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NEON Site-Level Plot Summary
Santa Rita Experimental Range (SRER)

Document Information

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Site Background

The Santa Rita Experimental Range (SRER) site is approximately 35 miles south of Tucson in Pima County, Arizona. This site is in a transition area between Major Land Resource Area (MLRA) 40, Sonoran Basin and Range and MLRA 41, Southeastern Arizona Basin and Range. This site consists of approximately 53,000 acres that lie at the foot of the northwestern edge of the Santa Rita Mountains.

Site Information

The site is characterized by small areas of steep, stony foothills and a few isolated buttes, while the greater part consists of long, gently sloping alluvial fans. Upper fans slope rather steeply and are cut by canyons and arroyos. Elevations across the SRER range from 2,900 feet above sea level in the northwestern corner to about 5,200 feet in the southeastern part. The average rainfall increases with elevation from about 10 inches at 2,900 feet to almost 20 inches at 4,300 feet.

The SRER is the longest continuously active rangeland research facility and among the 5 oldest biological field stations in the United States. The land use is primarily rangeland, hunting, nature studies, and bird watching. Currently there are approximately 540 livestock (cattle) that move through a combination of 18 pastures, between 3 on the Coronado National Forest, 3 on Arizona State Lands, and the rest on the Santa Rita Experimental Range. There is also a smaller, separate cattle herd, of about 70 animals that rotate into two pastures on the SRER at different times of the year.

Major vegetation changes have occurred since the early 1900's. Velvet mesquite (Prosopis juliflora var. velutina) is the dominant overstory species on 20,000-30,000 acres where shrub-free grassland dominated 80 years ago. Mesquite and prickly pear cactus are major species above 4,000 feet, but other species including acacia (Acacia greggii, A. angustissima), mimosa (Mimosa biuncifera, M. dysocarpa), and falsemesquite (Calliandra eriophylla) comprise 65% of the cover in this zone compared to 21% below 3,000 feet. Mesquite, burroweed (Haplopappus tenuisectus), and cholla cactus (Opuntia fulgida, O. spinosior, and O. versicolor) attain highest densities between 3,200 and 3,600 feet elevation (Martin and Reynolds 1973). Lower elevations (<3,200 feet) are dominated by creosote bush (Larrea tridentata).

Species composition of perennial grasses changes with elevation and rainfall (Martin and Reynolds 1973). Santa Rita threeawn (Aristida glabrata), Rothrock grama (Bouteloua rothrockii), and bush muhly (Muhlenbergia porteri) are important species of middle and lower elevations. Various species of grama (Bouteloua eriopoda, B. curtipendula, B. filiformis, B. chondrosioides, B. hirsuta) are widely distributed at higher elevations. Arizona cottontop (Trichachne californica) and species of threeawns (Aristida hamulosa, A. ternipes) are common at all elevations. Lehmann lovegrass (Eragrostis lehmanniana) is presently the dominant grass over nearly 40% of the range.

Annual vegetation is most abundant in areas with light to moderate density of perennial grasses and in areas where native grasses persist over Lehmann lovegrass (Medina 1988). The prevalence of many dry washes and small gullies afford microhabitats where cool- and warm-season annuals can propagate.

The geology varies from simple strata of recent deposits of alluvium to extensive thrust faulting. Alluvial caps cover about 95% of the area. These gravel strata vary in thickness from about 400 feet in higher elevations to well over 2,000 feet in the lower parts. Small outcrops of granodiorite, limestone, sandstone, and other conglomerates constitute the remaining 5%.

This information was found at: https://cals.arizona.edu/srer/

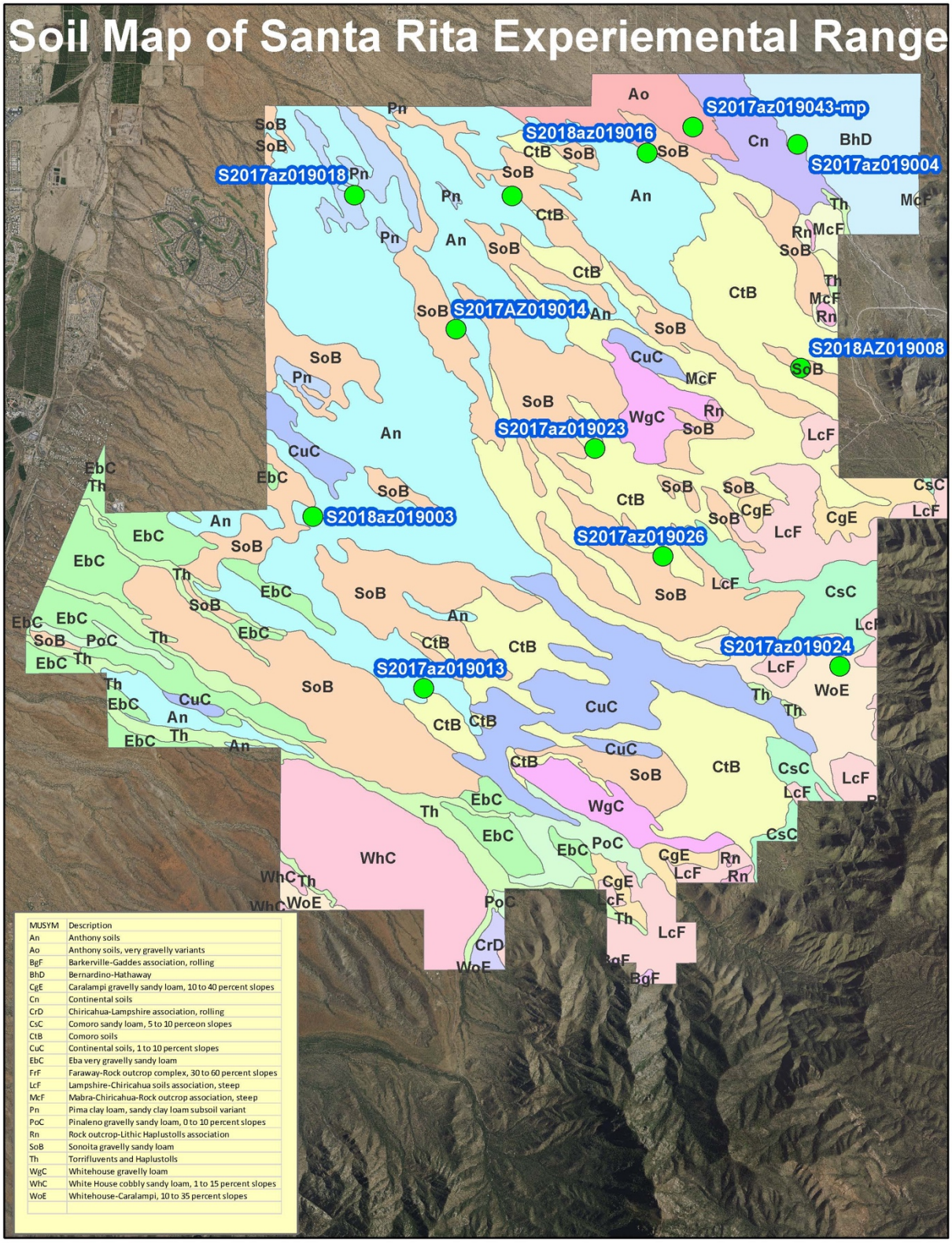
https://cals.arizona.edu/srer/history/range.html

Soils information was gathered from the Soil Survey of Santa Cruz and Parts of Cochise and Pima Counties, Arizona (Richardson et al, 1971) as well as a special project soil survey for the Santa Rita Experimental Range.

Analysis of Plots for Sampling

Out of the 34 potential plots available, 16 were chosen for sampling, and 4 of this total were selected as back up plots in case any of the 12 primary plots could not be properly sampled. Landform position, slope, elevation, and satellite image tones were used to select the 16 plots (Figure 1).

Figure 1. Soil mapping units at the SRER site showing NEON plot locations.



Plot Findings

Pedon and plot data were collected at 12 of the 16 plots. Pedon data included horizon designations, horizon depths, field texture including sand, silt, and clay estimates, color, effervescence, structure, consistence, horizon boundaries, concentrations, pedon void surface features, and root and pores. Plot data included parent material, geomorphic position, UTM and latitude and longitude coordinates, slope, vegetation, and area and map

Summary of Soils

Table 1 lists the NEON plots sampled and the corresponding soil classifications. None of the sampled plots were part of a named map unit najor or minor component.

The Soil Survey (Richardson et al, 1971) that includes the SRER NEON site provides the soil map unit descriptions utilized for selecting which NEON plots to sample. Soil survey concepts and detail of soil mapping have changed since the 1971 survey. Pedons sampled and identified on the SRER site often are not named series in the original map unit descriptions. Soils on site that were described and sampled were named for present known soil series in the vicinity or classified to the subgroup, if no named local series existed. Given the age and level of detail in the 1971 Soil Survey, it is not surprising to identify soils that are unnamed soil components in the soil map units. The soil map units in the 1971 Survey are referred to as a 'consociation', meaning there is one or two named dominant soils. The 1971 Soil Survey recognized that other series could exist in the map unit, but did identify these components because the use and mangagement (rangeland) would be similar.

Note that a Soil Survey of SRER was conducted in 1996 by NRCS personnel. This survey is available in conjunction with SRER spatial data from the Santa Rita Exsperimental Range website at https://cals.arizona.edu/SRER/data.html. However, this survey did not undergo National Cooperative Soil Survey correlation and therefore is not published as a formal document by the NRCS.

SRER_003 – This pedon is within the Anthony map unit and classified as the Hayhook series; Coase-loamy, mixed, superactive, thermic Typic Haplocambids. Hayhook is not a named major or minor map unit component. The Hayhook pedon has a cambic horizon. The profile is predominately sandy loam with coarse fragments increasing with depth and non-effervescent throughout.

SRER_004 – This pedon is within a Bernardino-Hathaway map unit and classified as Nahda; Clayey-skeletal, mixed, superactive, thermic, argic Petrocalcids. Nahda is not a named major or minor map unit component. The Nahda pedon has a smooth petrocalcic horizon at about 38 cm at that particular location. We were unable to excavate any further into the profile due to the level of cementation, but we were aware that this was not bedrock. This petrocalcic was not sampled to send into the lab due to the lack of material available to send in for a sample. This profile has a gravelly sandy loam surface over very gravelly to very cobbly sandy clay loam and sandy clay subsurface. The effervescence increased with depth.

NEON Plot ID	Map Unit Symbol	Map Unit Name	Soil Series Sampled	Named Map Unit Major or Minor Component
SRER_003	An	Anthony soils	Hayhook	No
SRER_004	BhD	Bernardino-Hathaway	Nahda	No
SRER_007	An	Anthony soils	Sandy, mixed, superactive, thermic Typic Haplocambid	No
SRER_008	SoB	Sonoita gravelly sandy loam	Eloma taxadjunct	No
SRER_012	CuC	Continental soils	No	
SRER_013	An	Anthony soils	Combate	No
SRER_014	SoB	Sonoita gravelly sandy loam	Sandy, mixed, superactive, thermic Typic Haplocambid	No
SRER_015	LcF	Lampshire-Chiricahua soils association, steep	No	Not sampled due to very steep slope, lack of access, and dry conditions
SRER_016	An	Anthony soils	Redo	No
SRER_018	Pn	Pima clay loam, sandy clay loam subsoil variant	Pima taxadjunct	No
SRER_021	WgC	Whitehouse gravelly loam	No	Not sampled due to very dry conditions, high clay content, and high gravel content.
SRER_022	EbC	Eba very gravelly sandy loam	No	Not sampled due to very dry conditions, lack of access, and high gravel content.
SRER_023	CtB	Comoro soils	Sandy, mixed, superactive, thermic Ustic Haplocambid	No
SRER_024	WoE	Whitehouse-Caralampi, 10 to 35 percent slopes	Baboquivari	No
SRER_025	WoE	Whitehouse-Caralampi, 10 to 35 percent slopes	No	Not sampled due to lack of access, steep slopes, high clay content, and high gravel content.
SRER_026	SoB	Sonoita gravelly sandy loam	Bodecker	No
SRER_043	Ao	Anthony soils, very gravelly variants	Rillino	No

Table 1. Soil map units containing NEON plots, soil series described and sampled, and whether or not named series is a named component in the soil map unit.

SRER_007 – This pedon is within an Anthony soils map unit and classified to above the soil series as Sandy, mixed, superactive, thermic Typic Haplocambid. There is no local soil series with this classification. This soil is not a named major or minor map unit component within the Anthony soils delineations. This soil is loamy sand throughout and no effervescence in any horizon. Besides the weak to moderately developed cambic horizon, this pedon has no other diagnostic features.

SRER_008 – This pedon is within a Sonoita gravelly sandy loam map unit and is classified as an Eloma (taxadjunct); Clayey-skeletal, mixed, superactive, thermic, ustic Paleargids. It was classified as a taxadjunct because although it fits the range of characteristics of the Eloma classification, a haplargid, a paleargid classification better reflects the pedon. Eloma is not a named major or minor component in the map unit. This pedon has a gravelly loamy sand and sandy loam surface over a very gravelly sandy clay subsurface and no effervescence throughout.

SRER_013 – This pedon is within an Anthoy soils delineation and is classified as Combate; Coarse-loamy, mixed, superactive, nonacid, thermic Ustic Torrifluvents. Combate is not a named major or minor component in the map unit. Anthony is calcareous and in the typic aridic moisture regime. This pedon has a sandy loam surface and a gravelly to very gravelly subsurface and does not effervesce throughout the profile.

SRER_014 – This pedon is in the Sonoita gravelly sandy loam delineation and is classified as Sandy, mixed, superactive, thermic, Typic Haplocambid. There is no soil series with this classification. The soil is not a named major or minor component in this map unit. This pedon is loamy sand over gravelly coarse sand and does not effervesce in any horizon.

SRER_016 – This pedon is in an Anthony soils delineation and is classified as Redo; Sandy-skeletal, mixed, thermic Typic Haplocalcids. Redo is not a named major or minor component in the map unit. This series was not established until 1993, while the survey was done in the 1970's. This pedon has a gravelly sandy loam surface and a subsurface of textures grading from sandy loam to coarse sand in the bottom horizon. There is a bulge of coarse fragments including cobbles in the middle of the profile. Effervescence is violent from about 25 cm from the surface to the bottom of the profile.

SRER_018 – This pedon is in the Pima clay loam, sandy clay loam subsoil variant and is classified as Pima taxadjunct; Fine-loamy, mixed, superactive, calcareous, thermic Typic Torrifluvents. This pedon is gravelly loamy sand over a finer subsoil of silt loam and silty clay loam that does not effervesce in the surface but does have decreasing effervescence just below the most recent surface deposition.

SRER_021 – This plot was navigated to and investigated. After finding the most representative spot to excavate the profile we found it most difficult to dig a small pit. The lack of soil moisture, quantity of coarse fragments, and heavy clay content encouraged the crew to find an alternative site.

SRER_023 – This pedon was in a Comoro soils delineation and is classified at the family level; Sandy, mixed, superactive, thermic Ustic Haplocambids. This is not a named major or minor

component in the map unit. This profile has a coarse sand surface and a loamy sand subsurface, it does not effervesce at any part of the profile and the coarse fragments increase with depth.

SRER_024 – This pedon was in a Whitehouse-Caralampi, 10 to 35 percent slopes delineation and is classified as Baboquivari; Fine-loamy, mixed, superactive, thermic Ustic Haplargids. This is not a named major or minor component of the map unit. This profile has a loamy sandy/sandy loam surface over a sandy clay subsurface. There is no effervescence throughout the profile.

SRER_026 – This pedon is in a Sonoita gravelly sandy loam delineation and is classified as Bodecker; Sandy-skeletal, mixed, thermic Ustic Torrifluvents. This is not a named major or minor component of the map unit. This profile is coarse sand throughout with increasing coarse fragments with depth. There is no effervescence throughout.

SRER_043 – This pedon is in an Anthony soils, very gravelly variants delineation and is classified as Rillino; Coarse-loamy, mixed superactive, thermic Typic Haplocalcids. This is not a named major or minor component of the map unit. The profile has a loamy sand surface with a sandy loam subsurface. This soil is effervescent throughout.

References

Richardson, M.L., Clemmons, S.C. and Walker, J.D. 1971. Soil Survey of Santa Cruz and parts of Cochise and Pima Counties Arizona. USDA-SCS. US Gov Print Office.