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NEON Site Level Plot Summary
San Joaquin Experimental Range (SJER)

Document Information

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Site Background

The San Joaquin Experimental Range (SJER) is an ecosystem research experimental area in the foothills of the Sierra Nevada (MLRA 18). The range is located near O'Neals, California, outside of the Sierra National Forest and about 32 kilometers (20 miles) north of Fresno, California.

The San Joaquin Experimental Range was established in 1934. The initial purpose was to learn how to better manage the annual grass / blue oak ecosystems of the foothills. The SJER is managed cooperatively by the Pacific Southwest Research Station of the United States Forest Service and California State University's Agricultural Foundation, primarily for research and education. The range was established as a UNESCO Biosphere Reserve under the designation San Joaquin Biosphere Reserve in 1976. The NEON site within the SJER is 4,500 acres in size.

Site Information

The SJER site has a mean annual temperature of 16.54°C; mean annual precipitation of 517 mm; effective precipitation of -369.68 mm; 259 frost-free days; growing degree days of 2677°C; elevation of 369 m; and slope gradient of 12%.

The parent materials at the SJER site are residuum, colluvium, and local alluvium derived from Mesozoic aged granite, quartz monzonite, granodiorite, and quartz diorite crystalline rocks.

Land use is dominated by rangeland, with a few areas cleared for pasture, hay, or other agricultural or general use.

Plant communities are dominantly annual grass/blue oak woodland, with scatterings (mostly on north aspects) of foothill pine (*Pinus sabiniana)*.

Major soil series on the site are Ahwahnee (Coarse-loamy, mixed, active, thermic Mollic Haploxeralfs) and Vista (Coarse-loamy, mixed, superactive, thermic Typic Haploxerepts). Both soils are moderately deep to a paralithic contact.

The Soil Survey that covers the SJER is an order 3 survey; All soil map units that occur within the site are undifferentiated groups. Table 1 gives the map unit symbol, soil series names and

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characteristics, and acreage within the site.

Madera Area, California (CA651)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AeD	Ahwahnee and Vista rocky coarse sandy loams, 8 to 30 percent slopes	4,137.5	91.9%
ArD	Ahwahnee and Vista very rocky coarse sandy loams, 15 to 30 percent slopes	101.2	2.2%
ArF	Ahwahnee and Vista very rocky coarse sandy loams, 30 to 75 percent slopes	261.2	5.8%
Totals for Area of Interest		**4,500.0**	**100.0%**

Table 1. Soil map unit information for the SJER site. Areas and percent coverage are based on the NEON site area.

Analysis of Plots for Sampling

Based upon the existing soil survey the SJER site has an apparent homogenous soil composition (at the scale of mapping). The distributed plots occur within two of the three map units extant on the site, one major geology, one landform (at the plots), and three major vegetative communities (Table 2). Our plot selection for sampling is representative of the two map units and three vegetative communities with variation according to hillslope position, slope gradient, and aspect. The hillslope positions identified were summits, shoulders, backslopes and footslopes. Backslopes are the dominant slope position within the site. Our plot evaluation resulted in 10 plots being selected for field description, sampling, and lab characterization. The 24 remaining plots either occurred in non-typical settings or were duplicate soil types of the selected plots.

NRCS Pedon ID	Plot ID	Series	Hillslope position	Slope %	Aspect	Vegetation
S2017CA039001	SJER_030	Friant	Shoulder	14	163	Shrub/Scrub
S2017CA039002	SJER_021	Kernville Tax	Backslope	25	127	Grassland Herbaceous
S2017CA039003	SJER_024	Tunis	Backslope	22	135	Grassland Herbaceous
S2017CA039004	SJER_023	Ahwahnee	Shoulder	11	117	Grassland Herbaceous
S2017CA039005	SJER_014	Ahwahnee	Backslope	30	170	Grassland Herbaceous
S2017CA039006	SJER_013	Vista Tax	Backslope	26	297	Evergreen Forest

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S2017CA039007	SJER_001	Vista Tax	Footslope	19	104	Grassland Herbaceous
S2017CA039008	SJER_029	Vista Tax	Backslope	13	242	Shrub/Scrub
S2017CA039009	SJER_028	Kernville	Backslope	25	190	Shrub/Scrub
S2017CA0390010	SJER_003	Feethill	Backslope	7	55	Evergreen Forest

Table 2. Summary of the selected plots by soil series, slope position, slope gradients, aspect, and vegetation.

Plot Findings

SJER_030: This plot occurs in map unit AeD - Ahwahnee and Vista rocky coarse sandy loams, 8 to 30 percent slopes. The soil was classified as Friant, a loamy, mixed superactive, thermic Lithic Haploxeroll. This soil is similar to Tollhouse (loamy, mixed, superactive, mesic, shallow Entic Haploxeroll) which at 10% is a minor component in this map unit. The main differences between Friant and Tollhouse is that Friant is found over unweathered bedrock (R horizon) and Tollhouse is shallow to a partially weathered, or paralithic contact (Cr). Tollhouse is also a mesic soil and as such should be replaced with a thermic analog during update work.

SJER_021: This plot occurs in map unit AeD - Ahwahnee and Vista rocky coarse sandy loams, 8 to 30 percent slopes. The soil has been called a Kernville taxadjunct, and it classifies as a sandy skeletal, mixed active, thermic Entic Haploxeroll (Kernville is a mixed, thermic, shallow Typic Xeropsamment). This soil is similar to Kernville in that it is relatively shallow (54cm) with very coarse textures throughout the profile. From 0 to 54 cm the texture of this soil is loamy coarse sand. The gravel content was 35 to 60% (vol) from 32 to 54 cm. The gravel content at 32 cm is not thought to affect use and management. The Kernville series as defined contains a thin Cr horizon over a R horizon (as described above). A Cr horizon was not recognized in the pedon sampled at this plot. Taxonomy for this series therefore needs to be updated. The geographic setting of this SJER plot is outside of the current series range for a couple properties. The elevation at the SJER plot(s) is lower than that allowed for Kernville while the mean annual precipitation and the frost-free days are both higher at the SJER plot. The official series description should be updated to reflect the current classification and a discussion needs to be had about widening the geographic range t in which this soil will be mapped.

SJER_024: This plot occurs in map unit AeD - Ahwahnee and Vista rocky coarse sandy loams, 8 to 30 percent slopes. The soil was classified as Tunis, a loamy, mixed, superactive, thermic, shallow Typic Haploxeroll. This soil is similar to Tollhouse (loamy, mixed, superactive, mesic, shallow Entic Haploxeroll) which at 10% is a minor component in this map unit. The main difference between Tunis and Tollhouse is that Tunis has a cambic horizon over the paralithic contact. Also, Tunis is a thermic soil, whereas Tollhouse is mesic soil and will need to be replaced with a thermic analog during update work.

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SJER_023: This plot occurs in map unit AeD - Ahwahnee and Vista rocky coarse sandy loams, 8 to 30 percent slopes. The soil was classified as similar to Ahwahnee, a coarse-loamy, mixed, active, thermic Mollic Haploxeralf. Differences found in this pedon compared to the series are: this pedon had strongly cemented bedrock (R) at 70 cm whereas this series is typically over a paralithic contact. Texture and clay content in the Bt2 of this pedon is higher than what is allowed for the series: We found a sandy clay loam with 22% estimated clay; The series concept is a sandy loam with 18% clay as the upper limit.

SJER_014: This plot occurs in map unit ArF - Ahwahnee and Vista very rocky coarse sandy loams, 30 to 75 percent slopes. The soil was classified as similar to Ahwahnee, a coarse-loamy, mixed, active, thermic Mollic Haploxeralf. Ahwahnee is a major component in this map unit and makes up 25% of the map unit total. Differences found in this pedon compared to the series are: this pedon had strongly cemented bedrock (R) at 97 cm whereas the Ahwahnee series is typically over a paralithic contact. Update work in MLRA 18 needs to include an examination of series data to determine the prevalence of both lithic and paralithic contacts occurring in these soils as it seems to be very common with the local geologies.

SJER_013: This plot occurs in map unit AeD - Ahwahnee and Vista rocky coarse sandy loams, 8 to 30 percent slopes. The soil was classified as sandy, mixed semiactive, thermic Entic Humixerept. This soil is a taxadjunct to Vista (coarse-loamy, mixed, superactive, thermic Typic Haploxerept) which is a named component in this map unit comprising 25% of the unit. Differences between this soil and Vista include a sandy particle size class in this soil instead of coarse-loamy, a lithic contact recorded 29 cm below the paralithic, whereas the Vista series has a paralithic contact documented to extend at least 66 cm.

SJER_001: This plot occurs in map unit AeD - Ahwahnee and Vista rocky coarse sandy loams, 8 to 30 percent slopes. The soil was classified as mixed, thermic Typic Xeropsamment. This soil is a taxadjunct to Vista (coarse-loamy, mixed, superactive, thermic Typic Haploxerept) which is a named component in this map unit comprising 25% of the unit. Differences between this soil and Vista include the absence of a particle size class in this soil (redundant) instead of coarse-loamy, a lithic contact recorded at 74 cm, whereas the Vista series has a paralithic contact anywhere from 100 to 150 cm.

SJER_029: This plot occurs in map unit AeD - Ahwahnee and Vista rocky coarse sandy loams, 8 to 30 percent slopes. The soil was classified as a mixed, thermic Typic Xeropsamment (as was S2017CA039007). This soil is a taxadjunct to Vista (coarse-loamy, mixed, superactive, thermic Typic Haploxerept) which is a named component in this map unit comprising 25% of the unit. Differences between this pedon and the Vista series include absence of a particle size class and a thin Cr horizon (6 cm) over a lithic contact at 70 cm. The Vista series does not have a lithic contact beneath the paralithic contact within 100 to 150cm of the surface.

SJER_028: This plot occurs in map unit ArF - Ahwahnee and Vista very rocky coarse sandy loams, 30 to 75 percent slopes. The plot sample location has a slope beyond the slope range specified in the map unit. The majority of the delineation, however is within the slope range stated in the map unit. The soil at this location has been classified as Kernville: mixed, thermic, shallow Typic Xeropsamment. This soil is shallow (40cm) to a Cr with a lithic contact coming in at 67 cm. The Kernville series is defined as shallow to a lithic contact (with a Cr over the R) with very coarse textures throughout the profile. From 0 to 40 cm the texture of this soil is loamy sand, which is outside the series range as defined. As for SJER_021, the taxonomic

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classification for the Kernsville series needs revision. A pedon that is shallow to a lithic contact (with a thin Cr overlying the R horizon), according to current taxonomy (12th edition of the Keys to Soil Taxonomy, 2014) classifies as a lithic Xeropsamment and not a typic Xeropsamment. The geographic setting of this SJER plot is outside of the series range as currently written. The elevation at this SJER plot is also lower than allowed for the Kernville series, while the mean annual precipitation and frost-free days at the plot are both higher than specified in the series. The official series description should be updated to reflect the current classification and a discussion needs to be had about widening the geographic range in which this soil occurs.

SJER_003: This plot occurs in map unit AeD - Ahwahnee and Vista rocky coarse sandy loams, 8 to 30 percent slopes. The soil was classified in the field as a fine-loamy, mixed, superactive, thermic Typic Argixeroll, although lab data may show that the base saturation is low enough to put this soil in an ultic sub group. If the soil is confirmed by laboratory data as typic, then it fits the Feethill series, except that the elevation of this soil is lower than that allowed in the Feethill series. This soil is moderately deep and is the only soil sampled that has a fine-loamy particle size class. This map unit has Auberry as a minor component at 10% and this soil fits that concept as a similar soil (Auberry is ultic and deep). This soil also has a thin Cr horizon (6 cm) over a lithic contact at 70 cm, whereas the Feethill series does not have a lithic contact documented under the paralithic contact.

Summary of Soils

The soils identified and sampled at the SJER site in general match with the soil map units designated and described in the soil survey for the site. The soil map units, as stated earlier, are undifferentiated units. Soils sampled on the site cover the range of expected soil in the map units. It should be noted that the Vista soil is currently mapped in three MLRAs: MLRA 20, where it was established, MLRA 15, and MLRA 18. The Soil Survey Region has determined the Vista series is too broadly defined and should be geographically constrained; a new soil series needs to be proposed for the Vista concept in MLRA 18. Although the soil description and sampling for this project is in a small geographic area, it will serve as documentation to define the new concept for what has been mapped as the Vista soil series in MLRA 18. The new series would be similar to a moderately deep Kernville.

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