine and medium subangular blocky structure; very firm, sticky, plastic; common fine roots; common fine black concretions; few pressure faces; medium acid; gradual smooth boundary. (4 to 10 inches thick)**

**Bg1--12 to 32 inches, dark gray (N 4/ ) clay, many medium distinct dark greenish gray (5BG 4/1) and few medium distinct brown (7.5YR 4/4) mottles; weak medium angular blocky structure; very firm, sticky, plastic; few fine roots; few pressure faces; medium acid; gradual smooth boundary. (15 to 25 inches thick)**

**Bg2--32 to 60 inches, dark greenish gray (5BG 4/1) clay, few fine distinct brown (7.5YR 4/4) mottles; weak medium angular blocky structure; very firm, sticky, plastic; few fine roots; few slickensides and pressure faces; medium acid.**

**TYPE LOCATION: Suroeste SCD, Puerto Rico; 2 miles northwest of the town of Cabo Rojo; 500 feet northeast on**

**old railroad from kilometer marker 3.2 of highway 103. 50 feet north of old railroad.**

**RANGE IN CHARACTERISTICS:** Solum thickness is more than 60 inches. The soil is medium acid and slightly acid throughout. The soil has cracks 1/2 to 2 inches wide to a depth of 30 inches during dry seasons in most years. Some polypedons are saline.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. It is silty clay or clay.

The Bw horizon has hue of 2.5Y, value of 3 to 6, and chroma of 0 to 2. It is clay and has few to many mottles.

The Bg horizon has hue of 2.5Y to 5BG, value of 4 or 5, and chroma of 0 to 2. It is clay and has few to many mottles.

**COMPETING SERIES:** There are no other known series in the same family.

**GEOGRAPHIC SETTING:** The Bajura soils are nearly level soils on river flood plains with slopes of 0 to 2 percent. The soils formed on fine textures sediments of mixed origin. The climate is humid tropical. The average annual precipitation is 84 inches and the mean annual temperature is 78 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Coloso, Dique, Igualdad, Maunabo, Santoni and Toa soils all of which are on river flood plains. Coloso soils are somewhat poorly drained and lack cracks. Dique soils are well drained and lack cracks. Igualdad soils have clayey over sandy or sandy-skeletal particle-size control sections. Maunabo soils do not have shrink-swell properties. Santoni soils are calcareous. Toa soils are well drained and moderately well drained and have a mollic epipedon.

**DRAINAGE AND PERMEABILITY:** Poorly drained, slow run-off, slow permeability.

**USE AND VEGETATION:** Most of the acreage is planted to sugarcane but some areas are used for growing pasture.

**DISTRIBUTION AND EXTENT:** Humid river flood plains of Puerto Rico. The series is of moderate extent with about 13,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED: Puerto Rico. (San Juan Soil Survey Area), 1972.**

**REMARKS: These soils were formerly included with the Coloso series, poorly drained phase.**

**Diagnostic horizons and features recognized in this pedon are:**

**Ochric epipedons - zone from 0 to 6 inches (Ap horizons)**

**Vertic property - cracks and pressure faces and slickensides.**

**National Cooperative Soil Survey  
U. S. A.**

**LOCATION BEJUCOS      PR**

**Established Series  
Rev. RER  
06/2002**

## **BEJUCOS SERIES**

**The Bejucos series consists of deep, well drained, moderately permeable soils on small valleys among limestone hills. They formed in moderately coarse over finer textured sediments. Slopes range from 2 to 5 percent. Mean annual precipitation is 66 inches and the mean annual temperature is 77 degrees F.**

**TAXONOMIC CLASS: Fine-loamy, mixed, subactive, isohyperthermic Typic Hapludalfs**

**TYPICAL PEDON: Bejucos sandy loam -- cultivated.  
(Colors are for moist soil.)**

**Ap--0 to 9 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine granular structure; loose, very friable, nonsticky, nonplastic; many fine roots; very strongly acid; abrupt smooth boundary. (7 to 10 inches thick)**

**Bw--9 to 13 inches; dark yellowish brown (10YR 4/4) sandy clay loam; weak coarse subangular blocky structure; very firm, slightly sticky, slightly plastic; common fine roots; strongly cemented; very strongly acid; few fine iron concretions; clear smooth boundary. (4 to 7 inches thick)**

**Bt1--13 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam, few medium faint yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; very firm, slightly sticky, plastic; few fine roots; few fine iron concretions; thin patchy clay films; strongly cemented; very strongly acid; clear smooth boundary. (4 to 8 inches thick)**

**Bt2--18 to 37 inches; yellowish brown (10YR 5/6) silty clay; moderate medium subangular blocky structure; very firm, sticky, plastic; few fine roots; common fine and medium iron concretions; strongly cemented; thin patchy dark yellowish brown (10YR 4/4) clay films; very strongly acid; abrupt wavy boundary. (15 to 20 inches thick)**

**Bt3--37 to 70 inches; strong brown (7.5YR 5/6) silty clay loam with common fine distinct red (2.5YR 4/6) and common**

**fine distinct pinkish gray (7.5YR 7/2) mottles; weak fine subangular blocky structure; very firm, sticky, plastic; weak cementation; common fine iron concretions; very strongly acid; sand grains are coated and bridged with clay.**

**TYPE LOCATION:** Noroeste SCD, Puerto Rico; 2 miles south of town of Isabela; 900 meters east of kilometer marker 2.0 on Highway 112 on dirt road, 25 feet south of road.

**RANGE IN CHARACTERISTICS:** Thickness of solum is more than 60 inches and the argillic horizon is more than 50 inches thick. These soils are strongly acid throughout.

The A horizon has hue of 10YR or 7.5YR, value of 4 and 5 and chroma of 3 and 4. It is sandy loam or sandy clay loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6 and chroma of 4 to 8. It is clay loam, silty clay loam, or silty clay. The organic matter content is less than 1.5 percent in the upper 6 inches of the argillic horizon. Clay films in the B2t vary from thin patchy to thin discontinuous.

**COMPETING SERIES:** This is the Maleza in the same family. The Maleza soils are redder, having colors in hues of 5YR and 2.5YR.

**GEOGRAPHIC SETTING:** The Bejucos series occur in gently sloping small valleys between low limestone hills with slope gradients from 2 to 5 percent. The regolith consists of moderate coarse over finer textured sediments. The climate is tropical humid. The average annual precipitation is 66 inches; and mean annual temperature of 77 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F. with less than 9 degrees F. difference between mean summer and winter temperatures.

**GEOGRAPHICALLY ASSOCIATED SOILS:** This is the competing Maleza series in addition to Coto, Tanama and Limestone outcrops. Coto soils are less acid and have finer textured profiles. Tanama soils are redder, finer textured and shallow to hard limestone. Limestone outcrops is a land type that has 75 percent or more of hard limestone outcrops and overlies the Bejucos soils.

**DRAINAGE AND PERMEABILITY:** Well drained, slow runoff. Permeability is rapid in the surface horizons and moderate in the subsoil and substratum.

**USE AND VEGETATION:** Most of the acreage is planted to subsistence crops and a minor acreage to sugarcane.

**DISTRIBUTION AND EXTENT:** Humid northern coastal plains of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Noroeste SCD, Puerto Rico.

**REMARKS:** This soil was formerly mapped in the Coto series.

**Diagnostic horizons and features recognized in this pedon are:**

**Ochric epipedon - zone from 0 to 9 inches (Ap horizon)**

**Argillic horizon - zone from 13 to 60 inches (Bt1, Bt2, Bt3 horizons)**

**National Cooperative Soil Survey**

**U. S. A.**

**LOCATION CABO ROJO PR**

**Established Series  
Rev. REG:LHR  
07/2001**

## **CABO ROJO SERIES**

**The Cabo Rojo series is moderately well drained, moderately permeable soils on uplands. These soils have dark brown, fine textured, sticky and plastic A horizons over thick, fine textured B horizons that have moderate structure and clay films.**

**TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Aquic Paleudults**

**TYPICAL PEDON: Cabo Rojo clay--sugarcane.  
(Colors are for moist soil.)**

**Ap--0 to 8 inches; dark brown (7.5YR 3/2) with few mixed particles (7.5YR 5/6) from the B horizons, clay; weak medium subangular blocky breaking to moderate medium granular structure; firm, sticky, plastic; many fine roots; common hard angular volcanic rock fragments 1/4 inch to 3 inches in diameter; strongly acid; clear smooth boundary. (6 to 10 inches thick)**

**B21t--8 to 18 inches; strong brown (7.5YR 5/6) clay with common fine distinct red (2.5YR 4/6) mottles and brown (7.5YR 4/4) coatings on exterior of peds; moderate fine subangular blocky structure with thin continuous clay films; firm, sticky, plastic; common fine roots; strongly acid; clear smooth boundary. (8 to 14 inches thick)**

**B22t--18 to 26 inches; strong brown (7.5YR 5/6) clay with few fine distinct greenish gray (5G 6/1), few fine distinct red (2.5YR 4/6) mottles and thin coatings of dark brown (7.5YR 4/4); weak fine subangular blocky structure with thin patchy clay films: firm, sticky, plastic; few fine roots; strongly acid; gradual smooth boundary. (6 to 10 inches thick)**

**B3 & C--26 to 60 inches; variegated colors as pale green (5G 6/2), greenish gray (5GY 6/1), brown (7.5YR 4/4) and distinct mottles of reddish yellow and red clay; moderate coarse subangular blocky structure; firm, sticky, plastic; common partially weathered subrounded volcanic rock fragments 1/4 inch to 3 inches in diameter; strongly acid.**

**TYPE LOCATION:** Suroeste SCD, Puerto Rico; 2.0 miles Northwest of the town of Cabo Rojo; 3/4 miles Southwest of entrance to Belvedere farm on kilometer marker 17.1 of Highway 102.

**RANGE IN CHARACTERISTICS:** Thickness of the solum is over 60 inches and that of the argillic over 50 inches. Clay is the dominant texture throughout. These soils are sticky and plastic. Reaction ranges from strongly to very strongly acid.

Colors of the A horizons have hues of 7.5YR and 10YR, values of 3, and chromas of 2 and 3.

The B horizons have colors that range in hues of 7.5YR and 10YR, values of 4 and 5, and chromas of 4 to 6. The B2t horizons have few to common mottles in shades of red and gray. The B3 horizons have variegated colors of brown, red, gray, pale green and yellow in varying proportions. Structure of the B2t horizons ranges from moderate fine and medium to weak coarse subangular blocky. Clay films in the B2t horizons vary from thin continuous to thin patchy. Organic matter content is 1.5 percent or less in the upper 6 inches of the argillic horizon. Low chroma colors in the lower B horizons are from the parent material and not indicative of restricted drainage.

**COMPETING SERIES:** These are the Cidral, Maleza, Bejucos, Rio Lajas, Jobos, Guanajibo and Guerrero series in the same great group. The Cidral soils have lighter colored surface horizons in values of 4 or more. The Maleza and Bejucos soils are redder and have more than 20 percent extractable sesquioxides in the clay fraction. The Rio Lajas soils have coarser textured profiles. The Jobos, Guanajibo and Guerrero soils have more than 5 percent by volume of nonindurated plinthite in the upper 60 inches.

**GEOGRAPHIC SETTING:** The Cabo Rojo soils occur on gently to moderately sloping low rolling hills and foot slopes with slope gradients of 2 to 12 percent. The regolith consists of fine textured sediments of mixed origin. The climate is humid tropical. The average annual precipitation is 64 inches and the mean annual temperature is 78 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F. with less than 9 degrees F. difference between mean summer and winter temperatures.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Guanajibo in addition to the Mucara, and Voladora series. The Mucara soils are darker colored, shallow to volcanic rock, and have weakly developed B horizons. The Voladora soils are redder and have thinner argillic horizons.

**DRAINAGE AND PERMEABILITY:** Moderately well drained, runoff is medium and permeability is moderate.

**USE AND VEGETATION:** Mostly used for sugarcane. Small acreage is in pasture.

**DISTRIBUTION AND EXTENT:** Humid coastal plains of Southwestern Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Soil Survey of Puerto Rico, 1942.

**REMARKS:** The Cabo Rojo series was formerly classified in the Red and Yellow Podzolic Great Soil Group.

**National Cooperative Soil Survey  
U. S. A.**

**LOCATION CAGUABO      PR**

**Established Series  
Rev. GRB  
06/2002**

### **CAGUABO SERIES**

**The Caguabo series consists of shallow, well drained soils on side slopes of strongly dissected uplands. They formed in material that weathered from igneous rocks. Near the type location, the mean annual precipitation is about 80 inches and the mean annual temperature is 76 degrees F. Slopes range from 5 to 70 percent.**

**TAXONOMIC CLASS: Loamy, mixed, active, isohyperthermic, shallow Typic Eutrudepts**

**TYPICAL PEDON: Caguabo clay loam - native pasture and weeds. (Colors are for moist conditions.)**

**Ap--0 to 4 inches; dark grayish brown (10YR 4/2) clay loam; weak fine granular structure; friable, slightly sticky, slightly plastic; about 10 percent, by volume, igneous rock fragments; common fine roots; slightly acid; clear smooth boundary. (2 to 5 inches thick)**

**Bw--4 to 10 inches; brown (10YR 4/3) very gravelly clay loam; weak fine subangular blocky structure parting to weak fine granular; friable, slightly sticky, slightly plastic; about 60 percent, by volume, igneous rock fragments; few fine roots; slightly acid; clear smooth boundary. (4 to 8 inches thick)**

**C--10 to 16 inches; mixture of weathered and partially weathered igneous rock fragments and saprolite that can be penetrated with the spade. (0 to 7 inches thick)**

**R--16+ inches; consolidated igneous rock.**

**TYPE LOCATION: Oeste SCD, Puerto Rico. Approximately 1.5 miles northwest of the town of Anasco; about 300 feet north of intersection of Highways 2 and 110.**

**RANGE IN CHARACTERISTICS: Solum thickness ranges from 6 to 20 inches and depth to bedrock ranges from**

**10 to 20 inches. The soil is slightly acid throughout.**

**The A horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 6. Texture is loam, clay loam, or their gravelly analogs.**

**The Bw horizon has hue of 7.5YR to 2.5Y, value of 2 to 6, and chroma of 3 to 6. Texture is gravelly to extremely analogs of silty clay loam, clay loam, or clay. Content of saprolite ranges from 0 to 20 percent, by volume.**

**The C horizon, where present, has hue of 7.5YR to 2.5Y, value of 2 to 6, and chroma of 3 to 6; or it has no dominant matrix color and is multicolored. Texture is gravelly or very gravelly analogs of sandy clay loam or clay loam. Content of saprolite ranges from 20 to 60 percent, by volume.**

**The Cr horizon, where present, is saprolite that is similar in color and texture as the C horizon.**

**The R layer is consolidated igneous rock.**

**COMPETING SERIES: There are no other known series in the same family.**

**GEOGRAPHIC SETTING: Caguabo soils are on lower positions of strongly dissected volcanic uplands at elevations below 1,800 feet or 550 meters. Slope range from 5 to 70 percent. They formed in fine-textured residuum or partially weathered igneous rocks. The climate is humid tropical. The average annual precipitation ranges from 75 to 85 inches and the average annual temperature ranges from 75 to 77 degrees F.**

**GEOGRAPHICALLY ASSOCIATED SOILS: These include the Juncos, Mabi, Maraquez, Maresua, Morado, Mucara, and Quebrada soils. All of these soils are deeper to bedrock. In addition, the Juncos, Mabi, and Mucara soils are have clayey, smectitic control sections. The Maraquez and Morado soils and have fine-loamy, mixed control sections. Maresua soils have mixed, clayey-skeletal control sections. Quebrada soils have mixed, clayey control sections.**

**DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.**

**USE AND VEGETATION: Most areas of this soil are used for pasture. A few small areas are planted to woodland. Vegetation consists of native and introduced grasses, shrubs, and trees.**

**DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of large extent.**

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama.**

**SERIES ESTABLISHED: Humacao Survey Area, Puerto Rico; 1969.**

**REMARKS: These soils were formerly included in the Mucara series.**

**Diagnostic horizons and features recognized in this pedon:**

**Ochric epipedon - the zone from 0 to 4 inches (Ap horizon).**

**Cambic horizon - the zone from 4 to 10 inches (Bw horizon).**

**Lithic contact - hard bedrock at 16 inches (R layer).**

**MLRA: 270.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION CAMAGUEY PR**

**Established Series  
Rev. REG-LHR-RLV  
02/97**

## **CAMAGUEY SERIES**

**The Camaguey series consists of very deep, somewhat poorly drained, slowly permeable soils that formed in fine textured sediments derived from limestone. Slopes range from 2 to 5 percent.**

**TAXONOMIC CLASS: Fine, smectitic, isohyperthermic Aquic Hapluderts**

**TYPICAL PEDON: Camaguey clay--sugarcane. (Colors are for moist soil)**

**Ap--0 to 14 inches, black (10YR 2/1) clay; weak coarse subangular blocky structure; firm, sticky, plastic; few fine roots; common fine and few medium volcanic rock fragments; strongly alkaline; clear smooth boundary. (12 to 16 inches thick)**

**Bss1--14 to 24 inches, dark grayish brown (2.5Y 4/2) clay, with common fine distinct light yellowish brown (2.5Y 6/4) mottles; massive; very firm, sticky, plastic; few fine roots; few fine shell fragments; slickensides that intersect; strong effervescence; clear wavy boundary. (10 to 15 inches thick)**

**Bss2--24 to 34 inches, olive yellow (2.5Y 6/6) with many medium distinct dark grayish brown (2.5Y 4/2) mottles, crushed color olive brown (2.5Y 4/4) clay; massive; very firm, sticky, plastic; few fine roots; few fine shell fragments; slickensides that intersect; violent effervescence; clear wavy boundary. (8 to 12 inches thick)**

**Bss3--34 to 50 inches plus, olive yellow (2.5Y 6/6) clay with many medium distinct gray (10YR 5/1) mottles; crushed color olive brown (2.5Y 5/4) massive; very firm, sticky, plastic; slickensides that intersect; violent effervescence.**

**TYPE LOCATION: Culebrinas SCD, Puerto Rico; 1 mile west of the town of Moca; 20 feet North of kilometer marker 3.9 of Highway 111.**

**RANGE IN CHARACTERISTICS: Clay is the dominant texture throughout. These soils are sticky and plastic and**

have cracks that open and close more than once during the year but do not remain open for more than 90 cumulative days during the year. Slickensides are close enough to intersect. Gilgai relief is common in pastures.

Reaction in the A horizon ranges from mildly to strongly alkaline. Thickness of the A horizons ranges from 12 to 16 inches. The A horizon has hue of 10YR, values of 2 and 3 and chroma of less than 1.5.

The Bss horizon has colors in shades of brown and yellow with common to many distinct light yellowish brown and gray mottles. The Bss horizon has slight to violent effervescence with dilute HCL.

**COMPETING SERIES:** This is the only series in the family. Series in similar families are the are the Aguirre, Cartagena, Fe, Fraternidad, Guanica, Paso Seco, and Santa Isabel series. These soils have cracks that remain open for more than 90 cumulative days in a year.

**GEOGRAPHIC SETTING:** The Camaguey soils occur on gently sloping footslopes with slope gradients of 2 to 5 percent. The regolith consists of fine textured sediments derived from limestone. The climate is humid tropical. The average annual precipitation is 84 inches and the mean annual temperatures 78 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F. with less than 9 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Colinas, Santa Clara, and Naranjo series all of which are calcareous, have thinner A horizons and weakly developed B horizons.

**DRAINAGE AND PERMEABILITY:** Somewhat poorly drained, runoff is slow and permeability is slow.

**USE AND VEGETATION:** Most of the acreage is in sugarcane. Small acreage is in pasture.

**DISTRIBUTION AND EXTENT:** Humid inner valleys of the Limestone areas of Northern Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Soil Survey of Puerto Rico, 1942.

**REMARKS:** The Camaguey series was formerly classified in the Chernozem Great Soil Group.

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION CATANO PR**

**Established Series  
Rev. REG  
04/2000**

## **CATANO SERIES**

**The Catano series is excessively drained, rapidly permeable upland soils. These soils are deep, calcareous, brown sands having more than 4 percent silt plus clay in the control section.**

**TAXONOMIC CLASS: Carbonatic, isohyperthermic Typic Udipsamments**

**TYPICAL PEDON: Catano sand--coconut grove.  
(Colors are for moist soil.)**

**A1--0 to 4 inches; light gray (10YR 7/2) sand sized shell fragments, and very dark brown (10YR 2/2) subrounded grains of quartz and miscellaneous volcanic rock fragments with organic matter coatings; overall color is very dark grayish brown (10YR 3/2); single grain; loose, nonsticky, and nonplastic; many fine roots; strong effervescence; clear smooth boundary. (3 to 6 inches thick)**

**AC--4 to 10 inches; dark brown (overall color) (10YR 3/3) sand and more than 4 percent silt plus clay consisting of light gray (10YR 7/2) shell fragments and very dark brown (10YR 2/2) miscellaneous volcanics; single grain; loose, nonsticky, and nonplastic; common fine roots; strong effervescence; clear smooth boundary. (4 to 8 inches thick)**

**C1--10 to 50 inches; brown (overall color) (10YR 4/3) sand and more than 4 percent silt plus clay consisting of light gray (10YR 7/2) shell fragments and very dark brown (10YR 2/2) miscellaneous subrounded volcanic; singly grain; loose, nonsticky and nonplastic; few fine roots; strong effervescence; clear smooth boundary. ( 30 to 60 inches thick)**

**C2--50 to 60 inches; grayish brown (10YR 5/2) (overall color) sand; single grain; loose, nonsticky and nonplastic; very few fine roots; strong effervescence.**

**TYPE LOCATION: Oeste SCD, Puerto Rico; 2 miles north of the city of Mayaguez; 1/2 mile on dirt road North of**

**Boquilla bridge, 300 feet East of dirt road.**

**RANGE IN CHARACTERISTICS:** The sandy materials extend to depth of more than 5 feet. Texture of the whole profile is sand. The sand consists of shell fragments, quartz grains, and volcanic subrounded fragments. Percent of silt plus clay in the control section varies from 4 to 10. These soils are single grain, nonsticky, and nonplastic throughout. Effervescence with dilute HCL varies from slight to violent.

**Overall colors of the A and AC horizons have hues of 10YR and values and chromas of 2 to 3.**

**The C horizons have hues of 10YR, values of 4 and 5, and chromas of 2 and 3.**

**COMPETING SERIES:** These are the St. Lucie (P.R.), Aguadilla, Espinal, Arenales, Meros, and Jaucas series. The St. Lucie (P.R.) soils have sands with more than 95 percent quartz. The Aguadilla soils are acid. The Espinal soils have noncalcareous A horizons and lighter colored C horizons. The Arenales, Meros, and Jaucas soils are dry for more than 90 cumulative days in most years. The Arenales and Meros soils are noncalcareous. The Jaucas soils have lighter colored profile.

**GEOGRAPHIC SETTING:** The Catano soils occur along the coast at elevations close to sea level with slope gradients from 0 to 5 percent. The regolith consists of sand size shell fragments, quartz grains, and miscellaneous volcanic subrounded fragments. The climate is humid tropical. The average annual precipitation is 76 inches and the mean annual temperature is 78 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F. with less than 9 degrees F. difference between mean summer and winter temperatures.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Aguadilla, St. Lucie (P.R.), and Espinal series in addition to the Corcega, and Coloso series and the land type coastal Beach. The Corcega and Coloso soils are finer textured, have low chroma mottles, and occur farther inland. The land type coastal Beach consists of unstabilized wave reworked narrow strips of sand along the coast.

**DRAINAGE AND PERMEABILITY:** Excessively drained; runoff is very slow, and permeability is rapid.

**USE AND VEGETATION:** Mostly on coconuts and undergrowth of pasture. Small acreage is in subsistence crops.

**DISTRIBUTION AND EXTENT:** Humid coastal plains of Puerto Rico. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama**

**SERIES ESTABLISHED: Puerto Rico, 1942; Soil Survey of Puerto Rico.**

**National Cooperative Soil Survey**

**U. S. A.**

**LOCATION CIDRAL            PR**

**Tentative Series  
Reg-LHR  
06/2002**

## **CIDRAL SERIES**

**The Cidral series have fine textured, dark yellowish brown A horizons over thick, fine textured B horizons that have mixed red, brown and yellow colors.**

**TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Typic Paleudults**

**TYPICAL PEDON: Cidral clay - sugarcane  
(Colors are for moist soil)**

**Ap--0 to 8 inches, dark yellowish brown (10YR 4/4) clay; weak medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; slight earthworm activity; very strongly acid; abrupt smooth boundary. 6 to 10 inches thick.**

**B21t--8 to 15 inches, mixed colors, yellowish brown (10YR 5/6), red (2.5YR 4/6) clay with coatings on ped surfaces of dark yellowish brown (10YR 4/4), crushed color strong brown (7.5YR 5/6); moderate medium subangular blocky structure; firm, extremely acid; gradual smooth boundary. 4 to 8 inches thick.**

**B22t--15 to 21 inches; mixed colors, red (2.5YR 4/6) yellowish brown (10YR 5/6, 5/4) crushed color yellowish red (5YR 5/6) clay; moderate fine and medium subangular blocky structure; firm, slightly sticky, plastic; common patchy clay film; few fine roots; extremely acid; clear wavy boundary. (6 to 8 inches thick)**

**B23t--21 to 29 inches, Mixed colors, red (2.5YR 4/6) brownish yellow (10YR 6/6) light yellowish brown (10YR 6/4) and few fine faint light gray (10YR 7/1) mottles; crushed color strong brown (7.5YR 5/8) clay, moderate fine and medium subangular blocky structure; slightly sticky, plastic; common patchy clay films, few fine roots; extremely acid; clear wavy boundary. (6 to 10 inches thick)**

**B31--29 to 40 inches, brownish yellow (10YR 6/8) clay with few fine prominent red (2.5YR 5/6) mottles; weak medium**

subangular blocky structure; friable, slightly sticky, plastic; few thin patchy clay films; few fine roots; extremely acid; clear smooth boundary. 6 to 12 inches thick.

B32--40 to 75 inches plus, yellow (10YR 7/8) clay loam with few fine faint yellowish red (5YR 5/6), and common fine distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable, slightly sticky, plastic; thin patchy clay films; extremely acid.

**TYPE LOCATION:** Culebrinas SCD, Puerto Rico; 4 miles west of the town of Lares; 150 meters north of kilometer marker 31.9 of Highway 111.

**RANGE IN CHARACTERISTICS:** Thickness of the solum is over 60 inches and the argillic horizon is over 50 inches. The soils are extremely acid; slightly sticky and plastic throughout.

The colors of the A horizons vary in hues from 7.5YR to 10YR, in values of 4 and chroma from 4 to 6.

Colors of the B2t horizons are mixed and range in hues from 10YR, 7.5YR and 2.5YR, in values and chroma of 4, 5, and 6. In the lower B horizons yellow colors are dominant mostly in chroma of 6 or higher. Texture of the A and B2t horizons is dominantly clay.

The B3 horizon varies in texture from clay loam to clay. Structure of the B2t horizons ranges from moderate fine to medium subangular blocky. Base saturation at 50 inches below the top of the argillic horizon is less than 35 percent (by sum of cations). Organic matter content in the upper 6 inches of the argillic horizon is less than 1.5 percent.

**COMPETING SERIES:** These are the Cabo Rojo, Maleze, and Bajucos series in the same subgroup and the Rio Lajas, Jobos, Guanajibo and Guerrero series in the same Great Group. The Cabo Rojo soils have darker colored horizons on values darker than 4. The Maleza and Bejucos soils have oxidic mineralogy, in addition, the Bejucos soils are yellower and have more oxides of iron and aluminum in their profiles. The Rio Lajas soils have coarser textured profiles and sandy surface horizons more than 20 inches thick. The Jobos, Guanajibo and Guerrero soils have more than 5 percent nonindurated plinthite in their profiles. The Guerrero soils have sandy surface horizons more than 20 inches thick.

**GEOGRAPHIC SETTING:** The Cidral soils occur in gently to moderately sloping small valleys between the limestone hills with slope gradients from 2 to 12 percent. The regolith consists of fine textured sediments of variegated colors derived from limestone and volcanic rocks. The climate is humid tropical. The average annual precipitation is 90 inches

**and the mean annual temperature is 77 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F. and the difference between mean summer and winter temperature is less than 9 degrees F.**

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Moca, Parchas, Colinas and Juncal series. The Moca soils are darker, moderately well drained, and are underlain by expanding clays. The Parchas soils are poorly drained. The Colinas soils are darker, calcareous, and do not have the weathered B horizons. The Juncal series have darker surface horizons, mildly alkaline B horizons and calcareous substrata.

**DRAINAGE AND PERMEABILITY:** Well drained, medium to slow runoff and moderate permeability.

**USE AND VEGETATION:** Most of the acreage is planted to sugarcane. Small areas are in native pasture.

**DISTRIBUTION AND EXTENT:** Humid uplands of Puerto Rico. The series is of small extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Culebrinas SCD, Puerto Rico.

**REMARKS:** This soil was formerly mapped in the Coto series, but differs from it in being more acid and redder.

**National Cooperative Soil Survey  
U. S. A.**

**LOCATION COLINAS      PR**

**Established Series  
Rev. LHR:REG  
06/2002**

## **COLINAS SERIES**

**The Colinas series is well drained, moderately permeable upland soils. These soils have dark brown, granular A horizons and lighter colored, friable, weakly developed B horizons over soft limestone.**

**TAXONOMIC CLASS: Coarse-loamy, carbonatic, isohyperthermic Typic Haprendolls**

**TYPICAL PEDON: Colinas clay loam--sugarcane.  
(Colors are for moist soil.)**

**Ap--0 to 6 inches; dark brown (10YR 3/3) moist and grayish brown (10YR 5/2) dry, clay loam; moderate fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; 3 percent by volume limestone fragments; violent effervescence; clear smooth boundary. (4 to 8 inches thick)**

**B2--6 to 12 inches; dark grayish brown (10YR 4/2) clay loam with few fine light yellowish brown (2.5Y 6/4) wormcasts; weak medium subangular blocky breaking to weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; 8 percent by volume common fine and medium limestone fragments 1/2 inch to 1 inch in diameter; violent effervescence; gradual smooth boundary. ((4 to 8 inches thick)**

**B3--12 to 16 inches; pale brown (10YR 6/3) clay loam; weak medium subangular blocky structure with stringers of B2 along fracture planes; friable, nonsticky and slightly plastic; few fine roots; 8 percent by volume common fine and medium limestone fragments 1/4 inch to 1 inch in diameter; strong effervescence; gradual smooth boundary. (4 to 8 inches thick)**

**C1--16 to 20 inches; light yellowish brown (10YR 6/4) clay loam with dark coatings along root channels; massive; friable, nonsticky, slightly plastic; common fine and medium limestone fragments 1/4 inch to 1 inch in diameter; few fine roots; violent effervescence; gradual wavy boundary. (4 to 6 inches thick)**

**C2--20 to 60 inches; mixture of soft yellow and white limestone containing 8 percent by volume common fine and medium fragments and concretions 1/4 inch to 1 inch in diameter.**

**TYPE LOCATION:** Culebrinas SCD, Puerto Rico; 3.5 miles east of the town of Moca; 900 meters on dirt road north of kilometer marker 9.65 of Highway 111. 50 feet west of dirt road.

**RANGE IN CHARACTERISTICS:** Thickness of the solum ranges from 12 to 24 inches. Depth to the soft limestone is 16 to 32 inches. Limestone fragments below the A horizon ranges from 5 percent to 10 percent by volume and from 1/4 to 1 inch in diameter. It is calcareous throughout. The mean annual soil temperature ranges from 74 degrees F. to 76 degrees F.

The A horizon has hues of 10YR, values of 3, and chromas of 2 and 3. It is clay loam. Some pedons have 20 to 50 percent cobbles in the A horizon. It is friable, slightly sticky and slightly plastic.

The B2 horizon has hues of 10YR, values of 4 to 6, and chromas of 2 and higher. It is clay loam or silty clay loam. It is slightly sticky to nonsticky and plastic. The B3 horizon is slightly plastic to plastic.

**COMPETING SERIES:** There are no other known series in the same family. The Aguilita, Fredensborg, Naranjo, Pozo Blanco, Santa Clara, Sion, Sollar, Tuque and Yauco series are similar soils in related families. The Aguilita, Fredensborg, Pozo Blanco, Sion, Yauco and Tuque soils have ustic moisture regimes. The Naranjo and Santa Clara soils are not calcareous in the B horizons. The Sollar soils are finer textured and are underlain by hard limestone.

**GEOGRAPHIC SETTING:** The Colinas soils are moderately steep to very steep. They are on ridges and sideslopes of low limestone hills. Slopes range in gradient from 12 to 60 percent. They formed in residuum from soft limestone. The climate is humid tropical. The average annual precipitation is 80 inches and the mean annual temperature is 76 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Santa Clara, Naranjo, and Sollar series in addition to the Camaguey series and the land type Limestone Outcrop. The Camaguey series have thicker and darker A horizons, lack cambic horizons, and have slickensides and pressure faces. The land type Limestone Outcrop has 75 percent or more of the surface area covered by limestone rock outcrops.

**DRAINAGE AND PERMEABILITY:** Well drained, runoff is medium to rapid, and permeability is moderate.

**USE AND VEGETATION:** Sugarcane and pasture. Small acreage is in brush.

**DISTRIBUTION AND EXTENT:** Humid limestone uplands in the northern coastal plains of Puerto Rico. The series is of moderate extent with about 35,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Puerto Rico, 1942; Soil Survey of Puerto Rico.

**Additional Data:** Lincoln Lab. characterization data S-73PR-07-5, 74B-186 to 74B-188.

**National Cooperative Soil Survey  
U. S. A.**

**LOCATION COLOSO            PR**

**Established Series  
Rev. GRB  
10/2001**

## **COLOSO SERIES**

**The Coloso series consists of very deep, somewhat poorly drained, slowly permeable soils on flood plains and terraces. They formed in stratified loamy and clayey alluvial sediments. Near the type location, the mean annual precipitation is about 80 inches and the mean annual air temperature is about 78 degrees F. Slopes range from 0 to 8 percent.**

**TAXONOMIC CLASS: Very-fine, kaolinitic, acid, isohyperthermic Aeric Endoaquepts**

**TYPICAL PEDON: Coloso silty clay loam - sugarcane. (Colors are for moist soil.)**

**Ap--0 to 7 inches; brown (10YR 4/3) silty clay loam; weak medium granular structure; firm, slightly sticky, plastic; many fine roots; few worm holes; slightly acid; clear smooth boundary. (5 to 12 inches thick)**

**Bw--7 to 13 inches; brown (10YR 4/3) silty clay loam, weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; few worm holes; few fine black (10YR 2/1) concretions; common fine distinct yellowish red (5YR 4/6) masses of iron accumulation and common fine faint light gray (10YR 7/2) areas of iron depletion; slightly acid; clear smooth boundary. (0 to 10 inches thick)**

**Cg1--13 to 33 inches; about 50 percent dark gray (10YR 4/1) and 50 percent light gray (5Y 7/1) silty clay loam; massive; firm, slightly sticky, plastic; few fine roots; few worm holes; common fine black (10YR 2/1) concretions; many medium distinct reddish brown (5YR 4/3) masses of iron accumulation; the areas in colors of dark gray and light gray are iron depletions; slightly acid; gradual smooth boundary. (15 to 25 inches thick)**

**Cg2--33 to 60 inches; dark gray (10YR 4/1) silty clay; massive; firm, slightly sticky, plastic; few fine roots; few worm holes; common fine black (10YR 2/1) concretions; many fine faint yellowish brown (10YR 5/8) masses of iron accumulation and common fine distinct greenish gray (5GY 5/1) areas of iron depletion; slightly acid.**

**TYPE LOCATION:** Oeste SCD, Puerto Rico. Approximately one kilometer west of the town of Anasco; about 250 meters west of kilometer marker 145.5 of Highway 2, and fifty feet north of farm road.

**RANGE IN CHARACTERISTICS:** Solum thickness ranges from 7 to 22 inches. Rock fragments range from 0 to 10 percent by volume throughout the profile. Reaction ranges from moderately acid to slightly acid throughout the profile.

The A or Ap horizon have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is silty clay loam or silty clay.

The Bw horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Redoximorphic features in shades of red, yellow, brown, or gray range from few to many. Texture is silty clay loam, silty clay, or clay.

The C horizons have hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 to 4. Redoximorphic features in shades of red, yellow, or brown range from few to many. Texture is silty clay loam, silty clay, or clay.

**COMPETING SERIES:** There are no other known series in the same family.

**GEOGRAPHIC SETTING:** Coloso soils are on river flood plains and terraces. They formed in stratified loamy and clayey alluvial sediments of mixed origin. Slopes range from 0 to 8 percent. The climate is humid tropical. The average annual precipitation ranges from 78 to 82 inches and the mean annual air temperature is 77 to 79 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These include the Bajura, Corcega, Dique, and Toa series. The poorly drained Bajura soils have mixed mineralogy and Vertic subgroups. Corcega soils are fine-loamy over sandy or sandy-skeletal. The well drained Dique soils are fine-loamy. The well drained Toa soils have mixed mineralogy and a Mollic epipedon.

**DRAINAGE AND PERMEABILITY:** Somewhat poorly drained; slow permeability.

**USE AND VEGETATION:** Most areas of Coloso soils are used for sugarcane production. Some areas are used for pasture. A few areas are in woodland consisting of native and introduced species.

**DISTRIBUTION AND EXTENT:** Humid river flood plains of Puerto Rico. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama.

**SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.**

**REMARKS: Diagnostic horizons and features recognized in this pedon.**

**Ochric epipedon - the zone from 0 to 7 inches (Ap horizon).**

**Cambic horizon - the zone from 7 to 13 inches (Bw horizon).**

**Aquic feature - apparant water table; 2 to 4 feet; July through September.**

**ADDITIONAL DATA: Rio Grande Municipality, Puerto Rico; S93PR-119-009 and S93PR-119-012. Samples by NSSL, Lincoln, NE.**

**MLRA: 270, 272.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION CONSUMO PR**

**Established Series  
Rev. BCD  
02/98**

## **CONSUMO SERIES**

**The Consumo series consists of moderately deep to saprolite, well drained, moderately permeable soils formed in residuum from basic volcanic rocks. They are steep to very steep soils on side slopes and ridges of maturely dissected uplands. Slopes range from 20 to 60 percent. The mean annual precipitation is about 76 inches and the mean annual temperature is about 77 degrees F.**

**TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Typic Haplohumults**

**TYPICAL PEDON: Consumo clay--Pangolagrass. (Colors are for moist soil unless otherwise stated.)**

**Ap--0 to 6 inches; reddish brown (5YR 4/4) clay; moderate medium granular structure; slightly hard friable, slightly sticky and slightly plastic; many fine roots; very strongly acid, clear smooth boundary. (4 to 8 inches thick)**

**Bt1--6 to 14 inches; red (2.5YR 4/8) clay; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; common fine roots; common fine pores and root channels; thin patchy clay films; very strongly acid; gradual smooth boundary. (6 to 8 inches thick)**

**Bt2--14 to 20 inches; red (2.5YR 4/8) rubbed color clay; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; few fine roots; thin patchy clay films; 50 percent of the horizon consists of saprolite; very strongly acid; gradual smooth boundary. (4 to 8 inches)**

**C--20 to 60 inches; variegated colors of the saprolite, which include red (2.5YR 4/8, 5/8), yellow (10YR 7/8), brown (7.5YR 5/4), light gray (10YR 7/1), silty clay loam; massive; black coatings on some faces; very friable, nonsticky, slightly plastic; very strongly acid. Original rock structure is visible and weathered rock fragments can be easily broken between fingers.**

**TYPE LOCATION:** Oeste SCD, Puerto Rico; 8 miles east of the city of Mayaguez; 100 feet west and 50 feet south of kilometer marker 13.5 on Highway 106.

**RANGE IN CHARACTERISTICS:** Thickness of the solum ranges from 14 to 24 inches. Thickness of the argillic horizon varies from 10 to 16 inches. This soil is strongly to very strongly acid throughout. The mean annual soil temperature ranges from 74 to 76 degrees F.

The A horizon has hues of 5YR or 2.5YR, values of 4 or 5, and chromas of 4 to 6. It is slightly sticky and slightly plastic or plastic.

The Bt horizon has hues of 5YR or 2.5YR, values of 4 or 5, and chroma of 6 or 8. It is clay in the upper part and clay or silty clay in the lower part. Structure varies in grade from weak to moderate subangular blocky. It is slightly sticky to nonsticky, and slightly plastic. Clay films vary from thin patchy to thin discontinuous. Saprolite ranges from 10 to 60 percent in the lower part.

The BC horizon, where present is clay or silty clay. Saprolite ranges from 40 to 80 percent. Consistence is nonsticky to slightly sticky.

**COMPETING SERIES:** There are no other known series in the same family. The Caspar, Consejo, Corozal, Corozo, Ingenio, Jagueyes, Lirios, Maricao, Moca, Patillas, and Rio Piedras series are similar soils in related families. The Caspar, Consejo, Lirios and Rio Piedras soils have argillic horizons thicker than 16 inches. The Corozal soils have thicker argillic horizons and low chroma mottles. The Corozo, Ingenio, and Jagueyes soils have thicker argillic horizons and CEC values lower than 24 meq/100 grams of clay. The Maricao soils have colder soil temperatures, lower than 72 degrees F. (mean annual). The Moca soils have thicker argillic horizons and also have higher COLE values and cracks when dry. The Patillas soils have coarser textured profiles with less than 35 percent clay.

**GEOGRAPHIC SETTING:** The Consumo soils are steep to very steep soils on side slopes and ridges. Slope gradients range from 20 to 60 percent. The soils formed in fine over coarser textured residuum weathered from basic volcanic rock. The climate is humid tropical. The average annual precipitation is 73 to 80 inches, and the mean annual temperature is 75 to 78 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Anones, Daguey, Humatas, Morado, and Mucara series. The Anones soils have weaker structure in the B horizons, lack clay skins, and are pinkish colored. Daguey and

**Humatas soils are deeper and have argillic horizons thicker than 16 inches. Morado and Mucara soils have coarser textured profiles, are less acid, and shallower to the basic volcanic rock.**

**DRAINAGE AND PERMEABILITY: Well drained; rapid runoff; moderate permeability.**

**USE AND VEGETATION: Used for coffee, pasture and food crops.**

**DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of large extent.**

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama**

**SERIES ESTABLISHED: Ponce Survey Area, Puerto Rico; 1971.**

**REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Dystropeptic Haplohumults to Clayey, mixed, isohyperthermic Typic Haplohumults. The previous OSED date was 10/75.**

**Diagnostic horizons and features recognized in this pedon:**

**Ochric epipedon - zone from 0 to 6 inches (Ap horizon)**

**Argillic horizon - zone from 6 to 20 inches (Bt horizons)**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION CORCEGA            PR**

**Established Series  
Rev. REG:LHR  
06/2002**

### **CORCEGA SERIES**

**The Corcega series consists of brown, granular, moderately fine textured A horizons and mottled, weakly developed moderately fine textured B horizons over dark gray sands.**

**TAXONOMIC CLASS: Fine-loamy over sandy or sandy-skeletal, mixed, semiactive, nonacid, isohyperthermic Fluvaquentic Endoaquepts**

**TYPICAL PEDON: Corcega silty clay loam - sugarcane. (Colors are for moist soil.)**

**Ap--0 to 8 inches; dark brown (10YR 4/3) silty clay loam; weak medium granular structure; firm, slightly sticky, slightly plastic; many fine roots; slightly acid; clear smooth boundary. (6 to 12 inches thick)**

**B2--8 to 14 inches; dark brown (10YR 4/3) silty clay loam with common fine prominent yellowish red (5YR 4/6) and few fine distinct light gray (10YR 7/2) mottles; weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; common fine black concretions; slightly acid; clear smooth boundary. (5 to 8 inches thick)**

**B3--14 to 32 inches; dark gray (10YR 4/1) sandy clay loam with common fine distinct reddish brown (5YR 4/3) and common fine distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine black concretions; few fine roots; slightly acid; clear smooth boundary. (13 to 20 inches thick)**

**IIC--32 to 50 inches plus; dark gray (10YR 4/1) sand; single grain; loose, nonsticky and nonplastic; slightly acid.**

**TYPE LOCATION: Oeste SCD, Puerto Rico; 2 miles west of the town of Anasco; 40 meters west of kilometer marker 2.0 on Highway 115.**

**RANGE IN CHARACTERISTICS: Depth to the sands varies from 24 to 40 inches. Depth to water table varies from**

**10 to 36 inches.**

**Colors of the A horizons have hues of 10YR and values of 3 and 4.**

**The B horizons have colors in hues of 10YR, values of 4 and chromas of 2 and 4. The B horizons have few to common mottles of yellowish red, reddish brown, light gray and gray colors. Structure of the B horizons ranges from weak fine to medium subangular blocky.**

**The C horizons have colors in hues of 10YR and 2.5Y, values of 4 and chromas of 1 and 2 and mottles of reddish brown, yellowish brown and gray colors. Silty clay loam is the dominant type. These soils have slightly sticky and slightly plastic sola. Reaction ranges from slightly to medium acid.**

**COMPETING SERIES:** These are the Maunabo, Vayas, Fortuna, Playa, Bajura, Santoni, Josefa, Talante, Coloso, and Pinones series. The Maunabo and Fortuna soils are acid, lack the sandy C horizons, and are finer textured throughout. The Playa, Bajura and Santoni soils are darker, finer textured, and have low chroma mottles higher in the profile. The Josefa soils are more acid. The Vayas soils are finer textured throughout and saline in the lower horizons. The Coloso soils are finer textured and do not have sandy C horizons. The Talante soils are more acid. The Pinones soils have buried organic materials within 20 inches of the surface.

**GEOGRAPHIC SETTING:** The Corcega soils occupy nearly level areas in the river flood plains. The regolith consists of moderately fine textured sediments of mixed origin over sands. The climate is humid tropical. The average annual rainfall is 80 inches and the mean annual temperature is 78 degrees F. Mean annual soil temperature at 20 inches is more than 71.6 degrees F. with less than 9 degrees F. difference between mean summer and mean winter temperature.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Playa, Bajura, Santoni, and Coloso series in addition to Toa and Dique soils both lacking low chroma mottles in the upper profile and the sands in the C horizons.

**DRAINAGE AND PERMEABILITY:** Somewhat poorly drained, runoff is slow and permeability is moderate.

**USE AND VEGETATION:** Sugarcane.

**DISTRIBUTION AND EXTENT:** Humid river flood plains of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama**

**SERIES ESTABLISHED: Puerto Rico; 1942.**

**REMARKS: The Corcega series was formerly classified in the Alluvial Great Soil Group. It is being revised and placed in the New System of Soil Classification.**

**National Cooperative Soil Survey  
U. S. A.**

**LOCATION COTITO            PR**

**Established Series  
Rev. BCD  
06/2002**

## **COTITO SERIES**

**The Cotito series consists of moderately deep, well drained, moderately permeable soils formed in colluvium and alluvium from surrounding volcanic hillsides. Slopes range from 0 to 5 percent. The mean annual precipitation is about 66 inches and the mean annual temperature is about 76 degrees F.**

**TAXONOMIC CLASS: Clayey, kaolinitic, isohyperthermic Lithic Kandustox**

**TYPICAL PEDON: Cotito clay-sugarcane (Colors are for moist soil)**

**Ap--0 to 6 inches; reddish brown (5YR 4/4) clay; weak fine granular structure; hard friable, slightly sticky, slightly plastic; common fine roots; slightly acid; gradual smooth boundary. (4 to 8 inches thick)**

**Bo1--6 to 12 inches; yellowish red (5YR 6/6) clay; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine roots; thin patchy clay films; few fine pores; neutral; gradual smooth boundary. (4 to 8 inches thick)**

**Bo2--12 to 20 inches; yellowish red (5YR 6/6) clay; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine roots; thin patchy clay films; common fine pores; slightly acid; gradual smooth boundary. (6 to 10 inches thick)**

**Bo3--20 to 24 inches; yellowish red (5YR 5/6) clay; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine roots; common fine pores; thin clay films in root channels; slightly acid; gradual smooth boundary. (4 to 6 inches thick)**

**Bo4--24 to 29 inches; strong brown (7.5 YR 5/6) clay; weak medium subangular blocky structure; slightly hard, friable,**

slightly sticky, slightly plastic; many fine pores; thin patchy clay films; slightly acid; abrupt irregular boundary.

R--29 inches; white hard fragmental limestone with outer edges stained with strong brown; pockets in limestone filled with material similar to the soil of the overlying horizon.

**TYPE LOCATION:** Noreste SCD, Puerto Rico, 5.0 miles east of city of Aguadilla; 1800 feet north of kilometer marker 115.1 of highway 2.

**RANGE IN CHARACTERISTICS:** Base retention is 10 meq. or less/100 grams of clay but more than 1 meq. in all subhorizons of the oxic horizon. CEC is 16 meq. or less per 100 grams of clay. Organic matter content is less than 20 kilograms in a volume 1 meter square to a depth of 1 meter. Base saturation is 35 percent or more in all subhorizons to the contact with the hard limestone. These soils are slightly acid to neutral throughout and consistency is slightly sticky and slightly plastic. Clay is the dominant texture. Depth to the hard fragmental limestone ranges from 20 to 40 inches.

Colors of the A horizon have hues of 5YR and 7.5YR, values of 3 and 4 and chromas of 4.

The Bo horizons have hues of 7.5YR and 5YR, values of 4 and 5 and chromas of 6 or higher. Structure of the Bo horizons ranges from weak fine to medium subangular blocky.

**COMPETING SERIES:** These are the Bayamon and Matanzas series in the same Subgroup and the Nipe, Delicias, Rosario, Catalina, Comerio and Coto series in the same Suborder. The Bayamon and Matanzas soils are redder and have higher content of iron oxides. The Nips soils have oxic horizons that extend to more than 80 inches from the surface and are more highly weathered. The Delcias soils have Base saturation of less than 35 percent, are redder and contain hard iron concretions in their profiles. The Rosario soils are redder, their oxic horizons are dominated by iron oxides and overlie serpentinite rock. The Catalina and Comerio soils have thicker and redder oxic horizons. The Coto soils have oxic horizons thicker than 40 inches and have base saturation less than 35 percent in some subhorizon of the oxic.

**GEOGRAPHIC SETTING:** The Cotito soils occur on nearly level and gently sloping footslopes and valleys with slopes gradients of 0 to 5 percent. The regolith consists of fine textures sediments washed from the surrounding limestone hills. The climate is humid tropical. The average annual precipitation is 66 inches and the mean annual temperature is 76 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F. and the difference between mean summer and winter temperatures is less than 9 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** This is the competing Matanzas in addition to the Aceitunas, and Tanama series and the land type limestone Outcrops. The Aceituna soils are deeper, redder and more acid. The Tamana soils are shallower being less than 20 inches to hard rock. The land type limestone outcrops consists of outcrops covering 75 percent or more of the surface area.

**DRAINAGE AND PERMEABILITY:** Well drained, runoff is medium, permeability is moderate.

**USE AND VEGETATION:** Most of the acreage is in sugarcane.

**DISTRIBUTION AND EXTENT:** Northwestern coastal plains of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Noroeste SCD, Puerto Rico.

**REMARKS:** The classification was updated with the 4/91 draft from Clayey, kaolinitic, isohyperthermic, shallow Tropeptic Eutrorthox to Very-fine, kaolinitic, isohyperthermic Lithic Eutradox. The previous OSED was dated 4/67.

This soil was formerly included in the Coto series but differs from it in being shallower to the limestone rock.

**Diagnostic horizons and features recognized in this pedon:**

Ochric epipedon - zone from 0 to 6 inches (Ap horizon)

Oxic horizon - zone from 6 to 29 inches (Bo horizons)

Lithic contact - zone at 29 inches (R layer)

National Cooperative Soil Survey  
U.S.A.

**LOCATION COTO            PR**

**Established Series  
Rev. BCD  
06/2002**

## **COTO SERIES**

**The Coto series consists of very deep, well drained, moderately permeable soils formed in sediments weathered from limestone. They are on upland foot slopes and valleys adjacent to limestone hills. Slopes range from 2 to 12 percent. The mean annual precipitation is about 69 inches and the mean annual temperature is about 77 degrees F.**

**TAXONOMIC CLASS: Very-fine, kaolinitic, isohyperthermic Typic Eutruxox**

**TYPICAL PEDON: Coto clay--Native pasture. (Colors are for moist soil.)**

**Ap--0 to 9 inches; dark brown (7.5YR 4/4) clay; moderate fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; many fine roots; strongly acid; clear smooth boundary. (7 to 11 inches thick)**

**Bo1--9 to 14 inches; reddish brown (5YR 4/4) clay; moderate fine and medium subangular blocky structure; firm, slightly sticky, slightly plastic; thin discontinuous clay films; common fine roots; few fine black nodules; very strongly acid; gradual smooth boundary. (4 to 7 inches thick)**

**Bo2--14 to 19 inches; yellowish red (5YR 4/8) clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few thin patchy clay films; few fine roots; few fine black nodules; common fine pores; very strongly acid; gradual smooth boundary. (4 to 7 inches thick)**

**Bo3--19 to 26 inches; strong brown (7.5YR 5/8) clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few thin patchy clay films; few fine roots; many fine pores; few fine black nodules; strongly acid; gradual smooth boundary. (6 to 9 inches thick)**

**Bo4--26 to 37 inches; strong brown (7.5YR 5/8) clay; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic, thin patchy clay films; few fine roots; common fine pores; few fine quartz grains; few fine**

**black nodules; strongly acid; gradual smooth boundary. (9 to 13 inches thick)**

**Bo5--37 to 49 inches; strong brown (7.5YR 5/8) clay with few fine distinct red (7.5R 4/8) mottles; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few thin clay films; many sand sized quartz grains; strongly acid; gradual smooth boundary. (10 to 14 inches thick)**

**Bo6--49 to 70 inches; strong brown (7.5YR 5/8) clay with common fine and medium distinct red (7.5R 4/8) mottles; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few thin patchy films; many sand sized quartz grains; strongly acid; gradual smooth boundary. (15 to 25 inches thick)**

**Bo7--70 to 92 inches; strong brown (7.5YR 5/8) clay with common medium distinct red (7.5R 4/8) mottles; massive; friable, slightly sticky, slightly plastic; very strongly acid.**

**TYPE LOCATION: Noroeste SCD, Puerto Rico; 11 kilometers east from town of Aguadilla; 6 kilometers southwest of town of Isabela; 200 feet south of kilometer marker 120 on Highway 2. Aerial Photograph GS-LR 5-94.**

**RANGE IN CHARACTERISTICS: Thickness of the solum and depth to the hard limestone is over 40 inches. Consistence is slightly sticky and slightly plastic in the Bo horizons. Reaction is strongly or very strongly acid in the whole profile. Bases plus aluminum meq/100 grams of clay range from 2.7 to 4.7 in the oxic horizon. CEC, by Nh4OAC, ranges from 7 to 15.0 meq/100 grams of clay in the oxic horizon. Base saturation by NH4OAC, in the upper part of the oxic horizon ranges from 20 to 34 percent. Some part of the oxic horizon has thin patchy films or reflective ped surfaces with pressure induced clay orientation. The mean annual soil temperature is 76 degrees F.**

**The A horizon has hues of 5YR or 7.5YR and values and chroma of 3 to 4. Texture is clay or sandy clay loam. Structure is weak or moderate, fine or medium subangular blocky.**

**The upper Bo horizons have hues of 5YR, value of 4 and chroma of 4 to 8. Texture is clay. Structure is weak to moderate, fine or medium subangular blocky. The lower Bo horizons have hues of 7.5YR, values of 4 or 5, and chromas of 6 to 8. Red mottles may or may not be present. Structure of the lower Bo horizon is weak fine to coarse or structureless (erosive).**

**COMPETING SERIES: There are no other known series in the same family. The Bayamon, Catalina, Cotito, Delicias, Hanamaulu, Kapaa, Kunuweia, Lawai, Makopili, Matanzas, Nipe, Pooku, Puhí, and Rosario series are similar soils in**

related families. The Bayamon and Delicias soils are more strongly weathered. The Catalina soils are redder, with color in hues of 2.5YR and redder, and have clay mineralogy dominated by oxides of iron. The Cotito, Matanzas, and Puhi soils have base saturation values higher than 35 percent in all parts of the oxic horizon. The Hanamaulu, Lawai and Makopili soils have an umbric surface horizon. The Kapaa and Pooku soils have sheets that contain 30 percent or more gibbsite. The Kunuweia and Nipe soils are extremely weathered and have much lower cation retention values. The Rosario soils have serpentine rock within 40 inches of the surface.

**GEOGRAPHIC SETTING:** The Coto soils are gently to moderately sloping soils on foot slopes and valleys adjacent to the limestone hills on slope gradients of 2 to 12 percent. They formed in fine textured sediments derived from limestone. The climate is humid tropical. The average annual precipitation is 67 to 70 inches and the mean annual temperature is 77 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Bayamon, Cotito, Matanzas series and the Aceitunas, Almirante, Espinosa, Tanama series. The Tanama soils are shallower to the fragmental limestone and have argillic horizons. The Almirante and Espinosa soils have thick argillic horizons. The Aceitunas soils are redder, acid and have thick argillic horizons.

**DRAINAGE AND PERMEABILITY:** Well drained, runoff is slow to medium and permeability is moderate.

**USE AND VEGETATION:** Most of the acreage is in sugarcane. Small acreage is in pasture and food crops.

**DISTRIBUTION AND EXTENT:** North central and Northwestern coastal plains of Puerto Rico. The series is of moderate extent with about 13,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Soil Survey of Puerto Rico, 1942.

**REMARKS:** The classification was updated with the 4/91 draft from Clayey, kaolinitic, isohyperthermic Tropeptic Haplorthox to Very-fine, kaolinitic, isohyperthermic Typic Hapludox. The previous OSED was dated 11/75.

**Diagnostic horizons and features recognized in this pedon:**

**Ochric epipedon - zone from 0 to 9 inches (Ap horizon)**

**Oxic horizon - zone from 9 to 92 inches (Bo horizons)**

**ADDITIONAL DATA: Laboratory data is available for typical pedon. S63PR-6-2.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION CUCHILLAS PR**

**Established Series  
Rev. REG:LHR  
08/1999**

## **CUCHILLAS SERIES**

**The Cuchillas series is of moderately deep, moderately permeable soils formed in materials weathered from volcanic rocks.**

**TAXONOMIC CLASS: Loamy, mixed, active, isothermic, shallow Typic Dystrudepts**

**TYPICAL PEDON: Cuchillas silty clay loam - coffee.**

**Ap--0 to 5 inches; dark brown (10YR 3/3) silty clay loam, moderate fine and medium granular structure; firm, slightly sticky, slightly plastic; many fine roots; weathered rock fragments 1/4 to 1/2 inch in diameter; very strongly acid; worm activity; clear smooth boundary. (4 to 8 inches thick)**

**B--5 to 15 inches; dark yellowish brown (10YR 3/4) silty clay loam; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; very strongly acid; partially weathered rock fragments 1/4 to 1/2 inch in diameter; worm activity; clear smooth boundary. (6 to 12 inches thick)**

**C--15 to 26 inches; weathered volcanic rock, slightly acid.**

**R--26 plus inches; Semi-consolidated volcanic rock.**

**TYPE LOCATION: Oeste SCD, Puerto Rico; 8.0 miles southeast of town of Maricao; 400 meters south on dirt road from kilometer marker 2.3 on Highway 374; 20 feet east of dirt road.**

**RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 10 to 20 inches. Depth to the semi-consolidated volcanic rock varies from 20 to 36 inches. Fine volcanic fragments in the sola may range from 0 to 5 percent. Base saturation is less than 50 percent in some parts of the epipedon and cambic horizon. Organic carbon**

content decreases regularly with depth. The mean annual soil temperature ranges from 69 to 71 degrees F.

The A horizon has hue of 10YR, values of 3 or 4, and chroma of 2 or 3. Texture is silty clay loam. Structure is weak or moderate, fine or medium granular. Consistence is slightly sticky and slightly plastic or plastic. Reaction is strongly or very strongly acid.

The B horizon has hue of 10YR, values of 3 or 4, and chroma of 4 and higher. Texture is silty clay loam or silty clay. Structure is weak, fine, or medium subangular blocky. Consistence is slightly sticky and slightly plastic or plastic. Reaction is strongly to very strongly acid.

The C horizon is slightly or medium acid.

**COMPETING SERIES:** The Utuado series in the same family. The Utuado soils have coarser textured C horizons. The Adjuntas, Anones, Callabo, Mayo, Maraguez, Maresua, Morado, Pandura, Pellejas, Plata, Quebrada, Santa Marta, Victory, Vieques and Yunes series are similar soils in related families. The Adjuntas, Anones, Mayo, Pellejas, Santa Marta and Yunes soils all have base saturation of less than 50 percent and have mean annual soil temperatures above 72 degrees F. The Callabo, Victory and Vieques soils have ustic moisture regimes and have less organic carbon to a depth of 1 meter. The Maraguez, Maresua, Morado, Pandura, Plata and Quebrada soils have base saturation of more than 50 percent.

**GEOGRAPHIC SETTING:** The Cuchillas are steep and very steep soils in sideslopes and ridges strongly dissected volcanic uplands with slope gradients from 20 to 60 percent. They formed in moderately fine textured residuum overlying hard bedded volcanic rock. The climate is humid tropical with annual rainfall ranging from 90 to 120 inches and the mean annual temperature is 74 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Humatas, Los Guineos, and Maricao series, all being redder, deeper, and having finer textured profiles.

**DRAINAGE AND PERMEABILITY:** Well drained; rapid runoff; moderate permeability.

**USE AND VEGETATION:** Most of the acreage is in brushland and abandoned coffee.

**DISTRIBUTION AND EXTENT:** Humid and high mountainous areas of Puerto Rico. The series is of minor extent

**with about 2,500 acres.**

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama**

**SERIES ESTABLISHED: Oeste SCD, Puerto Rico.**

**National Cooperative Soil Survey  
U. S. A.**

**LOCATION DAGUEY            PR**

**Established Series  
Rev. BCD  
06/2002**

## **DAGUEY SERIES**

**The Daguey series consists of very deep, well drained, moderately permeable soils on sideslopes, ridgetops and footslopes in volcanic uplands. They formed in fine textured residuum weathered from volcanic rock. Slopes range from 2 to 40 percent. The mean annual precipitation is about 85 inches and the mean annual temperature is about 76 degrees F.**

**TAXONOMIC CLASS: Very-fine, kaolinitic, isohyperthermic Inceptic Hapludox**

**TYPICAL PEDON: Daguey clay--pasture. (Colors are for moist soil.)**

**Ap--0 to 10 inches; brown (7.5YR 4/4) clay; weak medium subangular blocky parting to moderate fine granular structure; firm, slightly sticky, slightly plastic; very strongly acid; abrupt wavy boundary. (8 to 12 inches thick)**

**Bo1--10 to 14 inches; reddish brown (5YR 5/4) clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; very strongly acid; clear smooth boundary. (3 to 5 inches thick)**

**Bo2--14 to 23 inches; yellowish red (5YR 4/6) clay; few medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular and angular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; very strongly acid; clear smooth boundary. (6 to 11 inches thick)**

**Bo3--23 to 31 inches; red (2.5YR 4/6) clay; strong medium and fine subangular blocky structure; firm, slightly sticky, slightly plastic; thin continuous clay films on ped faces; very strongly acid; gradual smooth boundary. (6 to 10 inches thick)**

**Bo4--31 to 43 inches; red (2.5YR 4/6) clay; strong medium and fine subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; very strongly acid; gradual smooth boundary. (8 to 14 inches thick)**

**Bo5--43 to 59 inches; red (2.5YR 4/6) clay; moderate fine subangular blocky structure; firm, slightly sticky, slightly**

**plastic; thin patchy clay films; very strongly acid; gradual smooth boundary. (10 to 20 inches thick)**

**Bo6--59 to 72 inches; red (2.5YR 4/6) clay; weak medium and fine subangular blocky structure; firm, slightly sticky, slightly plastic; very thin patchy clay films; few small angular fragments of rock; very strongly acid; clear smooth boundary. (10 to 16 inches thick)**

**C--72 to 86 inches; yellowish red (5YR 4/6) silty clay loam; common fine strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) mottles; massive with evidence of original rock structure; friable, slightly sticky, slightly plastic; very strongly acid; gradual smooth boundary. (12 to 18 inches thick)**

**Cr--86 to 90 inches; Saprolite with well defined rock structure, similar in color and texture to C1 horizon.**

**TYPE LOCATION: Cibuco SCD, Puerto Rico; 40 feet west of Highway 113, 80 feet south of road junction to house.**

**RANGE IN CHARACTERISTICS: The solum is 60 to 80 inches thick. The soil is strongly or very strongly acid. Cation exchange capacity ranges from 8 to 16 meq/100 grams of clay in the kandic horizon. The organic carbon content in the upper 6 inches of the kandic horizon ranges from 1.0 to 1.6.**

**The Bo horizon has hue of 10R or 2.5YR, value of 4 to 5 and chroma of 6 through 8. Yellowish brown mottles are few or common and are more evident in the upper B horizons.**

**COMPETING SERIES: The Aibonito and Alonso series are in the same family. The Aibonito soils have yellower B horizons. The Alonso soils have darker colors with chroma of 3 or less.**

**GEOGRAPHIC SETTING: The Daguey soils are gently sloping to steep soils on stable hilltops, side slopes, and foot slopes of the volcanic uplands with slope of 2 to 40 percent. The soil is formed in fine textured residuum from very highly weathered basic volcanic rocks. The climate is humid tropical. The average annual precipitation ranges from 70 to 85 inches and the mean annual temperature ranges from 74 to 76 degrees F.**

**GEOGRAPHICALLY ASSOCIATED SOILS: These are the Consumo and Humatas soils. The Consumo soils occur on steeper less stable surfaces and have thinner B horizons. The Humatas soils have a CEC of more than 24 megs.**

**DRAINAGE AND PERMEABILITY: Well drained; medium to rapid runoff; moderate permeability.**

**USE AND VEGETATION:** Coffee, pasture and food crops.

**DISTRIBUTION AND EXTENT:** Humid uplands of Puerto Rico. The series is of moderate extent, about 16,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Ponce Survey Area, Puerto Rico; 1971.

**REMARKS:** The classification was updated with the 4/91 draft from Clayey, oxidic, isohyperthermic Orthoxic Tropohumults to Very-fine, mixed, isohyperthermic Typic Kandiudox. The previous OSED was dated 4/87.

**Diagnostic horizons and features recognized in this pedon are:**

**Ochric epipedon - zone from 0 to 10 inches (A horizon)**

**Oxic horizon - zone from 10 to 72 inches (Bo horizons)**

**ADDITIONAL DATA:** Characterization data are available for pedon S61PR-8-3 and S61PR-8-6.

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION DELICIAS      PR**

**Established Series  
Rev. BCD  
4/91**

**DELICIAS SERIES**

**The Delicias series consists of very deep, well drained, moderately permeable soils on old footslopes and alluvial fans in uplands. They formed in fine textured sediments rich in ironstone fragments and concretions. Slopes range from 5 to 12 percent. The mean annual precipitation is about 65 inches and the mean annual temperature is about 77 degrees F.**

**TAXONOMIC CLASS: Fine, ferruginous, isohyperthermic Rhodic  
Haplustox**

**TYPICAL PEDON: Delicias clay-Guinea grass. (Colors are for moist soil)**

**Ap--0 to 6 inches; dark reddish brown (2.5YR 3/4) clay; moderate medium granular structure; friable, slightly sticky, plastic; many fine roots, many fine and medium ironstone fragments and concretions; strongly acid; clear, smooth boundary. (4 to 8 inches thick)**

**Bo1--6 to 12 inches; dark red (10YR 3/6) clay; moderate medium granular structure; friable, sticky, plastic; common fine roots; many fine and medium ironstone fragments and concretions; strongly acid; clear, smooth boundary. (6 to 8 inches thick)**

**Bo2--12 to 22 inches; dark red (10YR 3/6) clay; weak medium subangular blocky breaking to weak granular structure; friable, nonsticky, slightly plastic; common fine roots; common fine pores; common fine and medium ironstone fragments and concretions; strongly acid; gradual wavy boundary. (8 to 12 inches thick)**

**Bo3--22 to 34 inches; dark red (10YR 3/6) clay; weak fine angular blocky structure; fine nonsticky, slightly plastic; few fine roots; many fine pores; many fine and medium ironstone fragments and concretions; strongly acid; gradual wavy boundary. (8 to 14 inches thick)**

**Bo4--34 to 45 inches; dark red (2.5YR 3/6) clay; weak fine angular blocky structure; friable; nonsticky, slightly plastic; few fine roots; many fine pores; common fine and medium ironstone fragments and concretions strongly acid; gradual wavy boundary. (8 to 14 inches thick)**

**Bo5--45 to 70 inches; dark red (2.5YR 3/6) clay; weak fine angular blocky structure; friable, nonsticky and nonplastic; very few fine roots; common fine ironstone concretions; strongly acid.**

**TYPE LOCATION:** Suroeste SCD, Puerto Rico; 3 miles north of the town of Cabo Rojo; 0.5 kilometers south on dirt road from kilometer marker 5.6 of highway 311, 50 feet east of fence.

**RANGE IN CHARACTERISTICS:** Thickness of the solum is more than 60 inches and the oxic horizon extends 50 to 80 inches below the surface. These soils have common to many ironstone fragments and concretions throughout the profile.

**The A horizon has hue of 10R or 2.5YR, value of 3 and 4 and chroma of 3 and higher.**

**The Bo horizon has hue of 10R or 2.5YR, value of 3 and 4 and chroma of 6 and higher. Clay is the dominant texture throughout. Reaction ranges from strongly to very strongly acid.**

**COMPETING SERIES:** This is the Bayamon series in the same family. Bayamon soils are lighter colors and do not have ironstone fragments.

**GEOGRAPHIC SETTING.** The Delicias soils occur on old footslopes or alluvial fans with slopes gradients of 5 to 12 percent. The regolith consists of very highly weathered, fine textured sediments that have common to many ironstone fragments and concretions. The climate is humid tropical. The average annual precipitation is 65 inches and the mean annual air temperature is 77 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Guanajibo, Nipe and Rosario series. The Guanajibo soils are darker, coarser textured, and have more than 10 percent nonindurated plinthite in their profiles. Nipe soils have oxic horizon that extent to more than 80 inches and have lower cation retention capacity. Rosario soils have oxic horizons less than 50 inches thick.

**DRAINAGE AND PERMEABILITY:** Well drained, medium runoff and moderate permeability.

**USE AND VEGETATION:** Most of the acreage is in sugarcane. Small acreage is in native pasture.

**DISTRIBUTION AND EXTENT:** Humid uplands of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Suroeste SCD, Puerto Rico.

**REMARKS:** The classification was updated with the 4/91 draft from Clayey, oxidic, isohyperthermic Typic Haplorthox to Fine, ferruginous, isohyperthermic Rhodic Haplustox. The previous OSED was dated 4/87.

These soils were formerly included with the Nipe series.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - zone from 0 to 6 inches (Ap horizon)

Oxic horizon - zone from 6 to 70 inches (Bo horizons)

Rhodic feature - 2.5YR hue and 3 value in oxic horizon.

National Cooperative Soil Survey  
U.S.A.

**LOCATION DESCALABRADO PR**

**Established Series  
Rev. GRB  
06/2002**

**DESCALABRADO SERIES**

**The Descalabrado series consists of shallow, well drained, moderately permeable soils on uplands. They formed in material weathered from basic volcanic rock. Near the type location, the mean annual temperature is about 79 degrees F., and the mean annual precipitation is about 35 inches. Slopes range from 2 to 60 percent.**

**TAXONOMIC CLASS: Clayey, mixed, superactive, isohyperthermic, shallow Typic Haplustolls**

**TYPICAL PEDON: Descalabrado clay loam--pasture. (Colors are for moist soil unless otherwise stated.)**

**Ap--0 to 5 inches; dark brown (10YR 3/3) clay loam; weak fine subangular blocky structure parting to moderate medium granular; slightly hard, friable; slightly sticky and slightly plastic; common fine roots; about 10 percent, by volume, angular pebbles of volcanic rock; neutral; clear smooth boundary. (4 to 8 inches thick)**

**Bw--5 to 12 inches; dark brown (7.5YR 3/2) gravelly clay; weak fine subangular blocky structure; slightly hard, firm; slightly sticky and slightly plastic; few fine roots; about 30 percent, by volume, angular pebbles of volcanic rock; neutral; clear wavy boundary. (6 to 12 inches thick)**

**R--12 inches; hard basic volcanic rock; few seams of secondary carbonates in cracks in upper part.**

**TYPE LOCATION: Lajas Valley, Puerto Rico. Approximately 0.3 miles east of km. 13.1, Highway 103 and about 132 feet north of cement marker AFF No. 38 on edge of main irrigation canal.**

**RANGE IN CHARACTERISTICS: Depth to bedrock ranges from 10 to 20 inches. Rock fragments range from 0 to 30 percent in the A and Bw horizons. Reaction ranges from slightly acid to slightly alkaline.**

**The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is clay loam or their gravelly or**

**cobbly analogs.**

**The Bw horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is clay loam, clay, or their gravelly or cobbly analogs.**

**Some pedons have a thin Cr layer composed of highly fractured volcanic rock. Colors are similar to the Bw horizon.**

**The R layer is hard, basic volcanic rock.**

**COMPETING SERIES: There are no known competing series in the same family.**

**GEOGRAPHIC SETTING: Descalabrado soils are on hills and mountains. They formed in material that weathered from basic volcanic rock. The climate is tropical semiarid. Slopes are 2 to 60 percent. The average annual temperature ranges from 77 to 81 degrees F., and the average annual precipitation ranges from 30 to 40 inches.**

**GEOGRAPHICALLY ASSOCIATED SOILS: These include the Aguilita, Guayama, Jacana, and Juana Diaz soils. Aguilita soils are generally on lower positions, are deep to limestone bedrock and are carbonatic. Guayama soils are on similar positions, have argillic horizons, and do not have a mollic epipedon. Jacana soils are on slightly lower positions and are moderately deep to volcanic rock. Juana Diaz soils are on similar positions, are shallow to semiconsolidated sandstone, and do not have mollic epipedons.**

**DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.**

**USE AND VEGETATION: Most areas are used for pastureland. A few areas are used for crops including corn, tobacco, pigeon peas, avocado, and mangos. Vegetation includes guineagrass, buffelgrass, and other native and introduced species.**

**DISTRIBUTION AND EXTENT: Semiarid uplands of southern Puerto Rico. The series is of moderate extent.**

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama.**

**SERIES ESTABLISHED: St. Croix, Virgin Islands, 1932.**

**REMARKS: The original concept of this series was 15 to 35 inches of residuum over volcanic bedrock as mapped by Dr. James Thorp during the first 1932 soil survey of St. Croix. This soil was correlated as a Lithic Vertic Ustropept in the 1970 Soil Survey of the Virgin Islands. The type location was moved to Lajas Valley, Puerto. This series was not correlated in the USVI soil survey update.**

**Diagnostic horizons and features recognized in this pedon are:**

**Mollic epipedon - zone from 0 to 12 inches (Ap and Bw horizons).**

**Cambic horizon - zone from 5 to 12 inches (Bw horizons).**

**Lithic contact - at 12 inches (R layer).**

**ADDITIONAL DATA: Sampled as S61PR-14-8. Sample by NSSL, Lincoln, NE.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION DIQUE            PR**

**Established Series  
Rev. RER  
08/2000**

## **DIQUE SERIES**

**The Dique series have dark grayish brown A horizons over dark yellowish brown B and C horizons and are friable, medium acid, and medium textured throughout.**

**TAXONOMIC CLASS: Fine-loamy, mixed, active, isohyperthermic Fluventic Eutrudepts**

**TYPICAL PEDON: Dique silt loam - sugarcane.  
(Colors are for moist soil unless otherwise stated.)**

**Ap--0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; medium acid; clear smooth boundary. (4 to 8 inches thick)**

**Bw1--6 to 12 inches; dark grayish brown(10YR 4/2) loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; medium acid; clear smooth boundary. (4 to 8 inches)**

**Bw2--12 to 36 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; medium acid; gradual smooth boundary. (12 to 30 inches thick)**

**C--36 to 60 inches; dark yellowish brown (10YR 4/4) loam; massive; friable, slightly sticky, slightly plastic; few fine roots, medium acid.**

**TYPE LOCATION: Suroeste SCD, Puerto Rico; 3 miles southeast of the town of Hormigueros; 400 feet northeast of Eureka Sugar Mill, 100 feet north of Rosario river; 150 feet west of farm road.**

**RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 20 to 40 inches. Thin lenses of sand or coarser materials may occur at different depths in the profile.**

**The A horizon has hue of 10YR, value of 4 or 5 and chroma of 2 through 4. It is silt loam.**

**The B horizon has hue of 10YR, value of 4 or 5 and chroma of 2 to 4. It is loam or silt loam.**

**The C horizon has hue of 10YR or 7.5YR, value of 4 to 6 and chroma of 4 to 6. It is loam or silt loam.**

**COMPETING SERIES:** This is the Humacao series in the same family. The Humacao soils are more acid.

**GEOGRAPHIC SETTING:** The Dique soils occur in nearly level river floodplains in natural levees near the streams or rivers with slope gradients ranging from 0 to 2 percent. The soil formed in medium textured alluvium of mixed origin. The average annual precipitation is 72 inches. The average annual temperature is 78 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Bajura, Coloso, Reilly and Toa series, all of which occur in the river floodplains. The Bajura and Coloso soils have finer textured profiles and are wetter, have low chroma mottles. The Reilly soils are shallower, excessively drained, and coarser textured throughout. Toa soils have mollic epipedons.

**DRAINAGE AND PERMEABILITY:** Well drained; medium run-off; moderate permeability.

**USE AND VEGETATION:** Most of the acreage is in sugarcane.

**DISTRIBUTION AND EXTENT:** Humid river floodplains of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Mayagues Survey Area, Puerto Rico; 1963.

**REMARKS** These soils were formerly included in the Toa series

**Diagnostic horizons and features recognized in this pedon are:**

**Ochric epipedon - zone from 0 to 6 inches (Ap horizon)**

**Cambic horizon - zone from 6 to 36 inches (Bw1, Bw2 horizon)**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION ESPINAL PR**

**Established Series  
Rev. RER  
04/2000**

## **ESPINAL SERIES**

**The Espinal series consists of deep, excessively drained, very rapidly permeable soils. They formed in sand-sized, shell fragments, quartz grains and volcanic fragments. These nearly level soils are on beaches and terraces in coastal plains. Slopes range from 0 to 2 percent. Mean annual precipitation is 65 inches and the mean annual temperature is 77 degrees F.**

**TAXONOMIC CLASS: Mixed, isohyperthermic Typic Udipsamments**

**TYPICAL PEDON: Espinal sand-cultivated-sweet potatoes.  
(Colors are for moist soil.)**

**A--0 to 12 inches; dark brown (10YR 3/3) sand; single grain; loose, nonsticky, nonplastic; few fine roots; common very dark brown (10YR 2/2) grains of sand-size volcanic fragments; medium acid; clear wavy boundary. (10 to 14 inches thick)**

**C1--12 to 19 inches; dark yellowish brown (10YR 4/4) sand; few dark brown (10YR 3/3) stains from the A horizon; loose, nonsticky, nonplastic; medium acid; abrupt wavy boundary. (6 to 10 inches thick)**

**C2--19 to 48 inches; very pale brown (10YR 7/4) sand; single grain; loose, nonsticky, nonplastic; many sand-size volcanic fragments; strong effervescence.**

**TYPE LOCATION: Noroeste SCD, Puerto Rico; 1.5 miles south of the town of Aquadilla; 100 meters east of kilometer marker 0.7 of Highway 442.**

**RANGE IN CHARACTERISTICS: Depth to the calcareous horizons ranges from 16 to 24 inches.**

**The A horizon has hue of 7.5YR and 10YR, and value and chroma of 2 and 3.**

**The C1 horizon has hue of 10YR, and value and chroma of 3 and 4. Reaction is slightly acid to medium acid.**

**The C2 horizon has hue of 10YR, value of 6 or 7, and chroma of 3 and 4. It has strong to violent effervescence and has less than 40 percent by weight of carbonates.**

**COMPETING SERIES:** This is the Aquadilla series in the same family. The Aquadilla soils are acid throughout their profiles.

**GEOGRAPHIC SETTING:** The Espinal series occur on nearly level terrain along the coast at elevation close to sea level. The regolith consists of quartz grains, shell fragments, and miscellaneous sand-size volcanic subrounded fragments. The climate is tropical humid. The average annual precipitation is 65 inches and mean annual temperature of 77 degrees F. The mean annual soil temperature at 20 inches depth is 72 degrees F. or more and the difference between mean summer and winter temperatures is less than 9 degrees F. These soils are usually moist and are not dry in any subhorizon from 7 to 20 inches for as much as 60 consecutive or 90 cumulative days in most years.

**GEOGRAPHICALLY ASSOCIATED SOILS:** This is the Coloso series which is finer textured, lighter in color, noncalcareous, and somewhat poorly drained.

**DRAINAGE AND PERMEABILITY:** Excessively drained, slow runoff and very rapid permeability.

**USE AND VEGETATION:** Mostly in food crops. Some areas in Guinoa and Pangolagrasses.

**DISTRIBUTION AND EXTENT:** Humid northern coastal plains of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Noroeste SCD, Puerto Rico; 1972.

**REMARKS:** This soil was formerly included in the Catano series.

**Diagnostic horizons and features recognized in this pedon are:**

**Ochric epipedon - zone from 0 to 12 inches (A horizon)**

**National Cooperative Soil Survey**

**U. S. A.**

**LOCATION GUANAJIBO PR**

**Established Series  
Rev. REG:LHR  
02/98**

## **GUANAJIBO SERIES**

**The Guanajibo series is well drained, moderately permeable on coastal terraces and alluvial fans. These soils have reddish brown, medium textured, granular A horizons over moderately fine textured, friable upper B2t horizons and fine textured, lower B2t horizons with soft plinthite.**

**TAXONOMIC CLASS: Fine-loamy, parasesquic, isohyperthermic Plinthic Paleudults**

**TYPICAL PEDON: Guanajibo loam--sugarcane.  
(Colors are for moist soil.)**

**Ap--0 to 10 inches; reddish brown (5YR 4/3) loam; weak medium granular structure; loose, very friable, nonsticky and nonplastic; common fine roots; very strongly acid; clear smooth boundary. (6 to 12 inches thick)**

**B1--10 to 17 inches; reddish brown (5YR 4/3) sandy clay loam; weak fine subangular blocky structure; thin patchy clay films on ped faces and root channels; friable, slightly sticky, slightly plastic; common fine roots; few fine pores; few fine and medium black concretions; very strongly acid; clear smooth boundary. (5 to 9 inches thick)**

**B21t--17 to 23 inches; yellowish red (5YR 4/6) heavy clay loam; weak fine subangular blocky structure; thin patchy clay films on ped faces and root channels; friable, slightly sticky, slightly plastic; common fine roots; few fine pores; few fine and medium black concretions; very strongly acid; clear smooth boundary. (4 to 8 inches thick)**

**B22t--23 to 37 inches; yellowish red (5YR 4/8) sandy clay loam; weak fine subangular blocky structure; thin patchy clay films on ped faces and root channels; friable, slightly sticky, slightly plastic; few fine roots, few fine pores; few fine black concretions; very strongly acid; clear smooth boundary. (10 to 16 inches thick)**

**B23t--37 to 44 inches; red (2.5YR 4/6) clay with less than 10 percent nonindurated plinthite by volume; weak fine**

**subangular blocky structure; thin patchy clay films; friable, slightly sticky, slightly plastic; few fine roots; common fine pores; few fine black concretions; very strongly acid; clear smooth boundary. (5 to 9 inches thick)**

**B24t--44 to 60 inches; red (2.5YR 4/6) clay with more than 10 percent nonindurated plinthite by volume and common medium distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; thin patchy clay films; friable, slightly sticky, slightly plastic; common fine pores; few fine black concretions; very strongly acid.**

**TYPE LOCATION:** Suroeste SCD, Puerto Rico 2.5 miles north of the town of Cabo Rojo; 25 feet east of kilometer marker 4.2 on Highway 311. **RANGE IN CHARACTERISTICS:** Thickness of solum is over 60 inches and that of the argillic is more than 50 inches. Depth to the horizons with more than 5 percent plinthite ranges from 30 to 54 inches. Black concretions range from few to many and from fine to medium.

**Colors of the Ap horizons varies in hues of 5YR and 7.5YR, values of 4 to 5, and chromas of 6 and higher. Texture of the A horizons is loam.**

**Colors of the B2t horizons ranges in hues of 5YR and 2.5YR, values of 4 and 5, and chromas of 6 and higher. Texture of the argillic ranges from clay loam to clay. Structure of the B2t horizons ranges from weak fine to medium subangular blocky. These soils have very friable, nonsticky and nonplastic A horizons, and slightly sticky and slightly plastic B2t horizons. Reaction ranges from strongly to very strongly acid. Base saturation (by sum of cations) is less than 35 percent at 50 inches below the top of the argillic horizon. Organic matter content is less than 1.5 percent in the upper 6 inches of the argillic horizon.**

**COMPETING SERIES:** These are the Maleza, Bejucos and Rio Lajas series in the same great group and the Jobos series in the same subgroup. The Maleza, Bejucos, and Rio Lajas soils do not have subhorizons with more than 5 percent nonindurated plinthite within 50 inches of the surface. The Maleza and Bejucos soils have more than 35 percent clay in the argillic. The Rio Lajas soils have sandy epipedons thicker than 20 inches. The Jobos soils have darker colored A horizons, finer textured B2t horizons, and have the nonindurated plinthite within 30 inches of the soil surface.

**GEOGRAPHIC SETTING:** These soils occur on gently to moderately sloping old coastal terraces and alluvial fans with slope gradients of 2 to 12 percent. The regolith consists of moderately fine over fine textured sediments that have nonindurated plinthite. The climate is humid tropical. The average precipitation is 68 inches and the mean annual temperature is 77 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F. with less than 9 degrees difference between mean summer and winter temperatures.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Delicias, Nipe and Cabo Rojo series all of which are finer textured throughout and lack a plinthic subhorizon. The Delicias and Nipe soil are darker red. The Cabo Rojo soils are yellower and have low chroma mottles in the lower B2t horizon.

**DRAINAGE AND PERMEABILITY:** Well drained, runoff is medium to slow, permeability is rapid in the surface and moderate in the subsoil.

**USE AND VEGETATION:** Most of the acreage is planted to sugarcane.

**DISTRIBUTION AND EXTENT:** Humid coastal plains of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Suroeste SCD, Puerto Rico; 1979.

**REMARKS:** These soils were formerly included in the Sabana Seca series.

**National Cooperative Soil Survey  
U. S. A.**

**LOCATION GUERRERO PR**

**Established Series  
Rev. REG/LHR  
6/2002**

## **GUERRERO SERIES**

**These soils have thick dark brown sandy surface horizons over thick, fine textured B2t horizons.**

**TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Arenic Paleudalfs**

**TYPICAL PEDON: Guerrero sand-pasture and coconuts (Colors are for moist soil).**

**Ap--0 to 10 inches; grayish brown (10YR 5/2) dry, dark brown (7.5YR 4/2) moist, sand; single grain; loose, nonsticky, nonplastic; many fine roots; medium acid; clear smooth boundary. 8 to 12 inches thick.**

**A12--10 to 22 inches; dark brown (7.5YR 4/4) sand; single grain; loose, nonsticky, nonplastic; many fine roots; few fine soft black concretions; medium acid; clear smooth boundary. 8 to 18 inches thick.**

**A13--22 to 28 inches; yellowish red (5YR 4/6) loamy sand; single grain; loose, nonsticky, nonplastic; few fine roots; few black concretions; medium acid; clear smooth boundary. 4 to 10 inches thick.**

**B21t--28 to 36 inches; yellowish red (5YR 4/6) sandy clay; weak coarse subangular blocky structure; firm, slightly sticky, plastic; very few roots; common fine soft black concretions; strongly acid; sand grains are coated and bridged by red colored clays; clear wavy boundary. 6 to 10 inches thick.**

**B22t--36 to 44 inches; strong brown (7.5YR 5/6) clay with common fine prominent red (2.5YR 4/6), and common fine faint dark brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; firm, slightly sticky, plastic; few fine black concretions; many fine quartz grains; strongly acid; 10 to 20 percent soft plinthite; clear wavy boundary. 6 to 10 inches thick**

**B23t--44 to 50 inches; strong brown (7.5YR 5/8) clay with common medium distinct yellowish brown (10YR 5/6),**

common fine and medium prominent dark red (2.5YR 3/6), and common medium prominent light gray (10YR 6/1) mottles; weak coarse subangular blocky structure; firm, slightly sticky, plastic; many fine quartz grains; very strongly acid; 10 to 20 percent soft plinthite; clear wavy boundary. 6 to 8 inches thick.

B24t--50 to 70 inches +; yellowish brown (10YR 5/6) clay with common medium prominent light gray (10YR 7/1) and few fine prominent dark red (2.5YR 3/6) mottles; weak coarse subangular blocky structure; firm, slightly sticky, plastic, many fine quartz grains; very strongly acid; 5 to 10 percent soft plinthite.

**TYPE LOCATION:** Noroeste SCD, Puerto Rico, 1.0 mile west of the town of Isabela; 80 feet north and 30 feet west of kilometer marker 1.7 of highway 459.

**RANGE IN CHARACTERISTICS:** These soils have medium acid A horizons and strongly or very strongly acid B2t horizons. Thickness of the sandy A horizons varies from 20 to 40 inches. Thickness of the argillic horizon is over 50 inches. Colors of surface horizons range in hues of 7.5YR and 10YR, values of 4 or more and chromas of 2 to 4. Colors of the B2t horizons range in hues of 7.5YR and 5YR, values of 4 and 5 and chromas higher than 6. The B2t horizons have more than 5 percent nonindurated plinthite nodules. Texture of the A horizons is sand and that of the B2t horizons varies from sandy clay to clay. Structure of the B2t horizons ranges from weak moderate to weak coarse subangular blocky. Base saturation (by sum of cations) is less than 35 percent at 50 inches below the top of the argillic horizon. The organic matter content is less than 1.5% in the upper 6 inches of the argillic horizon.

**COMPETING SERIES:** These are the Cabo Rojo, Cidral, Maleza, Bejucos, Rio Lajas, Jobos and Guanajibo series in the same Great Group. The Cabo Rojo soils have surface horizons with moist color values of less than 4. The Cidral soils have finer textured and thinner A horizons and lack the nonindurated plinthite nodules. The Maleza and Bejucos soils have thinner sandy A horizons, lack the plinthite nodules, and, in addition, the Maleza soils are redder, with hues redder than 5YR. The Rio Lajas soils have darker surface horizons and less than 35 percent clay in the B horizons. The Jobos and Guanajibo soils lack the thick sandy A horizon.

**GEOGRAPHIC SETTING:** The Guerrero soils occur on gently sloping coastal plains with slope gradients of 2 to 5 percent. The regolith consists of coarse over fine textured sediments. The climate is humid tropical. The average annual precipitation is 60 inches and mean annual temperature 75 degrees F. The mean annual soil temperature at depth of 20 inches is more than 72 degrees F. and the difference between mean summer and winter temperatures is less than 9 degrees F.

**PRINCIPAL ASSOCIATED SOILS:** These are the competing Jobos, Rio Lajas and Maleza series.

**DRAINAGE AND PERMEABILITY:** Excessively drained and slow runoff, permeability is rapid in the surface and moderately slow in the subsoil.

**USE AND VEGETATION:** Native pasture and subsistence crops.

**DISTRIBUTION AND EXTENT:** Humid coastal plains of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES PROPOSED:** Norosete SCD, Puerto Rico; Guerrero is the name of a "barrio" where the series was first recognized.

**REMARKS:** These soils were formerly mapped in the Guayabo series but differ from it being usually moist and not having a subhorizon from 7 to 20 inches dry for as much as 60 consecutive days in most years.

**OSD scanned by SSQA. Last revised by state on 4/67.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION HUMATAS            PR**

**Established Series  
Rev. GRB  
06/2002**

## **HUMATAS SERIES**

**The Humatas series consists of very deep, moderately slowly permeable, well drained soils on side slopes and ridges of strongly dissected uplands. They formed in clayey and loamy material that weathered from igneous rocks. Near the type location, the mean annual precipitation is about 78 inches and the mean annual temperature is about 75 degrees F. Slopes range from 5 to 60 percent.**

**TAXONOMIC CLASS: Very-fine, parasesquic, isohyperthermic Typic Haplohumults**

**TYPICAL PEDON: Humatas clay - native pasture. (Colors are for moist conditions.)**

**Ap-- 0 to 4 inches; dark brown (7.5YR 4/4) clay; moderate fine granular structure; firm, slightly sticky, slightly plastic; many fine roots; very strongly acid; clear smooth boundary. (4 to 8 inches thick)**

**Bt1--4 to 9 inches; yellowish red (5YR 5/6) clay; moderate fine subangular blocky structure; few faint clay films on faces of peds; firm; slightly sticky, plastic; many fine roots; few fine vesicular and tubular pores; few fine black particles; very strongly acid; clear smooth boundary.**

**Bt2--9 to 15 inches; red (2.5YR 5/8) clay; moderate fine and medium subangular blocky structure; few faint clay films on faces of peds; firm; slightly sticky, plastic; common fine roots; few fine vesicular and tubular pores, very strongly acid; clear smooth boundary.**

**Bt3--15 to 25 inches; red (2.5YR 5/6) clay; weak fine subangular blocky structure; few faint clay films on faces of peds; firm; slightly sticky, slightly plastic; few fine roots; common fine vesicular and tubular pores; very strongly acid; clear smooth boundary. (Total thickness of the Bt horizons ranges from 12 to 31 inches)**

**BC--25 to 32 inches; rubbed color red (2.5YR 5/6) silty clay loam; about 30 percent of this horizon consists of saprolite**

of variegated colors as: red (2.5YR 4/6), dark red (2.5YR 3/6), very pale brown (10YR 7/4), yellowish brown (10YR 5/8); weak fine and medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine roots; many fine vesicular and tubular pores; very strongly acid; clear smooth boundary. (6 to 12 inches thick)

C1--32 to 45 inches; about 25 percent red (2.5YR 4/6), about 25 percent dark red (2.5YR 3/6), about 25 percent very pale brown (10YR 7/4), and about 25 percent yellowish brown (10YR 5/8), rubbed color is red (2.5YR 4/6); silty clay loam; massive; friable, nonsticky, slightly plastic; many fine pores; very strongly acid; clear smooth boundary.

C2--45 to 60 inches; about 25 percent red (2.5YR 4/6), about 25 percent dark red (2.5YR 3/6), about 25 percent very pale brown (10YR 7/4), and about 25 percent yellowish brown (10YR 5/8), rubbed color is red (2.5YR 4/6); saprolite that has a silty clay loam texture; massive; friable, nonsticky and slightly plastic; very strongly acid.

C3--60 to 96 inches; about 25 percent red (2.5YR 4/6), about 25 percent dark red (2.5YR 3/6), about 25 percent very pale brown (10YR 7/4), and about 25 percent yellowish brown (10YR 5/8), rubbed color is red (2.5YR 4/6) saprolite that has a clay loam texture; massive; very friable, nonsticky, slightly plastic; very strongly acid.

**TYPE LOCATION:** Oeste SCD, Puerto Rico. Approximately 6.5 miles northeast of the city of Mayaguez; about 660 feet on dirt road from kilometer marker 2.45 on Highway 406, and about 350 feet southwest of dirt road.

**RANGE IN CHARACTERISTICS:** Thickness of the solum ranges from 22 to 51 inches. Reaction is very strongly acid or strongly acid. Rock fragments range from 0 to 20 percent, by volume throughout, except for the A horizon which can range to 40 percent by volume.

The A horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 to 6. Texture is silty clay loam, silty clay, clay, or their gravelly analogs.

The Bt horizon has hue of 10R to 10YR, value of 4 to 6, and chroma of 4 to 8. Texture is silty clay, clay, or their gravelly analogs.

The BC horizon has hue of 10R to 10YR, value of 4 to 6, and chroma of 4 to 8; or there is no dominant matrix color and are multicolored in shades of red, yellow, brown and gray. Texture is silty clay loam, silty clay, clay, or their gravelly analogs.

**The C horizons has hue of 10R to 10YR, value of 4 to 6, and chroma of 4 to 8. Texture is silty clay loam, clay loam, clay, or their gravelly analogs.**

**COMPETING SERIES:** There are no other known series in the same family.

**GEOGRAPHIC SETTING:** Humatas soils are on side slopes and ridges of uplands. They formed in fine-textured residuum weathered from basic igneous rock. The climate is humid tropical. Slopes range from 5 to 60 percent. The average annual precipitation ranges from 70 to 86 inches and the average annual temperature ranges from 74 to 76 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Alonso, Consumo, Daguey, Lares, Los Guineos, and Zarzal soils. Alonso soils have oxidic control sections. Consumo soils are moderately deep to saprolite. Daguey soils have more clay in the control section and are Oxisols. The somewhat poorly drained Lares soils are on terraces at lower elevations. Los Guineos soils are on higher positions, are isothermic, have more clay in the control section, and are Oxisols. Zarzal soils have more clay in the control section and are Oxisols.

**DRAINAGE AND PERMEABILITY:** Well drained; moderately slowly permeability.

**USE AND VEGETATION:** Most areas of Humatas soils are used for pasture, food crops, and coffee production. Vegetation consists of native and introduced upland species.

**DISTRIBUTION AND EXTENT:** Humid uplands of Puerto Rico. The series is of large extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama.

**SERIES ESTABLISHED:** Humacao Survey Area, Puerto Rico; 1968.

**REMARKS:** Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 4 inches (Ap horizon).

Argillic horizon - zone from 4 to 25 inches (Bt horizons).

**ADDITIONAL DATA: Characterization data are available for the typical pedon S61PR-8-1 and pedon S61PR-8-4, both are published in Soil Survey Investigation Report No. 12. Samples by NSSL, Lincoln, NE.**

**MLRA: 270.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION IGUALDAD PR**

**Established Series  
Rev. REG-LHR  
08/2000**

## **IGUALDAD SERIES**

**The Igualdad series have fine textured, very dark brown, A and B horizons over fine textured, gleyed upper C horizons and gleyed, calcareous sandy lower C horizons.**

**TAXONOMIC CLASS: Clayey over sandy or sandy-skeletal, mixed, superactive, nonacid, isohyperthermic Typic Endoaquepts**

**TYPICAL PEDON: Igualdad Clay - sugar cane  
(Colors are for moist soil)**

**Ap--0 to 4 inches; very dark grayish brown (10YR 3/2) clay; moderate fine granular structure; hard, firm, sticky, plastic; common fine black concretions; many fine roots; strongly acid; clear, smooth boundary. (4 to 8 inches thick)**

**B2--4 to 10 inches; very dark gray (10YR 3/1) clay with common medium distinct reddish brown (5YR 4/3) and gray (5Y 6/1) mottles; weak fine subangular blocky structure with pressure faces; firm, sticky, plastic; common fine black concretions; common fine roots; medium acid; clear smooth boundary. (4 to 8 inches thick)**

**B3--10 to 24 inches; dark gray (N 4/0) clay; with dark brown (10YR 4/3) coatings on ped faces and root channels; massive with pressure faces; firm, sticky, plastic; few fine roots; gradual smooth boundary. (12 to 16 inches thick)**

**IIC2g--24 to 30 inches; dark greenish gray (5C 4/1) sandy clay with common fine distinct brown (7/5YR 4/4) mottles; massive; firm, sticky, plastic; mildly alkaline; clear smooth boundary. (4 to 8 inches thick)**

**IIC3g--30 to 36 inches plus; dark greenish gray (5G 4/1) sand with many calcareous shell fragments.**

**TYPE LOCATION: Oeste SCD, Puerto Rico; 2 miles west of the town of Anasco; 50 meters west of kilometer marker**

**2.2 of highway 115.**

**RANGE IN CHARACTERISTICS:** Thickness of solum ranges from 20 to 32 inches. Depth to calcareous sand ranges from 24 to 40 inches. Depth to water table varies from 4 to 30 inches.

**Color of the A horizons ranges in hues of 2.5Y and 10YR, values of 3, and chromas of 1 to 3.**

**Colors of the B and C horizons have dominantly low chromas. Texture of the solum and the upper C horizons is clay. The lower C2g horizons vary in texture from sandy clay to sandy clay loam. Organic matter content does not decrease regularly with depth.**

**COMPETING SERIES:** These are the Vayas and Fortuna series in the same Subgroup and the Perchas, Maunabo, Bajura, Santoni, Josefa, Talante, Coloso, Corcega, and Pinones series in the same Great Group. The Vayas and Fortuna soils lack sandy horizons in their lower profiles. The Perchas and Maunabo soils have organic matter content that decreases regularly with depth and lack sandy lower horizons. The Bajura and Santoni soils have clays with high shrink-swell behavior and common to many pressure faces. The Josefa, Talante, and Corcega soils have coarser textured profiles and brighter colors in their upper profiles. The Coloso soils are better drained and have brighter colors in their upper profiles. The Pinones soils are underlaid by organic layers within their control sections.

**GEOGRAPHIC SETTING:** The Igualdad series occurs on nearly level river flood plains with slope gradients from 0 to 2 percent. The regolith consists of fine textured sediments over sands. The climate is humid tropical. The average annual precipitation is 84 inches and the mean annual temperature is 78 degrees F. The mean annual soil temperature at 20 inches deep is over 71.6 degrees F with less than 9 degrees F difference between mean summer and winter temperatures.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Bajura, Aguada and Coloso series in addition to the Toa series. The Toa soils are better drained and occur at slightly higher positions in the river flood plain.

**DRAINAGE AND PERMEABILITY:** Poorly drained, slow runoff and permeability. If not drained, soils are saturated with water during wet seasons.

**USE AND VEGETATION:** Most of the acreage is planted to sugar cane, small undrained areas are in native pasture.

**DISTRIBUTION AND EXTENT:** Humid river flood plains of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Oeste SCD, Puerto Rico. Igualdad is the name of a sugar mill near the place where this series was first recognized.

**REMARKS:** This soil was formerly mapped as a poorly drained phase of the Coloso series, which are now classified in the Aeric Fluventic Trophaquepts Subgroup.

National Cooperative Soil Survey  
U.S.A

**LOCATION JACANA            PR**

**Established Series  
Rev. BCD  
01/2001**

## **JACANA SERIES**

**The Jacana series consists of moderately deep, well drained, moderately slowly permeable soils formed in material weathered from volcanic rock. These gently sloping to moderately steep soils are on fans, foot slopes and low hills. Slopes range from 2 to 20 percent. The mean annual precipitation is about 35 inches and the mean annual temperature is about 79 degrees F.**

**TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Vertic Haplustolls**

**TYPICAL PEDON: Jacana clay--cultivated. (Colors are for moist soil unless otherwise stated.)**

**Ap--0 to 6 inches; very dark brown (10YR 2/2) clay; moderate fine granular structure; hard, friable, slightly sticky, plastic; common fine roots; medium acid; clear smooth boundary. (4 to 8 inches thick)**

**A--6 to 13 inches; very dark brown (10YR 2/2) clay; weak coarse subangular blocky structure; hard, firm, slightly sticky, plastic; few fine roots; few pressure faces and small slickensides; medium acid; clear wavy boundary. (3 to 9 inches thick)**

**Bss--13 to 21 inches; dark brown (7.5YR 3/2) clay; streaks of very dark brown (10YR 2/2) from overlying horizon; weak coarse blocky structure; hard, firm, slightly sticky, plastic; few fine roots; many small pressure faces and slickensides; cracks to 21 inches; neutral; clear wavy boundary. (6 to 10 inches thick)**

**C/B--21 to 28 inches; 80 percent saprolite from volcanic rock and 20 percent by volume dark brown (7.5YR 3/2) clay in pockets and seams; clay loam; massive; friable slightly sticky, slightly plastic; neutral; gradual wavy boundary. (6 to 10 inches thick)**

**Cr--29 to 40 inches; highly weathered, semi-consolidated bedded, volcanic rock.**

**TYPE LOCATION:** Lajas Valley, Puerto Rico; 60 feet east of kilometer marker 1.7 of Highway 117, and 35 feet south of fence along highway.

**RANGE IN CHARACTERISTICS:** Depth to semiconsolidated rock ranges from 20 to 40 inches. Reaction ranges from medium acid to mildly alkaline.

The A horizons have hue of 10YR or 7.5YR, and value and chroma of 2 or 3. Texture is clay loam or clay.

The Bss horizon has hue of 10YR or 7.5YR and value and chroma of 2 through 4.

The Cr horizon consists of highly weathered, semi-consolidated bedded volcanic rock. In places, secondary lime occurs as coatings along cleavage planes.

**COMPETING SERIES:** There are no other series in this family.

**GEOGRAPHIC SETTING:** The Jacana soils are on fans foot slopes and low hills. Slope is 2 to 20 percent. These soils formed in material weathered from volcanic rock. The climate is tropical semiarid. The mean annual precipitation is 30 to 40 inches and mean annual temperature is 78 to 80 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** There are the Callabo, Coamo, Descalabrado, Fraternidad, Juana Diaz, Llanos, and San German soils. Callabo soils do not have vertic properties. Coamo soils have an argillic horizon and do not have bedrock within a depth of 40 inches. Descalabrado, Juana Diaz, and San German soils have bedrock at depths less than 20 inches. Fraternidad and Llanos soils do not have bedrock within a depth of 40 inches.

**DRAINAGE AND PERMEABILITY:** Well drained; medium runoff; moderately slow permeability.

**USE AND VEGETATION:** Most areas are used for pasture. The main pasture species are Guineagrass and buffelgrass. Some areas are used for crops including tomatoes, peppers, pigeon peas, and mangos.

**DISTRIBUTION AND EXTENT:** Semiarid areas of Puerto Rico and the U.S. Virgin Islands. The soils of this series are of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED: Puerto Rico; 1936.**

**REMARKS: The classification was updated with the 4/91 draft from Fine, mixed, isohyperthermic Udertic Haplustolls to Fine, mixed, isohyperthermic Vertic Haplustolls. It is presently impossible to have a Udic-ustic soil moisture regime in the tropics. The previous OSED date was 11/84.**

**Prior to 1984 this soil was classified as a fine, mixed, isohyperthermic Vertic Ustropept.**

**Diagnostic horizons and features recognized in this soil:**

**Mollic epipedon - zone from 0 to 13 inches (Ap and A horizons)**

**Vertic properties - pressure faces and slickensides in A and Bss horizons.**

**ADDITIONAL DATA: Sampled as S61PR-14-4.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION JAUCAS**

**VI+HI PR**

**Established Series**

**Rev. GRB**

**7/98**

## **JAUCAS SERIES**

The Jaucas series consists of very deep, excessively drained, very rapidly permeable soils on vegetated beach areas along the sea coast. They formed in calcareous sand deposits. Near the type location, the mean annual temperature is about 80 degrees F., and the mean annual precipitation is about 40 inches. Slopes range from 0 to 15 percent.

**TAXONOMIC CLASS:** Carbonatic, isohyperthermic Typic Ustipsamments

**TYPICAL PEDON:** Jaucas sand. (Colors for moist conditions.)

**A--0 to 6 inches; grayish brown (10YR 5/2) sand; single grained; loose; common fine and few coarse roots; about 5 percent, by volume, shell and coral pebbles; strongly effervescent; moderately alkaline; gradual smooth boundary. (2 to 10 inches thick)**

**C1--6 to 16 inches; light brownish gray (10YR 6/2) sand; single grained; loose; common fine roots; about 5 percent, by volume, shell and coral pebbles; strongly effervescent; moderately alkaline; gradual smooth boundary. (8 to 12 inches thick)**

**C2--16 to 26 inches; pale brown (10YR 6/3) sand; single grained; loose; few fine roots; about 10 percent, by volume, shell and coral pebbles; strongly effervescent; moderately alkaline; gradual smooth boundary. (8 to 20 inches thick)**

**C3--26 to 60 inches; very pale brown (10YR 7/3) sand; single grained; loose; about 10 percent, by volume, shell and coral pebbles; strongly effervescent; moderately alkaline.**

**TYPE LOCATION:** St. Croix Island, U.S. Virgin Islands. Sandy Point; about 200 feet north of the sea. Frederiksted topographic quadrangle; lat. 17 degrees 40 minutes 51 seconds N.; long. 64 degrees 54 minutes 13 seconds W.; PRD 1940.

**RANGE IN CHARACTERISTICS:** Reaction is moderately alkaline throughout the profile. The soil is moderately saline throughout the profile.

The A horizon has hue of 10YR, value of 4 to 8, and chroma of 2 or 3. Content of shell and coral pebbles fragments ranges from 0 to 30 percent, by volume.

The AC horizon, where present, has hue of 7.5YR or 10YR, value of 4 to 8, and chroma of 1 to 3. Content of shell and coral pebbles ranges from 0 to 30 percent, by volume.

The C horizon has hue of 7.5YR or 10YR, value of 6 to 8, and chroma of 1 to 3. Content of shell and coral pebbles ranges from 0 to 30 percent, by volume.

**COMPETING SERIES:** These are the Puuone and Shioya series in the same family. Puuone soils have a cemented sand layer. Shioya soils have loamy sand surface layers.

**GEOGRAPHIC SETTING:** Jaucas soils are on coastal beaches above high tide. They formed in sand-sized fragments of coral and sea shells. Slopes range from 0 to 15 percent. The climate is tropical semiarid. The average annual air temperature ranges from 76 to 82 degrees F., and the mean annual precipitation is about 40 inches.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Cinnamon Bay, Glynn, Redhook, Sandy Point, Solitude, and Sugar Beach soils. Cinnamon Bay soils are on higher positions and have fine-loamy subsoils. Glynn soils are on higher positions and have clayey-skeletal particle-size control sections. Sandy Point soils and Sugar Beach soils are in slightly lower saline marshes, flats and ponds and are very poorly drained. In addition, Sandy Point soils have fine-loamy particle-size control sections and Sugar Beach soils are organic. Solitude soils are in areas adjacent to saline marshes, flats, and ponds, have loamy subsoils and are somewhat poorly drained.

**DRAINAGE AND PERMEABILITY:** Excessively drained; very rapid permeability.

**USE AND VEGETATION:** Most areas are used for recreation and as marine wildlife refuges. The vegetation includes sea grapes, coconuts and other xerophytic and salt-tolerant plants.

**DISTRIBUTION AND EXTENT:** U.S. Virgin Islands, Puerto Rico, and Hawaii. They are not extensive.

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama**

**SERIES ESTABLISHED: St. Croix. U.S.Virgin Islands, 1932.**

**REMARKS: Diagnostic horizons and other features recognized in this pedon include:**

**Ochric epipedon - the zone from 0 to 6 inches (A horizon).**

**Psammentic feature - sandy textures throughout the particle-size control section - the zone from 10 to 40 inches (C1, C2 and C3 horizons).**

**MLRA: 163, 271, 273.**

**SIR: VI0011, PR0500 (RARELY FLOODED), PR0501 (SALINE), HI0159 (SALINE).**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION** **JOBOS**            **PR**

**Established Series**  
**Rev. REG:LHR**  
**06/2002**

## **JOBOS SERIES**

The Jobos series consists of deep, moderately well drained soils formed in coastal plain clays overlain by sandy sediments. They are gently sloping and sloping soils in the coastal plain. These soils are sandy loam, nonplastic in the A horizon and have clay, plastic thick B horizon with plinthite.

**TAXONOMIC CLASS:** Very-fine, parasesquic, isohyperthermic Typic Haplohumults

**TYPICAL PEDON:** Jobos sandy loam - native pasture.  
(Colors are for moist soil.)

**Ap--0 to 10 inches;** dark grayish brown (10YR 4/2) moist and light brownish gray (10YR 6/2) dry, sandy loam; weak medium subangular blocky structure to single grain; loose, nonsticky, nonplastic; few fine roots; few fine subrounded black concretions; strongly acid; abrupt smooth boundary. (6 to 19 inches thick)

**B21t--10 to 16 inches;** red (10YR 4/6) and strong brown (7.5YR 5/6) clay; strong coarse subangular blocky structure; very hard, very firm, slightly sticky, plastic; few fine roots follow cleavage planes; thick continuous dark brown clay films on ped surfaces; strongly acid; 10 to 25 percent by volume of nonindurated plinthite; gradual smooth boundary. (5 to 8 inches thick)

**B22t--16 to 29 inches;** red (10R 4/6) and strong brown (7.5YR 5/6) clay with few fine distinct light gray (10YR 7/1) mottles; moderate medium and coarse subangular blocky structure; very hard, very firm, slightly sticky, plastic; few fine roots; continuous brown clay films on vertical cleavage planes and patchy clay films on horizontal planes; few fine black concretions; strongly acid; 10 to 25 percent by volume of nodules of nonindurated plinthite; gradual wavy boundary. (12 to 16 inches thick)

**B23t--29 to 34 inches;** red (10R 4/6), yellowish brown (10YR 5/6) and light gray (10YR 7/2) clay; weak coarse

**subangular blocky structure; very hard, very firm, slightly sticky, plastic; very few roots; thin patchy clay films; strongly acid; less than 10 percent by volume of nonindurated plinthite; gradual smooth boundary. (4 to 8 inches thick)**

**B24t--34 to 54 inches; red (10R 4/6), yellowish brown (10YR 5/6) and light gray (10YR 7/2) clay; weak coarse subangular blocky structure; very hard, very firm, slightly sticky, plastic; very thin patchy clay films on ped faces; strongly acid; less than 6 percent by volume of nonindurated plinthite.**

**TYPE LOCATION: Noroeste SCD, Puerto Rico; 5 miles west of the town of Isabela; 50 feet south of kilometer marker 9.1 on Highway 459.**

**RANGE IN CHARACTERISTICS: Thickness of the solum is over 60 inches. Thickness of the argillic horizon is over 50 inches. Content of plinthite in the B horizon varies from 6 to 30 percent. Clay films in the B horizon varies from thin patchy to thick continuous. Reaction ranges from strongly to extremely acid in the whole profile. The mean annual soil temperature is 75 degrees F.**

**The A horizon has hues of 10YR, values of 3 and 4, and chroma of 2 to 4. Texture is dominantly sandy loam. Structure is weak fine or medium granular or subangular blocky parting to single grain. Thickness of the A horizon is 6 to 19 inches.**

**The B2t horizons have red, strong brown, light gray, yellowish brown, and dark red colors in varying proportions in a reticulate pattern. Texture is clay. Structure varies from weak to strong and from medium to coarse subangular blocky. Consistence is slightly sticky or sticky and plastic.**

**COMPETING SERIES: There are no other known series in the same family. The Almirante, Cabo Rojo, Cidral, Espinosa, Guanajibo, Guerrero, Maleza, Sosa, Torres and Vega Alta series are similar soils in related families. The Almirante and Guanajibo soils lack the low chroma mottles. The Bejucos, Cidral, Espinosa and Maleza soils lack the nonindurated plinthite within 60 inches from the surface. The Cabo Rojo and Vega Alta soils have mixed mineralogy in the clay fraction. The Guerrero soils have thicker sandy surface layers. The Sosa soils have ustic moisture regimes. The Torres soils have higher organic matter content in the upper argillic horizons.**

**GEOGRAPHIC SETTING: The Jobos soils are gently sloping and sloping soils in the coastal plains on slope gradients of 2 to 12 percent. The texture is clay sediments overlain by sandy sediments. The climate is humid tropical. The average annual precipitation ranges from 67 to 70 inches and the mean annual temperature is 77 degrees F.**

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Bejucos, Guerrero, Maleza, and Rio Lajas series. The Algarrobo, Arecibo, and Corozo soils have illuvial accumulation of organic matter. The Algarrobo, Arecibo, Corrizales, Corozo soils are sandy throughout.

**DRAINAGE AND PERMEABILITY:** Moderately well drained, runoff is slow and permeability is rapid in the A horizons and slow in the B2t horizons.

**USE AND VEGETATION:** Coconuts, food crops and pasture.

**DISTRIBUTION AND EXTENT:** Humid coastal plains of northern Puerto Rico. The series is of moderate extent with about 6,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Noroeste SCD, Puerto Rico; 1972.

**National Cooperative Soil Survey  
U. S. A.**

**LOCATION JUNCAL            PR**

**Established Series  
Rev. BCD  
08/2000**

## **JUNCAL SERIES**

**The Juncal series consists of very deep, moderately well drained, moderately permeable soils on foot slopes and low rounded hill sides of uplands. They formed in limestone residuum. Slopes range from 5 to 20 percent. The mean annual precipitation is about 90 inches and the mean annual temperature is about 77 degrees F.**

**TAXONOMIC CLASS: Fine, mixed, active, isohyperthermic Typic Hapludalfs**

**TYPICAL PEDON: Juncal clay - Brush. (Colors are for moist soil unless otherwise stated.)**

**Ap--0 to 8 inches; dark grayish brown (10YR 4/2) clay; weak coarse subangular block structure; firm, slightly sticky, plastic; many fine roots; medium acid; clear wavy boundary. (6 to 10 inches thick)**

**Bt1--8 to 14 inches; dark yellowish brown (10YR 4/4) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; few faint clay films; common fine roots; mildly alkaline; clear wavy boundary. (4 to 6 inches thick)**

**Bt2--14 to 20 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; common distinct clay films; few fine roots; mildly alkaline; clear wavy boundary. (6 to 8 inches thick)**

**Bt3--20 to 33 inches; brownish yellow (10 YR 6/6) clay; common fine distinct yellowish red (5YR 5/8) mottles; moderate medium and fine subangular blocky structure; firm, slightly sticky, plastic; few fine roots; few faint clay films; few black stains; mildly alkaline; clear wavy boundary. (8 to 14 inches thick)**

**Bt4--33 to 43 inches; brownish yellow (10YR 6/6) clay; common fine prominent red (2.5YR 5/6) mottles; moderate medium and fine subangular blocky structure; firm, slightly sticky, plastic; few faint clay films; few fine roots; few black concretions; few black stains; neutrals; clear wavy boundary. 8 to 12 inches thick)**

**Bt5--43 to 49 inches; yellowish brown (10YR 5/6) clay; few fine prominent light greenish gray (5G 7/1) and few fine prominent red (2.5YR 5/6) mottles; moderate fine subangular blocky structure; firm, slightly sticky; few faint clay films; very few roots; few black stains; moderately alkaline; clear wavy boundary. (4 to 10 inches thick)**

**C--49 to 66 inches; brownish yellow (10YR 6/8) silty clay loam, many fine faint light gray (10YR 7/2) mottles; crushed color, yellow (10YR 7/8); massive; friable, slightly sticky, plastic; fine lime is from 25 to 35 percent of the horizons; strong effervescence.**

**TYPE LOCATION: Culebrinas SCD, Puerto Rico, 3 miles north of the town of San Sebastian; 2.4 kilometers on Highway 447 from junction of Highways 447 and 119; and 220 meters south on paved unnumbered road.**

**RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 36 inches to 60 inches. These soils are slightly sticky and plastic throughout.**

**The A horizon is in hues of 7.5YR or 10YR, in values of 4, and in chromas from 2 or 3. The A horizon is medium or slightly acid.**

**The Bt horizons have colors in hues of 7.5YR or 10YR, in values of 4 or 5, and chromas from 4, 6, or 8. Clay is the dominant texture in the solum and coarser in the C horizon. Structure ranges from moderate fine to medium subangular blocky. Reaction is mildly or moderately alkaline.**

**The C horizon is calcareous and effervescence ranges from slight to strong. Base saturation (by sum of cations) is more than 60 percent at 50 inches below the top of the argillic horizon.**

**COMPETING SERIES: These are the Machete, Rio Arriba, San Sebastian, and Tanama series. The Machete soils are redder, having hues of 5YR throughout their profiles. The Rio Arriba soils have cracks at some period during most years and clays with COLE values that exceed 0.09. The San Sebastian soils have more than 35 percent coarse fragments in their profiles and are calcareous throughout. The Tanama soils have hard rock within 20 inches of the soil surface.**

**GEOGRAPHIC SETTING: The Juncal series occur on footslopes and low rounded hills. Slope gradients range from 5 to 20 percent. The soil formed in fine textured residuum of limestone rocks. The climate is humid tropical. The average annual precipitation is 90 inches and the mean annual temperature is 77 degrees F.**

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Colinas series. The Colinas soils are darker, shallower, and lack a well developed B horizon.

**DRAINAGE AND PERMEABILITY:** Moderately well drained; medium runoff; moderate permeability.

**USE AND VEGETATION:** Most of the acreage is planted to sugar cane.

**DISTRIBUTION AND EXTENT:** Humid northern uplands of Puerto Rico. The series is of small extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** San Juan Area, Puerto Rico; 1974

**REMARKS:** The classification was updated with the 4/91 draft from Fine, mixed, isohyperthermic Typic Tropudalfs to Fine, mixed, isohyperthermic Typic Hapludalfs. The previous OSED date was 3/91. This soil was formerly included in the Colinas series.

**Diagnostic horizons and features recognized in this pedon:**

Ochric epipedon - zone from 0 to 8 inches (Ap horizon)

Argillic horizon - zone from 8 to 49 inches (Bt horizons)

National Cooperative Soil Survey  
U.S.A.

**LOCATION LARES            PR**

**Established Series  
Rev. BCD  
06/2002**

## **LARES SERIES**

**The Lares series consists of very deep, somewhat poorly drained, moderately slowly permeable soils on dissected terraces. They formed in transported volcanic rocks. Slopes range from 2 to 20 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 78 degrees F.**

**TAXONOMIC CLASS: Very-fine, mixed, semiactive, isohyperthermic Aquic Paleudults**

**TYPICAL PEDON: Lares silty clay - sugar cane. (Colors are for moist soil unless otherwise stated.)**

**Ap--0 to 9 inches; brown (10YR 4/3) silty clay; weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots; very strongly acid; clear smooth boundary. (5 to 10 inches thick)**

**Bt1--9 to 14 inches; light yellowish brown (10YR 6/4) and grayish brown (10YR 5/2) clay; weak medium subangular blocky structure; friable, slightly sticky, plastic; few faint clay films; common fine roots; few fine concretions; very strongly acid; clear smooth boundary. (4 to 7 inches thick)**

**Bt2--14 to 20 inches; light yellowish brown (10YR 6/4) clay with few fine prominent dark red (10YR 3/6), common fine faint very pale brown (10YR 7/3), and few fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm, slightly sticky, plastic; many prominent clay films; few fine roots; common fine and medium partially weathered angular rock fragments; strongly acid; clear smooth boundary. (5 to 8 inches thick)**

**BC1--20 to 29 inches; yellowish brown (10YR 5/6) clay with few fine prominent dark red (10YR 3/6), few fine prominent red (10YR 4/8), and few fine faint light gray (10YR 7/2) mottles; weak fine and medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; many weathered rock fragments; few hard slightly weathered angular rock fragments; very strongly acid; gradual smooth boundary. (8 to 10 inches thick)**

**BC2--29 to 45 inches; mixed yellowish brown (10YR 5/6), greenish gray (5GY 6/1) and yellowish brown (10YR 5/6) clay; yellowish brown (10YR 5/6) when crushed; weak coarse subangular blocky structure; firm, slightly sticky, plastic; very strongly acid; gradual smooth boundary. (12 to 18 inches thick)**

**C--45 to 71 inches; weathered rock fragments of variegated colors as yellowish brown (10YR 5/6), red (10YR 4/6), and greenish gray (5GY 6/1) clay; massive; friable, slightly sticky, slightly plastic; common fine hard rock fragments; very strongly acid.**

**TYPE LOCATION: Oeste SCD, Puerto Rico. One mile northwest of the town of Anasco. Three hundred feet southeast of kilometer marker 143.6 of highway 2.**

**RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 34 to 53 inches. Thickness of the argillic horizon does not exceed 43 inches.**

**The A horizon is in hues of 7.5YR or 10YR, values of 4 and chromas of 3 or 4. Texture is silty clay loam, silty clay or clay. These soils have slightly sticky and slightly plastic A horizons. They are strongly or very strongly acid.**

**The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4, 5, or 6 and chroma of 4 and higher. They have red, yellow and brown mottles. Depth to mottles with chromas of 2 or less range from 18 to 30 inches of the soil surface. Clay films range from few faint to many prominent. Texture is clay and silty clay. Structure range from moderate to strong and from fine to medium. Wet consistence is slightly sticky and plastic. They are strongly or very strongly acid. Organic carbon content ranges from 1.0 to 1.4 percent in the upper 6 inches of the argillic horizon.**

**The mean annual soil temperature ranges from 75 to 78 degrees F.**

**COMPETING SERIES: These are the Naranjito and Picacho series in the same subgroup and Corozal, Daguao, and Los Guineos series. Daguao, Los Guineos, and Naranjito soils lack low chromas mottles in their profiles. In addition, Los Guineos soils are cooler and have yellower colors in the upper argillic horizon. The Corozal soils have less organic matter and have low chroma mottles immediately below the A horizons. Picacho soils have cooler soil temperatures.**

**GEOGRAPHIC SETTING: The Lares soils occur on gently to moderately sloping dissected terraces on slope gradients from 2 to 20 percent. The soil formed in fine textured material in transported volcanic rocks. The climate is humid tropical. The average annual precipitation is 80 inches and the mean annual temperature is 78 degrees F.**

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Daguey, Humatas, and Consumo series. These soils occur on steeper slopes, have colors of redder hues and lack low chroma mottles in the argillic horizon.

**DRAINAGE AND PERMEABILITY:** Somewhat poorly drained; medium to slow runoff; moderately slow permeability.

**USE AND VEGETATION:** Most of the acreage is in sugar cane.

**DISTRIBUTION AND EXTENT:** Humid valleys of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Puerto Rico; 1936.

**REMARKS:** The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Aquic Tropudults to Clayey, mixed, isohyperthermic Aquic Hapludults. The previous OSED date was 6/71.

**Diagnostic horizons and features recognized in this pedon:**

Ochric epipedon - zone from 0 to 9 inches (Ap horizon)

Argillic horizon - zone from 9 to 20 inches (Bt horizons)

Aquic feature - 2 chroma mottles in Bt1 horizon

National Cooperative Soil Survey  
U.S.A.

**LOCATION LOS GUINEOS PR**

**Established Series  
BCD-HRM. Rev. GRB  
07/2001**

## **LOS GUINEOS SERIES**

**The Los Guineos series consists of very deep, well drained soils on side slopes of mountains. They formed in residuum from sandstone material. The mean annual precipitation is about 120 inches and the mean annual temperature is about 68 degrees F. Slopes range from 5 to 60 percent.**

**TAXONOMIC CLASS: Very-fine, kaolinitic, isothermic Humic Hapludox**

**TYPICAL PEDON: Los Guineos clay - forest. (Colors are for moist conditions.)**

**A--0 to 1 inch; dark yellowish brown (10YR 4/4) clay; moderate medium granular structure parting to moderate fine granular; firm; sticky, plastic; common very fine roots, many fine roots; few fine discontinuous tubular pores; many faint organic coats on vertical and horizontal faces of peds; extremely acid; clear smooth boundary. (1 to 5 inches thick).**

**Bt1--1 to 3 inches; yellowish brown (10YR 5/4) clay; moderate fine subangular blocky structure; firm; very sticky, very plastic; very few coarse, common fine and medium roots throughout; common very fine discontinuous tubular pores; few faint clay films on vertical and horizontal faces of peds; few worm casts; extremely acid; clear smooth boundary.**

**Bt2--3 to 9 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure parting to moderate coarse subangular blocky; firm; very sticky, very plastic; common fine and medium roots; common fine and medium discontinuous tubular pores; many distinct clay films on vertical and horizontal faces of peds; few worm casts; extremely acid; clear smooth boundary.**

**Bt3--9 to 18 inches; brownish yellow (10YR 6/6) clay; moderate coarse subangular blocky structure; firm; very sticky, very plastic; common fine and medium roots; few fine discontinuous tubular pores; many distinct clay films on vertical and horizontal faces of peds; few worm casts; common fine distinct red (2.5YR 4/6) masses of iron accumulation; extremely acid; clear wavy boundary.**

**Bt4--18 to 31 inches; red (2.5YR 4/6) clay; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; very sticky, very plastic; few fine roots; few medium discontinuous tubular pores; many distinct clay films on vertical and horizontal faces of peds; few worm casts; many coarse distinct yellowish brown (10YR 5/6) masses of iron accumulation; very strongly acid; gradual smooth boundary. (Combined thickness of the Bt horizons range from 25 to 50 inches)**

**Bw1--31 to 43 inches; red (2.5YR 4/6) clay; weak coarse subangular blocky structure; firm; very sticky; very plastic; few fine roots; few medium discontinuous tubular pores; common distinct films on vertical faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; very strongly acid; gradual smooth boundary.**

**Bw2--43 to 61 inches; strong brown (7.5YR 5/6) clay; weak very coarse subangular blocky structure; firm; sticky, plastic; few fine roots; few medium discontinuous tubular pores; common faint films on vertical faces of peds; many medium distinct yellowish red (5YR 4/6) and few medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; very strongly acid; clear smooth boundary.**

**Bw3--61 to 74 inches; strong brown (7.5YR 5/6) clay; weak very coarse subangular blocky structure; firm; sticky, plastic; few medium discontinuous tubular pores; common distinct coatings in root channels and/or pores; about 10 percent, by volume, saprolite; many medium distinct yellowish red (5YR 4/6) masses of iron accumulation; very strongly acid; gradual smooth boundary.**

**Bw4--74 to 93 inches; yellowish red (5YR 4/6) clay; weak very coarse subangular blocky structure; firm; sticky, plastic; few medium discontinuous tubular pores; about 10 percent, by volume, saprolite; very strongly acid. (Thickness of the Bw horizon is 50 to 80 inches).**

**TYPE LOCATION: Rio Grande Municipio, Noreste SWCD; Caribbean National Forest, Puerto Rico. Approximately 150 feet southwest of bridge on Road 911. El Yunque topographic quadrangle; lat. 18 degrees 18 minutes 47 seconds N.; long. 65 degrees 49 minutes 27 seconds W.; PRD 1940.**

**RANGE IN CHARACTERISTICS: Solum thickness and depth to bedrock is more than 80 inches. Rock fragments range from 0 to 10 percent, by volume, throughout the profile. Reaction ranges from extremely acid to strongly acid throughout the profile. The lower depth of the Oxic horizon is above 50 inches. Stones and cobbles range from 0 to 15 percent on the surface.**

**The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is clay loam or clay.**

**The Bt horizon has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. Texture is clay loam or clay.**

**The Bo horizon, where present, has hue of 2.5YR to 10YR, value of 4 or 5 and chroma of 6 or 8. Texture is clay.**

**The Bw horizon has hue of 2.5YR to 7.5YR, value of 4 to 6 and chroma of 6 to 8. Texture is clay (using either 2.5 or 3 times the 15 bar water). Because of poor dispersion, the measured clay content ranges from 15 to 45 percent. Saprolite ranges from 0 to 20 percent, by volume, in the lower part.**

**COMPETING SERIES:** There are no competing series in the same family.

**GEOGRAPHIC SETTING:** These soils are mountain sides or deeply dissected plateaus of uplands. They formed in residuum from sandstone material. The climate is humid tropical. Slopes range from 5 to 60 percent. The annual precipitation ranges from 100 to 140 inches and the average annual temperature ranges from 65 to 72 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These include the Moteado, Yunque, and Zarzal soils. The poorly drained Moteado soils are deep to bedrock. The moderately well drained Yunque soils have less clay in the control section. The moderately well drained Zarzal soils have a kaolinitic control section.

**DRAINAGE AND PERMEABILITY:** Well drained; moderate permeability.

**USE AND VEGETATION:** Watershed protection, recreation, research, and wildlife habitat. Most of the areas are now forested.

**DISTRIBUTION AND EXTENT:** Upland areas of Puerto Rico. The series is of small extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama.

**SERIES ESTABLISHED:** Puerto Rico, 1936.

**REMARKS:** Diagnostic horizons and features recognized in this pedon:

**Ochric epipedon - zone from 0 to 1 inch (A horizon).**

**Oxic horizon - zone from 1 to 31 inches (Bt horizons).**

**Cambic horizon - zone from 31 to 93 inches (Bw horizons).**

**LABORATORY DATA: Characterization data - Caribbean National Forest, Puerto Rico. Pedon No. 86P303 and Soil Survey No. S86PR-3-10. Sample by NSSL, Lincoln NE., February, 1986.**

**MLRA: 270.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION MABI            PR**

**Established Series  
Rev. LHR  
07/2001**

## **MABI SERIES**

**The Mabi series is a member of the fine, montmorillonitic, isohyperthermic family of Vertic Eutropepts. These soils have fine textured, sticky, plastic layers with pressure faces and slickensides that intersect.**

**TAXONOMIC CLASS: Very-fine, mixed, active, isohyperthermic Aquic Hapluderts**

**TYPICAL PEDON: Mabi clay - Guava orchard.  
(Colors are for moist soil unless otherwise stated.)**

**Ap--0 to 7 inches; very dark grayish brown (10YR 3/2) clay with few fine faint yellowish brown mottles and red (2.5YR 4/6) coatings along root channels; weak fine granular structure; hard, very firm, slightly sticky, plastic; common fine roots; common fine black nodules; few fine fragments of volcanic rock; very strongly acid; clear smooth boundary. (6 to 12 inches thick)**

**B1--7 to 15 inches; dark yellowish brown (10YR 4/4) clay with few fine distinct gray (10YR 5/1) and common medium distinct yellowish brown (10YR 5/6) mottles; brown (10YR 4/3) rubbed color; weak fine and medium angular blocky structure with many pressure faces; very firm, slightly sticky, plastic; common fine roots; few fine black nodules; few fine fragments of volcanic rock; strongly acid; clear wavy boundary. (6 to 12 inches thick)**

**B2--15 to 24 inches; yellowish brown (10YR 5/6) clay with many medium distinct gray (10YR 5/1) mottles; brown (10YR 4/3) rubbed color; weak fine and medium angular blocky structure with many pressure faces and slickensides that intersect; very firm; slightly sticky, plastic; few fine roots; few fine black nodules; few fine fragments of volcanic rock; coatings along root channels; medium acid; clear wavy boundary. ( 8 to 12 inches thick)**

**C1--24 to 38 inches; yellowish brown (10YR 5/4) clay with few fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium and coarse angular blocky structure with many pressure faces and**

**slickensides that intersect; very firm, slightly sticky, plastic; few fine black nodules; few fine fragments of volcanic rock; few fine and medium carbonatic concretions; mildly alkaline; gradual smooth boundary. (12 to 14 inches thick)**

**C2--38 to 53 inches; yellowish brown (10YR 5/4) clay with common fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium angular blocky structure with common pressure faces and slickensides; very firm, slightly sticky, plastic; few fine black nodules; few fine fragments of volcanic rock; few fine and medium carbonatic concretions; mildly alkaline; gradual smooth boundary. (12 to 18 inches thick)**

**C3--53 to 67 inches; yellowish brown (10YR 5/4) clay with common fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium angular blocky structure with few pressure faces and slickensides very firm, slightly sticky, plastic; few fine black nodules; few fine and medium fragments of volcanic rock; few fine carbonatic concretions; mildly alkaline; gradual wavy boundary. (10 to 18 inches thick)**

**C4--67 to 90 inches; auger sample-mixed yellowish brown (10YR 5/4) and greenish gray (5GY 6/1) clay; massive; very firm, slightly sticky, plastic; few fine black nodules; weak effervescence with dilute HCL; mildly alkaline. (15 to 30 inches thick)**

**C5--90 to 113 inches; auger sample-yellowish brown (10YR 5/6) clay with few medium distinct greenish gray (5GY 6/1) mottles; massive; very firm, slightly sticky, plastic; weak effervescence with dilute HCL; mildly alkaline.**

**TYPE LOCATION: Turabo SCD, Puerto Rico; 1.2 kilometers west of town of Gurabo. Eight hundred feet north and 600 feet west of Gurabo Experiment Station headquarters. Photo CS-LR 15-72.**

**RANGE IN CHARACTERISTICS: Depth to semiconsolidated volcanic rock is more than 5 feet. Distinct or prominent low chroma mottles occur within 20 inches of the surface. These soils have crack that open and close more than once during the year, but do not remain open for more than 90 cumulative days. There are years in which the soil may not crack. These soils are plastic throughout. The soil ranges from very strongly acid in the surface horizons through moderately alkaline in the lower C horizon.**

**The A horizon has a hue of 10YR, moist values of 3 or less, dry values of 5 or less, and chromas of 2 or more.**

**The B and C horizons have hues of 10YR or 2.5YR, values of 4 through 6, and chromas of 2 through 4.**

**COMPETING SERIES:** These are the Camaguey, Cartagena, Fraternidad, Juncos, Montegrande, Mucara, Paso Seco, and Santa Isabel series. The Camaguey soils have chromas of less than 1.5 in the upper 12 inches. The Cartagena, Fraternidad, Paso Seco, and Santa Isabel soils all have cracks that open and close more than once during the year but remain open for more than 90 cumulative days during the year. The Juncos and Mucara soils are moderately deep to semiconsolidated volcanic rock. The Montegrande soils contain gravelly horizons within 40 inches of the surface.

**GEOGRAPHIC SETTING:** The Mabi soils occur in gently to moderately sloping alluvial fans and terraces above the river flood plains. The slope gradient ranges from 2 to 20 percent. The soil formed in fine textured sediments derived volcanic rocks. The climate is humid tropical. The average annual rainfall is 78 inches and the mean annual temperature is 80 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Gurabo, Juncos, Mucara, Montegrande, and Rio Arriba series. The Gurabo soils occupy similar positions in the landscape, but have gravelly horizons within 40 inches of the surface. The Rio Arriba soils have brighter colors and argillic horizons.

**DRAINAGE AND PERMEABILITY:** Somewhat poorly drained; medium to slow runoff; slow permeability.

**USE AND VEGETATION:** Sugar cane and pasture.

**DISTRIBUTION AND EXTENT:** Humid inner valleys of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Soil Survey of Puerto Rico; 1942.

**REMARKS:** The Mabi series was formerly classified in the Grumusols great soil group.

National Cooperative Soil Survey  
U.S.A.

**LOCATION MALAYA            PR**

**Established Series  
Rev. REG:LHR  
06/2002**

## **MALAYA SERIES**

**The Malaya series is well drained, moderately permeable soils formed in residuum from calcareous volcanic rocks. These soils have dark yellowish brown, and brown fine textured, non-calcareous A and B horizons and moderately fine textured C horizons over calcareous, semi- consolidated tuffaceous rocks.**

**TAXONOMIC CLASS: Clayey, mixed, superactive, isohyperthermic, shallow Typic Eutrudepts**

**TYPICAL PEDON: Malaya clay - native pasture.  
(Colors are for moist soil.)**

**Ap--0 to 6 inches; dark yellowish brown (10YR 3/4) clay; weak medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; few fine black concretions; common fine and medium rock fragments occupy 15 percent by volume of the horizons; slightly acid; clear smooth boundary. (5 to 7 inches thick)**

**B--6 to 12 inches; brown (10YR 4/3) gravelly clay with stringers of dark yellowish brown (10YR 3/4), crushed color dark grayish brown (10YR 4/2); weak medium subangular blocky structure; firm, sticky, plastic; common fine roots; common fine black concretions; common fine and medium rock fragments occupy 25 percent by volume of horizons; mildly alkaline; clear smooth boundary. (4 to 8 inches thick)**

**C--12 to 16 inches; dark yellowish brown (10YR 4/4) clay loam with common medium faint brown (10YR 5/3) mottles; crushed color brown (10YR 4/3); massive; firm, slightly sticky, slightly plastic; black coatings on faces; partially weathered rock fragments that can be crushed between fingers; moderatley alkaline; gradual wavy boundary. (3 to 5 inches thick)**

**R--16 to 20 inches plus; Semi-consolidated calcareous tuffaceous rock.**

**TYPE LOCATION:** Suroeste SCD, Puerto Rico 2 miles north of the town of Hormigueros. 150 feet east of kilometer marker 1.2 on Highway 344.

**RANGE IN CHARACTERISTICS:** Thickness of the solum ranges from 9 to 15 inches. Depth to the hard calcareous tuffaceous rock varies from 12 to 20 inches. Fine and medium volcanic rock fragments occupy 15 to 30 percent by volume of the horizons. Colors of the A and B horizons have hues of 5YR to 10YR, values of 3 and 4, and chromas of 4. Texture of the solum is clay.

The C horizons vary in textures from clay loam to silty clay loam. Structure of the B horizons ranges from weak fine to medium subangular blocky. These soils have slightly sticky and slightly plastic A horizons and sticky and plastic B horizons. Reaction of the A horizons ranges from medium to slightly acid and the B and C horizons from neutral to moderately alkaline. The base saturation (by NH<sub>4</sub> OAc) is 50 percent or more in the epipedon and cambic horizon. Organic matter content decreases regularly with depth. Exchange capacity per 100 grams of clay (NH<sub>4</sub> OAc) is more than 20 meg.

**COMPETING SERIES:** These are the Caguabo series in the same subgroup and the Cuchillas, Quebrada, Morado, Plata, Maresua, and Juncos series in the same great group. The Caguabo soils have more than 35 percent coarse fragments in the solum. The Cuchillas soils have lower soil temperatures (less than 71.6 degrees F.) and are not lithic. The Quebrada, Morado, and Maresu soils have semi-consolidated volcanic rocks deeper than 20 inches. The Plata soils have coarser textured, more acid deeper profiles. The Juncos soils have clays with high shrink-swell behavior and are not lithic.

**GEOGRAPHIC SETTING:** The Malaya soils occur on strongly sloping to steep side slopes of strongly dissected volcanic uplands on slope gradients of 20 to 60 percent. The regolith consists of fine textured residuum derived from calcareous volcanic rocks. The climate is humid tropical. The average annual precipitation is 75 inches and the mean annual temperature is 77 degrees F. Soil temperatures at depth of 20 inches is more than 22 degrees C. (71.6 degrees F.) and the difference between mean summer and winter temperature is less than 5 degrees C. (9 degrees F.).

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Quebrada, Maresua, Morado and Caguabo series in addition to the Mucara series. The Mucara soils are non-lithic and are underlain by noncalcareous volcanic rocks.

**DRAINAGE AND PERMEABILITY:** Well drained, medium to rapid runoff, and moderate permeability.

**USE AND VEGETATION: Pasture and brush.**

**DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of moderate extent.**

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama**

**SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.**

**REMARKS: The Malaya series was formerly classified in the Reddish Brown Lateritic Great Soil Group.**

**National Cooperative Soil Survey  
U. S. A.**

**LOCATION MALEZA      PR**

**Established Series  
Rev. REG:LHR  
06/2002**

## **MALEZA SERIES**

**The Maleza series have moderately coarse textured, very friable A horizons over thick, red, plastic, fine textured B2t horizons.**

**TAXONOMIC CLASS: Fine, parasitic, isohyperthermic Typic Paleudults**

**TYPICAL PEDON: Maleza fine sandy loam - native pasture  
(Colors are for moist soil.)**

**Ap--0 to 10 inches; reddish brown (5YR 4/3) sandy loam; single grain; loose, very friable, slightly sticky, nonplastic; common fine roots; slightly acid; clear smooth boundary. (6 to 12 inches thick)**

**B1--10 to 17 inches; dark reddish brown (2.5YR 3/4) sandy clay loam; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; few black sandy concretions; slightly acid; clear smooth boundary. (5 to 9 inches thick)**

**B21t--17 to 34 inches; red (10R 4/6) clay; weak medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; few fine roots; few patchy clay films on ped faces and root channels; common very fine concretions; slightly acid; abrupt wavy boundary. (10 to 20 inches thick)**

**B22t--34 to 60 inches plus; (2.5YR 4/6) clay with common fine distinct weak red (10R 4/4) and common fine distinct strong brown (7.5 YR 5/6) mottles; weak medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few patchy clay films; strongly acid.**

**TYPE LOCATION: Noroeste SCD, Puerto Rico; 0.4 miles west of the town of Isabela. 0.5 miles on dirt road from kilometer marker 1.4 of highway 459. Twenty feet west of dirt road.**

**RANGE IN CHARACTERISTICS:** Thickness of the solum is over 60 inches and that of the argillic horizon over 50 inches. Reaction ranges from slightly to medium acid throughout. Base saturation (by sum of cations) is less than 35 percent at 50 inches below the top of the argillic horizon. The organic matter content is 1.5 percent or less in the upper 6 inches of the argillic horizon.

Colors of the A horizons have hues of 5YR, values of 4 and chromas of 3 and higher.

The B2t horizons have colors in hues of 10R and 2.5YR, values of 4 and chromas of 4 and higher. Texture of the B2t horizons ranges from sandy clay to clay. Structure of the B2t horizons ranges from weak medium to coarse subangular blocky. These soils have slightly sticky and nonplastic A horizons and slightly sticky and slightly plastic B2t horizons. **COMPETING SERIES:** These are the Bajucos and Cidrel series in the same subgroup and the Cabo Rojo, Rio Lajas, Jobos and Guanajibo series in the same Great Group. The Bejucos soils are more acid and have yellower profiles. The Cidral soils have less than 20 percent oxides of iron and aluminum in the clay fraction. The Cabo Rojo soils have Ap horizons with moist color values of less than 4. The Rio Lajas soils have thick, sandy surface horizons and coarser textured profiles. The Jobos and Guanajibo soils have more than 5 percent nonindurated plinthite in their profiles.

**GEOGRAPHIC SETTING:** The Maleza soils occur on gently sloping coastal plains of slope gradients of 2 to 5 percent. The regolith consists of coarse textured over fine textured sediments. The climate is humid tropical. The average annual precipitation is 68 inches and the mean annual temperature 77 degrees F. Soil temperature at 20 inches is over 71.6 degrees F. and the difference between mean summer and winter temperature is less than 9 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Bejucos, Rio Lajas, Jobos, and Guanajibo series in addition to the Coto, Cotito, and Matanzas series. The Coto and Cotito soils have finer textured and darker A horizons, and thinner, yellower B2t horizons. The Matanzas soils are dark red, have finer textured A horizons, and have thinner B horizons.

**DRAINAGE AND PERMEABILITY:** Well drained, slow runoff, and moderate permeability.

**USE AND VEGETATION:** Pasture, subsistence crops and coconuts.

**DISTRIBUTION AND EXTENT:** North coastal plains of Puerto Rico. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED: Soil Survey of Puerto Rico, 1942.**

**REMARKS: The Maleza series was formerly classified in the Reddish Brown Lateritic Great Soil Group.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION MANI            PR**

**Established Series  
Rev. REG:LHR  
04/2000**

## **MANI SERIES**

**The Mani series have brown, fine textured, sticky and plastic A horizons over strong brown, mottled, fine textured, sticky and plastic B horizons and gray, mottled fine textured, sticky and plastic C horizons.**

**TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Fluvaquentic Eutrudepts**

**TYPICAL PEDON: Mani clay - sugar cane.  
(Colors are for moist soil.)**

**Ap--0 to 6 inches; brown (10YR 4/3) clay; weak medium granular structure; firm, sticky, plastic; many fine roots; common worm holes; few fine subrounded volcanic fragments; medium acid; clear smooth boundary. (4 to 8 inches thick)**

**B1--6 to 12 inches; brown (10YR 4/3) clay with few fine distinct strong brown (7.5YR 5/8), gray (2.5YR 6/0) and brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; firm, sticky, plastic; common fine roots; few fine volcanic fragments; few worm holes; medium acid; clear smooth boundary. (4 to 8 inches thick)**

**B21--12 to 19 inches; strong brown (7.5YR 5/6) clay with common fine distinct gray (10YR 5/1) and brown (10YR 4/3) mottles; weak medium subangular blocky structure; firm, sticky, plastic; few fine roots; few fine volcanic fragments; few fine black concretions; many fine pores; medium acid; clear smooth boundary. (5 to 9 inches thick)**

**B22--19 to 32 inches; strong brown (7.5YR 5/6) clay with many medium distinct gray (10YR 5/1) mottles; weak fine subangular block structure; firm, sticky, plastic; few fine roots; few fine black concretions; medium acid; clear smooth boundary. (10 to 16 inches thick)**

**C--32 to 58 inches plus; gray (10YR 5/1) clay with many medium distinct strong brown (7.5YR 5/6) mottles; massive, firm, sticky, plastic; few fine black concretions; medium acid.**

**TYPE LOCATION:** Oeste SCD, Puerto Rico, 4.0 miles north of city of Mayaguez; 300 meters north of the Northwest corner of the Mayaguez airport on dirt road, 10 feet from road.

**RANGE IN CHARACTERISTICS:** Thickness of solum ranges from 23 to 41 inches. Texture of the soil is clay throughout. Depth to water table varies from 24 to 48 inches. Reaction ranges from slightly acid to medium acid. Soils are not dry for as much as 90 cumulative days in any horizon in most year. Organic matter content does not decrease regularly with depth. CEC by (NH<sub>4</sub> OAc) is 24 meq/100 grams of clay or more in all horizons to 40 inches. COLE values in the A and B horizons are less than 0.09.

Colors of the A horizons vary in hues of 7.5YR and 10YR, values and chromas of 3 and 4. The B horizons have hues of 7.5YR and 10YR and chromas of 3 and higher.

The B and C horizons are mottled with colors having chromas of 2 or less. Structure of the B horizons varies from weak fine to weak medium subangular blocky. Base saturation (by NH<sub>4</sub> OAc) is 50 percent or more in the surface and cambic horizons.

**COMPETING SERIES:** These are the Dique and Humacao series in addition to the Quebrada, Morado, Plata, Maresua, Junquitos, Caguabo, Malaya, Juncos, Mucara, Gurabo and Montegrando series in the same Great Group. The Dique and Humacao soils do not have low chroma mottles within 40 inches of the surface. The Quebrada, Morado, Plata and Maresua soils lack low chroma mottles within 40 inches of the surface and have organic matter content that decreases regularly with depth. The Plata and Maresua soils have more than 35 percent coarse fragments in their profiles. The Junquitos soils have organic matter content that decreases regularly with depth. The Caguabo and Malaya soils have hard rock within 20 inches of the surface. The Juncos, Mucara, Gurabo and Montegrando soils have cracks at some period in most years and more than 35 percent clay with COLE values of 0.09 or more.

**GEOGRAPHIC SETTING:** The Mani soil occur on nearly level low terraces slightly above the river flood plains with slopes gradients of 0 to 2 percent. The regolith consists of fine textured sediments washed from the volcanic and limestone hills. The climate is humid tropical. The average annual precipitation is 76 inches and the mean annual temperature is 77 degrees F. The mean annual soil temperature at 20 inches depth is more than 72 degrees F. and the difference between mean summer and winter temperatures is less than 9 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Lares, Coloso, and Bajura in addition to the competing Dique series. The Lares soils are redder, better drained, and have argillic horizons. The Coloso soils have darker colored

**and coarser textured profiles. The Bajura soils are poorly drained with low chromas colors dominating in the profile.**

**DRAINAGE AND PERMEABILITY: Somewhat poorly drained, permeability is moderately slow.**

**USE AND VEGETATION: Most of the acreage is in sugar cane.**

**DISTRIBUTION AND EXTENT: Humid flood plains of Puerto Rico. The series is of minor extent.**

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama**

**SERIES ESTABLISHED: Oeste SCD, Puerto Rico, Mani is the name of the barrio where the series was first recognized.**

**REMARKS: This soil was formerly mapped in the Coloso series, but differs from it in being redder and having finer textured profiles.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION MARESUA        PR**

**Established Series  
Rev. JLL/SRT/GRB  
12/2001**

## **MARESUA SERIES**

**The Maresua series consists of moderately deep, well drained, moderately permeable soils on side slopes of the serpentinite hills and mountains of the Humid Mountains and Valleys MLRA. They formed in material that weathered from serpentinite bedrock. Near the type location, the mean annual temperature is about 81 degrees F., and the mean annual precipitation is about 80 inches. Slopes range from 12 to 60 percent.**

**TAXONOMIC CLASS: Fine-loamy, magnesian, isohyperthermic Typic Argiudolls**

**TYPICAL PEDON: Maresua silty clay loam - forestland (Colors are for moist soil unless otherwise indicated.)**

**Oi-0 to 1 inch; leaves, needles, twigs, sticks, and bark.**

**A--1 to 4 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable, slightly hard; slightly sticky and plastic; many very fine, fine, and medium roots, few coarse roots; many very fine interstitial and vesicular pores; about 5 percent, by volume, pebbles; neutral; clear smooth boundary. (4 to 8 inches thick)**

**AB--4 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine to medium subangular blocky structure; friable, slightly hard; slightly sticky and plastic; common fine and medium roots, few coarse roots; common fine interstitial pores, few fine tubular pores; common distinct dark reddish brown (5YR 3/3) stains and coatings on ped faces and in pores; about 5 percent, by volume, pebbles; neutral; clear smooth boundary. (4 to 8 inches thick)**

**Bt--10 to 26 inches; dark reddish brown (5YR 3/3) extremely paragravelly clay, dark reddish brown (5YR 3/2) dry; weak fine subangular blocky structure; firm, slightly hard, sticky, and plastic; many fine and medium roots between paragravel fragments; few very fine interstitial pores; common distinct clay films on faces of peds; about 85 percent, by**

volume, paragravel fragments; neutral; abrupt wavy boundary. (4 to 10 inches thick)

Cr--26 to 46 inches; soft semiconsolidated serpentinite bedrock that is rippable by hand tools.

R-46+ inches; hard consolidated serpentinite bedrock.

**TYPE LOCATION:** San German Municipality, Puerto Rico; approximately 0.8 mile northwest of the city of San German; downtown from the intersection of P.R. Highway 102 and P.R. Highway 347; 0.1 mile north of the Aqueduct paved road at the farm facilities of the Interamerican University-San German Campus; about 50 feet east of road on forestland. USGS San German, PR Quadrangle; lat. 18 degrees 05 minutes 35 seconds N.; long. 67 degrees 02 minutes 57 seconds W.

**RANGE IN CHARACTERISTICS:** Solum thickness of the solum ranges from 12 to 26 inches. Depth to the semi-consolidated serpentinite rock ranges from 40 to 60 inches. Reaction is neutral throughout the profile. clay. Rock fragments include pebbles and cobbles composed of serpentinite.

The A and AB horizons have hue of 10YR, value of 2 or 2 and chroma of 1 to 3. Texture is silty clay loam or clay loam. Content of pebbles and cobbles range from 5 to 15 percent, by volume.

The Bt horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is clay loam or clay. Content of pebbles and cobbles range from 5 to 15 percent, by volume.

The Cr horizon is composed of soft semiconsolidated serpentinite. It can be excavated with difficulty with hand tools, and is rippable by mechanized equipment.

The R horizon is composed of hard consolidated serpentinite bedrock.

**COMPETING SERIES:** There are no other series in the same family.

**GEOGRAPHIC SETTING:** Maresua soils are on side slopes of serpentinite hills and mountains in southern Puerto Rico. They formed in material that weathered from serpentinite. The climate is humid tropical. The average annual precipitation ranges from 78 to 82 inches and the average annual temperature is 79 to 83 degrees F. Slopes range from 12 to 60 percent slopes.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These include the El Cacique (T), La Taina (T), Nipe, Rosario, and Santa Marta soils. All of these soils are on similar positions. El Cacique soils have more clay in the control section. La Taina soils are clayey-skeletal. In addition, El Cacique and La Taina soils do not have argillic horizons. Nipe, Rosario, and Santa Marta soils are redder, finer textured, and do not have a large amount of pararock or rock fragments throughout the profile. In addition, Nipe soils are very deep and Nipe and Rosario soils are acid and have oxic horizons.

**DRAINAGE AND PERMEABILITY:** Well drained; moderate permeability.

**USE AND VEGETATION:** Most areas of Maresua soils are used for forestland, grazing or wildlife habitat. The vegetation consists of Maricao doncella and Algarrobo trees, Cariaquillo, Leucaena, Arbol de navidad del pobre, and Carrasco shrubs, along with lamina and guinea grasses.

**DISTRIBUTION AND EXTENT:** Humid side slopes of serpentinite hills and mountains of southern Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama.

**SERIES ESTABLISHED:** San German Municipality, Puerto Rico, 1964. The name is from the Maresua Ward, where it was originally recognized.

**REMARKS:** These soils were formerly included in the Rosario series and classified in the Lithosols group. The 12/01 revision changed the classification from Eutrudepts to Argiudolls in recognition of the mollic epipedon and the argillic horizon.

**Diagnostic horizons and features recognized in the pedon include:**

**Mollic epipedon - 1 to 10 inches.**

**Argillic horizon - 10 to 26 inches.**

**Paralithic contact - The contact at 26 inches (Cr horizon).**

**Lithic contact - The contact at 46 inches (R horizon).**

**ADDITIONAL DATA: Characterization pedon - San German Municipality, Puerto Rico; S00PR-125-001. Sample by the NSSL, Lincoln, NE.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION MARIANA      PR**

**Established Series  
Rev. JLL/GRB  
06/2002**

## **MARIANA SERIES**

**The Mariana series consists of deep or very deep, well drained, moderately permeable soils on side slopes of dissected uplands. They formed in residuum that weathered from acid volcanic rock. Near the type location, the mean annual temperature is about 79 degrees F., and the mean annual precipitation is about 50 inches. Slopes range from 12 to 20 percent.**

**TAXONOMIC CLASS: Fine, mixed, active, isohyperthermic Typic Haplohumults**

**TYPICAL PEDON: Mariana gravelly clay - Pangola grass (Colors are for moist conditions unless otherwise stated).**

**Ap--0 to 6 inches; brown (7.5YR 4/2) moist and brown (7.5YR 5/4) dry, gravelly clay; moderate fine granular structure; friable; slightly sticky, slightly plastic; many fine roots; about 20 percent, by volume, pebbles; very strongly acid; clear smooth boundary. (4 to 8 inches thick.)**

**Bw1--6 to 16 inches; 50 percent red (2.5YR 4/6) and 50 percent brown (7.5YR 4/2) clay having a crushed color that is yellowish red (5YR 4/8); weak fine and medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; about 5 percent, by volume, pebbles; few clay films in root channels; very strongly acid; clear smooth boundary. (6 to 10 inches thick.)**

**Bw2--16 to 26 inches; 50 percent red (10R 4/6) and 50 percent reddish yellow (5YR 6/8) clay having a crushed color that is red (2.5YR 4/8); weak medium subangular blocky structure; firm; slightly sticky, plastic; few fine roots; few faint discontinuous clay films in root channels; very strongly acid; gradual wavy boundary. (6 to 10 inches thick)**

**C--26 to 38 inches plus; 25 percent reddish yellow (5YR 6/8), 25 percent red (10YR 4/6), 25 percent white (5YR 8/1), and 25 percent dark brown (7.5YR 4/2) variegated saprolite with a clay texture and having a crushed color that is reddish yellow (5YR 6/8); massive; firm; slightly sticky, plastic; extremely acid.**

**TYPE LOCATION:** San German Municipality, Puerto Rico. Approximately 1.8 miles southwest of the Sabana Eneas community from the intersection of P.R. Hwy. 102 and P.R. Hwy. 317; about 0.5 mile southwest of P.R. Hwy. 314 on dirt road. San German topographic quadrangle; lat. 18 degrees 03 minutes 58 seconds N.; long. 67 degrees 05 minutes 46 seconds W. PRD 1940.

**RANGE IN CHARACTERISTICS:** Solum thickness ranges from 16 to 28 inches. Fine and coarse gravel ranges from 20 to 40 percent, by volume, in the A horizon, and from 0 to 10 percent, by volume, in the Bw and C horizons. Reaction ranges from extremely acid to very strongly acid. Base saturation (ammonia acetate) in the epipedon and Cambic horizon is less than 50 percent. Exchange capacity (ammonia acetate) per 100 grams of clay is more than 20 meq.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. Texture is the gravelly and very gravelly analogs of silt loam or silty clay loam.

The Bw horizon has hue of 10R to 5YR, value of 3 to 5, and chroma of 3 to 6. Texture ranges from clay loam to clay.

The C horizon has hue of 5YR to 10YR value of 4 to 6, and chroma of 3 to 6; or there is no dominant color and is multicolored in shades of red, yellow, white, and brown. Structure of parent rock is evident in C horizons. Texture ranges from clay loam to clay.

**COMPETING SERIES:** These are no other known competing series in the same family.

**GEOGRAPHICAL SETTING:** Mariana soils are on side slopes of uplands. They formed in residuum that weathered from acid volcanic rock. The climate is tropical semiarid. Slopes range from 12 to 40 percent. The average annual temperature ranges from 78 to 80 degrees F., and the average annual precipitation ranges from 45 to 55 inches.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These include the Descalabrado, Jacana, and Palmarejo series. Descalabrado and Jacana soils have Mollic epipedons. In addition, Descalabrado soils are shallow to bedrock and Jacana soils are moderately deep to bedrock. The moderately well drained Palmarejo soils have argillic horizons.

**DRAINAGE AND PERMEABILITY:** Well drained; moderate permeability.

**USE AND VEGETATION:** Most areas of Mariana soils are in native pasture. The vegetation consists of native and introduced grasses and brush.

**DISTRIBUTION AND EXTENT: Semiarid uplands of Puerto Rico. The series is of minor extent.**

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama.**

**SERIES ESTABLISHED: Soil Survey of Puerto Rico, 1942.**

**REMARKS: Diagnostic horizons and features recognized in this pedon:**

**Ochric epipedon - the zone from 0 to 6 inches (A horizon).**

**Cambic horizon - the zone from 6 to 16 inches (Bw horizon).**

**MLRA: 271.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION MARICAO PR**

**Established Series  
Rev. BCD  
06/2002**

## **MARICAO SERIES**

**The Maricao series consists of very deep, well drained, moderately permeable soils formed in material weathered from volcanic rocks. They are steep and very steep soils on strongly dissected uplands. Slopes range from 20 to 60 percent. The mean annual precipitation is about 110 inches and the mean annual temperature is about 72 degrees F.**

**TAXONOMIC CLASS: Fine, mixed, subactive, isohyperthermic Inceptic Hapludults**

**TYPICAL PEDON: Maricao clay -- native pasture. (Colors are for moist soil.)**

**Ap--0 to 5 inches; reddish brown (5YR 4/4) clay, some mixture of red (2.5YR 5/8) from underlying horizon; weak fine and medium subangular blocky parting to moderate medium granular structure; firm, slightly sticky, plastic; many fine roots; few worm channels; very strongly acid; clear smooth boundary. (4 to 7 inches thick)**

**Bt--5 to 14 inches, red (2.5YR 5/8) clay, coatings of light red (2.5YR 6/8) and yellowish red (5YR 5/8); weak medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; few faint clay films; 10 percent of horizon is saprolite; 2 percent firm weathered rock fragments; very strongly acid; clear wavy boundary. (6 to 9 inches thick)**

**BC--14 to 20 inches; red (2.5YR 5/8) clay, and mixed colors from the saprolite; weak fine subangular blocky structure; friable, slightly sticky, plastic; few fine roots; 40 percent of horizon is saprolite; very strongly acid; clear wavy boundary. (5 to 12 inches thick)**

**C--20 to 60 inches; crushed color red (2.5YR 5/8) silty clay loam, variegated colors of saprolite; massive, saprolite; friable, nonsticky, slightly plastic; very strongly acid.**

**TYPE LOCATION: Oeste SCD, Puerto Rico; 7.0 miles southeast of the town of Maricao; 2.3 kilometers on dirt road south of kilometer marker 44.5 of Highway 105; 25 meters west of dirt road.**

**RANGE IN CHARACTERISTICS:** Solum thickness ranges from 15 to 25 inches. Thickness of the argillic horizon ranges from 6 to 16 inches. Depth to semi-consolidated tuffs, mudstone or lava is more than 5 feet. The soil is extremely acid or very strongly acid. The mean annual soil temperature ranges from 68 to 72 degrees F.

The A horizons have hues of 2.5YR or 5YR, values of 4 or 5, and chroma of 3 to 6. They are clay.

The Bt horizons have hues of 2.5YR or 5YR, values of 4 or 5, and chroma of 6 or 8. They are clay. Structure is weak fine or medium subangular blocky. The Bt horizon has 5 to 20 percent saprolite and the BC horizon has 20 to 60 percent saprolite.

The C horizon has crushed hues of 2.5YR or 5YR, values of 4 to 6, and chroma of 4 to 8. They are silty clay or silty clay loam.

**COMPETING SERIES:** These are no other known series in the same family.

The Ciales, Consumo, Corozal, Ingenio, Moca, Patillas, and Vega Alta series and similar soils in related families. All of these soils except Ciales soils have isohyperthermic temperature regimes. Ciales soils have argillic horizons thicker than 16 inches and have gray mottles.

**GEOGRAPHIC SETTING:** The Maricao soils are steep and very steep soils on strongly dissected uplands at elevations above 550 meters, with slope gradients of 20 to 60 percent. The soils formed in highly weathered residuum from basic volcanic rocks. The climate is humid tropical with annual precipitation that ranges from 90 to 120 inches and mean annual temperature of 70 to 74 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Ciales series and the Cuchillas, Los Guineos, Picacho, and Yunque soils. Cuchillas soils have a cambic horizon. Los Guineos and Yunque soils have hue of 10YR and mottles in the upper part of the B horizon. Picacho soils have low chroma mottles in the argillic horizon.

**DRAINAGE AND PERMEABILITY:** Well drained; rapid runoff; moderate permeability.

**USE AND VEGETATION:** Most of the acreage is in brushland or abandoned coffee plantations. Small acreage is used for growing native pasture, tame pasture, and coffee.

**DISTRIBUTION AND EXTENT:** Humid and high elevation areas of Puerto Rico. The series is of moderate extent with about 36,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Puerto Rico, (Ponce Survey Area), 1971.

**REMARKS:** The classification was updated with the 4/91 draft from Clayey, mixed, isothermic Dystropeptic Tropudults to Clayey, mixed, isothermic Ochreptic Hapludults with this draft. The previous OSED date was 5/75.

**Diagnostic horizons and features recognized in this pedon:**

**Ochric epipedon - zone from 0 to 5 inches (Ap horizon)**

**Argillic horizon - zone from 5 to 14 inches (Bt horizon)**

**Ochreptic feature - Bt horizon less than 10 inches thick.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION MATANZAS PR**

**Established Series  
Rev. BCD  
6/2002**

## **MATANZAS SERIES**

**The Matanzas series consists of deep, well drained soils formed in sediments derived from limestone. They are nearly level and gently sloping soils on foot slopes and small valleys between limestone hills. Slopes range from 0 to 5 percent. The mean annual precipitation is about 64 inches and the mean annual temperature is about 77 degrees F.**

**TAXONOMIC CLASS: Clayey, kaolinitic, isohyperthermic Lithic Kandustox**

**TYPICAL PEDON: Matanzas clay--native pasture. (Colors are for moist soil.)**

**Ap--0 to 14 inches; dark reddish brown (2.5YR 3/4) clay; moderate coarse granular structure; firm, slightly sticky, slightly plastic; common fine roots; few sand-size black aggregates; neutral; gradual smooth boundary. (10 to 16 inches thick)**

**Bo1--14 to 27 inches; dusky red (10R 3/4) clay; weak medium subangular blocky structure parting to moderate fine granular; friable, slightly sticky, plastic; many medium pores; common fine roots; very fine granules in micro channels; neutral; gradual smooth boundary. (10 to 16 inches thick)**

**Bo2--27 to 44 inches; dark red (2.5YR 3/6) clay; weak coarse subangular blocky structure parting to moderate fine granular; friable, slightly sticky, plastic; many medium pores; common fine roots; very fine granules in micro channels; neutral; gradual smooth boundary. (10 to 16 inches thick)**

**R--44 to 46 inches; white hard limestone with fractures stained dark red.**

**TYPE LOCATION: Noroeste SCD, Puerto Rico; 125 feet east of kilometer marker 125 of highway 2; on south side of highway.**

**RANGE IN CHARACTERISTICS:** Solum thickness and depth to limestone bedrock ranges from 40 to 50 inches. The soil ranges from medium acid to neutral. Base saturation of the oxic horizon ranges from 65 to 100 percent and cation retention ranges from 7.5 to 10 meg/100 g of clay. They are clay throughout with clay content ranging from 60 to 90 percent. The mean annual soil temperature ranges from 76 to 80 degrees F.

The A horizons have hues of 2.5YR and 5YR, value of 3, and chroma of 2 to 4.

The Bo horizons have hues of 10R and 2.5YR, values of 3 and 4, and chroma of 4 to 8. They have weak coarse to medium subangular blocky structure. They have slightly sticky and plastic consistence.

**COMPETING SERIES:** The Puhi series is in the same family. Puhi soils have less than 60 percent clay in the particle-size control section. The Bayamon, Catalina, Cotito, Coto, Delicias, Hanamaula, Lawai, Makapili, and Rosario series are similar soils in related families. Bayamon and Delicias soils have oxic horizons that extend to depths of more than 60 inches. Catalina, Coto, and Rosario soils have base saturation of less than 35 percent. Cotito soils have bedrock within a depth of 40 inches. Hanamaula, Lawai, and Makapili soils have umbric epipedons.

**GEOGRAPHIC SETTING:** The Matanzas soils are nearly level and gently sloping soils on foot slopes and small valleys between the limestone hills on slope gradients of 0 to 5 percent. The soils formed in fine textured sediments derived from limestone. Limestone outcrops are common in some areas. The climate is humid tropical. The average annual precipitation is 64 inches and the mean annual temperature 77 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Bayamon, Cotito, and Coto series and the Aceitunas and Tanama series. The Aceitunas soils are more acid and deeper than 60 inches to the hard limestone. The Tanama soils are yellower, have stronger structure in the B horizons and are shallower than 20 inches to the limestone.

**DRAINAGE AND PERMEABILITY:** Well drained, slow runoff and moderate permeability.

**USE AND VEGETATION:** Mostly used for growing food crops but a small acreage is in tame grasses and native pasture.

**DISTRIBUTION AND EXTENT:** Northern coastal plains of Puerto Rico. The series is of minor extent, about 3,200 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Soil Survey of Puerto Rico; 1942.

**REMARKS:** The classification was updated with the 4/91 draft from Clayey, oxidic, isohyperthermic Tropeptic Eutrorthox to Very-fine, kaolinitic, isohyperthermic Lithic Eustrustox. The previous OSED date was 5/75.

**Diagnostic horizons and features recognized in this pedon:**

**Umbric epipedon - zone from 0 to 14 inches (Ap horizon)**

**Oxic horizon - zone from 14 to 44 inches (Bo horizons)**

**Lithic contact - zone at 44 inches (R layer)**

**ADDITIONAL DATA:** Characterization data are available for the typical pedon S61PR6-2 and pedon S63PR7-1 both of which are published in SSIR No. 12.

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION MOCA            PR**

**Established Series  
Rev. BCD  
07/2001**

## **MOCA SERIES**

**The Moca series consists of very, deep moderately well drained, moderately slowly permeable soils formed in clayey materials overlaying a basal conglomerate of clay, gravel and cobbles. They are sloping and steep soils on foot slopes and side slopes of low hills in the humid uplands. Slopes range from 5 to 40 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 77 degrees F.**

**TAXONOMIC CLASS: Very-fine, mixed, semiactive, isohyperthermic Vertic Paleudults**

**TYPICAL PEDON: Moca clay - sugarcane. (Colors are for moist soil.)**

**Ap--0 to 6 inches; brown (7.5YR 4/2) clay; weak medium subangular blocky structure; very hard, firm, slightly sticky, plastic; small amount of Bt mixed with this horizon; many fine roots; fine and medium volcanic rock fragments; extremely acid; clear smooth boundary. (4 to 8 inches thick)**

**Bt1--6 to 10 inches; red (7.5R 4/8) clay with common fine distinct brown (10YR 5/3) mottles; weak medium subangular blocky structure; very hard, firm, slightly sticky, plastic; common fine roots; few faint clay films; common krotovinas 2 mm in diameter; very strongly acid; clear smooth boundary. (4 to 7 inches thick)**

**Bt2--10 to 18 inches; red (7.5R 4/8) and brown (10YR 5/3) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; common distinct clay films; cracks to 20 inches; organic staining along root channels; few pressure faces and slickensides; very strongly acid; gradual smooth boundary. (7 to 12 inches thick)**

**Bt3--18 to 32 inches; grayish brown (10YR 5/2) with approximately 30 percent red (7.5R 4/8) clay; weak medium and coarse subangular blocky structure; firm, slightly sticky, plastic; few fine roots; few faint clay films; organic staining along root channels; few pressure faces and slickensides; very strongly acid, abrupt smooth boundary. (12 to 16 inches thick)**

**C1--32 to 48 inches; light gray (2.5Y 7/2) clay with many medium distinct red (7.5R 4/8) mottles; massive; firm, slightly**

**sticky, slightly plastic; very strongly acid; abrupt smooth boundary. (12 to 18 inches thick)**

**C2--48 to 64 inches; red (7.5R 4/8), light gray (2.5Y 7/2) and reddish yellow (7.5YR 6/8) clay; massive; firm slightly sticky and slightly plastic; very strongly acid; gradual smooth boundary. (12 to 18 inches thick)**

**C3--64 inches plus; stratified mottled red and gray clays with varying amount of gravel. Fracture plains in gray clay lenses appear as pressure faces or slickensides and are light gray (5Y 7/1).**

**TYPE LOCATION: Culebrinas SCD, Puerto Rico; 2.5 miles southeast of the town of Moca; 0.6 kilometer north and 50 feet east of junction of Highways 111 and 110.**

**RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 27 to 43 inches. Thickness of the argillic horizon varies from 23 to 35 inches. Texture is clay throughout the profile. Consistence in the solum is slightly sticky or sticky and plastic. Reaction ranges from strongly to extremely acid in the whole profile. Cracks occur throughout the B horizon. The mean annual soil temperature ranges from 75 to 80 degrees F.**

**The A horizon has hues of 5YR or 7.5YR, values of 3 or 4, and chroma of 2 to 4. Structure is weak, fine or medium subangular blocky. Rock fragments range from 0 to 10 percent.**

**The Bt horizons have red, brown, and grayish brown colors in varying proportions. Structure is weak or moderate, medium or coarse subangular blocky. Clay films range from few faint to many prominent. Pressure faces may occur in any portion of the argillic horizon. Slickensides may or may not be present.**

**The C horizons have gray colors with varying proportions of red and reddish yellow. Varying amounts of gravel may be present in this horizon.**

**COMPETING SERIES: There are no other known series in the same family. The Consejo, Consumo, Corozal, Corozo, Ingenio, Jagueyes, Lirios, Maricao, Patillas and Rio Piedras series are similar soils in related families. The Consejo, Liros and Rio Piedras all lack horizons with COLE value of 0.09 or more. The Consumo and Maricao soils have thinner argillic horizons. The Corozal soils have low chroma mottles in the upper part of the argillic horizon. The Corozo soils have sandy surface layers. The Ingenio and Jagueyes soils have lower CEC values, less than 24 meq/100 grams of clay. The Patillas soils are coarser textured.**

**GEOGRAPHIC SETTING: The Moca soils are sloping to steep soils on foot slopes and side slopes of low hills on**

slope gradients of 5 to 40 percent. They formed in fine textured materials over clays, gravels, and cobbles geologically referred to as the San Sebastian Formation, a basal conglomerate. The climate is humid tropical. The average annual precipitation ranges from 70 to 90 inches and the mean annual temperature is 77 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Voladora, Plata, and Perchas series. The Voladora soils are redder, have thinner B horizons, and friable, coarser textured C horizons. The Plata soils are browner, and lack argillic horizons. The Perchas soils have cambic horizons, are browner, and have low chroma mottles.

**DRAINAGE AND PERMEABILITY:** Moderately well drained, medium to rapid runoff and moderately slow permeability.

**USE AND VEGETATION:** Gentler slopes in sugarcane. Steeper slopes in native pasture.

**DISTRIBUTION AND EXTENT:** Humid uplands of northwestern Puerto Rico. The series is of minor extent with about 8,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Soil Survey of Puerto Rico; 1942.

**REMARKS:** The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Vertic Tropudults to Clayey, mixed, isohyperthermic Aquic Paleudults. Although this soil contains vertic features such as slickensides, there is no evidence of cracking to the surface or the base of the Ap horizon in the description. This needs to be tested. The previous OSED date was 11/75.

**Diagnostic horizons and features recognized in this pedon:**

Ochric epipedon - zone from 0 to 6 inches

Argillic horizon - zone from 6 to 32 inches

Pale clay curve - Less than 20 percent clay cutback in Bt and C horizons.

Aquic feature - 2 chroma mottles in Bt3 horizon

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION MONTEGRANDE PR**

**Established Series  
Rev. REG  
07/2001**

## **MONTEGRANDE SERIES**

**The Montegrande series have dark yellowish brown, fine textured A horizons and dark yellowish brown, low chroma mottled, fine textured B horizons that crack when dry over C horizons that have more than 35 percent coarse fragments by volume.**

**TAXONOMIC CLASS: Very-fine, mixed, superactive, isohyperthermic Chromic Hapluderts**

**TYPICAL PEDON: Montegrande clay - sugar cane (Colors are for moist soils unless otherwise stated.)**

**Ap--0 to 6 inches; dark yellowish brown (10YR 3/4) clay; weak medium subangular blocky structure with few pressure faces; firm, slightly sticky, plastic; many fine roots; common fine volcanic fragments; few fine black concretions; strongly acid; clear smooth boundary. (5 to 8 inches thick)**

**B1--6 to 10 inches; dark grayish brown (10YR 4/2) clay; weak medium subangular blocky structure with pressure faces; firm, slightly sticky, plastic; common fine roots; few fine volcanic fragments; common fine black concretions; strongly acid; clear wavy boundary. (4 to 9 inches thick)**

**B2--10 to 14 inches; dark yellowish brown (10YR 3/4) clay with many fine distinct yellowish brown (10YR 5/6, 5/4, 5/8), and gray (10YR 5/1) mottles; moderate medium angular blocky structure with pressure faces and slickensides; firm, slightly sticky, plastic; few fine roots; many fine and few medium volcanic fragments; many fine black concretions; strongly acid; clear smooth boundary. (4 to 8 inches thick)**

**B3--14 to 24 inches; yellowish brown (10YR 5/6) clay with many medium distinct gray (10YR 5/1) mottles; crushed color dark yellowish brown (10YR 4/4), weak medium angular blocky structure with slickensides; few fine roots; many sand size volcanic fragments; few fine white concretions; many fine black concretions; mildly alkaline; clear smooth boundary. (7 to 11 inches thick)**

**11C1--24 to 32 inches; yellowish brown (10YR 5/6) gravelly clay with many medium distinct gray (10YR 5/1) and few fine distinct grayish brown (10YR 5/2) mottles; massive; friable; slightly sticky, slightly plastic; volcanic fragments 1/8 to 1 inch and many fine black concretions; mildly alkaline; clear smooth boundary. (7 to 15 inches thick)**

**11C2--32 to 60 inches; gray (10YR 5/1) gravelly clay with many medium distinct yellowish brown (10YR 5/6) and gray (5YR 5/1) mottles; dark brown (7.5YR 4/2) crushed; massive; friable, slightly sticky and nonplastic; volcanic fragments 1/4 to 1/2 inch in size make up more than 60 percent of the horizon; many fine black and few fine white concretions; moderately alkaline. There are thin lenses and strata of fine material interbedded.**

**TYPE LOCATION: Suroeste SCD, Puerto Rico, 5.0 miles west of the town of San German; 150 feet south on dirt road from kilometer marker 5.3 of Highway 102; 20 feet west of dirt road.**

**RANGE IN CHARACTERISTICS: Thickness of solum and depth to the gravelly horizons varies from 20 to 36 inches.**

**The A horizons have hues of 10YR, values of 3 or 4, and chromas of 2, 3, or 4.**

**The B2 horizons have hues of 10YR or 2.5Y with low chroma mottles. Clay is the dominant texture throughout.**

**From 50 to 70 percent by volume of the lower C horizons consists of volcanic fragments that range in size from 1/8 to 1 inch.**

**Pressure faces are present in the A horizons. The B2 horizons have cracks during the dry season, and slickensides. Reaction in the upper B horizons ranges from strongly to medium acid in the C horizons from annual soil temperature ranges from 73 to 78 degrees F.**

**COMPETING SERIES: These are the Gurabo, Juncos, and Mucara series in the same subgroup and Jacana, Llanos, Maguayo, and Parcelas series. The Gurabo soils have loamy textures in the lower half of the control section. The Juncos soils have montmorillonitic mineralogy and have semi-consolidated volcanic rocks below 20 inches. The Mucara soils and Maguayo soils are drier with ustic soil moisture regimes. The Parcelas soils have base saturations below 50 percent.**

**GEOGRAPHIC SETTING: The Montegrando soils occur on alluvial fans and foot slopes of volcanic hills with slope gradients of 2 to 12 percent. The soil formed in stratified fine textured sediments over gravelly strata washed from the**

**surrounding volcanic hills. The climate is humid tropical, the average annual precipitation is 76 inches, and the mean annual temperature is 77 degrees F.**

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Caguabo series in addition to the competing Mucara series. The Caguabo series has hard rock within 20 inches. Both series occur in adjacent higher positions in the landscape.

**DRAINAGE AND PERMEABILITY:** Moderately well drained; medium runoff; moderately slow permeability.

**USE AND VEGETATION:** Most of the acreage is in sugarcane.

**DISTRIBUTION AND EXTENT:** Humid inner valleys of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Ponce Survey Area, Puerto Rico; 1971.

**REMARKS:** This is a format update only performed by the NSSQA Staff on 8/89.

**The soil was formerly classified in the Reddish Prairie great soil group.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION MONTEGRANDE PR**

**Established Series  
Rev. REG  
07/2001**

## **MONTEGRANDE SERIES**

**The Montegrande series have dark yellowish brown, fine textured A horizons and dark yellowish brown, low chroma mottled, fine textured B horizons that crack when dry over C horizons that have more than 35 percent coarse fragments by volume.**

**TAXONOMIC CLASS: Very-fine, mixed, superactive, isohyperthermic Chromic Hapluderts**

**TYPICAL PEDON: Montegrande clay - sugar cane (Colors are for moist soils unless otherwise stated.)**

**Ap--0 to 6 inches; dark yellowish brown (10YR 3/4) clay; weak medium subangular blocky structure with few pressure faces; firm, slightly sticky, plastic; many fine roots; common fine volcanic fragments; few fine black concretions; strongly acid; clear smooth boundary. (5 to 8 inches thick)**

**B1--6 to 10 inches; dark grayish brown (10YR 4/2) clay; weak medium subangular blocky structure with pressure faces; firm, slightly sticky, plastic; common fine roots; few fine volcanic fragments; common fine black concretions; strongly acid; clear wavy boundary. (4 to 9 inches thick)**

**B2--10 to 14 inches; dark yellowish brown (10YR 3/4) clay with many fine distinct yellowish brown (10YR 5/6, 5/4, 5/8), and gray (10YR 5/1) mottles; moderate medium angular blocky structure with pressure faces and slickensides; firm, slightly sticky, plastic; few fine roots; many fine and few medium volcanic fragments; many fine black concretions; strongly acid; clear smooth boundary. (4 to 8 inches thick)**

**B3--14 to 24 inches; yellowish brown (10YR 5/6) clay with many medium distinct gray 910YR 5/1) mottles; crushed color dark yellowish brown (10YR 4/4), weak medium angular blocky structure with slickensides; few fine roots; many sand size volcanic fragments; few fine white concretions; many fine black concretions; mildly alkaline; clear smooth boundary. (7 to 11 inches thick)**

**11C1--24 to 32 inches; yellowish brown (10YR 5/6) gravelly clay with many medium distinct gray (10YR 5/1) and few fine distinct grayish brown (10YR 5/2) mottles; massive; friable; slightly sticky, slightly plastic; volcanic fragments 1/8 to 1 inch and many fine black concretions; mildly alkaline; clear smooth boundary. (7 to 15 inches thick)**

**11C2--32 to 60 inches; gray (10YR 5/1) gravelly clay with many medium distinct yellowish brown (10YR 5/6) and gray (5YR 5/1) mottles; dark brown (7.5YR 4/2) crushed; massive; friable, slightly sticky and nonplastic; volcanic fragments 1/4 to 1/2 inch in size make up more than 60 percent of the horizon; many fine black and few fine white concretions; moderately alkaline. There are thin lenses and strata of fine material interbedded.**

**TYPE LOCATION: Suroeste SCD, Puerto Rico, 5.0 miles west of the town of San German; 150 feet south on dirt road from kilometer marker 5.3 of Highway 102; 20 feet west of dirt road.**

**RANGE IN CHARACTERISTICS: Thickness of solum and depth to the gravelly horizons varies from 20 to 36 inches.**

**The A horizons have hues of 10YR, values of 3 or 4, and chromas of 2, 3, or 4.**

**The B2 horizons have hues of 10YR or 2.5Y with low chroma mottles. Clay is the dominant texture throughout.**

**From 50 to 70 percent by volume of the lower C horizons consists of volcanic fragments that range in size from 1/8 to 1 inch.**

**Pressure faces are present in the A horizons. The B2 horizons have cracks during the dry season, and slickensides. Reaction in the upper B horizons ranges from strongly to medium acid in the C horizons from annual soil temperature ranges from 73 to 78 degrees F.**

**COMPETING SERIES: These are the Gurabo, Juncos, and Mucara series in the same subgroup and Jacana, Llanos, Maguayo, and Parcelas series. The Gurabo soils have loamy textures in the lower half of the control section. The Juncos soils have montmorillonitic mineralogy and have semi-consolidated volcanic rocks below 20 inches. The Mucara soils and Maguayo soils are drier with ustic soil moisture regimes. The Parcelas soils have base saturations below 50 percent.**

**GEOGRAPHIC SETTING: The Montegrando soils occur on alluvial fans and foot slopes of volcanic hills with slope gradients of 2 to 12 percent. The soil formed in stratified fine textured sediments over gravelly strata washed from the**

**surrounding volcanic hills. The climate is humid tropical, the average annual precipitation is 76 inches, and the mean annual temperature is 77 degrees F.**

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Caguabo series in addition to the competing Mucara series. The Caguabo series has hard rock within 20 inches. Both series occur in adjacent higher positions in the landscape.

**DRAINAGE AND PERMEABILITY:** Moderately well drained; medium runoff; moderately slow permeability.

**USE AND VEGETATION:** Most of the acreage is in sugarcane.

**DISTRIBUTION AND EXTENT:** Humid inner valleys of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Ponce Survey Area, Puerto Rico; 1971.

**REMARKS:** This is a format update only performed by the NSSQA Staff on 8/89.

**The soil was formerly classified in the Reddish Prairie great soil group.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION MORADO            PR**

**Established Series  
Rev. REG:LHR  
06/2002**

## **MORADO SERIES**

**The Morado series consists of moderately deep, well drained soils formed in materials weathered from volcanic rocks. They are moderately steep to very steep soils on side slopes and ridgetops of the dissected uplands. They are friable clay loam in the A and B horizons over loam saprolite of variegated colors. Semi-consolidated volcanic rock is at 33 inches.**

**TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Dystric Eutrudepts**

**TYPICAL PEDON: Morado clay loam - pigeon peas.  
(Colors are for moist soil.)**

**Ap--0 to 7 inches; dark reddish gray (10YR 4/1) clay loam; weak fine subangular blocky structure; friable, slightly sticky, plastic; common fine roots; neutral; clear smooth boundary. (4 to 7 inches thick)**

**B2--7 to 17 inches; reddish gray (5YR 5/2) clay loam with few fine faint weak red (2.5YR 4/2), yellowish red (5YR 4/6) and reddish brown (5YR 4/3) mottles; weak fine subangular blocky structure breaking to weak fine granular; friable, slightly sticky, plastic; common fine roots; slightly acid; gradual wavy boundary. (6 to 11 inches thick)**

**B3--17 to 24 inches; variegated colors, brown, dark brown (7.5YR 4/2), dark reddish gray (5YR 4/2) and dark gray (5YR 4/1) clay loam; weak fine subangular blocky structure; friable, slightly sticky, plastic; few fine roots; slightly acid; clear wavy boundary. (6 to 12 inches thick)**

**C--24 to 33 inches; variegated colors; brown, dark brown (7.5YR 4/2), dark reddish gray (5YR 4/2) and dark gray (5YR 5/1) loam; massive; friable, slightly sticky, slightly plastic; slightly acid. (6 to 12 inches thick)**

**R--33 plus inches ; reddish gray, semi-consolidated volcanic rock.**

**TYPE LOCATION:** Oeste SCD, Puerto Rico; 6.5 miles northwest of the city of Mayaguez; 500 meters on dirt road from kilometer marker 3.85 on Highway 406 and 100 feet north of dirt road.

**RANGE IN CHARACTERISTICS:** Thickness of the solum ranges from 16 to 30 inches. Depth to the semi-consolidated volcanic rock varies from 22 to 42 inches. These soils are slightly sticky and plastic or slightly plastic throughout. The mean annual soil temperature ranges from 74 to 76 degrees F.

The A horizon has hues of 5YR to 10R, values of 4 or 5, and chroma of 1 or 3. It is clay loam or silty clay loam. Consistence is slightly sticky and plastic or slightly plastic. Reaction is neutral or slightly acid.

The B2 horizon has hues of 5YR to 2.5YR, values of 4 or 5, and chromas of 2 to 4. Some pedons have weak red, yellowish red and reddish brown mottles. Texture varies from clay loam to silty clay loam. Structure of the B2 horizon when present has 40 to 50 percent saprolite. Reaction varies from medium acid to neutral.

The C horizon is loam or clay loam.

**COMPETING SERIES:** The Maraguez series is in the same family. The Maraguez soils are deeper in the semi-consolidated rock and have yellower colors in hue of 10YR. The Caguabo, Juncos, Junquitos, Mabi, Malaya, Maresua, Montegrande, Mucara, Pandura, Plata and Quebrada are the soils in similar families. Caguabo and Malaya soils are shallower to the volcanic rocks. The Juncos, Mabi, Montegrande, and Mucara soils are all finer textured and have higher COLE value. The Junquitos soils are finer textured and have low chroma mottles. The Maresua soils are finer textured and are gravelly throughout. The Pandura soils are coarser textured throughout. The Plata soils have more than 35 percent by volume of gravel. The Quebrada soils have finer soil texture throughout.

**GEOGRAPHIC SETTING:** The Morado soils are strongly sloping to very steep soils on side slopes and ridgetops of dissected uplands with slope gradients of 12 to 60 percent. The soil formed in moderately fine and medium textured residuum weathered from volcanic rocks. The climate is humid tropical. The average annual precipitation is 88 inches and the mean annual temperature is 76 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Caguabo, Maraguez, Mucara, and the Quebrada series. All of these soils occur in similar positions.

**DRAINAGE AND PERMEABILITY:** Well drained; rapid runoff; moderate permeability.

**USE AND VEGETATION:** Coffee, pasture and brush.

**DISTRIBUTION AND EXTENT:** Humid uplands of Puerto Rico. The series is of moderate extent about 34,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Ponce Survey Area, Puerto Rico; 1971.

**ADDITIONAL DATA:** Characterization data are available of the typical pedon. S61PR-8-2.

**National Cooperative Soil Survey  
U. S. A.**

**LOCATION MUCARA            PR**

**Established Series  
Rev. GRB  
06/2002**

## **MUCARA SERIES**

**The Mucara series consists of moderately deep, well drained soils on side slopes of strongly dissected uplands. They formed in material that weathered from igneous rocks. Near the type location, the mean annual precipitation is about 78 inches and the mean annual temperature is about 76 degrees F. Slopes range from 15 to 70 percent.**

**TAXONOMIC CLASS: Fine-loamy, mixed, superactive, isohyperthermic Dystric Eutrudepts**

**TYPICAL PEDON: Mucara clay - pasture. (Colors are for moist soil)**

**Ap--0 to 6 inches; very dark grayish brown (10YR 3/2) clay; weak medium granular structure; firm, slightly sticky, plastic; few fine black (10YR 2/1) concretions; many fine roots; moderately acid; clear smooth boundary. (4 to 8 inches thick)**

**Bw--6 to 12 inches; about 50 percent very dark grayish brown (10YR 3/2) and about 50 percent brown (10YR 5/3) clay; weak medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots along structural faces; few distinct pressure faces on surfaces of peds; slightly acid; abrupt irregular boundary. (6 to 12 inches thick)**

**C--12 to 22 inches; brown (10YR 4/3) loam; massive; friable; slightly sticky, slightly plastic; few fine roots; about 30 percent, by volume, saprolite; few distinct tongues of B material; neutral; gradual wavy boundary. (10 to 16 inches thick)**

**R--22+ inches; semi-consolidated igneous rock.**

**TYPE LOCATION: Suroeste SCD, Puerto Rico. Approximately 1.5 miles east of bridge of Highway 2 over the Rosario River and about 100 feet north of the highway.**

**RANGE IN CHARACTERISTICS: Solum thickness ranges from 10 to 20 inches. Rock fragments range from 0 to**

**15 percent, by volume. Depth to semi-consolidated rock ranges from 20 to 40 inches. Reaction ranges from moderately acid to neutral in the A and Bw horizons and slightly acid or neutral in the C horizon.**

**The A horizon has hue of 5YR to 2.5Y, value of 2 to 5, and chroma of 2 to 4. Texture is silty clay loam, silty clay, or clay.**

**The Bw horizon has hue of 7.5YR to 2.5Y, value of 3 to 6, and chroma of 2 to 6. Texture is clay loam, silty clay, or clay.**

**The BC horizon, where present, has colors and textures similar to the Bw horizon.**

**The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4; or there is no dominant color and is multicolored in shades of brown, yellow, and gray. Texture is loam or clay loam.**

**The R layer is semi-consolidated igneous rock.**

**COMPETING SERIES: There no competing series in the same family.**

**GEOGRAPHIC SETTING: Mucara soils are on side slopes of strongly dissected uplands. They formed in fine-textured residuum weathered from basic igneous rock. The climate is humid tropical. Slopes range from 15 to 70 percent. The average annual precipitation ranges from 75 to 80 inches and the average annual temperature ranges from 75 to 77 degrees F.**

**GEOGRAPHICALLY ASSOCIATED SOILS: These include the Caguabo, Maraguez, Morado, and Quebrada series. These soils are on similar landscape positions. In addition, Caguabo soils are shallow to bedrock, Maraguez soils are very deep and have less clay in the subsoil, Morado soils have less clay in the subsoil, and Quebrada soils are very deep and have mixed mineralogy in the control section.**

**DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.**

**USE AND VEGETATION: Many areas of Mucara soils are used for growing sugarcane, food crops, coffee, and pastureland. Some areas are in woodland. Vegetation consists of native and introduced species.**

**DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of major extent.**

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama.**

**SERIES ESTABLISHED: Puerto Rico, 1942.**

**REMARKS: Diagnostic horizons and features recognized in this pedon:**

**Ochric epipedon - the zone from 0 to 6 inches (Ap horizon).**

**Cambic horizon - the zone from 6 to 12 inches (Bw horizon).**

**MLRA: 270.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION NARANJO PR**

**Established Series  
Rev. REG:LHR  
07/2001**

## **NARANJO SERIES**

**The Naranjo series consists of deep, well drained soils formed in materials weathered from limestone. They are sloping to very steep soils on side slopes, foot slopes, and hilltops of the humid uplands. These soils are very dark grayish brown clay, calcareous in the A horizon, lighter colored, calcareous B and C horizons.**

**TAXONOMIC CLASS: Fine, carbonatic, isohyperthermic Inceptic Haprendolls**

**TYPICAL PEDON: Naranjo clay-native pasture.  
(Colors are for moist soil.)**

**Ap--0 to 9 inches; very dark grayish brown (10YR 3/2) clay; weak fine granular structure; firm, slightly sticky; plastic; many fine roots; volcanic fragments 1/2 to 1 inch in diameter; common fine shell fragments; fine and medium limestone fragments; strong effervescence; abrupt smooth boundary. (8 to 12 inches thick)**

**B2--9 to 17 inches; brownish yellow (10YR 6/6) clay; weak fine subangular blocky structure; firm, slightly sticky, plastic; common fine roots; fine shell fragments; fine and medium limestone fragments, 5 to 10 percent from 1/2 to 1 inch in diameter; strong effervescence; clear smooth boundary. (6 to 10 inches thick)**

**B3--17 to 25 inches; yellow (10YR 7/6) clay; weak fine subangular blocky structure; friable, slightly sticky, plastic; common fine roots; common lime splotches; fine and medium limestone fragments, 5 to 10 percent from 1/2 to 1 inch in diameter; strong effervescence; gradual smooth boundary. (6 to 10 inches thick)**

**C1--25 to 36 inches; yellow (10YR 7/6) clay; with common medium prominent light gray (7.5YR 7/0) and few fine faint brownish yellow (10YR 6/6) mottles; massive; firm, sticky, plastic; few fine roots; common lime splotches; fine and medium limestone fragments 5 to 10 percent from 1/2 to 1 inch in diameter; violent effervescence; gradual wavy boundary. (8 to 12 inches thick)**

**C2--36 to 60 inches; mixed colors, yellow (10YR 7/6) brownish yellow (10YR 6/6) and light gray (7.5YR 7/0), crushed color, yellow (10YR 7/8) clay; massive; firm, slightly sticky, plastic; many lime splotches; violent effervescence.**

**TYPE LOCATION:** Noroeste SCD, Puerto Rico; 1.5 miles southeast of the town of Aguadilla; 100 meters south of kilometer marker 1.2 on Highway 111.

**RANGE IN CHARACTERISTICS:** Thickness of the solum ranges from 18 to 30 inches. Depth to the soft limestone is over 60 inches. Texture is clay in the whole profile. Consistence is slightly sticky or sticky and plastic. Gravel fragments range from 0 to 10 percent. These soils are calcareous throughout and effervescence increases with depth. Pressure faces may or may not be present. The mean annual soil temperature ranges from 74 to 76 degrees F.

The A horizon has hues of 10YR to 2.5Y, and values and chromas of 2 or 3.

The B horizons have hues of 10YR or 7.5YR, values of 5 to 7, and chromas of 6 to 8.

The C horizons have yellow, brownish yellow, very pale brown, and light gray colors in varying proportions. Effervescence is violent.

**COMPETING SERIES:** The Santa Clara series is in the same family. The Aguilita, Coamo, Colinas, Ensenada, Guanabano, Pozo Blanco, Sion, Soller and Yauco series are similar soils in related families. The Santa Clara soils are shallower with hard rock within 40 inches. The Aguilita soils have more than 35 percent coarse fragments in their profiles and lack cambic horizons. The Coamo, Guanabano and Ensenada, have argillic horizons. The Colinas have coarser textured profiles. The Pozo Blanco, Sion and Yauco soils are coarser textured and have ustic moisture regimes. The Soller soils are shallow to the hard limestone.

**GEOGRAPHIC SETTING:** The Naranjo soils are sloping to very steep soils on foot slopes, side slopes and hilltops with slopes ranging from 5 to 60 percent. They formed in fine textured, calcareous residuum from soft limestone. The climate is humid tropical. The average annual precipitation is 70 to 90 inches and the mean annual temperature is 77 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Colinas and Santa Clara, Camaguey and Juncal series. The Camaguey soils have thicker and darker A horizons and slickensides close enough to intersect at 12 to 16 inches of the surface. The Juncal soils have argillic horizons.

**DRAINAGE AND PERMEABILITY:** Well drained, medium and rapid runoff and moderate permeability.

**USE AND VEGETATION:** Some acreage is planted to sugarcane. Some acres are in native pasture or brush.

**DISTRIBUTION AND EXTENT:** Humid uplands of northern Puerto Rico. The series is of minor extent with about 5000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Noroeste SCD, Puerto Rico; 1979.

**National Cooperative Soil Survey  
U. S. A.**

**LOCATION NIPE            PR**

**Established Series  
Rev. BCD  
6/2002**

## **NIPE SERIES**

**The Nipe series consists of very deep, well drained, moderate to rapidly permeable soils formed in extremely weathered iron-rich materials. They are on mesa-like, stable ridge tops of uplands. Slopes range from 3 to 20 percent. The mean annual precipitation is about 76 inches and the mean annual temperature is about 77 degrees F.**

**TAXONOMIC CLASS: Very-fine, ferruginous, isohyperthermic Anionic Acrudox**

**TYPICAL PEDON: Nipe clay-native pasture. (Colors are for moist soil)**

**Ap--0 to 11 inches; dark reddish brown (2.5YR 2/4) clay; strong fine granular structure; friable, nonsticky, slightly plastic; many fine roots; strongly acid; clear smooth boundary. 6 to 12 inches thick.**

**Bo1--11 to 18 inches; dark reddish brown (2.5YR 3/4) clay; weak fine angular blocky structure; very friable, nonsticky, slightly plastic; many fine pores; common fine roots; very strongly acid; clear smooth boundary. 6 to 10 inches thick.**

**Bo2--18 to 28 inches; dark red (7.5R 3/8) clay; weak fine angular blocky structure; very friable, nonsticky, slightly plastic; many fine pores; few fine roots; very strongly acid; diffuse smooth boundary. 8 to 12 inches thick.**

**Bo3--28 to 38 inches; dark red (7.5R 3/6) clay; massive; firm, nonsticky, slightly plastic; many fine pores; few fine iron concretions; strongly acid; diffuse smooth boundary. 8 to 12 inches thick.**

**Bo4--38 to 48 inches; dusky red (7.5R 3/4) clay; massive; friable, nonsticky, slightly plastic; many fine pores; few fine iron concretions; strongly acid; gradual smooth boundary. 8 to 12 inches thick.**

**Bo5--48 to 62 inches; dark red (7.5R 3/6) clay; massive; friable, nonsticky, slightly plastic; many fine pores; medium acid; diffuse smooth boundary. 10 to 20 inches thick.**

**Bo6--62 to 80 inches; dusky red (7.5 3/4) clay; massive; friable, nonsticky and nonplastic; many fine pores; medium acid.**

**TYPE LOCATION: Oeste SCD, Puerto Rico; 1 miles east of the city of Mayaguez; 0.5 mile west of kilometer marker 5.5 of highway 349. On top of hill.**

**RANGE IN CHARACTERISTICS: Thickness of the solum and depth to the serpentinite rock is over 80 inches but the majority of the areas ranges from 7 to 10 feet. Clay is the dominant texture throughout. Fine iron concretions range from none to few throughout the profile.**

**Colors of the A horizons have hues of 2.5YR and 10R, values of 2 and 3 and chromas of 2 to 4.**

**The Bo horizons have colors in hues of 2.5YR to 7.5R, values of 3 and 4 and chromas of 4 and higher. Structure varies from weak fine angular blocky to massive. Consistence is usually friable but hardening or cementation is common in areas devoid of vegetation and exposed to wetting and drying conditions. Reaction ranges from medium to very strongly acid.**

**Base retention is 1 meq. /100 grams of clay in some subhorizon of the oxic. CEC is less than 16 meq/100 grams of clay in the Bo horizons. Organic matter content is less than 20 kilograms in a volume of 1 meter square to a depth of 1 meter.**

**COMPETING SERIES: These are Bayamon, Matanzas, Cotito, Delicias, Rosario, Catalina, Comerfo and Coto series in the same suborder. All soils have a cation retention capacity of more than 1 meq. per 100 grams of clay in all parts of the oxic horizon. The Bayamon, Matanzas and Cotito soils have base saturation of 35 percent or more in all subhorizons of the oxic horizon. The Roserio soils have oxic horizons that extend to less than 50 inches below the surface. The Catalina, Comerlo and Coto soils have thinner oxic horizons and have discernible structure with reflective ped surfaces.**

**GEOGRAPHIC SETTING: The Nipe soils occur on gently to moderately sloping mesa-like, stable ridge tops on slope gradients of 3 to 20 percent. The regolith consists of extremely weathered, fine textured iron rich materials. The climate is humid tropical. The average annual precipitation is 76 inches and the mean annual temperatures 77 degrees F. Soil temperatures is less than 9 degrees F.**

**GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Rosario and Delicias series in addition to Maresua and Santa Marta series and the land type Serpentinite Rockland. The Maresua and Santa Marta soils are shallower to the serpentinite rock, nonacid, lack the red and dusky red colors, and have less weathered profiles.**

**Serpentinite Rockland is a land type that has 75 percent or more of the surface area covered by outcrops and rock fragments.**

**DRAINAGE AND PERMEABILITY: Well drained, medium runoff, and moderate to rapid permeability.**

**USE AND VEGETATION: Pasture and brushes. Used mostly for suburban residential purposes.**

**DISTRIBUTION AND EXTENT: Western uplands of Puerto Rico. The series is of minor extent.**

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama**

**SERIES ESTABLISHED: Soil Survey of Puerto Rico, 1942.**

**REMARKS: The classification was updated with the 4/91 draft from Clayey, oxidic, isohyperthermic Typic Acrorthox to Fine, sesquic, isohyperthermic Anionic Acrudox. The previous OSED date was 4/67. This soil was observed during the 1990 South Regional Cooperative Soil Survey Work Planning Conference.**

**Diagnostic horizons and features recognized in this pedon:**

**Umbric epipedon - zone from 0 to 11 inches (Ap horizon)**

**Oxic horizon - zone from 11 to 80 inches (Bo horizons)**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION PALMAREJO PR**

**Established Series  
Rev. JLL/GRB  
07/2001**

## **PALMAREJO SERIES**

**The Palmarejo series consists of very deep, moderately well drained, moderately permeable soils on fans and benches. They formed in sediments derived from volcanic rocks. Near the type location, the mean annual temperature is about 79 degrees F., and the mean annual precipitation is about 35 inches. Slopes range from 2 to 12 percent.**

**TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Typic Haplustults**

**TYPICAL PEDON: Palmarejo loam - cultivated (Colors are for moist conditions.)**

**Ap--0 to 9 inches, dark brown (7.5YR 3/2) loam; weak medium granular structure; friable; sticky, slightly plastic; many fine roots; few fine volcanic rock fragments; very strongly acid; abrupt smooth boundary. (7 to 12 inches thick)**

**Bt1--9 to 18 inches; yellowish brown (10YR 5/6) clay; few distinct dark brown (7.5YR 3/2) splotches; moderate medium subangular blocky structure; firm; slightly sticky, plastic; common fine roots; few faint clay films on faces of peds; few fine pebbles of volcanic rock; very strongly acid; clear smooth boundary.**

**Bt2-- 18 to 30 inches; yellowish brown (10YR 5/8) clay loam; moderate medium subangular block structure; firm; slightly sticky, plastic; few fine roots; few faint clay films on faces of peds; many coarse distinct dark yellowish brown (10YR 4/6) masses of iron accumulation; very strongly acid; clear smooth boundary. (Combined thickness of the Bt horizons range from 17 to 25 inches)**

**BC1--30 to 41 inches, yellowish brown (10YR 5/8) clay loam; massive; firm; sticky, plastic; few fine roots; common fine pebbles of volcanic rock; few fine indurated black (10YR 2/1) concretions; many coarse distinct white (7.5YR 8/0) areas of iron depletions; very strongly acid; clear smooth boundary.**

**BC2--41 to 60 inches, variegated red (10YR 4/8) and white (7.5YR 8/0) sandy clay loam; massive; firm; slightly sticky,**

**plastic; many fine pebbles of volcanic rock; few indurated black (10YR 2/1) rounded concretions; the areas in shades of red are iron accumulations and the areas in shades of white are iron depletions; very strongly acid.**

**TYPE LOCATION:** Lajas Municipality, Puerto Rico. Approximately 1.0 mile southwest of the intersection of P.R. Hwy. 306 and P.R. Hwy. 101, about 0.3 miles south of P.R. Hwy. 306 in sugarcane field. San German topographic quadrangle; lat 18 degrees 02 minutes 18 seconds N.; long. 67 degrees 05 minutes 31 seconds W. PRD 1940.

**RANGE IN CHARACTERISTICS:** Solum thickness ranges from 22 to more than 60 inches. Reaction ranges from very strongly acid to strongly acid throughout the profile.

**The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is loam or silty clay loam.**

**The Bt horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 4 though 8. Texture is clay loam or clay.**

**The BC horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8; or there is no dominant color and is multicolored in shades red, brown, yellow, and gray. Texture is sandy clay loam or clay loam.**

**COMPETING SERIES:** There are other series in the same family.

**GEOGRAPHIC SETTING:** Palmarejo soils are on fans and benches. They formed in sediments that weathered from volcanic rock. The climate is tropical semiarid. Slopes range from 2 to 12 percent. The average annual temperature ranges from 78 to 80 degrees F., and the average annual precipitation ranges from 30 to 40 inches.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These include the Fraternidad and Mariana soils. Fraternidad soils do not have an argillic horizon and are clay throughout. Mariana soils do not have an argillic horizon and have saprolite within a depth of 40 inches.

**DRAINAGE AND PERMEABILITY:** Moderately well drained; moderate permeability.

**USE AND VEGETATION:** Palmarejo soils are used for pasture and for cultivated crops including pineapples, corn, pigeon peas, and pumpkins. Vegetation consists of native and introduced species.

**DISTRIBUTION AND EXTENT:** Semiarid areas of southwestern area of Puerto Rico. The series is of small extent.

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama.**

**SERIES ESTABLISHED: Lajas Valley, Puerto Rico; 1959.**

**REMARKS: Diagnostic horizons and features in this pedon include:**

**Ochric epipedon - the zone from 0 to 9 inches (Ap horizon).**

**Argillic horizon - the zone from 9 to 30 inches (Bt1 and Bt2 horizons).**

**Aquic feature - perched water table at 30 inches.**

**ADDITIONAL DATA: Sampled as S57PR-14-2 and S58PRO14-010. Sample by NSSL, Lincoln, NE.**

**MLRA: 271, 273.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION PERCHAS            PR**

**Established Series  
Rev. REG:LHR  
07/2001**

## **PERCHAS SERIES**

**The Perchas series consists of deep, poorly drained soils formed in materials over Tertiary clays. They are gently sloping to moderately steep soils on foot slopes and rolling hills of the tropical uplands. These soils are dark grayish brown clay in the A horizon, light gray, gley in the cambic and C horizons.**

**TAXONOMIC CLASS: Fine, smectitic, isohyperthermic Chromic Dystraquerts**

**TYPICAL PEDON: Perchas clay - native pasture.  
(Colors are for moist soil.)**

**Ap--0 to 5 inches; dark grayish brown (10YR 4/2) clay with few medium distinct gray (10YR 5/1) few fine prominent greenish gray (5GY 6/1) and few fine prominent dark greenish gray (5BG 4/1) mottles; weak medium and coarse subangular blocky structure; firm, slightly sticky, plastic; many fine roots; rust color due to root decay; very strongly acid; abrupt smooth boundary. (4 to 6 inches thick)**

**B2g--5 to 12 inches; light gray (5Y 7/2), light brownish gray (10YR 6/2), and light yellowish brown (10YR 6/4) clay with few fine prominent greenish gray (5GY 6/1) mottles; weak medium and coarse subangular blocky structure; firm, slightly sticky, plastic; common fine roots; very strongly acid; clear wavy boundary. (5 to 9 inches thick)**

**B3g--12 to 19 inches; light gray (10YR 7/2) and greenish gray (5GY 5/1) clay with common fine strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm, slightly sticky, plastic; few fine roots; very strongly acid; clear wavy boundary. (5 to 11 inches thick)**

**C1g--19 to 28 inches; light gray (10YR 7/2) clay with many fine prominent strong brown (7.5YR 5/6) mottles; massive, firm, slightly sticky, plastic; very strongly acid; clear wavy boundary. (7 to 10 inches thick)**

**C2g--28 to 40 inches; light gray (10YR 7/2) clay with few medium prominent greenish gray (5BG 5/1) and common fine prominent strong brown (7.5YR 5/6) mottles; massive; firm, slightly sticky, plastic; very strongly acid.**

**TYPE LOCATION: Culebrinas SCD, Puerto Rico, 3 miles west of the town of Lares. 350 meters south of kilometer marker 32.9 on Highway 111, on paved, unnumbered road, 25 meters west of road.**

**RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 14 to 26 inches. Texture is clay in the whole profile. Consistence is slightly sticky or sticky and plastic. Structure is weak, fine to coarse subangular blocky in the cambic horizon. Reaction is strongly to extremely acid throughout. Organic matter content decreases regularly with depth. The mean annual soil temperature is 75 degrees F.**

**The A horizon has hues of 7.5YR or 10YR, values of 4 or 5, and chromas of 1 to 2. Mottles are gray, greenish gray or dark greenish gray. Structure is weak or medium subangular blocky.**

**The B horizons are gleyed with 60 percent or more by volume of the matrix as low chroma. Hues are 5Y, 10YR, or 2.5Y, values of 5 to 7, and chroma of 2 or less. Structure is weak, fine to coarse subangular blocky.**

**The C horizon is also gley with hues of 2.5Y, 5Y, or 10YR, chroma of 2 or less in more than 60 percent by volume of the matrix.**

**COMPETING SERIES: The Maunabo series is in the same family. The Bajura, Coloso, Corcega, Fortuna, Guayabota, Igualdad, Jareales, Pinones, Reparada, Santoni, Talante, Vayas and Vigia series are similar soils in related families. Maunabo soils have coarser textured lower horizons. The Bajura and Santoni soils have horizons with COLE values of more than 0.09 in their profiles. The Coloso, Corcega and Talante soils are better drained and have less than 60 percent by volume of the upper 30 inches with low chroma mottles. The Corcega and Talante soils have coarser textured profiles. The Fortuna and Vayas soils have organic matter content that does not decrease regularly with depth. The Guayabota soils are shallow to the rock and have colder mean annual soil temperatures. The Igualdad are coarser textured in the lower horizons and are less acid. The Jareales, Pinones, Reparada and Vigia soils all have organic layer with their profiles.**

**GEOGRAPHIC SETTING: The Perchas soils are gently sloping and moderately steep soils on foot slopes and low rolling hills on slopes ranging from 2 to 20 percent. The regolith formed in fine textured sediments over Tertiary clays. The climate is humid tropical. The average annual precipitation ranges from 80 to 90 inches and the mean annual temperature**

is 77 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Moca, Voladora and Plata series. The Moca and Voladora soils are redder and better drained. The Plata soils are coarser textured and have a conglomerate of cobbles, sands and clays in the substrata.

**DRAINAGE AND PERMEABILITY:** Poorly drained, runoff is medium and permeability is slow.

**USE AND VEGETATION:** Most of the acreage is in native pasture. Small acreage is in sugarcane and coffee.

**DISTRIBUTION AND EXTENT:** Humid northern uplands of Puerto Rico. The series is of minor extent, with about 5,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Culebrinas SCD, Puerto Rico; 1979.

National Cooperative Soil Survey  
U. S. A.

**LOCATION PLATA            PR**

**Established Series  
Rev BCD-HRM  
06/2002**

## **PLATA SERIES**

The Plata series consists of very deep, well drained soils on moderately steep to steep sideslopes, formed in residuum derived from volcanic conglomerates. The climate is humid tropical. The average annual precipitation is 80 inches and the mean annual temperature 76 degrees F. The soil temperature at depth or 20 inches is over 71.6 degrees F and the difference between mean summer and winter temperatures is less than 9 degrees F. Slopes range from 0 to 60 percent slopes.

**TAXONOMIC CLASS: Clayey-skeletal, smectitic, isohyperthermic Dystric Eutrudepts**

**TYPICAL PEDON: Plata clay-native pasture. (Colors are for moist soil)**

**Ap--0 to 6 inches; dark yellowish brown (10YR 3/4) clay; weak fine and medium subangular blocky breaking to moderate fine and medium granular structure; firm, slightly sticky, plastic; many fine roots; common fine and medium volcanic rock fragments; many fine quartz grains; strongly acid; clear smooth boundary. (4 to 8 inches thick.)**

**Bw--6 to 11 inches; dark yellowish brown (10YR 4/4) clay; weak fine and medium subangular blocky structure firm, slightly sticky; plastic; common fine roots; common fine and medium volcanic rock fragments; many fine quartz grains; strongly acid; clear smooth boundary. (4 to 8 inches thick.)**

**BC--11 to 17 inches; yellowish brown (10YR 5/8), pale brown (10YR 6/3), brown (10YR 5/3), and strong brown (7.5YR 5/8), crushed color, brownish yellow (10 6/6) gravelly clay loam; weak medium subangular blocky structure, friable; few fine roots; many medium and coarse volcanic rock fragments; few fine quartz grains; strongly acid; gradual wavy boundary. (4 to 8 inches thick.)**

**C1--17 to 27 inches; yellowish brown (10YR 5/8), pale brown (10YR 5/3), and strong brown (7.5YR 5/8), crushed color, pale brown (10YR 6/3), gravelly clay loam, massive; friable, slightly sticky, slightly plastic; strongly acid; diffuse**

wavy boundary.

**C2--27 to 60 inches; brownish yellow (10YR 6/6) gravelly clay loam with few medium distinct light gray (10YR 6/1) mottles; massive; friable, slightly sticky, slightly plastic; very strongly acid.**

**TYPE LOCATION:** Noroeste SCD, Puerto Rico; 4.5 miles southeast of the town of Aguada; 250 meters on dirt road from kilometer marker 5.6 of highway 417. 50 feet west of dirt road.

**RANGE IN CHARACTERISTICS:** Thickness of the solum ranges from 12 to 30 inches. Depth to gravelly horizons vary from 8 to 16 inches. Reaction ranges from strongly to very strongly acid throughout. Base saturation of the epipedon and cambic horizon is 50 percent or more. Exchange capacity is more than 20 meg/100 grams of clay. Texture of the control section averages gravelly clay loam with less than 35 percent clay and more than 35 percent by volume of medium and coarse gravel. These soils have slightly sticky and plastic solum and slightly sticky and slightly plastic C horizons.

The A horizon has hue of 10YR, value of 3 and 4 and chroma of 4. Texture is clay loam or clay.

The Bw horizon has hue of 10YR, value of 4 and 5 and chroma of 4 and 6. Texture is clay loam or clay

The BC horizon has hue of 10YR, value of 4 to 6 and chroma of 3 to 8. Texture is loam, clay loam, or sandy clay loam.

The C horizon has texture and color similar to the BC horizon.

**COMPETING SERIES:** These are the Cuchillas, Quebrada, Morado, Maresua series in the same Subgroup and the Junquitos, Dique, Humacao, Mani, Caguabo, Malaya, Juncos and Montegrando series in the same Great Group. The Cuchillas soils have soil temperatures below 71.6 degrees F at depth of 20 inches and lack the coarse fragments in their profiles. The Quebrada and Morado soils are less acid and lack the gravelly horizons. The Maresua soils have finer textured profiles and are less acid. The Junquitos and Gurabo soils have finer textured profiles and have low chroma mottles within 20 inches of the surface. The Dique, Humacao and Mani soils lack the coarse fragments and have irregular distribution of organic matter with depth. The Caguabo and Malaya soils have semi-consolidated volcanic rock within 20 inches of the surface. The Juncos and Montegrando soils have horizons with COLE values exceeding 0.09.

**GEOGRAPHIC SETTING:** The Plata soils occur on moderately steep to steep sideslopes on slope gradients of 0 to 60 percent. The regolith consists of fine and moderately fine textured residuum derived from volcanic conglomerates. The

**climate is humid tropical. The average annual precipitation is 80 inches and the mean annual temperature 76 degrees F. The soil temperature at depth or 20 inches is over 71.6 degrees F and the difference between mean summer and winter temperatures is less than 9 degrees F. See Remarks.**

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Moca, Voladora, and Perchas series. The Moca and Voladora soils are redder and have argillic horizons. The Perchas soils are finer textured throughout and have low chroma mottles in the upper part of the sola.

**DRAINAGE AND PERMEABILITY:** Well drained, rapid runoff and moderate permeability.

**USE AND VEGETATION:** Native pasture and brush.

**DISTRIBUTION AND EXTENT:** Humid uplands of Northwestern Puerto Rico. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Soil Survey of Puerto Rico, 1942.

**REMARKS:** In the Caribbean National Forest, a taxajunct of this series was correlated on nearly level terraces.

**Diagnostic horizons and features recognized for this pedon:**

**Ochric epipedon - the zone from 0 to 6 inches (Ap horizon).**

**Cambic horizon - the zone from 6 to 17 inches (Bw and BC horizons).**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION QUEBRADA PR**

**Established Series  
Rev. REG  
06/2002**

## **QUEBRADA SERIES**

**The Quebrada series have plastic, fine textured, slightly acid or neutral A and B horizons over deep, friable, nonplastic saprolite.**

**TAXONOMIC CLASS: Fine, mixed, active, isohyperthermic Dystric Eutrudepts**

**TYPICAL PEDON: Quebrada silty clay - native pasture.  
(Colors are for moist soil unless otherwise stated.)**

**Ap--0-7 inches; Dark brown (10YR 3/3) silty clay loam; moderate fine and medium granular structure; firm, hard when dry, slightly sticky, plastic; many fine roots; 10 percent by volume subangular volcanic rock fragments; common fine black concretions; slightly acid; clear smooth boundary. (5 to 8 inches thick)**

**B--7-14 inches; Dark yellowish brown (10YR 4/4) clay; weak medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; neutral; gradual wavy boundary. (7 to 10 inches thick)**

**C--14-50 inches; Weathered parent material with variegated colors as very dark brown, gray, and greenish gray; silty clay loam; massive; friable, slightly sticky, nonplastic; neutral.**

**TYPE LOCATION: Caribe SCD, Puerto Rico; 1.5 miles east of kilometer marker 5.9 of Highway 151.**

**RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 12 to 18 inches (30-46cm). Depth to the semi-consolidated rock is over 5 feet. These soils have slightly sticky and plastic A and B horizons and slightly sticky and nonplastic C horizon. They are medium acid through neutral. Rock fragments comprise less than 20 percent by volume of the soil mass. The mean annual soil temperature ranges from 75 to 78 degrees F.**

**The A horizon has hues of 10YR, values of 3 and chromas of 3.**

**The B horizon has hues of 10YR, values of 4 or 5, and chromas of 4 and higher. The C horizon has variegated colors of the saprolite as greenish gray, bluish gray, gray, and browns in varying amounts. The A horizon is silty clay loam and the B horizon is silty clay or clay.**

**The C horizon ranges from loam to silty clay loam inclusive. Peds in the A horizon are friable when moist, become hard when dry. Structure of the B horizon ranges from weak fine to medium subangular blocky inclusive.**

**COMPETING SERIES:** These are the Adjuntas, Caguabo, Callabo, Maraguez, Maresua, Morado, Pandura, and Plata series. The Adjuntas are more acid throughout and have lower base saturation. The Caguabo soils have consolidated volcanic rock at 10 to 20 inches. The Callabo soils are drier and have ustic soil moisture regimes. The Maraguez and Morado soils are coarser textured; in addition, the Morado soils have redder colors. The Maresua and Plata soils have profiles with more than 50 percent coarse fragments. In addition, the Plata soils are more acid and have gravelly substrata. The Pandura soils have paralithic contacts within 20 inches.

**GEOGRAPHIC SETTING:** The Quebrada soils occur in strongly sloping to moderately steep sideslopes of dissected uplands on slope gradients from 12 to 60 percent. The soil formed in deep medium textured residuum weathered from volcanic rock. The climate is humid tropical. The average annual precipitation is 78 inches (200 cm) and the mean annual temperature 76 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Maraguez and Morado series in addition to the Caguabo and Mucara series. The Caguabo soils have hard rock within 20 inches and the Mucara soils have paralithic contacts within 20 inches.

**DRAINAGE AND PERMEABILITY:** Well drained; rapid runoff; moderate permeability.

**USE AND VEGETATION:** Predominantly native pasture and brush. A few areas are planted to coffee and other crops.

**DISTRIBUTION AND EXTENT:** Humid uplands of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED: Ponce Survey Area, Puerto Rico; 1971.**

**REMARKS: These soils were formerly classified in the Lithosol great soil group.**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION REILLY            PR**

**Established Series  
Rev. JLL/GRB  
08/1999**

## **REILLY SERIES**

**The Reilly series consists of very deep, excessively drained, rapid permeable soils on flood plains adjacent to streams. They formed in stratified sediments of gravel and sand. Near the type location, the mean annual temperature is about 78 degrees F., and the mean annual precipitation is about 70 inches. Slopes range from 0 to 2 percent.**

**TAXONOMIC CLASS: Sandy-skeletal, mixed, isohyperthermic Mollic Udifluvents**

**TYPICAL PEDON: Reilly gravelly loam - sugarcane. (Colors are for moist soil.)**

**Ap--0 to 9 inches; dark brown (10YR 3/3) gravelly silt loam; weak fine granular structure; friable; slightly sticky, nonplastic; many fine roots; moderately acid; abrupt smooth boundary. (7 to 16 inches thick)**

**C1--9 to 16 inches; dark grayish brown (10YR 4/2) very gravelly sand; massive; very friable; few fine roots; moderately acid, about 60 percent, by volume, pebbles; few thin silty and clayey layers; abrupt smooth boundary.**

**C2--16 to 48 inches; clean, coarse sand and gravel; about 70 percent, by volume, coarse gravel, 2 to 3 inches in diameter.**

**TYPE LOCATION: Suroeste SCD, San German Municipality, Puerto Rico. Approximately 1.0 miles northwest of the city of San German; from the intersection of P.R. Hwy. 102 and P.R. Hwy 347, about 490 feet north of P.R. Hwy. 347 on farm road, about 165 feet west of road in sugarcane field. San German topographic quadrangle; lat. 18 degrees 05 minutes 52 seconds N.; long. 67 degrees 02 minutes 43 seconds W.; PRD 1940.**

**RANGE IN CHARACTERISTICS: Thickness of the A horizon and depth to the sand and gravel ranges from 7 to 16 inches. Reaction ranges from very strongly acid to slightly acid throughout.**

**The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 and 3. Texture is loam, silt loam, or their gravelly analogs. Content of pebbles ranges from 25 to 35 percent, by volume.**

**The C horizon has hue of 10YR, value of 3 or 4, and value of 3 to 6. Texture is very gravelly sand or extremely gravelly sand. Content of pebbles ranges from 50 to 75 percent, by volume.**

**COMPETING SERIES:** There are no other known series in the same family.

**GEOGRAPHIC SETTING:** The Reilly soils are on flood plains adjacent to streams. They formed in medium and moderately coarse-textured sediments stratified with gravel and sands in dominant proportions. Slope range from 0 to 2 percent. The climate is humid tropical. The average annual temperature ranges from 76 to 80 degrees F., and the average annual rainfall ranges from 65 to 75 inches.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These include the Bajura, Coloso, Dique, and Toa series. All of these soils are in flood plains. The poorly drained Bajura soils have more clay in the substratum. The somewhat poorly drained Coloso soils have more clay in the subsoil. The well drained Dique soils have more clay in the subsoil. The well drained Toa soils have more clay in the control section and have Mollic epipedons.

**DRAINAGE AND PERMEABILITY:** Excessively drained; rapid permeability.

**USE AND VEGETATION:** Most areas of Reilly soils are in pasture. A few small acreage are in vegetable crops or sugarcane. Vegetation consists of native and introduced species.

**DISTRIBUTION AND EXTENT:** Humid river flood plains of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama.

**SERIES ESTABLISHED:** Humacao Soil Survey Area, Puerto Rico; 1968.

**MLRA:** 272.

**National Cooperative Soil Survey**

**U.S.A.**

**LOCATION RIO LAJAS PR**

**Established Series  
Rev. BCD  
6/2002**

## **RIO LAJAS SERIES**

**The Rio Lajas series consists of very deep, somewhat excessively drained, rapidly permeable soils formed in sandy coastal plains sediments. This nearly level to sloping soils is in the coastal plains. Slopes range from 2 to 12 percent. The mean annual precipitation is about 67 inches and the mean annual temperature is about 77 degrees F.**

**TAXONOMIC CLASS: Mixed, isohyperthermic Psammentic Paleudalfs**

**TYPICAL PEDON: Rio Lajas sand - cultivated. (Colors are for moist soil.)**

**A1--0 to 8 inches; dark reddish brown (5YR 3/4) sand; single grain; loose; few fine roots; slightly acid; gradual smooth boundary. (6 to 10 inches thick)**

**A2--8 to 24 inches; dark reddish brown (5YR 3/3) loamy sand; single grain; loose; nonsticky, nonplastic; very few fine roots; slightly acid; gradual smooth boundary. (12 to 18 inches thick)**

**A3--24 to 32 inches; dark reddish brown (5YR 3/4) loamy sand; single grain; loose; nonsticky and nonplastic; slightly acid; gradual smooth boundary. (8 to 12 inches thick)**

**Bt--32 to 60 inches; dark reddish brown (2.5YR 3/4) loamy fine sand; weak coarse subangular blocky structure parting to single grain; loose, nonsticky, nonplastic; slightly acid.**

**TYPE LOCATION: Noroeste SCD, Puerto Rico; 5.5 miles west of the town of Isabela; 125 yards south of junction of roads to Punta Jacinto and east-west dirt road along the beach; 50 feet west of highway and 300 yards south of the sea.**

**RANGE IN CHARACTERISTICS: Thickness of the solum is over 60 inches. Thickness of the argillic is more than 50 inches. These soils are loose, nonsticky and nonplastic throughout. Reaction ranges from medium acid to neutral**

throughout the profile. The mean annual soil temperature is 75 degrees F.

The A1 horizon has hues of 5YR, values of 3, and chroma of 3 and 4. Texture is dominantly sand. The A2 and A3 is sand or loamy sand. Thickness of the A horizons is 26 to 40 inches.

The Bt horizon has hues of 5YR or 2.5YR, values of 3 or 4, and chroma of 4 to 6. Texture is loamy fine sand.

**COMPETING SERIES:** There are no other know series in the same family. The Candelerio, Cayagua, Fajardo, Islote, Juncal, Rio Arriba, San Sebastian, Tanama, Vega Baja and Via series are similar soils in related families. The Candelerio, Cayagua and Vega Baja soils are finer textured and all have low chroma mottles in their profiles. The Fajardo and Rio Arriba soils have COLE value higher than 0.09 in their horizons. The Islote, Juncal, San Sebastian and Via soils all are finer textured. The Tanama soils are finer textured and shallower to the hard limestone.

**GEOGRAPHIC SETTING:** The Rio Lajas soils are gently sloping and sloping coastal plains. Slightly above sea level on slope gradients of 2 to 12. They formed in reworked sandy sediments of the coastal plains. The climate is sub-humid tropical. The average annual precipitation ranges from 60 to 70 inches and the mean annual temperature is 77 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Malaze, Jabos, Bajucos, Guerrero and Guanajibo series and the Carrizales, Coto, Cotito and Matanzas series. The Carrizales soils are sandy throughout and do not have argillic horizon.

**DRAINAGE AND PERMEABILITY:** Somewhat excessively drained, slow runoff, and rapid permeability.

**USE AND VEGETATION:** Mostly in pasture and food crops.

**DISTRIBUTION AND EXTENT:** Northwestern Puerto Rico. This series is of minor extent, with about 2,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Soil Survey of Puerto Rico; 1942.

**REMARKS:** The classification was updated with the 4/91 draft from Loamy, mixed, isohyperthermic Typic Tropudalfs to Sandy, mixed, isohyperthermic Psammentic Paleudalfs. The previous OSED date was 4/67.

**Diagnostic horizons and features recognized in this pedon:**

**Ochric epipedon - zone from 0 to 32 inches (A horizons)**

**Argillic horizon - zone from 32 to 60 inches (Bt horizon)**

**LABORATORY DATA: Available for the Type Location.**

**National Cooperative Soil Survey  
U.S.A.**

## **LOCATION RIO PIEDRAS PR**

**Established Series  
Rev. BCD  
01/98**

### **RIO PIEDRAS SERIES**

The Rio Piedras series consists of very deep, moderately well drained, slowly permeable soils on dissected uplands. They formed in residuum from thin bedded siltstone and shale. Slopes range from 2 to 20 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 78 degrees F.

**TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Typic Hapludults**

**TYPICAL PEDON: Rio Piedras clay - sugarcane. (Colors are for moist soil)**

**Ap--O to 7 inches; reddish brown (5YR 4/4) moist, light reddish brown (5YR 6/4) dry; clay; moderate medium granular structure; hard, firm, slightly sticky, slightly plastic, many fine roots; extremely acid; clear smooth boundary. 6 to 8 inches thick.**

**Bt1--7 to 11 inches; yellowish red (5YR 4/8) clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; few faint clay films; few fine roots; extremely acid, clear smooth boundary. 4 to 6 inches thick.**

**Bt2--11 to 21 inches; red (2.5YR 4/8) clay with many medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic, many prominent clay films on vertical and common distinct clay films on horizontal ped surfaces; few fine roots; few small siltstone fragments; extremely acid; clear smooth boundary. 8 to 12 inches thick.**

**Bt3--21 to 27 inches; red (2.5YR 5/6) clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; few faint clay films; many weathered and partially weathered shale fragments giving a yellow (10YR 7/6) mottled appearance; common fine pores; extremely acid; gradual smooth boundary. 6 to 8 inches thick.**

**C--27 to 42 inches plus; highly weathered thin bedded siltstone, original platy structure clearly visible; variegated colors**

consisting of red, gray, and yellow, easily penetrated with auger.

**TYPE LOCATION:** Noroeste SCD, Puerto Rico; 2.5 kilometers east of the town of Aguada; 600 meters north of kilometer marker 134.0 of highway 2.

**RANGE IN CHARACTERISTICS:** These soils are extremely acid and clayey throughout. Thickness of the solum ranges from 24 to 34 inches. Thickness of the argillic horizons range from 18 to 26 inches. Depth to the hard bedded siltstone is over 3 feet. These soils are slightly sticky and slightly plastic throughout. Base saturation (by sum of cations) is less than 35 percent at 50 inches below the top of the argillic. Organic matter content is 1.5 percent or less in the top 6 inches of the argillic horizon. CEC is more than 24 meq/100 grams of clay in the argillic horizon.

Colors of the A horizons have hues of 7.5YR and 5YR, values and chromas of 3 and 4.

The Bt horizons have colors in hues of 5YR, 2.5YR and 10R, values of 4 and 5 and chromas of 6 and 8. Structure ranges from moderate coarse to medium subangular blocky. Clay films vary from few faint to many prominent.

**COMPETING SERIES:** These are the Corozal, Consumo, Maricao, Lirios, Moca, Alonso, Ingenio, Jagueyes and Vega Alta series. The Corozal soils have low chroma mottles in the upper part of the argillic horizon. The Consumo, Maricao and Lirios soils have thinner argillic horizons. The Moca soils have clays with COLE values greater than 0.09. The Alonso, Ingenio, and Jagueyes soils have lower exchange capacity values. The Vega Alta soils have more than 5 percent nonindurated plinthite within 60 inches of the surface.

**GEOGRAPHIC SETTING:** The Rio Piedras soils occur on gently to strongly sloping sideslopes of dissected uplands with slope gradients from 2 to 20 percent. The regolith consists of fine textured residuum from thin bedded siltstone and shale. The climate is humid tropical. The average annual precipitation is 80 inches. The mean annual air temperature is 78 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F with a difference less than 9 degrees F between mean summer and mean winter temperatures.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Moca series in addition to Plata, Yunes, Voladora, and Fajardo series. The Plata and Yunes soils are shallow and have cambic horizons. The Voladora soils have redder A and B horizons. The Fajardo soils are darker colored and have low chromas mottles.

**DRAINAGE AND PERMEABILITY:** Moderately well drained, runoff is medium, and permeability is slow.

**USE AND VEGETATION:** Sugarcane and pasture.

**DISTRIBUTION AND EXTENT:** Humid uplands of Puerto Rico. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Puerto Rico, 1942.

**REMARKS:** The classification was updated with the 4/91 draft from Clayey, kaolinitic, isohyperthermic Typic Tropudults to Clayey, kaolinitic, isohyperthermic Typic Hapludults. The previous OSED date was 2/67.

**Diagnostic horizons and features recognized in this pedon:**

Ochric epipedon - zone from 0 to 7 inches (Ap horizon)

Argillic horizon - zone from 7 to 27 inches (Bt horizons)

National Cooperative Soil Survey  
U.S.A.

**LOCATION ROSARIO        PR**

**Established Series  
Rev. BCD  
6/2002**

## **ROSARIO SERIES**

**The Rosario series consists of moderately deep, well drained, moderately to rapidly permeable soils on dissected uplands. They formed in clayey residuum overlying serpentinitic rock. Slopes range from 12 to 60 percent. The mean annual precipitation is about 76 inches and the mean annual temperature is about 77 degrees F.**

**TAXONOMIC CLASS: Clayey, ferruginous, isohyperthermic Lithic Hapludox**

**TYPICAL PEDON: Rosario clay-native pasture. (Colors are for moist soil)**

**Ap--0 to 6 inches; dusky red (10YR 3/3) clay; weak fine subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; many fine roots; strongly acid; gradual smooth boundary. (4 to 8 inches thick.)**

**Bo1--6 to 12 inches; dusky red (10YR 3/4) clay; weak fine subangular blocky breaking to moderate medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; few fine iron concretions; strongly acid; gradual wavy boundary. (4 to 8 inches thick.)**

**Bo2--12 to 25 inches; dark red (10YR 3/6) clay; moderate fine granular structure; friable, slightly sticky, slightly plastic; few fine roots; few fine pores; few fine iron concretions; strongly acid, abrupt wavy boundary. (12 to 20 inches thick.)**

**R--26 inches plus; consolidated serpentinite rock.**

**TYPE LOCATION: Suroeste SCD, Puerto Rico; 2 miles north of the town of Cabo Rojo on Sabana Alta ridge; 600 meters southwest of kilometer marker 193.95 of Highway 114.**

**RANGE IN CHARACTERISTICS: Thickness of the solum and depth to the serpentinite rock ranges from 20 to 40 inches. Reaction ranges from strongly to very strongly acid. Base retention varies from more than 1 to 10 meq/100 grams**

of clay in the C horizon. CEC is 16 meq/100 grams of clay or less in the B horizons. Base saturation is less than 35 percent in some subhorizon of the oxic. Fine iron concretions range from none to few throughout the profile.

The A horizons have hues of 2.5YR and 10YR, values of 2 and 3 and chromas of 2 to 4.

The Bo horizons have colors in hues of 2.5YR, 7.5YR, and 10YR, values of 3 and 4 and chromas of 4 and higher. Clay is the dominant texture throughout. Structure of the B horizons varies from weak fine and medium subangular blocky to granular. Consistence is friable but hardening or cementation is common in areas devoid of vegetation and exposed to wetting and drying.

**COMPETING SERIES:** These are the Catalina, Comerlo, and Coto series in the same Subgroup and the Nipe, Bayamon, Matanzae, Cotito, and Delicias series in the same Suborder. The Catalina, Comerio and Coto soils have oxic horizons and extend to 50 inches or more from the surface, but have moderate subangular blocky structure and reflective ped surfaces. The Coto soils are yellower and mineralogy of the clay is dominated by kaolinite. The Nipe soils have oxic horizons that extend to 80 inches or more from the soil surface, and have cation retention capacity of less than 1 meq/100 grams of clay in some subhorizon of the oxic. The Bayamon, Matanzas and Cotito soils have 35 percent or more base saturation in all subhorizons of the oxic. The Cotito soils are yellower. The Delicias soils have oxic horizons that extend to 50 inches or more from the soil surface and have common to many indurated iron modules throughout their profiles.

**GEOGRAPHIC SETTING:** The Rosario soils occur on strongly sloping to steep sideslopes with slope gradients of 12 to 60 percent. The regolith consists of highly weathered, fine textured materials that rest abruptly over serpentinite rock. The climate is humid tropical. The average annual precipitation is 76 inches and the mean annual temperatures 77 degrees F. Mean annual soil temperature at depth of 20 inches is over 71.6 degrees F and the difference between mean summer and winter temperatures is less than 9 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Nipe and Delicias series in addition to Maresua and Santa Marta series and the land type Serpentinite Rockland. The Maresua and Santa Marta soils are nonacid, have less weathered profiles, and lack the red and dusky red colors. Serpentinite Rockland is a land type that has 75 percent or more of the surface area covered by rock outcrops. The Rosario soils occur in association with the Nipe soils. The Nipe soils are in the hilltops on flat or gently sloping stable surfaces. The Rosario soils are in the strongly sloping to steep sideslopes where apparently geologic or man made erosion has truncated the upper profile and reduced the thickness of the solum to less than 40 inches.

**DRAINAGE AND PERMEABILITY:** Well drained, medium runoff, and moderate to rapid permeability.

**USE AND VEGETATION:** Native pasture and brush.

**DISTRIBUTION AND EXTENT:** Western uplands of Puerto Rico. The series is of minor extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Soil Survey of Puerto Rico, 1942.

**REMARKS:** The classification was updated with the 4/91 draft from Clayey, oxidic, isohyperthermic Tropeptic Haplorthox to Fine, ferruginous, isohyperthermic Lithic Hapludox. The previous OSED date was 4/67.

**Diagnostic horizons and features recognized in this pedon:**

**Ochric epipedon - zone from 0 to 6 inches (Ap horizon)**

**Oxic horizon - zone from 6 to 25 inches (Bo horizons)**

**Lithic contact - zone at 26 inches (R layer)**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION SAN GERMAN PR**

**Established Series  
Rev. LRR/GRB  
06/2002**

## **SAN GERMAN SERIES**

The San German series consists of shallow, well drained, very slowly permeable soils on ridgetops, summits and side slopes in uplands of limestone hills and mountains of the Semiarid Mountains and Valleys MLRA. They formed in material weathered from limestone bedrock. Near the type location, the mean annual temperature is about 79 degrees F., and the mean annual precipitation is about 35 inches. Slopes range from 5 to 90 percent.

**TAXONOMIC CLASS: Clayey-skeletal, mixed, superactive, nonacid, isohyperthermic, shallow Typic Ustorthents**

**TYPICAL PEDON: San German gravelly loam-pasture. (Colors are for moist soil unless otherwise indicated.)**

**Ap--0 to 2 inches; dark brown (10YR 3/3) gravelly clay, brown (10YR 4/3) dry; strong medium granular structure; slightly hard, firm; slightly sticky, slightly plastic; many very fine and fine roots; many very fine and common fine interstitial pores; about 15 percent, by volume pebbles, about 2 percent, by volume, cobbles; moderately alkaline; strongly effervescent (HCl, 1N); clear wavy boundary. (1 to 4 inches thick)**

**AC--2 to 11 inches; brown (10YR 4/3) extremely gravelly clay; brown (10YR 5/3) dry; slightly hard, firm; massive; slightly sticky, slightly plastic; many very fine and fine roots; many very fine and common fine tubular and vesicular pores; about 70 percent, by volume, pebbles; moderately alkaline; strongly effervescent (HCl, 1N); abrupt wavy boundary. (4 to 10 inches thick)**

**Cr1--11 to 21 inches; very pale brown (10YR 7/4) hard semi-consolidated fractured limestone; white (10YR 8/2) dry; strong medium and thick platy rock structure; many very fine roots, common fine and medium roots in fracture planes; moderately alkaline; violently effervescent (HCl, 1N); clear wavy boundary.**

**Cr2--21 to 27 inches; very pale brown (10YR 7/4) hard semi-consolidated fractured limestone, white (10YR 8/2) dry; strong medium and thick platy rock structure; few very fine roots in fracture planes; moderately alkaline; violently**

**effervescent (HCl, 1N); abrupt wavy boundary. (Combined thickness of the Cr horizons is from 5 to 26 inches.)**

**R--27 to 80 inches; very pale brown (10YR 7/4) hard consolidated limestone bedrock, white (10YR 8/2) dry; moderately alkaline; violently effervescent (HCl, 1N).**

**TYPE LOCATION: Lajas Municipio, Puerto Rico; approximately 3.0 miles west of La Parguera, about 1.7 miles southeast of Rancho Cabassa, and about 20 feet east of gravel road. Parguara topographic quadrangle; lat. 17 degrees 58 minutes 56 seconds N., long. 67 degrees 5 minutes 32 seconds W.; PRD 1940.**

**RANGE IN CHARACTERISTICS: Depth to hard semi-consolidated limestone ranges from 5 to 20 inches. Depth to hard unweathered limestone bedrock ranges from 25 to 40 inches. Reaction is moderately alkaline throughout.**

**The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 to 4. Texture is clay loam or clay in the fine-earth fraction.**

**The AC horizon, where present, has hue of 7.5R or 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is clay loam or clay in the fine-earth fraction.**

**The C horizon, where present, has hue of 7.5YR or 10YR, value of 4 or 5 and chroma of 1 to 4. Texture is clay loam or clay in the fine-earth fraction.**

**The Cr horizons are composed of hard semi-consolidated fractured limestone. It has hue of 7.5YR to 2.5Y, value of 6 to 8, and chroma of 2 to 6. It can be excavated with difficulty with hand tools, and is rippable by mechanical equipment.**

**The R layer is composed of hard consolidated limestone bedrock.**

**COMPETING SERIES: There are no competing series in the same family.**

**GEOGRAPHIC SETTING: San German soils are on ridge tops, summits, and side slopes in uplands of limestone hills and mountains of the Semiarid Mountains and Valleys MLRA of southern Puerto Rico. Slopes range from 5 to 90 percent. They formed in material weathered from limestone bedrock. The climate is semiarid tropical. The mean annual temperature ranges from 78 to 80 degrees F., and the mean annual precipitation ranges from 30 to 40 inches.**

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Aguilita, Descalabrado, Duey, Pozo Blanco, Seboruco, and Tuque soils. Aguilita, Duey, and Tuque soils are on similar positions, In addition, Aguilita soils have a Mollic epipedon and coarse-loamy, carbonatic subsoils. Descalabrado soils formed in igneous bedrock. Duey soils have fine-loamy carbonatic control sections. Tuque soils have a Mollic epipedon. Pozo Blanco are on lower adjacent positions, are very deep, and have a Mollic epipedon. Seboruco soils are on slightly lower positions and have red, fine-silty control sections.

**DRAINAGE AND PERMEABILITY:** Well drained; very slow permeability.

**USE AND VEGETATION:** Most areas of San German soils are used for pasture and rangeland. Vegetation consists of buffellgrass, huracan grass, and other xerophytic grasses, shrubs, and trees.

**DISTRIBUTION AND EXTENT:** In the semiarid limestone hills and mountains of southern Puerto Rico. The series is of small extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Puerto Rico, 1942.

**REMARKS:** Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 2 inches (Ap horizon).

Paralithic contact - zone at 11 inches (Cr layer).

Lithic contact - zone at 27 inches (R layer).

The type location was moved to its present location in 1998 and the series reclassified based on soil lab data and observations in the field.

**ADDITIONAL DATA:** Characterization pedon - Lajas Municipio, Puerto Rico; SPR97-079-003. Sample by the NSSL, Lincoln, NE. 6/97.

**MLRA:** 271.

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION SAN SEBASTIAN PR**

**Established Series  
Rev. BCD  
06/2002**

## **SAN SEBASTIAN SERIES**

**The San Sebastian series consists of very deep, well drained, moderately permeable soils on dissected uplands. They formed in limestone residuum. Slopes range from 20 to 60 percent. The mean annual precipitation is about 85 inches and the mean annual temperature is about 77 degrees F.**

**TAXONOMIC CLASS: Clayey-skeletal, carbonatic, isohyperthermic Calcic Argiudolls**

**TYPICAL PEDON: San Sebastian gravelly clay-weeds. (Colors are for moist soil)**

**Ap--0 to 4 inches; dark brown (10YR 3/3) gravelly clay, moderate fine and medium granular structure; friable, slightly sticky, plastic; many fine roots; slight effervescence; clear wavy boundary. 3 to 6 inches thick.**

**Bk1--4 to 9 inches; strong brown (7.5YR 5/6) very gravelly clay; weak medium subangular blocky structure; firm, sticky, plastic; few fine roots; few faint clay films; clay coatings on gravel faces; slight effervescence; from 50 to 60 percent by volume of gravel; clear smooth boundary. 4 to 7 inches thick.**

**Bk2--9 to 14 inches; strong brown (7.5YR 5/6) extremely gravelly clay; weak medium subangular blocky structure; firm, sticky, plastic; few fine roots; few faint clay films; clay coatings on gravel faces; strong effervescence; more than 60 percent by volume of gravel; clear smooth boundary 4 to 8 inches thick.**

**BC--14 to 22 inches; reddish yellow (7.5YR 6/8) extremely gravelly clay; weak fine subangular blocky structure; firm, sticky, plastic; clay coatings on gravel faces; strong effervescence; more than 60 percent by volume of grave; gradual wavy boundary. 7 to 11 inches thick.**

**C1--22 to 33 inches; reddish yellow (7.5YR 7/6) very gravelly clay; massive; friable; sticky and plastic; strong effervescence; from 50 to 60 percent by volume of gravel; gradual wavy boundary. 9 to 13 inches thick.**

**C2--33 to 41 inches plus; reddish yellow (7.5YR 7/6) gravelly clay; massive; friable; slightly sticky, plastic; from 25 to 60 percent by volume of gravel; strong effervescence.**

**TYPE LOCATION:** Culebrinas SCD, Puerto Rico, 5 miles northwest of the town of San Sebastian; 250 meters east of kilometers marker 9.2 of Highway 112.

**RANGE IN CHARACTERISTICS:** Thickness of the solum ranges from 29 to 32 inches. These soils are calcareous throughout. Fine to medium gravel is present throughout the profile. These soils have slightly sticky and plastic A horizons and sticky and plastic Bk and C horizons. Base saturation (by sum of cations) is more than 60 percent at 50 inches below the top of the argillic horizon. CEC is more than 24 meq/100 grams of clay in the major part of the argillic horizon. Coarse fragments exceeds 35 percent, by volume, throughout the major part of the control section.

The A horizons have colors in hues of 7.5YR and 10YR, values of 3 and 4, and chromas of 2, 3 and 4.

The Bk horizons range in hues of 7.5YR to 10YR, values of 4 to 5, and chromas of 4 to 8. Texture of the soil is gravelly clay throughout. Structure ranges from weak fine to medium subangular blocky.

**COMPETING SERIES:** These are the Juncal and Machete series in the same Subgroup and the Tanama and Rio Arriba series in the same Great Group. The Juncal and Machete soils lack the coarse fragments in their profiles and are not calcareous. The Tanama soils have hard rock within 20 inches of the surface. The Rio Arriba soils have horizons with COLE values greater than 0.09 and crack when dry.

**GEOGRAPHIC SETTING:** The San Sebastian series are on moderately steep to steep sideslopes with slope gradients from 20 to 60 percent. The regolith consists of fine textured gravelly residuum from limestone. The climate is humid tropical.

The average annual precipitation is 85 inches and the mean annual temperature 77 degrees F. The mean annual soil temperature at 20 inches is more than 72 degrees F. and the difference between mean summer and winter temperatures is less than 9 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** This is the competing Juncal in addition to Colinas and Cidral series. The Colinas soils are shallower, darker, and lack argillic horizons. The Cidral soils are redder, acid, and free of gravel throughout.

**DRAINAGE AND PERMEABILITY:** Well drained, rapid runoff and moderate permeability.

**USE AND VEGETATION:** Most of the acreage is in brush. Small areas are in sugar cane and native pasture.

**DISTRIBUTION AND EXTENT:** Humid limestone uplands of Puerto Rico. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Culebrinas SCD, Puerto Rico. Name is from a town where the series was first recognized.

**REMARKS:** The classification was updated with the 4/91 draft from CLayey-skeletal, carbonatic, isohyperthermic Typic Tropudalfs to Clayey-skeletal, carbonatic, isohyperthermic Eutropeptic Rendolls based on lab data from the Type Location. The previous OSED date was 4/67.

This soil was formerly included in the Tanama series.

**Diagnostic horizons and features recognized in the pedon:**

**Mollic epipedon - zone from 0 to 9 inches (Ap and Bk1 horizons)**

**Calcic horizon - zone from 4 to 22 inches (Bk horizons)**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION SANTA CLARA PR**

**Established Series  
Rev. REG:LHR  
06/2002**

## **SANTA CLARA SERIES**

**The Santa Clara series consists of moderately deep, well drained soils formed in materials weathered from limestone. They are gently sloping to moderately steep soils in foot slopes and rounded hills. These soils are silty clay loam or clay, neutral in the A horizon, silty clay, calcareous in the cambic horizon over a C horizon that is mainly soft limestone.**

**TAXONOMIC CLASS: Fine, mixed, active, isohyperthermic Typic Eutrudepts**

**TYPICAL PEDON: Santa Clara silty clay loam - native pasture.  
(Colors are for moist soil.)**

**Ap--0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam, strong medium and coarse granular structure; slightly hard, firm, slightly sticky, plastic; many fine roots; neutral; clear smooth boundary. (5 to 10 inches thick)**

**B--6 to 23 inches; dark yellowish brown (10YR 4/4) silty clay; weak medium and coarse subangular blocky structure; slightly hard, firm slightly sticky, plastic; common fine roots; worm channels; slight effervescence; clear smooth boundary. (15 to 20 inches thick)**

**C--23 to 30 inches; yellow (10YR 7/6) with few faint very pale brown (10YR 8/3) mottles; massive; friable, slightly sticky, slightly plastic; very few fine roots; violent effervescence with dilute HCL; clear smooth boundary. This horizon is mainly soft limestone. (6 to 10 inches thick)**

**R--30 plus inches; hard fragmental limestone.**

**TYPE LOCATION: Norceste SCD, Puerto Rico; one mile south of the town of Isabela; one kilometer on dirt road east of kilometer marker 1.7 on Highway 112; 50 meters south of dirt road.**

**RANGE IN CHARACTERISTICS:** Thickness of the solum ranges from 20 to 30 inches. Depth to the hard fragmental limestone varies from 26 to 40 inches. Base saturation (by NH<sub>4</sub>OAC) is 80 to 90 percent throughout the profile. The mean annual soil temperature is 75 degrees F.

The A horizon has hues of 10YR or 7.5YR, values and chromas of 2 or 3. Texture is silty clay loam or clay. Structure is moderate or strong, medium or coarse granular. Consistence is slightly sticky or sticky and plastic. Reaction is slightly acid to mildly alkaline.

The B horizon has hues of 7.5YR or 10YR, values of 4 or 5, and chromas of 4 to 6. Texture is silty clay or clay. Structure is moderate weak, fine to coarse subangular blocky. Consistence is slightly sticky or sticky and plastic. Reaction is neutral to moderately alkaline. May have from 5 to 10 percent fine limestone fragments.

The C horizon is a mixture of clay and soft limestone. Consistence is slightly sticky and slightly plastic or plastic.

**COMPETING SERIES:** The Naranjo series is in the same family level. The Aguilita, Colinas, Fredensborg, Pozo Blanco, Sion, Soller and Yauco series are similar soils in related families. The Naranjo soils are deeper and lack the hard fragmental limestone. The Aguilita soils are coarser textured and have more than 35 percent coarse fragments in their profiles. The Colinas soils are calcareous and are coarser texture over soft limestone. The Fredensborg, Pozo Blanco, Sion and Yauco soils are coarser textured and have ustic moisture regimes. The Soller soils are shallower to hard rock and have thinner sola.

**GEOGRAPHIC SETTING:** The Santa Clara soils are gently sloping to moderately steep soils on foot slopes and rounded limestone hills with slope gradients of 2 to 25 percent. They formed in moderately fine and fine textured residuum derived from limestone. The climate is humid tropical. The average annual precipitation ranges from 75 to 80 inches and the mean annual temperature is 76 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Camaguey, Colinas, Naranjo, San German, Soller, and Tanama. The Camaguey soils have thicker and darker A horizons, lack cambic horizons, have many slickensides and pressure phases, and are deeper. The Tanama soils are redder and have argillic horizons. The San German soils are coarser textured and lack B horizons.

**DRAINAGE AND PERMEABILITY:** Well drained, medium runoff, and moderate permeability.

**USE AND VEGETATION:** Sugarcane and pasture.

**DISTRIBUTION AND EXTENT:** Humid limestone areas of Puerto Rico. The series is of minor extent, with about 2,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Soil Survey of Puerto Rico; 1942.

**National Cooperative Soil Survey**  
**U. S. A.**

**LOCATION SANTA MARTA PR**

**Established Series  
REG/LHR; Rev. JLL/SRT  
06/2002**

## **SANTA MARTA SERIES**

**The Santa Marta series consists of moderately deep, well drained, moderately permeable soils on side slopes of serpentinite hills and mountains of the Humid Mountains and Valleys MLRA. They formed in material that weathered from serpentinite bedrock. Near the type location, the mean annual temperature is about 78 degrees F., and the mean annual precipitation is about 72 inches. Slopes range from 20 to 40 percent.**

**TAXONOMIC CLASS: Fine, magnesian, isohyperthermic Typic Kanhapludults**

**TYPICAL PEDON: Santa Marta gravelly clay loam - forestland (Colors are for moist conditions unless otherwise indicated.)**

**Ap--0 to 8 inches; dark brown (7.5YR 3/3) gravelly clay loam, brown (7.5YR 4/3) dry; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots, common coarse roots; many very fine and fine interstitial pores, few medium and coarse interstitial pores; about 20 percent, by volume, pebbles; neutral; clear wavy boundary. (5 to 9 inches thick.)**

**Bt1--8 to 21 inches; dark reddish brown (5YR 3/4) clay, reddish brown (5YR 4/4) dry; weak fine to medium subangular blocky structure; firm; slightly sticky, slightly plastic; common fine and medium roots, few coarse roots; common very fine and fine interstitial pores, few fine and medium tubular pores; common faint clay films on faces of peds and in pores; about 20 percent, by volume, paragravel; about 1 percent, by volume, paracobbles; slightly acid; clear wavy boundary.**

**Bt2--21 to 37 inches; dark reddish brown (5YR 3/4) very paragravelly clay, yellowish red (5YR 4/6) dry; weak medium subangular blocky structure; firm; slightly sticky, slightly plastic; common medium roots, few coarse roots; many very fine and fine interstitial pores few medium and coarse interstitial pores; few distinct clay films on faces of peds; about 50 percent, by volume, paragravels; about 2 percent, by volume, paracobbles; slightly acid; abrupt irregular boundary. (Combined thickness of the Bt horizons ranges from 15 to 31 inches)**

**Cr--37 to 57 inches; highly fractured serpentinite bedrock.**

**R--57+ inches; hard unconsolidated serpentinite bedrock.**

**TYPE LOCATION:** San German Municipality, Puerto Rico; approximately 1.0 mile northwest of the city of downtown San German from the intersection of P.R. Highway 102 and P.R. Highway 347; 0.5 miles northwest of the water company aqueduct at the Interamerican University-San German campus; about 300 feet north of paved road on forest land; San German quadrangle; lat. 18 degrees 05 minutes, 34 seconds N.; long. 67 degrees 03 minutes 21 seconds W.

**RANGE IN CHARACTERISTICS:** Solum thickness and depth to serpentinite ranges from 20 to 40 inches. Rock fragments include pebbles and cobbles composed of serpentinite. Reaction ranges from slightly acid to neutral throughout the profile.

The A or Ap horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 3 to 6. Texture is clay loam or clay in the fine-earth fraction. Content of pebbles and cobbles ranges from 5 to 20 percent, by volume.

The Bt horizons have hue of 2.5YR or 5YR, value of 3 and 4, and chroma of 4 to 6. Texture is clay loam or clay in the fine-earth fraction. Content of pebbles and cobbles range from 15 to 30 percent, by volume.

The Cr horizon is composed of highly fractured serpentinite. It can be excavated with hand tools.

The R horizon is composed of hard unconsolidated serpentinite bedrock. It is rippable by mechanized equipment.

**COMPETING SERIES:** There are no known series in the same family.

**GEOGRAPHIC SETTING:** Santa Marta soils are on side slopes of serpentinite hills and mountains of southern Puerto Rico. They formed in material that weathered from serpentinite bedrock. Slopes range from 20 to 40 percent. The climate is humid tropical. The average annual temperature ranges from 79 to 83 degrees F., and the average annual precipitation ranges from 78 to 82 inches.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These include the El Cacique (T), La Taina (T), Maresua, Nipe, and Rosario series. All of these soils are on similar positions. El Cacique soils are shallow to serpentinite. La Taina soils are skeletal. Maresua soils are fine-loamy. Nipe and Rosario soils are acid, redder, and have extremely weathered profiles. In

**addition, they are Oxisols.**

**DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.**

**USE AND VEGETATION: Most areas of Santa Marta soils are used for forestland, grazing, or as habitat for wildlife. The vegetation consists of Mahogany, Maricao doncella, and Algarrobo trees. The understory vegetation includes Cariaquillo, Leucaena, Arbol de navidad del pobre, and Carrasco shrubs, along with lamina and guinea grasses.**

**DISTRIBUTION AND EXTENT: Side slopes of humid serpentinite hills and mountains of southern Puerto Rico. The series is of minor extent.**

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama.**

**SERIES ESTABLISHED: San German Municipality, Puerto Rico, 1963. The name is from the Santa Marta hills, where it was originally recognized.**

**REMARKS: Diagnostic horizons and features recognized in this pedon:**

**Ochric epipedon - the zone from 0 to 8 inches (Ap horizon).**

**Argillic horizon - the zone from 8 to 37 inches (Bt1 and Bt2 horizons).**

**Paralithic contact - The contact at 37 inches (Cr horizon).**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION SANTONI      PR**

**Established Series  
REG-LHR  
06/2002**

## **SANTONI SERIES**

**The Santoni series have very dark grayish brown, fine textured, sticky and plastic, calcareous A horizons over fine textured, gley, calcareous B and C horizons.**

**TAXONOMIC CLASS**Fine, mixed, superactive, isohyperthermic Vertic Endoaquolls

**TYPICAL PEDON:** Santoni clay-sugar cane  
(Colors are for moist soil)

**Ap--0 to 7 inches; very dark grayish brown (2.5Y 3/2) clay; weak coarse subangular blocky structure; hard, very firm, sticky, plastic; many fine roots; few pressure faces; strong effervescence; abrupt smooth boundary. 5 to 9 inches thick.**

**A12--7 to 12 inches; very dark grayish brown (2.5Y 3/2) clay with many medium faint olive brown (2.5Y 4/2) and common fine prominent yellowish red (5YR 5/8) mottles; weak coarse subangular blocky structure; firm, sticky, plastic; common fine roots common pressure faces; strong effervescence; clear smooth boundary. 5 to 7 inches thick.**

**B2g--12 to 18 inches; mixed colors; gray (5Y 7/1), olive brown (2.5Y 4/4), dark grayish brown (2.5Y 4/2), and few fine prominent dark reddish brown (5YR 3/4) mottless; crushed color dark grayish brown (2.5Y 4/2) clay; weak coarse subangular blocky structure; firm, sticky, plastic; few fine roots; common pressure faces; black stains due to root decay; strong effervescence; clear wavy boundary. 5 to 7 inches thick.**

**C1g--18 to 29 inches; gray (5Y 5/1) clay with common medium prominent olive brown (2.5Y 4/4) mottles; massive; firm, sticky, plastic; few fine roots; common pressure faces; few fine calcareous fragments; slight effervescence; gradual wavy boundary. 9 to 12 inches thick.**

**C2g--29 to 38 inches; mixed colors: dark gray (5Y 4/1), gray (5Y 5/1) olive brown (2.5Y 4/4), brownish yellow ( 10YR**

**6/6), crushed color olive (5Y 4/3) clay; massive; firm, sticky, plastic; few fine calcareous fragments; slight effervescence; gradual wavy boundary. 7 to 10 inches thick.**

**C3g--38 to 54 inches; dark gray (5Y 4/1) clay with common medium prominent olive brown (2.5Y 4/4) mottles; massive; firm, sticky, plastic; slight effervescence; gradual wavy boundary. 12 to 18 inches thick.**

**C4g--54 to 61 inches plus; mixed colors; dark gray (5Y 4/1), yellowish brown (10YR 5/6), greenish gray (5BG 6/1), crushed color olive brown (2.5Y 4/4) clay; massive; firm, sticky, plastic; slight effervescence.**

**TYPE LOCATION: Culebrinas SCD, Puerto Rico; 2 miles west of the town of Moca, 200 meters south of kilometer marker 1.9 of highway #111.**

**RANGE IN CHARACTERISTICS: Depth to the gley colors ranges from 10 to 16 inches, and to the water table from 20 to 36 inches. Texture of the soil is clay throughout. Consistency when wet is always sticky and plastic. Effervescence with dilute HCL varies from strong to slight and decreases with depth.**

**Colors of the A horizons are in hues of 2.5Y and 10YR, values of 3 and chromas of 1 and 2.**

**Colors of the B and C horizons have dominantly low chromas and yellowish to bluish hues. Pressure faces vary from common to many. Cracks can be seen in these soils during dry season and the COLE value for the upper 30 inches is more than 0.09.**

**COMPETING SERIES: This is the Bajura Series in the same Subgroup and the Perchas, Maunabo, Vayas, Fortuna, Playa, Josefa, Talante, Coloso, Corcega and Pinones series in the same Great Group. The Bajura soils are not calcareous. The Perchas and Maunabo soils are more acid throughout their profiles. The Vayas and Fortuna soils do not have clays with shrink and swell behavior. The Playa soils are underlaid by sandy sediments within the control section. The Josefa, Talante and Corcega soils have coarser textured profiles and are better drained. The Coloso soils are not calcareous and have brighter colors in the upper profile. The Pinones soils are underlaid by organic horizons within 40 inches of the surface.**

**GEOGRAPHIC SETTING: The Santoni soils occur on nearly level river flood plains on slope gradients between 0 and 2 percent. These flood plains are associated with overlying limestone hills which recharge the soil with carbonates. The regolith consists of fine textured sediments derived from limestone and volcanic hills. The climate is humid tropical. The average annual precipitation is 84 inches and the mean annual temperature is 78 degrees F. Average yearly soil temperature at 20 inches depth is over 71.6 degrees F and the difference between mean summer and winter temperatures**

is less than 9 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Coloso and Bajura series in addition to the Toa and Dique series. Toa and Dique soils occur on similar river flood plains but at slightly higher positions. These two soils are coarser textured and better drained.

**DRAINAGE AND PERMEABILITY:** Poorly drained, slow runoff and slow permeability.

**USE AND VEGETATION:** Most of the acreage is planted to sugar cane. Small undrained areas are in native pasture.

**DISTRIBUTION AND EXTENT:** Humid river flood plains of Puerto Rico. The series is of limited extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Culebrines SCD, Puerto Rico, name is for a "barrio" near to where the series was first recognized in northwestern Puerto Rico.

**REMARKS:** The soil was formerly mapped in the Coloso series, from which it differs in being more poorly drained and in being calcareous.

National Cooperative Soil Survey  
U.S.A.

**LOCATION SOLLER            PR**

**Established Series  
Rev. LHR:REG  
06/2002**

## **SOLLER SERIES**

**The Soller series consists of moderately, deep, well drained soils formed in materials weathered from limestone. They are gently sloping to very steep soils on side slopes and hilltops in the humid limestone area. They are clay or clay loam, dark colored, calcareous in the A and B horizons over partially weathered limestone. Hard, fragmental limestone is at 26 inches.**

**TAXONOMIC CLASS: Clayey, mixed, active, isohyperthermic, shallow Typic Haprendolls**

**TYPICAL PEDON: Soller clay - pasture.  
(Colors are for moist soil.)**

**Ap--0 to 5 inches; very dark gray (10YR 3/1) clay; weak fine and medium subangular blocky structure; firm, slightly sticky, plastic; many fine roots; moderately alkaline; clear smooth boundary. (4 to 6 inches thick)**

**B--5 to 12 inches; very dark grayish brown (10YR 3/2) clay; moderate coarse subangular blocky structure; firm, slightly sticky, plastic; few fine roots; moderately alkaline; clear smooth boundary. (6 to 12 inches thick)**

**C--12 to 26 inches; white (10YR 8/1) partially weathered limestone that can be penetrated with the spade. (10 to 16 inches thick)**

**R--26 plus inches; hard fragmental limestone.**

**TYPE LOCATION: Culebrinas SCD, Puerto Rico; 4 miles west of the town of Laras; 350 meters north of kilometer marker 28.45 on Highway 111.**

**RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 10 to 20 inches. Depth to the hard**

fragmental limestone varies from 20 to 34 inches. Some pedons have up to 30 percent cobbles in the surface. Reaction of the solum is neutral to moderately acid. It is slightly sticky or sticky and plastic. Calcium carbonate equivalent in the solum is more than 40 percent. The mean annual soil temperature ranges from 76 to 78 degrees F.

The A horizon has hues of 10YR, values of 2 or 3, and chromas of 1 or 2. Structure is weak fine or medium granular of subangular blocky.

The B horizon has hues of 10YR, values of 3 or 4, and chromas of 2 to 4. Structure ranges from weak medium to moderate coarse subangular blocky.

**COMPETING SERIES:** There are no other known series in the same family. The Aguilita, Binnsville, Castalia, Colinas, Fredensborg, Hesselberg, Otaway, Pedlar, Pozo Blanco, Redmanson, Sheege, Sion, Snowy, Tumbez, Tugur, Urtah, and Yauco. The Aguilita, Fredensborg, Hesselberg, Pozo Blanco, Sion, Tugur, and Yauco soils do not have cambic horizons and have ustic moisture regimes. The Binnsville, Castalia, Otaway, Redmanson, Sheege, Snowy, Tumbez and Urtah soils have colder soil temperatures and do not occur in the tropics. The Colinas soils have coarser textured sola and carbonatic mineralogy. The Pedlar soils have colder soil temperatures and have hard rock within 20 inches.

**GEOGRAPHIC SETTING:** The Soller soils occur on gently sloping to very steep hilltops and side slopes of limestone hills with slope gradients of 2 to 60 percent. The regolith consists of fine textured residuum derived from limestone. The climate is humid tropical. The average annual precipitation ranges from 80 to 90 inches and the mean annual temperature is 78 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing Santa Clara, Naranjo, and Colinas series in addition to the Canaguey series and the land type Limestone Outcrop. The Canaguey soils have thick A horizons, lack cambic horizons, and have slickensides and pressure phases. The land type Limestone Outcrops have 75 percent or more of the surface area covered by rock outcrops.

**DRAINAGE AND PERMEABILITY:** Well drained, runoff is medium to rapid and permeability is moderate.

**USE AND VEGETATION:** Native pasture and brushes.

**DISTRIBUTION AND EXTENT:** Humid limestone areas in the northern coastal plains of Puerto Rico. The series is of moderate extent, about 65,000 acres.

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama**

**SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.**

**National Cooperative Soil Survey**

**U. S. A.**

**LOCATION TALANTE            PR**

**Established Series  
Rev. RAB-WEM  
06/2002**

## **TALANTE SERIES**

**The Talante series have moderately fine textured brown to grayish-brown mottled A horizons, medium textured gleyed B horizons and coarse textured gleyed C horizons.**

**TAXONOMIC CLASS: Coarse-loamy over sandy or sandy-skeletal, mixed, subactive, acid, isohyperthermic Aeric Fluvaquents**

**TYPICAL PEDON: Talante clay loam (Colors are for moist soil unless otherwise noted).**

**Apg-- 0 to 4 inches; dark brown (10YR 4/3) clay loam, many medium distinct gray (10YR 5/1) and brown (7.5YR 4/4) mottles; weak fine subangular blocky structure breaking to granular structure; friable, slightly plastic; very strongly acid; clear smooth boundary. (6 to 10 inches thick.)**

**Alg--4 to 10 inches; grayish-brown (10YR 5/2) sandy clay loam, many medium prominent dark gray (5Y 4/1) and yellowish-red (5YR 4/8) mottles; structureless, massive; friable, slightly plastic; many mica flakes; strongly acid; clear smooth boundary. (4 to 10 inches thick.)**

**Blg-- 10 to 18 inches; brown (10YR 5/3) light loam, many medium prominent gray (5Y 5/1) and brown (7.5YR 4/4) mottles; structureless, massive; friable; strongly acid; clear smooth boundary. (6 to 12 inches thick.)**

**IIC1g--18 to 40 inches; mixed brown (7.5YR 4/4) and gray (5Y 5/1) loamy sand; structureless, massive; very friable; strongly acid; clear smooth boundary. (14 to 25 inches thick.)**

**IIC2g--40 to 58 inches; gray (2.5Y 5/1) coarse sand, many medium prominent yellowish-brown (10YR 5/6) mottles; structureless, single grain; loose; strongly acid.**

**TYPE LOCATION:** Yabucoa, Puerto Rico; 1000 meters northeast of Central Roig and 600 feet north of the Guayanes River.

**RANGE IN CHARACTERISTICS:** Color of the Ap horizon ranges from very dark grayish-brown (10YR 3/2) to yellowish-brown (10YR 5/3) and has common to many gray (10YR 5/1), dark brown (7.5YR 4/4), dark gray (5Y 4/1), yellowish-red (5YR 4/8) or dark reddish-brown (5YR 3/4) mottles. Texture of the Ap horizon ranges from sandy clay loam to clay loam.

Color of the upper part of control section ranges from grayish-brown (10YR 5/2) to brown (10YR 5/3) and contains common to many dark gray (5Y 4/1) to gray (5Y 5/1) mottles. Texture ranges from sandy loam to loam.

The IIC horizon ranges in color from dark brown (10YR 3/3-7YR 4/4), brown (10YR 5/3), gray (2.5YR 5/1) to dark greenish-gray (5BG 4/1) and contains common to many reddish-brown (5YR 4/6), dark reddish-brown (5YR 3/4), brownish-yellow (10YR 6/8) or dark bluish-gray (5B 4/1) mottles. Texture of the IIC horizons range from sandy loam to loam. Depth to water table ranges from 20 to 40 inches.

**COMPETING SERIES:** To date no other soils that are closely related taxonomically have been recognized.

**GEOGRAPHIC SETTING:** The Talante soils are on nearly level flood plains having slope of 0 to 1 percent. The regolith is medium to coarse textured sediments derived from granitic rock. The climate is humid tropical. Average annual precipitation is 87 inches, and the average annual temperature is 79 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are in the Fortuna, Josefa, Maunabo, Reilly, Vivi and Yabucoa soils, which have formed in somewhat similar sediments. The Maunabo and Fortuna soils are similar in color and drainage but are finer textured. The Josefa soils are somewhat poorly drained; they have higher chroma mottles, finer texture and are on slightly higher topographic positions. The Yabucoa soils are brighter colored and moderately fine textured soils. The Reilly soils are shallow gravelly soils and are on levees along the streams. The Vivi soils are deep and well drained and are on higher well drained topographic positions on the level flood plains.

**DRAINAGE AND PERMEABILITY:** Poorly drained. Runoff is slow, and permeability is moderate.

**USE AND VEGETATION:** Most of the soil is cultivated and used for growing sugar cane.

**DISTRIBUTION AND EXTENT:** In the humid parts of Puerto Rico. The series is of small extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED:** Puerto Rico, 1932

**REMARKS:** The Talante series was formerly classified in the Low Humic-Gley great soil group.

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION TANAMA            PR**

**Established Series  
Rev. BCD  
08/2000**

## **TANAMA SERIES**

**The Tanama series consists of shallow, well drained, moderately permeable soils formed in materials weathered from limestone. They are gently sloping to very steep soils on foot slopes and side slopes of limestone hills. Slopes range from 2 to 60 percent. The mean annual precipitation is about 70 inches and the mean annual temperature is about 76 degrees F.**

**TAXONOMIC CLASS: Clayey, mixed, active, isohyperthermic Lithic Hapludalfs**

**TYPICAL PEDON: Tanama clay - sugarcane. (Colors are for moist soil.)**

**Ap--0 to 4 inches; dark reddish brown (5YR 3/4) clay; moderate fine and medium granular structure; firm, slightly sticky, plastic; many fine roots; common fine and medium limestone fragments; slightly acid; clear smooth boundary. (3 to 5 inches thick)**

**Bt1--4 to 11 inches; reddish brown (5YR 4/4) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; few faint clay films; slightly acid; abrupt wavy boundary. (5 to 9 inches thick)**

**Bt2--11 to 16 inches; reddish brown (5YR 5/4) clay with reddish brown (5YR 4/4) coatings in exterior of peds; moderate medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; few faint clay films; slightly acid. (4 to 6 inches thick)**

**R--16 inches; hard limestone.**

**TYPE LOCATION: Noroeste SCD, Puerto Rico; 2 miles southwest of the town of Aguada. 1.2 miles on dirt road west of kilometer marker 24.9 on Highway 115 (old Highway 2).**

**RANGE IN CHARACTERISTICS: Thickness of the solum and depth to the hard limestone ranges from 12 to 20**

**inches. Texture is clay in the whole profile. Consistence is slightly sticky and plastic throughout. Reaction ranges from slightly acid to neutral. The mean annual soil temperature is 75 degrees F.**

**The A horizon has hues of 5YR or 7.5YR, values and chromas of 3 or 4. Structure is weak or moderate, fine and medium granular.**

**The Bt horizon has hues of 5YR or 2.5YR, values of 3 or 5, and chromas of 4 to 6. Structure is moderate fine or medium subangular blocky. Clay films range from few faint to many distinct.**

**COMPETING SERIES:** There are no other known series in the same family. The Caracoles, Islote, Juncal, Rio Lajas, San German, San Sebastian and Teja series are similar soils in related families. The Caracoles, San German, and Teja soils lack B horizons. The Islote soils are deeper to the calcareous sandstone. The Juncal soils have thicker argillic horizons. The Rio Lajas soils are sandy throughout. The San Sebastian are calcareous and have more than 35 percent coarse fragments in their profiles.

**GEOGRAPHIC SETTING:** The Tanama soils are gently sloping to very steep soils on foot slopes and side slopes of limestone hills with slope gradients of 2 to 60 percent. They formed in fine textured residuum derived from limestone. The climate is humid tropical. The average annual precipitation is 70 inches and the mean annual temperature is 76 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the competing San Sebastian and the San German series. The San Sebastian soils are deeper, very gravelly and calcarous. The San German soils are shallower, calcareous, and lack argillic horizon.

**DRAINAGE AND PERMEABILITY:** Well drained, medium to rapid runoff, and moderate permeability.

**USE AND VEGETATION:** Gentler slopes are in sugarcane. Steeper slopes are in pasture and brush. Small areas are in food crops.

**DISTRIBUTION AND EXTENT:** Along the north coastal plains of Puerto Rico. The series is of moderate extent, with about 75,000 acres.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama

**SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.**

**REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Lithic Tropudalfs to Clayey, mixed, isohyperthermic Lithic Hapludalfs. The previous OSED date was 11/75.**

**Diagnostic horizons and features recognized in this pedon:**

**Ochric epipedon - zone from 0 to 4 inches (Ap horizon)**

**Argillic horizon - zone from 4 to 16 inches (Bt horizons)**

**Lithic contact - zone at 16 inches (R layer)**

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION TOA            PR**

**Established Series  
Rev. JLL/GRB  
06/2002**

## **TOA SERIES**

**The Toa series consists of very deep, well drained, moderately permeable soils are on river flood plains. They formed in stratified alluvial sediments of mixed origin. Near the type location, the mean annual temperature is about 78 degrees F., and the mean annual precipitation is about 70 inches. Slopes range from 0 to 2 percent.**

**TAXONOMIC CLASS: Fine, mixed, active, isohyperthermic Fluvaquentic Hapludolls**

**TYPICAL PEDON: Toa silty clay loam - sugarcane. (Colors are for moist conditions.)**

**Ap--0 to 8 inches; dark brown (10YR 3/3) silty clay loam; weak fine granular structure; friable; slightly sticky, slightly plastic; common fine roots; many fine sand grains; about 3 percent, by volume, volcanic fragments 1/4 to 1/2 inch in diameter; strongly acid; clear smooth boundary.**

**A--8 to 17 inches; dark brown (10YR 3/3) silty clay loam; weak medium subangular blocky structure, parting to weak fine granular; friable; slightly sticky, slightly plastic; few fine roots; common fine black (10YR 2/1) nodules; neutral; clear smooth boundary. (Combined thickness of the Ap and A horizons ranges from 12 to 20 inches)**

**Bw--17 to 29 inches; dark yellowish brown (10YR 3/4) silty clay loam; weak medium and coarse subangular blocky parting to weak fine subangular blocky; friable; slightly sticky, slightly plastic; few fine roots, few fine vesicular pores, common fine black (10YR 2/1) nodules; few fine distinct dark brown (7.5YR 4/4) masses of iron accumulation; slightly alkaline; clear smooth boundary. (8 to 15 inches thick)**

**BC--29 to 43 inches; dark brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine roots; few brick fragments found at the top of this horizon; few fine distinct reddish brown (5YR 5/3) masses of iron accumulation; slightly alkaline; clear smooth boundary. (0 to 15 inches thick)**

**C--43 to 64 inches; dark yellowish brown (10YR 4/4) clay loam; massive; friable; slightly sticky, slightly plastic; few fine black (10YR 2/1) nodules; few fine faint yellowish brown (10YR 5/6) masses of iron accumulation; few fine faint light gray (10YR 7/1) areas of iron depletions; slightly alkaline.**

**TYPE LOCATION:** Suroeste SCD, Puerto Rico. Approximately 0.9 mile southwest of the Lavadero community from the intersection of P.R. Hwy. 2 and P.R. Hwy. 345, about 2,300 feet south of P.R. Hwy. 345 on dirt road from the intersection of the highway at the kilometer marker 2.5, and about 650 feet east of road in sugarcane field. Rosario topographic quadrangle; lat. 18 degrees 07 minutes 31 seconds N., long. 67 degrees 06 minutes 47 seconds W.; PRD 1940.

**RANGE IN CHARACTERISTICS:** Solum thickness ranges from 20 to 35 inches. Thickness of the mollic epipedon ranges from 12 to 20 inches. Reaction ranges from strongly acid to neutral in the Ap and A horizons, and from neutral to slightly alkaline in the Bw, BC, and C horizons. Organic carbon does not decrease regularly with depth. Fragments of volcanic rock ranges from 0 to 5 percent, by volume, throughout the profile.

The Ap or A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is silty clay loam or silty clay. Fine volcanic fragments range from 0 to 5 percent, by volume.

The Bw horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is silty clay loam or clay loam. Redoximorphic features in shades of brown range from none to common.

The BC horizon, where present, has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Texture is silty clay loam or clay loam. Redoximorphic features in shades of brown range from none to common.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Texture is silty clay loam or clay loam. Redoximorphic features in shades of brown and gray range from few to many. Texture is silty clay loam or clay loam. Lenses of sand may be present.

**COMPETING SERIES:** There are no other known series in the same family.

**GEOGRAPHIC SETTING:** Toa soils are on river flood plains. They formed in sediments of mixed origin. Slopes range from 0 to 2 percent. The climate is humid tropical. The average annual air temperature ranges from 77 to 79 degrees F., and the average annual precipitation ranges from 60 to 82 inches.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These include the Bajura, Coloso, Dique, Reilly, and Vivi series. All of these soils are in flood plain positions. Bajura, Coloso, and Dique soils lack mollic epipedons. In addition, Bajura soils are poorly drained, Coloso soils are somewhat poorly drained, and Dique soils have fine-loamy control sections. The excessively drained Reilly soils have sandy-skeletal control sections. The somewhat excessively drained Vivi soils have coarse-loamy control sections.

**DRAINAGE AND PERMEABILITY:** Well drained; moderate permeability.

**USE AND VEGETATION:** Most areas of Toa soils are used for the production of sugarcane. Some areas are in tame grasses and used for pasture. Vegetation consists of native and introduced species.

**DISTRIBUTION AND EXTENT:** Humid river flood plains of Puerto Rico. The series is of moderate extent.

**MLRA OFFICE RESPONSIBLE:** Auburn, Alabama.

**SERIES ESTABLISHED:** Soil Survey of Puerto Rico; 1942.

**MLRA:** 272, 273.

**National Cooperative Soil Survey  
U.S.A.**

**LOCATION VOLADORA      PR**

**Established Series  
Rev. REG:LHR  
06/2002**

## **VOLADORA SERIES**

**The Voladora series is well drained moderately permeable on terraces and alluvial fans. These soils have dark reddish brown or dark red extremely acid fine textured A and B horizons over moderately fine textured conglomerate of varying colors.**

**TAXONOMIC CLASS: Very-fine, mixed, active, isohyperthermic Typic Palehumults**

**TYPICAL PEDON: Voladora clay - sugarcane.  
(Colors are for moist soil.)**

**Ap--0 to 8 inches; dark reddish brown (5YR 3/4) clay; moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; volcanic rock fragments; numerous krotovinas; extremely acid; clear smooth boundary. (6 to 10 inches thick)**

**B2t--8 to 16 inches; dark reddish brown (2.5YR 3.4) moist, red (2.5YR 4/6) dry clay with organic staining along root channels; moderate medium subangular blocky structure; friable, slightly sticky, plastic; thin patchy clay films; common fine roots; extremely acid; clear smooth boundary. (6 to 12 inches thick)**

**B3--16 to 26 inches; dark red (2.5YR 3/6) moist, red (2.5YR 4/8) dry clay loam; weak medium subangular blocky structure; friable, slightly sticky, plastic; thin patchy clay films; few fine roots; many fine weathered yellow sand grains; extremely acid; gradual wavy boundary. (12 to 18 inches thick)**

**C--26 to 48 inches; mixed colors, red (2.5YR 4/8), very pale brown (10YR 7/4), and brownish yellow (10YR 6/6) highly weathered conglomerate; clay loam with original rock structure visible; massive; friable, slightly sticky, plastic; extremely acid.**

**TYPE LOCATION:** Culebrinas SCD, Puerto Rico; 3 miles east of the town of Moca; 0.2 kilometers west on dirt road from kilometer marker 1.1 on Highway 420; 300 feet south of dirt road.

**RANGE IN CHARACTERISTICS:** Thickness of the solum ranges from 24 to 40 inches. Thickness of the argillic horizon varies from 18 to 30 inches. Reaction is strongly to extremely acid throughout. Consistence is slightly sticky, slightly plastic or plastic. Base saturation (by sum of cations) is 20 to 30 percent below the upper part of the argillic horizon. Organic carbon ranges from 0.6 to 0.8 in the upper 6 inches of the argillic horizon. The mean annual soil temperature is 70 degrees F.

The A horizon has hue of 5YR or 2.5YR, value of 3 and chroma of 3 or 4. It is clay. Structure is weak or moderate, fine or medium granular. Fine volcanic fragments range from 2 to 5 percent.

The B horizons have hues of 2.5YR or 10R, values of 3 or 4, and chromas of 4 to 8. Texture is clay. Structure is weak or more moderate, fine or medium subangular blocky.

The C horizons consists of clay loam or silty clay loam, weathered conglomerate of variegated colors.

**COMPETING SERIES:** There are no other known series in the same family. The Almirante, Bejucos, Cabo Rojo, Cidral, Consejo, Consumo, Corozal, Corozo, Espinosa, Guanajibo, Guerrero, Ingenio, Jagueyes, Jobos, Lirios, Maleza, Maricao, Patillas, Rio Piedras, and Vega Alta series are similar soils in related families. The Almirante, Guanajibo, Guerrero, Jobos, and Vega Alta soils have plinthite in their profiles. The Bejucos, Cidral, Consejo, Corozo, Espinosa, Ingenio, Jagueyes, Lirios, Maleza, and Rio Piedras soils all have dry color values of 5 or more in the argillic horizon and change more than 1 unit of value from dry to moist colors. The Cabo Rojo soils have thicker argillic horizons. The Consumo, Maricao and Patillas soils have thinner argillic horizons. The Corozal soils have low chroma mottles in their profile.

**GEOGRAPHIC SETTING:** The Voladora soils are sloping to steep soils on dissected terraces and alluvial fans on slope gradients of 5 to 40 percent. They formed in fine and moderately fine textured residuum of highly weathered conglomerate. The climate is humid tropical. The average annual precipitation is 80 inches and the mean annual temperature is 78 degrees F.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Moca, Perchas and Plata series. The Moca soils are deeper, more plastic throughout and lack the weathered conglomerate. The Perchas soils are poorly drained. The Plata

**soils are lighter colored, shallower, and lack argillic horizons.**

**DRAINAGE AND PERMEABILITY: Well drained; runoff is medium; permeability is moderate.**

**USE AND VEGETATION: Sugarcane in gentler slopes, pasture in the steeper ones.**

**DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of minor extent, with about 16,000 acres.**

**MLRA OFFICE RESPONSIBLE: Auburn, Alabama**

**SERIES ESTABLISHED: Culebrinas SCD, Puerto Rico; 1979.**

**National Cooperative Soil Survey  
U. S. A.**