



Supplement of

Soil carbon, nitrogen, and phosphorus storage in juniper–oak savanna: role of vegetation and geology

Che-Jen Hsiao et al.

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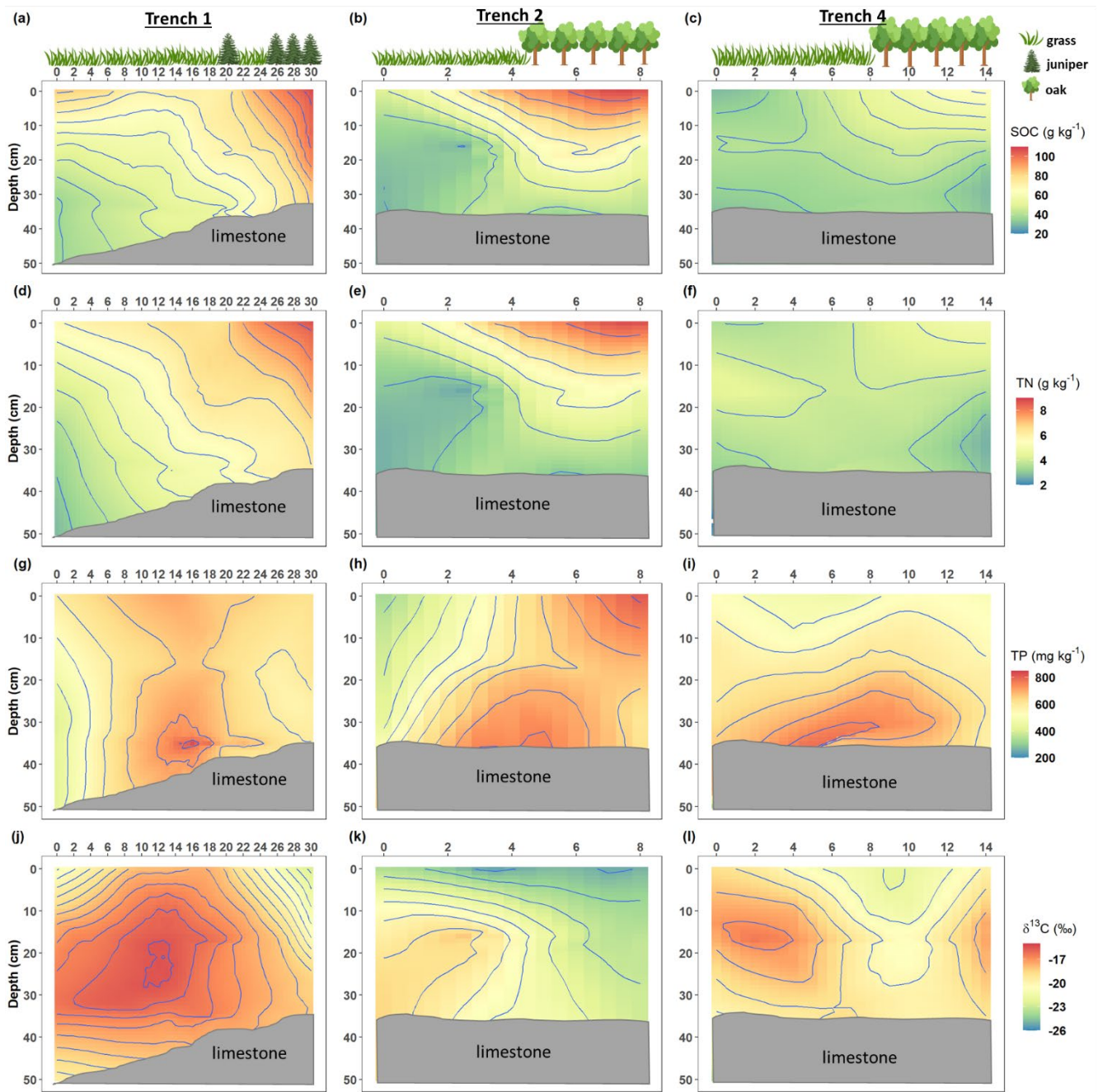





Figure S1. Contour maps of (a, b, c) soil organic carbon (SOC), (d, e, f) total nitrogen (TN), (g, h, i) total phosphorus (TP), and (j, k, l) $\delta^{13}\text{C}$ along trench faces in soil lying atop Edwards limestone. The X-axis denotes the location (m) along each individual trench. Vegetation occurring at specific locations along the trench faces is represented with the following symbols: grass () , juniper () , and oak () .

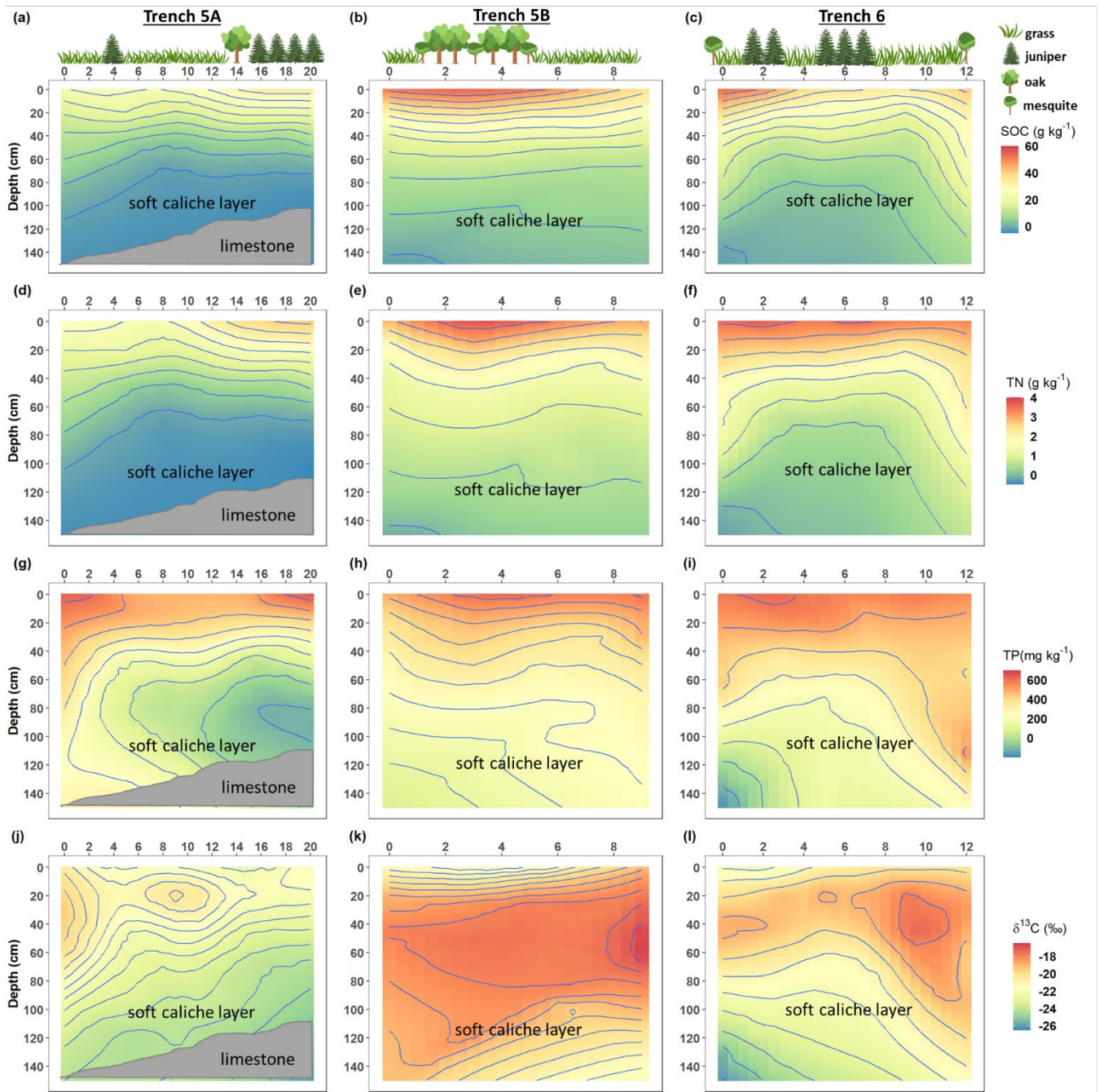
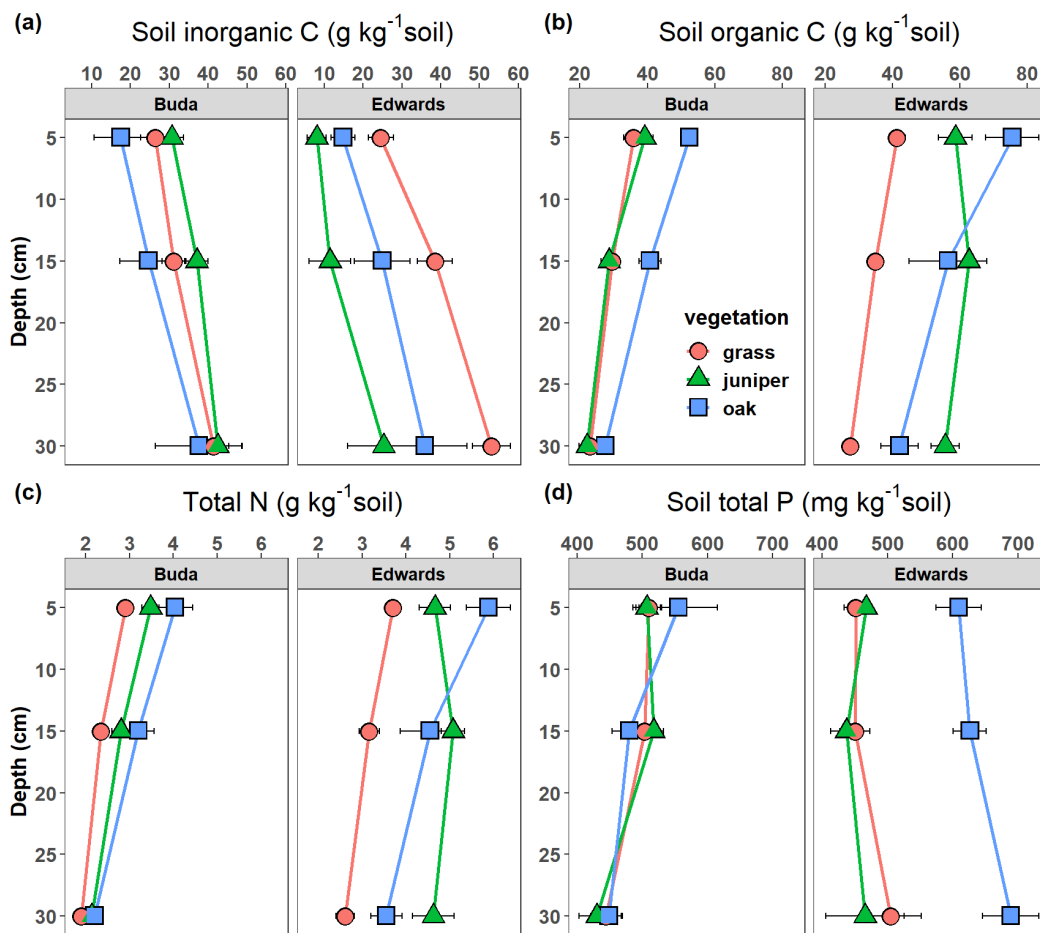


Figure S2. Contour maps of (a, b, c) soil organic carbon (SOC), (d, e, f) total nitrogen (TN), (g, h, i) total phosphorus (TP), and (j, k, l) $\delta^{13}\text{C}$ along trench faces in soil lying atop Buda limestone. The X-axis denotes the location (m) along each individual trench. Vegetation occurring at specific locations along the trench faces is represented with the following symbols: grass (grass icon), juniper (juniper icon), oak (oak icon), and mesquite (mesquite icon).



Figure S3. Trench 5A (a) and Trench 6 (b) in Buda soil at Texas A&M AgriLife Sonora Research Station on the Edwards Plateau, Texas. The yellow-whitish layer of Trench 5 is unconsolidated paralithic (Cr) layer weathered from limestone. The gray fractured layer between A and Cr horizons in Trench 6 is petrocalcic (Bkkm) horizon.

15



20 **Figure S4.** The vertical distributions of (a) soil inorganic C, (b) SOC, (c) total N, and (d) total P concentrations beneath grass, juniper, and oak in soils derived from the Buda vs. Edwards formations. Results are given as means \pm standard errors. Data are plotted at the midpoints of the depth increments.

Table S1. ANOVA results for effects of soil depth, vegetation, geology, and their interactions on soil organic carbon (SOC), total nitrogen (TN), total phosphorous (TP), and soil inorganic carbon (SIC) concentrations. Asterisks label the significant changes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ns, non-significant.

	SOC	TN	TP	SIC
	(g kg ⁻¹ soil)			
Depth (D)	***	***	ns	***
Vegetation (V)	***	***	ns	***
Geology (G)	***	***	ns	ns
D \times V	ns	*	ns	ns
D \times G	ns	ns	ns	ns
V \times G	**	ns	*	***
D \times V \times G	*	ns	ns	ns

25

Soil Pedon Descriptions

PEDON DESCRIPTION (Trench 1, location 5 m)**Print Date:** Jun 11 2019**Description Date:** Mar 13 2019**Describer:** Ashley Anderson, Travis Waiser, Geraldine Vega**Site ID:** S2019TX1370007**Pedon ID:** S2019TX1370007**Site Note:****Pit Location:****Pedon Note:****Lab Source ID:****Lab Pedon #:****User Transect ID:****Soil Name as Described/Sampled:** Harper**Classification:** Clayey, smectitic, thermic Lithic Haplustolls**Soil Name as Correlated:****Classification:****Pedon Type:** undefined observation**Pedon Purpose:** research site**Taxon Kind:** family**Associated Soils:****Physiographic Division:****Physiographic Province:****Physiographic Section:****State Physiographic Area:****Local Physiographic Area:****Geomorphic Setting:** on footslope of base slope of ridge on dissected plateau**Upslope Shape:** concave**Cross Slope Shape:** linear**Country:****State:** Texas**County:** Edwards**MLRA:** 81B -- Edwards Plateau, Central Part**Soil Survey Area:** TX607 -- Edwards and Real Counties, Texas**Soil Survey Area:** TX607 -- Edwards and Real Counties, Texas**Map Unit:****Quad Name:** Dunbar Draw SE, Texas**Std Latitude:** 30.2895833**Std Longitude:** -100.5594333**Latitude:** 30 degrees 17 minutes 22.50 seconds north**Longitude:** 100 degrees 33 minutes 33.96 seconds west**Datum:** WGS84**UTM Zone:** 14**UTM Easting:** 350026 meters**UTM Northing:** 3351904 meters**Primary Earth Cover:****Secondary Earth Cover:****Existing Vegetation:** algerita, live oak, redberry juniper, slim tridens, Texas persimmon, Texas wintergrass**Parent Material:** alluvium derived from limestone**Bedrock Kind:****Bedrock Depth:****Bedrock Hardness:****Bedrock Fracture Interval:**

Particle Size Control Section: 25 to 44 cm.

Description origin: NASIS

Surface Fragments:

Description database:

MLRA09_Temple

Diagnostic Features: mollic epipedon 0 to 18 cm.
cambic horizon 18 to 44 cm.
lithic contact 44 to cm.

Top Depth (cm)	Bottom Depth (cm)	Restriction Kind	Restriction Hardness
44		bedrock, lithic	Indurated

Cont. Site ID: S2019TX1370007

Pedon ID: S2019TX1370007

40

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
	675.7									

45

A--0 to 18 centimeters (0.0 to 7.1 inches); silty clay, very dark brown (10YR 2/2), moist; moderate fine granular structure; slightly hard, friable; common very fine roots throughout and common fine roots throughout; 4 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; strong effervescence, by HCl, 1 normal; gradual smooth boundary.

50

Bw--18 to 44 centimeters (7.1 to 17.3 inches); silty clay, brown (10YR 4/3), moist; weak medium subangular blocky, and moderate fine subangular blocky structure; slightly hard, friable; common very fine roots throughout and common fine roots throughout; 7 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; abrupt smooth boundary.

R--44 centimeters (17.3 inches); bedrock; .

55

PEDON DESCRIPTION (Trench 1, location 17 m)

Print Date: Jun 11 2019

Description Date: Mar 13 2019

Describer: Ashley Anderson, Travis Waiser, Geraldine Vega

Site ID: P2019TX1370005

Pedon ID: P2019TX1370005

Site Note:

Pit Location:

Pedon Note:

Lab Source ID:

Lab Pedon #:

User Transect ID:

Soil Name as Described/Sampled: Prade

Classification: Clayey-skeletal, smectitic, thermic, shallow Petrocalcic Calciustolls

Soil Name as Correlated:

Classification:

Pedon Type: undefined observation

Pedon Purpose: research site

Taxon Kind: family

Associated Soils:

Physiographic Division:

Physiographic Province:

Physiographic Section:

State Physiographic Area:

Local Physiographic Area:

Geomorphic Setting: on backslope of side slope of ridge on dissected plateau

Upslope Shape: linear

Cross Slope Shape: linear

Country:

State: Texas

County: Edwards

MLRA: 81B -- Edwards Plateau, Central Part

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Map Unit:

Quad Name: Dunbar Draw SE, Texas

Std Latitude: 30.2895667

Std Longitude: -100.5593000

Latitude: 30 degrees 17 minutes 22.44 seconds north

Longitude: 100 degrees 33 minutes 33.48 seconds west

Datum: WGS84

UTM Zone: 14

UTM Easting: 350038 meters

UTM Northing: 3351902 meters

Primary Earth Cover:

Secondary Earth Cover:

Existing Vegetation: cedar sedge, hairy wedelia, purple threeawn, redberry juniper, Texas bluebonnet

Parent Material: residuum weathered from limestone

Bedrock Kind:

Bedrock Depth:

Bedrock Hardness:

Bedrock Fracture Interval:

Particle Size Control Section: 0 to 34 cm.

Surface Fragments: 25.0 percent nonflat subangular indurated 2- to 75-millimeter Limestone fragments and 15.0 percent nonflat subangular indurated 75- to 250-millimeter Limestone fragments

Description origin: NASIS

Description database:
MLRA09_Temple

Diagnostic Features: mollic epipedon 0 to 34 cm.
petrocalcic horizon 34 to 65 cm.
lithic contact 65 to cm.

Top Depth (cm)	Bottom Depth (cm)	Restriction Kind	Restriction Hardness
34	65	petrocalcic	Strongly cemented
65		bedrock, lithic	Indurated

60

Cont. Site ID: P2019TX1370005

Pedon ID: P2019TX1370005

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
	676.7									

65

A--0 to 14 centimeters (0.0 to 5.5 inches); gravelly clay, black (10YR 2/1), moist; moderate fine granular structure; slightly hard, friable; common very fine roots throughout and few medium roots throughout and common fine roots throughout; 5 percent nonflat subangular indurated 75 to 250-millimeter Limestone fragments and 12 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear smooth boundary.

70

Bw--14 to 34 centimeters (5.5 to 13.4 inches); very dark grayish brown (10YR 3/2) very gravelly clay, very dark brown (10YR 2/2), moist; moderate fine granular structure; slightly hard, friable; common very fine roots throughout and common medium roots throughout and common fine roots throughout; 20 percent nonflat subangular indurated 75 to 250-millimeter Limestone fragments and 35 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; abrupt wavy boundary.

75

Bkkm--34 to 65 centimeters (13.4 to 25.6 inches); material; few very fine roots throughout and few fine roots throughout; abrupt wavy boundary.

R--65 centimeters (25.6 inches); bedrock; .

80

PEDON DESCRIPTION (Trench 1, location 25 m)

Print Date: Jun 11 2019

Description Date: Mar 13 2019

Describer: Ashley Anderson, Travis Waiser, Geraldine Vega

Site ID: S2019TX1370004

Pedon ID: S2019TX1370004

Site Note:

Pit Location:

Pedon Note:

Lab Source ID:

Lab Pedon #:

User Transect ID:

Soil Name as Described/Sampled: Prade

Classification: Clayey-skeletal, smectitic, thermic, shallow Petrocalcic Calciustolls

Soil Name as Correlated:

Classification:

Pedon Type: correlates to named soil

Pedon Purpose: research site

Taxon Kind: series

Associated Soils:

Physiographic Division:

Physiographic Province:

Physiographic Section:

State Physiographic Area:

Local Physiographic Area:

Geomorphic Setting: on backslope of side slope of ridge on dissected plateau

Upslope Shape: linear

Cross Slope Shape: linear

Country:

State: Texas

County: Edwards

MLRA: 81B -- Edwards Plateau, Central Part

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Map Unit:

Quad Name: Dunbar Draw SE, Texas

Std Latitude: 30.2895167

Std Longitude: -100.5591667

Latitude: 30 degrees 17 minutes 22.26 seconds north

Longitude: 100 degrees 33 minutes 33.00 seconds west

Datum: WGS84

UTM Zone: 14

UTM Easting: 350051 meters

UTM Northing: 3351896 meters

Primary Earth Cover:

Secondary Earth Cover:

Existing Vegetation: cedar sedge, hairy wedelia, redberry juniper, Texas bluebonnet, Texas pricklypear

Parent Material: residuum weathered from limestone

Bedrock Kind:

Bedrock Depth:

Bedrock Hardness:

Bedrock Fracture Interval:

Particle Size Control Section: 0 to 31 cm.

Surface Fragments: 30.0 percent nonflat subangular indurated 2- to 75-millimeter Limestone fragments and 34.0 percent nonflat subangular indurated 75- to 250-millimeter Limestone fragments and 1.0 percent nonflat subangular indurated 250- to 600-millimeter Limestone fragments

Description origin: NASIS

Description database:
MLRA09_Temple

Diagnostic Features: mollic epipedon 0 to 31 cm.
petrocalcic horizon 31 to 50 cm.
paralithic contact 50 to cm.

Top Depth (cm)	Bottom Depth (cm)	Restriction Kind	Restriction Hardness
31	50	petrocalcic	Weakly cemented
50		bedrock, paralithic	Weakly cemented

Cont. Site ID: S2019TX1370004

Pedon ID: S2019TX1370004

85

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
	679.1									

85 A--0 to 15 centimeters (0.0 to 5.9 inches); clay, black (10YR 2/1), moist; moderate fine granular structure; slightly hard, friable; common very fine roots throughout and common medium roots throughout and common fine roots throughout; 2 percent nonflat angular indurated 75 to 250-millimeter Limestone fragments and 5 percent nonflat angular indurated 2 to 75-millimeter Limestone fragments; slight effervescence, by HCl, 1 normal; clear wavy boundary.

90 Bw--15 to 31 centimeters (5.9 to 12.2 inches); extremely gravelly clay, very dark gray (10YR 3/1), moist; moderate fine granular structure; slightly hard, friable; common very fine roots throughout and common medium roots throughout and common fine roots throughout and few coarse roots throughout; 25 percent flat subangular 2 to 150-millimeter Petrocalcic fragments and 40 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; strong effervescence, by HCl, 1 normal; abrupt wavy boundary.

100 Bkkm--31 to 50 centimeters (12.2 to 19.7 inches); cemented material; few very fine roots in cracks and few medium roots in cracks and few fine roots in cracks and few coarse roots in cracks; soil in cracks, ; abrupt wavy boundary.

Cr--50 centimeters (19.7 inches); bedrock; .

PEDON DESCRIPTION (Trench 2)

Print Date: Jun 11 2019
Description Date: Mar 13 2019
Describer: Ashley Anderson, Travis Waiser, Geraldine Vega
Site ID: S2019TX1370009

Pedon ID: S2019TX1370009

Site Note:

Pit Location:

Pedon Note:

Lab Source ID:

Lab Pedon #:

User Transect ID:

Soil Name as Described/Sampled: Tarrant

Classification: Clayey-skeletal, smectitic, thermic Lithic Calciustolls

Soil Name as Correlated:

Classification:

Pedon Type: correlates to named soil

Pedon Purpose: research site

Taxon Kind: series

Associated Soils:

Physiographic Division:

Physiographic Province:

Physiographic Section:

State Physiographic Area:

Local Physiographic Area:

Geomorphic Setting: on summit of interfluvium of ridge on dissected plateau

Upslope Shape: linear

Cross Slope Shape: linear

Country:

State: Texas

County: Edwards

MLRA: 81B -- Edwards Plateau, Central Part

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Map Unit:

Quad Name: Dunbar Draw SE, Texas

Std Latitude: 30.2895833

Std Longitude: -100.5534500

Latitude: 30 degrees 17 minutes 22.50 seconds north

Longitude: 100 degrees 33 minutes 12.42 seconds west

Datum: WGS84

UTM Zone: 14

UTM Easting: 350601 meters

UTM Northing: 3351896 meters

Primary Earth Cover:

Secondary Earth Cover:

Existing Vegetation: algerita, live oak, redberry juniper, Texas persimmon, Texas pricklypear, Texas wintergrass

Parent Material: residuum weathered from limestone

Bedrock Kind:

Bedrock Depth:

Bedrock Hardness:

Bedrock Fracture Interval:

Particle Size Control Section: 25 to 41 cm.

Surface Fragments: 5.0 percent flat indurated 2- to 150-millimeter Limestone fragments

Description origin: NASIS

Description database:
MLRA09_Temple

Diagnostic Features: mollic epipedon 0 to 41 cm.
calcic horizon 17 to 41 cm.
lithic contact 41 to cm.

Top Depth (cm)	Bottom Depth (cm)	Restriction Kind	Restriction Hardness
41		bedrock, lithic	Indurated

Cont. Site ID: S2019TX1370009

Pedon ID: S2019TX1370009

110

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
	694.9									

115 A--0 to 17 centimeters (0.0 to 6.7 inches); silty clay, black (10YR 2/1), moist; moderate fine subangular blocky parts to moderate fine granular structure; hard, friable; common very fine roots throughout and few medium roots throughout and common fine roots throughout and few coarse roots throughout; 5 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; slight effervescence, by HCl, 1 normal; clear wavy boundary.

120 Ak--17 to 41 centimeters (6.7 to 16.1 inches); very dark gray (10YR 3/1) extremely gravelly clay, black (10YR 2/1), moist; moderate fine subangular blocky parts to moderate fine granular structure; hard, friable; common very fine roots throughout and common medium roots throughout and common fine roots throughout and few coarse roots throughout; 5 percent carbonate nodules on bottom of rock fragments; 15 percent flat indurated 2 to 150-millimeter Limestone fragments and 15 percent flat indurated 150 to 350-millimeter Limestone fragments and 35 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; strong effervescence, by HCl, 1 normal; abrupt wavy boundary.

125 R--41 centimeters (16.1 inches); .

PEDON DESCRIPTION (Trench 4)

Print Date: Jun 11 2019

Description Date: Mar 13 2019

Describer: Ashley Anderson, Travis Waiser, Geraldine Vega

Site ID: P2019TX1370010

Pedon ID: P2019TX1370010

Site Note:

Pit Location:

Pedon Note:

Lab Source ID:

Lab Pedon #:

User Transect ID:

Soil Name as Described/Sampled: Tarrant

Classification: Clayey-skeletal, smectitic, thermic, shallow Typic Calciustolls

Soil Name as Correlated:

Classification:

Pedon Type: taxadjunct to the series

Pedon Purpose: research site

Taxon Kind: taxadjunct

Associated Soils:

Physiographic Division:

Physiographic Province:

Physiographic Section:

State Physiographic Area:

Local Physiographic Area:

Geomorphic Setting: on summit of interfluvium of ridge on dissected plateau

Upslope Shape: linear

Cross Slope Shape: linear

Particle Size Control Section: 25 to 42 cm.

Country:

State: Texas

County: Edwards

MLRA: 81B -- Edwards Plateau, Central Part

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Map Unit:

Quad Name: Dunbar Draw SE, Texas

Std Latitude: 30.2799833

Std Longitude: -100.5603667

Latitude: 30 degrees 16 minutes 47.94 seconds north

Longitude: 100 degrees 33 minutes 37.32 seconds west

Datum: WGS84

UTM Zone: 14

UTM Easting: 349921 meters

UTM Northing: 3350841 meters

Primary Earth Cover:

Secondary Earth Cover:

Existing Vegetation: live oak, redberry juniper, sacahuista, Texas pricklypear, Texas wintergrass

Parent Material: residuum weathered from limestone

Bedrock Kind:

Bedrock Depth:

Bedrock Hardness:

Bedrock Fracture Interval:

Surface Fragments: 40.0 percent nonflat subangular indurated 2- to

75-millimeter Limestone fragments and 5.0 percent nonflat subangular indurated 75- to 250-millimeter Limestone fragments

Description origin: NASIS

Description database:
MLRA09_Temple

Diagnostic Features: mollic epipedon 0 to 42 cm.
calcic horizon 16 to 42 cm.
paralithic contact 42 to cm.

Top Depth (cm)	Bottom Depth (cm)	Restriction Kind	Restriction Hardness
42		bedrock, paralithic	Moderately cemented

Cont. Site ID: P2019TX1370010

Pedon ID: P2019TX1370010

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
	696.8									

135

A--0 to 16 centimeters (0.0 to 6.3 inches); clay, black (10YR 2/1), moist; moderate fine granular structure; common very fine roots throughout and common medium roots throughout and common fine roots throughout and few coarse roots throughout; 5 percent nonflat subangular moderately cemented 2 to 75-millimeter Petrocalcic fragments.

140

Ak--16 to 42 centimeters (6.3 to 16.5 inches); extremely gravelly clay, very dark grayish brown (10YR 3/2), moist; moderate fine granular structure; common very fine roots throughout and few very coarse roots throughout and common medium roots throughout and common fine roots throughout and few coarse roots throughout; 5 percent carbonate nodules on bottom of rock fragments; 20 percent flat moderately cemented 2 to 150-millimeter Petrocalcic fragments and 20 percent flat moderately cemented 150 to 380-millimeter Petrocalcic fragments and 25 percent nonflat subangular moderately cemented 2 to 75-millimeter Petrocalcic fragments.

145

Cr--42 centimeters (16.5 inches); bedrock; .

150

PEDON DESCRIPTION (Trench 5A, location 10 m)

Print Date: Jun 11 2019

Description Date: Mar 14 2019

Describer: Ashley Anderson, Travis Waiser, Geraldine Vega

Site ID: S2019TX1370013

Pedon ID: S2019TX1370013

Site Note:

Pit Location:

Pedon Note:

Lab Source ID:

Lab Pedon #:

User Transect ID:

Soil Name as Described/Sampled: Ozona

Classification: Loamy, mixed, superactive, thermic, shallow Petrocalcic Calciustolls

Soil Name as Correlated:

Classification:

Pedon Type: correlates to named soil

Pedon Purpose: research site

Taxon Kind: series

Associated Soils:

Physiographic Division:

Physiographic Province:

Physiographic Section:

State Physiographic Area:

Local Physiographic Area:

Geomorphic Setting: on backslope of side slope of ridge on dissected plateau

Upslope Shape: linear

Cross Slope Shape: convex

Particle Size Control Section: 0 to 34 cm.

Country:

State: Texas

County: Edwards

MLRA: 81B -- Edwards Plateau, Central Part

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Map Unit:

Quad Name: Dunbar Draw SE, Texas

Std Latitude: 30.2553056

Std Longitude: -100.5723333

Latitude: 30 degrees 15 minutes 19.10 seconds north

Longitude: 100 degrees 34 minutes 20.40 seconds west

Datum: WGS84

UTM Zone: 14

UTM Easting: 348732 meters

UTM Northing: 3348122 meters

Primary Earth Cover:

Secondary Earth Cover:

Existing Vegetation: cedar sedge, purple threeawn, redberry juniper

Parent Material: residuum weathered from limestone

Bedrock Kind:

Bedrock Depth:

Bedrock Hardness:

Bedrock Fracture Interval:

Surface Fragments: 5.0 percent nonflat subangular strongly

cemented 2- to 75-millimeter Limestone fragments and 5.0 percent nonflat subangular strongly cemented 75- to 250-millimeter Limestone fragments

Description origin: NASIS

Description database:
MLRA09_Temple

Diagnostic Features: mollic epipedon 0 to 34 cm.
petrocalcic horizon 34 to 37 cm.
paralithic contact 37 to 200 cm.

Top Depth (cm)	Bottom Depth (cm)	Restriction Kind	Restriction Hardness
34	37	petrocalcic	Moderately cemented
37	200	bedrock, paralithic	Weakly cemented

155

Cont. Site ID: S2019TX1370013

Pedon ID: S2019TX1370013

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
	685.5									

160 A1--0 to 20 centimeters (0.0 to 7.9 inches); very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2), moist; moderate medium granular structure; slightly hard, friable; common very fine roots throughout and few medium roots throughout and common fine roots throughout; 8 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear wavy boundary.

165 A2--20 to 34 centimeters (7.9 to 13.4 inches); dark grayish brown (10YR 4/2) extremely channery silty clay loam, very dark brown (10YR 2/2), moist; moderate medium granular structure; slightly hard, friable; common very fine roots throughout and common medium roots throughout and common fine roots throughout and common coarse roots throughout; 30 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments and 35 percent flat angular indurated 2 to 150-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear wavy boundary.

170 Bkkm--34 to 37 centimeters (13.4 to 14.6 inches); material; clear wavy boundary.

175 Cr--37 to 200 centimeters (14.6 to 78.7 inches); bedrock; very few very fine roots throughout and few medium roots throughout and very few fine roots throughout; Small pocket at 100 to 130 cm of soil material in Cr was silty clay with 17% sand, 42% silt, and 41% clay.

PEDON DESCRIPTION (Trench 5A, location 18 m)

Print Date: Jun 11 2019

Description Date: Mar 14 2019

Describer: Ashley Anderson, Travis Waiser, Geraldine Vega

Site ID: P2019TX1370014

Pedon ID: P2019TX1370014

Site Note:

Pit Location:

Pedon Note:

Lab Source ID:

Lab Pedon #:

User Transect ID:

Soil Name as Described/Sampled: Prade

Classification: Clayey-skeletal, smectitic, thermic, shallow Petrocalcic Calciustolls

Soil Name as Correlated:

Classification:

Pedon Type: correlates to named soil

Pedon Purpose: research site

Taxon Kind: series

Associated Soils:

Physiographic Division:

Physiographic Province:

Physiographic Section:

State Physiographic Area:

Local Physiographic Area:

Geomorphic Setting: on backslope of side slope of ridge on dissected plateau

Upslope Shape: linear

Cross Slope Shape: convex

Particle Size Control Section: 25 to 41 cm.

Country:

State: Texas

County: Edwards

MLRA: 81B -- Edwards Plateau, Central Part

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Map Unit:

Quad Name: Dunbar Draw SE, Texas

Std Latitude: 30.2555833

Std Longitude: -100.5726389

Latitude: 30 degrees 15 minutes 20.10 seconds north

Longitude: 100 degrees 34 minutes 21.50 seconds west

Datum: WGS84

UTM Zone: 14

UTM Easting: 348703 meters

UTM Northing: 3348153 meters

Primary Earth Cover:

Secondary Earth Cover:

Existing Vegetation: cedar sedge, purple threeawn, redberry juniper

Parent Material: residuum weathered from limestone

Bedrock Kind:

Bedrock Depth:

Bedrock Hardness:

Bedrock Fracture Interval:

Surface Fragments: 5.0 percent nonflat subangular strongly

cemented 2- to 75-millimeter Limestone fragments and 5.0 percent nonflat subangular strongly cemented 75- to 250-millimeter Limestone fragments

Description origin: NASIS

Description database:
MLRA09_Temple

Diagnostic Features: mollic epipedon 0 to 41 cm.
petrocalcic horizon 41 to 43 cm.
paralithic materials 43 to 86 cm.

Top Depth (cm)	Bottom Depth (cm)	Restriction Kind	Restriction Hardness
41	43	petrocalcic	Strongly cemented
43	86	bedrock, paralithic	Moderately cemented

180

Cont. Site ID: P2019TX1370014

Pedon ID: P2019TX1370014

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
	691.0									

185

A1--0 to 21 centimeters (0.0 to 8.3 inches); very dark grayish brown (10YR 3/2) clay, very dark brown (10YR 2/2), moist; moderate medium granular structure; slightly hard, friable; common very fine roots throughout and few medium roots throughout and common fine roots throughout; 6 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear wavy boundary.

190

A2--21 to 41 centimeters (8.3 to 16.1 inches); dark grayish brown (10YR 4/2) extremely gravelly clay, very dark brown (10YR 2/2), moist; moderate medium granular structure; slightly hard, friable; common very fine roots throughout and few very coarse roots throughout and few medium roots throughout and common fine roots throughout and few coarse roots throughout; 10 percent flat angular moderately cemented 2 to 150-millimeter Petrocalcic fragments and 25 percent flat angular moderately cemented 150 to 350-millimeter Petrocalcic fragments and 30 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear wavy boundary.

195

Bkkm--41 to 43 centimeters (16.1 to 16.9 inches); material; clear wavy boundary.

Cr--43 to 86 centimeters (16.9 to 33.9 inches); bedrock; .

PEDON DESCRIPTION (Trench 5B)

Print Date: Jun 11 2019

Description Date: Mar 14 2019

Describer: Ashley Anderson, Travis Waiser, Geraldine Vega

Site ID: S2019TX1370012

Pedon ID: S2019TX1370012

Site Note:

Pit Location:

Pedon Note:

Lab Source ID:

Lab Pedon #:

User Transect ID:

Soil Name as Described/Sampled: Rio Diablo

Classification: Fine, mixed, superactive, thermic Pachic Haplustolls

Soil Name as Correlated:

Classification:

Pedon Type: taxadjunct to the series

Pedon Purpose: research site

Taxon Kind: taxadjunct

Associated Soils:

Physiographic Division:

Physiographic Province:

Physiographic Section:

State Physiographic Area:

Local Physiographic Area:

Geomorphic Setting: on footslope of base slope of ridge on dissected plateau

Upslope Shape: concave

Cross Slope Shape: linear

Country:

State: Texas

County: Edwards

MLRA: 81B -- Edwards Plateau, Central Part

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Map Unit:

Quad Name: Dunbar Draw SE, Texas

Std Latitude: 30.2552500

Std Longitude: -100.5721667

Latitude: 30 degrees 15 minutes 18.90 seconds north

Longitude: 100 degrees 34 minutes 19.80 seconds west

Datum: WGS84

UTM Zone: 14

UTM Easting: 348748 meters

UTM Northing: 3348115 meters

Primary Earth Cover:

Secondary Earth Cover:

Existing Vegetation: Christmas cactus, honey mesquite, redberry juniper, Texas pricklypear

Parent Material: alluvium derived from limestone

Bedrock Kind:

Bedrock Depth:

Bedrock Hardness:

Bedrock Fracture Interval:

Particle Size Control Section: 25 to 100 cm.

Surface Fragments: 2.0 percent nonflat subrounded indurated 2- to 75-millimeter Limestone fragments

Description origin: NASIS

Description database:
MLRA09_Temple

Diagnostic Features: mollic epipedon 0 to 60 cm.
cambic horizon 60 to 118 cm.
paralithic materials 118 to 147 cm.

Top Depth (cm)	Bottom Depth (cm)	Restriction Kind	Restriction Hardness
118	147	bedrock, paralithic	Moderately cemented

Cont. Site ID: S2019TX1370012

Pedon ID: S2019TX1370012

205

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
	691.0									

210 A1--0 to 18 centimeters (0.0 to 7.1 inches); very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2), moist; weak medium subangular blocky parts to moderate fine granular structure; slightly hard, friable; common very fine roots throughout and common fine roots throughout; 2 percent nonflat subangular indurated 2 to 20-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear smooth boundary.

215 A2--18 to 35 centimeters (7.1 to 13.8 inches); very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2), moist; weak medium subangular blocky parts to moderate fine granular structure; slightly hard, friable; common very fine roots throughout and few medium roots throughout and common fine roots throughout; 4 percent nonflat subangular indurated 2 to 20-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear smooth boundary.

220 Bw--35 to 60 centimeters (13.8 to 23.6 inches); brown (7.5YR 4/3) silty clay, dark brown (10YR 3/3), moist; moderate medium subangular blocky structure; hard, firm; common very fine roots throughout and few medium roots throughout and common fine roots throughout and few coarse roots throughout; common very fine tubular pores; 6 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; gradual wavy boundary.

225 Bk1--60 to 92 centimeters (23.6 to 36.2 inches); brown (7.5YR 4/4) silty clay, brown (7.5YR 4/4), moist; weak medium subangular blocky parts to moderate fine subangular blocky structure; hard, firm; common very fine roots throughout and few medium roots throughout and common fine roots throughout and few coarse roots

230 throughout; common very fine tubular pores; 2 percent fine threadlike carbonate masses throughout; 8 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; gradual wavy boundary.

235 Bk2--92 to 118 centimeters (36.2 to 46.5 inches); strong brown (7.5YR 5/6) silty clay, strong brown (7.5YR 5/6), moist; moderate fine subangular blocky structure; hard, firm; few very fine roots throughout and few medium roots throughout and few fine roots throughout; common very fine tubular and common fine tubular pores; 4 percent fine threadlike carbonate masses throughout; 8 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal.

Cr--118 to 147 centimeters (46.5 to 57.9 inches); bedrock; few fine roots throughout; violent effervescence, by HCl, 1 normal.

240

PEDON DESCRIPTION (Trench 6, location 4 m)

Print Date: Jun 11 2019

Description Date: Mar 12 2019

Describer: Ashley Anderson, Travis Waiser, Geraldine Vega

Site ID: P2019TX1370002

Pedon ID: P2019TX1370002

Site Note:

Pit Location:

Pedon Note:

Lab Source ID:

Lab Pedon #:

User Transect ID:

Soil Name as Described/Sampled: Mereta

Classification: Clayey, mixed, superactive, thermic, shallow Petrocalcic Calciustolls

Soil Name as Correlated:

Classification:

Pedon Type: correlates to named soil

Pedon Purpose: research site

Taxon Kind: series

Associated Soils:

Physiographic Division:

Physiographic Province:

Physiographic Section:

State Physiographic Area:

Local Physiographic Area:

Geomorphic Setting: on toeslope of base slope of ridge on dissected plateau

Upslope Shape: linear

Cross Slope Shape: linear

Country:

State: Texas

County: Edwards

MLRA: 81B -- Edwards Plateau, Central Part

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Map Unit:

Quad Name: Dunbar Draw SE, Texas

Std Latitude: 30.2833000

Std Longitude: -100.5410667

Latitude: 30 degrees 16 minutes 59.88 seconds north

Longitude: 100 degrees 32 minutes 27.84 seconds west

Datum: WGS84

UTM Zone: 14

UTM Easting: 351783 meters

UTM Northing: 3351183 meters

Primary Earth Cover:

Secondary Earth Cover:

Existing Vegetation: honey mesquite, live oak, redberry juniper, Texas pricklypear, Texas wintergrass

Parent Material: alluvium derived from limestone

Bedrock Kind:

Bedrock Depth:

Bedrock Hardness:

Bedrock Fracture Interval:

Particle Size Control Section: 25 to 39 cm.

Surface Fragments: 5.0 percent nonflat subangular indurated 2- to 75-millimeter Limestone fragments and 5.0 percent nonflat subangular indurated 75- to 250-millimeter Limestone fragments

Description origin: NASIS

Description database:
MLRA09_Temple

Diagnostic Features: mollic epipedon 0 to 39 cm.
petrocalcic horizon 39 to 65 cm.
cambic horizon 65 to 145 cm.
paralithic contact 145 to 155 cm.

Top Depth (cm)	Bottom Depth (cm)	Restriction Kind	Restriction Hardness
39	65	petrocalcic	Strongly cemented
145	155	bedrock, paralithic	Weakly cemented

245

Cont. Site ID: P2019TX1370002

Pedon ID: P2019TX1370002

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
	644.3									

250 A1--0 to 20 centimeters (0.0 to 7.9 inches); very dark gray (10YR 3/1) clay, very dark brown (10YR 2/2), moist; moderate medium subangular blocky, and moderate fine subangular blocky structure; slightly hard, friable; common very fine roots throughout and few medium roots throughout and common fine roots throughout; 8 percent nonflat subrounded indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear smooth boundary.

255 A2--20 to 39 centimeters (7.9 to 15.4 inches); dark grayish brown (10YR 4/2) gravelly clay, dark brown (10YR 3/3), moist; moderate fine subangular blocky structure; hard, firm; common very fine roots throughout and few very coarse roots throughout and common medium roots throughout and common fine roots throughout and few coarse roots throughout; 1 percent nonflat subrounded indurated 75 to 250-millimeter Limestone fragments and 15 percent nonflat subangular indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear wavy boundary.

260 Bkkm--39 to 65 centimeters (15.4 to 25.6 inches); cemented material; few very fine roots throughout and few medium roots throughout and few fine roots throughout; violent effervescence, by HCl, 1 normal; abrupt wavy boundary.

265 Bk1--65 to 107 centimeters (25.6 to 42.1 inches); brown (7.5YR 4/3) clay, brown (7.5YR 4/3), moist; weak fine subangular blocky structure; slightly hard, friable; common very fine roots throughout and few very coarse roots throughout and common fine roots throughout and few coarse roots throughout; 3 percent fine threadlike carbonate masses; 2 percent nonflat subrounded indurated 75 to 250-millimeter Limestone fragments and 10 percent nonflat subrounded indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear wavy boundary.

270
275 Bk2--107 to 145 centimeters (42.1 to 57.1 inches); light brown (7.5YR 6/4) clay, brown (7.5YR 5/4), moist; weak fine subangular blocky structure; slightly hard, friable; common very fine roots throughout and few medium roots throughout and common fine roots throughout and few coarse roots throughout; 3 percent fine threadlike carbonate masses; 1 percent nonflat subrounded indurated 75 to 250-millimeter Limestone fragments and 8 percent nonflat subrounded indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; abrupt wavy boundary.

Cr--145 to 155 centimeters (57.1 to 61.0 inches); bedrock; violent effervescence, by HCl, 1 normal.

280

PEDON DESCRIPTION (Trench 6, location 6 m)

Print Date: Jun 11 2019

Description Date: Mar 12 2019

Describer: Ashley Anderson, Travis Waiser, Geraldine Vega

Site ID: S2019TX1370001

Pedon ID: S2019TX1370001

Site Note:

Pit Location:

Pedon Note:

Lab Source ID:

Lab Pedon #:

User Transect ID:

Soil Name as Described/Sampled: Mereta

Classification: Clayey, mixed, superactive, thermic, shallow Petrocalcic Calciustolls

Soil Name as Correlated:

Classification:

Pedon Type: correlates to named soil

Pedon Purpose: research site

Taxon Kind: series

Associated Soils:

Physiographic Division:

Physiographic Province:

Physiographic Section:

State Physiographic Area:

Local Physiographic Area:

Geomorphic Setting: on toeslope of base slope of ridge on dissected plateau

Upslope Shape: linear

Country:

State: Texas

County: Edwards

MLRA: 81B -- Edwards Plateau, Central Part

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Map Unit:

Quad Name: Dunbar Draw SE, Texas

Std Latitude: 30.2833833

Std Longitude: -100.5411167

Latitude: 30 degrees 17 minutes 0.18 seconds north

Longitude: 100 degrees 32 minutes 28.02 seconds west

Datum: WGS84

UTM Zone: 14

UTM Easting: 351778 meters

UTM Northing: 3351193 meters

Primary Earth Cover:

Grass/herbaceous cover

Secondary Earth Cover:

Savanna rangeland

Existing Vegetation: honey mesquite, live oak, redberry juniper, Texas pricklypear, Texas wintergrass

Parent Material: alluvium derived from limestone

Bedrock Kind:

Bedrock Depth:

Bedrock Hardness:

Cross Slope Shape: linear

Particle Size Control Section: 25 to 43 cm.

Bedrock Fracture Interval:

Surface Fragments: 5.0 percent nonflat subangular indurated 2- to 75-millimeter Limestone fragments and 5.0 percent nonflat subangular indurated 75- to 250-millimeter Limestone fragments

Description origin: NASIS

Description database:
MLRA09_Temple

Diagnostic Features: mollic epipedon 0 to 43 cm.
petrocalcic horizon 43 to 55 cm.

Top Depth (cm)	Bottom Depth (cm)	Restriction Kind	Restriction Hardness
43	55	petrocalcic	Weakly cemented

285

Cont. Site ID: S2019TX1370001

Pedon ID: S2019TX1370001

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
	638.6									

290 A1--0 to 23 centimeters (0.0 to 9.1 inches); very dark grayish brown (10YR 3/2) clay, very dark brown (10YR 2/2), moist; moderate medium subangular blocky, and moderate fine subangular blocky structure; slightly hard, friable; common very fine roots throughout and common medium roots throughout and common fine roots throughout and few coarse roots throughout; few fine tubular pores; 8 percent nonflat subrounded indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; gradual smooth boundary.

295 A2--23 to 43 centimeters (9.1 to 16.9 inches); dark grayish brown (10YR 4/2) clay, dark brown (10YR 3/3), moist; moderate medium subangular blocky structure; hard, firm; common very fine roots throughout and very few very coarse roots throughout and common medium roots throughout and few fine roots throughout and few coarse roots throughout; 1 percent nonflat subangular indurated 75 to 255-millimeter Limestone fragments and 8 percent nonflat subrounded indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; abrupt wavy boundary.

300 Bkkm--43 to 55 centimeters (16.9 to 21.7 inches); cemented material; few very fine roots in cracks and few fine roots in cracks; violent effervescence, by HCl, 1 normal; gradual wavy boundary.

Ck1--55 to 125 centimeters (21.7 to 49.2 inches); pink (7.5YR 8/3) material; few very fine roots in cracks and few

305 medium roots in cracks and few fine roots in cracks; violent effervescence, by HCl, 1 normal; gradual wavy boundary.

Ck2--125 to 180 centimeters (49.2 to 70.9 inches); pink (7.5YR 8/3) material; few very fine roots in cracks and few medium roots in cracks and few fine roots in cracks; 10 percent coarse carbonate masses and 10 percent coarse carbonate nodules; violent effervescence, by HCl, 1 normal.

PEDON DESCRIPTION (Trench 6, location 8 m)

Print Date: Jun 11 2019

Description Date: Mar 12 2019

Describer: Ashley Anderson, Travis Waiser, Geraldine Vega

Site ID: S2019TX1370003

Pedon ID: S2019TX1370003

Site Note:

Pit Location:

Pedon Note:

Lab Source ID:

Lab Pedon #:

User Transect ID:

Soil Name as Described/Sampled: Rio Diablo

Classification: Fine, mixed, superactive, thermic Aridic Haplustolls

Soil Name as Correlated:

Classification:

Pedon Type: correlates to named soil

Pedon Purpose: research site

Taxon Kind: series

Associated Soils:

Physiographic Division:

Physiographic Province:

Physiographic Section:

State Physiographic Area:

Local Physiographic Area:

Geomorphic Setting: on toeslope of base slope of ridge on dissected plateau

Upslope Shape: linear

Cross Slope Shape: linear

Country:

State: Texas

County: Edwards

MLRA: 81B -- Edwards Plateau, Central Part

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Soil Survey Area: TX607 -- Edwards and Real Counties, Texas

Map Unit:

Quad Name: Dunbar Draw SE, Texas

Std Latitude: 30.2834000

Std Longitude: -100.5411667

Latitude: 30 degrees 17 minutes 0.24 seconds north

Longitude: 100 degrees 32 minutes 28.20 seconds west

Datum: WGS84

UTM Zone: 14

UTM Easting: 351773 meters

UTM Northing: 3351195 meters

Primary Earth Cover:

Secondary Earth Cover:

Existing Vegetation: curly-mesquite, honey mesquite, redberry juniper, Texas pricklypear, Texas wintergrass

Parent Material: alluvium derived from limestone

Bedrock Kind:

Bedrock Depth:

Bedrock Hardness:

Bedrock Fracture Interval:

Particle Size Control Section: 25 to 100 cm.

Surface Fragments: 5.0 percent nonflat subangular indurated 2- to 75-millimeter Limestone fragments and 5.0 percent nonflat subangular indurated 75- to 250-millimeter Limestone fragments

Description origin: NASIS

Description database:
MLRA09_Temple

Diagnostic Features: mollic epipedon 0 to 29 cm.
cambic horizon 29 to 120 cm.

315

Cont. Site ID: S2019TX1370003

Pedon ID: S2019TX1370003

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
	675.4									

320 A--0 to 29 centimeters (0.0 to 11.4 inches); very dark gray (10YR 3/1) silty clay, black (10YR 2/1), moist; strong fine subangular blocky parts to moderate fine granular structure; slightly hard, friable; common very fine roots throughout and common fine roots throughout; 4 percent nonflat subrounded indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear smooth boundary.

325 Bw--29 to 61 centimeters (11.4 to 24.0 inches); brown (7.5YR 4/3) clay, brown (7.5YR 4/3), moist; moderate medium subangular blocky, and moderate medium angular blocky structure; hard, firm; common very fine roots throughout and few medium roots throughout and common fine roots throughout; 8 percent nonflat subrounded indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear smooth boundary.

330 Bk1--61 to 100 centimeters (24.0 to 39.4 inches); weak red (7.5R 4/3) clay, brown (7.5YR 4/3), moist; moderate medium prismatic structure; hard, firm; common very fine roots throughout and common fine roots throughout; 4 percent fine threadlike carbonate masses; 1 percent nonflat subrounded indurated 75 to 250-millimeter Limestone fragments and 10 percent nonflat subrounded indurated 2 to 75-millimeter Limestone fragments; violent effervescence, by HCl, 1 normal; clear smooth boundary.

335 Bk2--100 to 120 centimeters (39.4 to 47.2 inches); light brown (7.5YR 6/4) clay, red (7.5R 5/6), moist; weak medium subangular blocky structure; hard, firm; few very fine roots throughout and few fine roots throughout; 3 percent fine spherical carbonate masses; 1 percent nonflat subrounded indurated 75 to 250-millimeter Limestone fragments and 8 percent nonflat subrounded indurated 2 to 75-millimeter Limestone fragments; violent
340 effervescence, by HCl, 1 normal.