

SOIL AND PLANT SCIENCE DIVISION

Technical Soil Services

Southwest Soil Survey Region and California NRCS

Sonora, California, Major Land Resource Area (MLRA) Soil Survey Office (SSO) and California NRCS State Office

NRCS Assists with the 2023 National North American Colleges and Teachers of Agriculture Soil Judging Contest

Purpose

In April 2023, the Soil and Plant Science Division (SPSD) Southwest Soil Survey Region and California NRCS State Office staff assisted Modesto Junior College (MJC) in hosting the [North American Colleges and Teachers of Agriculture \(NACTA\)](#) soil judging contest.

Background

The 2023 NACTA Judging Conference is an annual event that brings together students from both 2- and 4-year colleges from across the country to compete in up to 17 different agricultural related contests. The subject matter for each contest ranges from agricultural business management and communications to dairy, equine, and crop management as well as everyone's favorite—soil judging.

MJC, the host for this year's Judging Conference, reached out to local NRCS soil scientists for assistance with the soil judging competition. The college located and excavated the soil pits, which was delayed due to a series of atmospheric rivers in March that flooded many parts of California and doubled the seasonal rainfall in the Modesto area. NRCS soil scientists described the practice (9) and contest (4) soil pits and formulated the scorecards. NACTA contest rules mandate two control sections within the soil pits, one for 2-year and one for 4-year teams, and score cards that acknowledge the difference in educational levels.



Figure 1. Early morning gathering of contestants at the contest site, which was a recently removed walnut orchard. Photo courtesy of Rafael Ortiz-Vasquez.

The coordination between MJC, NRCS SPSD, and California NRCS staff made for a successful contest. MJC Instructors Ron Alves (retired), Troy Gravatt, and Taylor Doo hosted the contest. MJC agriculture operations manager, Andy Alderson, dug spacious backhoe pits, and MJC students served as pit monitors. Matt Young of A & L Western Agriculture Labs ran particle size analysis and pH. Theresa Kunch, Sonora SSO leader, and Philip Smith, NRCS California resource soil scientist, coordinated the efforts of the NRCS. NRCS agronomist Amber Gariety met with the SPSD staff in the field to inform them of the specific agricultural history of the contest site. Soil scientists from the Sonora MLRA SSO (Cathy Scott, Andrew Brown), Hanford MLRA SSO (Rafael Ortiz-Vasquez), Chico MLRA SSO (Cathy Valentine), district conservationist Jennifer Wood (former SPSD SDQS), and SPSD researcher Dylan Beaudette were also called in to help.

The soil judging practice and contest soil pits included both alluvial parent materials of the California Central Valley (MLRA 17) and the residual parent materials of the Sierra Nevada Foothills (MLRA 18). The interface between these two MLRAs is a complex assemblage of basement rock types, overlain by both consolidated and unconsolidated sediments ranging from recent Holocene deposits to Eocene-age paleosol remnants. Features observed in the contest area broadly represent the ancient pathways of pyroclastic flows and rivers, coupled with the process of uplift of the Sierra Nevada fault block. The result of this complex geologic and geomorphic history is an incredible diversity of soils in the area.

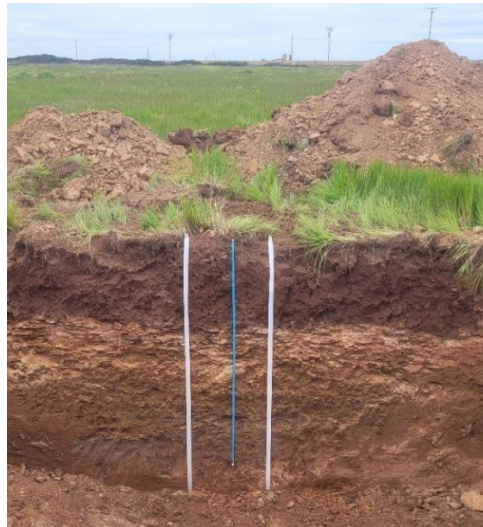


Figure 2. A photograph of one of the practice soil pits for the 2023 NACTA soil judging contest. The soil was described as the San Joaquin series, the California State Soil, a fine, mixed, active, thermic Abruptic Durixeralf. Over 400,000 acres of San Joaquin soils are found in the central valley. Photo courtesy of Theresa Kunch.

The soils pattern of occurrence in this area is further complicated by how humans have used the land. In general, the alluvial soils of the Central Valley are highly suitable for irrigated agriculture, whereas in the foothills, geomorphic complexity, and depth to bedrock make these soils more suited to rangeland.

Contestants saw first-hand the differences in these soils and landscapes along with how humans have increased the productivity of the soil such as using deep ripping, a practice used to mechanically loosen deep soil compaction. Also evident to the contestants were large cultural changes, such as the removal of walnut orchards, as growers try to balance production costs, water availability, and market prices.

Soil scientists and contestants described lithologic discontinuities and stratigraphy, vertic characteristics, silica accumulation and duripan formation, abrupt textural changes, and carbonate and soluble salt accumulation in the soil pits. They also observed parent materials derived (primarily) from andesitic sediments of the Merhten formation in the contest soil pits and (dominantly) granitic alluvium in the practice soil pits. They described an array of stream terraces and alluvial fan remnants in the practice soil pits that spanned a broad range in age (~10kya to 200kya+) and pedogenic development (Entisols to Alfisols) on otherwise similar materials and landforms.



Figure 3. Students describing the physical properties found in a contest pit. Photo courtesy of Theresa Kunch.

Key Outcomes

The [2023 NACTA Judging Conference](#) had a total of 87 student contestants and 15 teams involved in the soil judging contest. In many cases, students and coaches were visiting California and experiencing its soils for the first time. After the contest, while scoring was underway, NRCS soil scientists discussed what they observed in the contest soil pits in the field directly with the students. The students listened intently, asked many thought-provoking questions, and commented that these discussions were vital to their understanding of soils.

This year's contest included a total of seven 2-year teams (38 contestants) and eight 4-year teams (49 contestants). Eastern Oklahoma State won 1st place, followed by Black Hawk College taking 2nd place, and the College of Southern Idaho taking 3rd place in the 2-year soil judging contest. The University of Wisconsin-River Falls won 1st place, Southern Illinois University (Carbondale) took 2nd place, and West Virginia University came in 3rd place in the 4-year soil judging contest.

NRCS staff would like to see more soil judging contests hosted in the Western states that showcase a diversity of soils and production systems. They also see the benefit of broadening the soil judging programs to make them available at more 2- and 4-year colleges in the West.

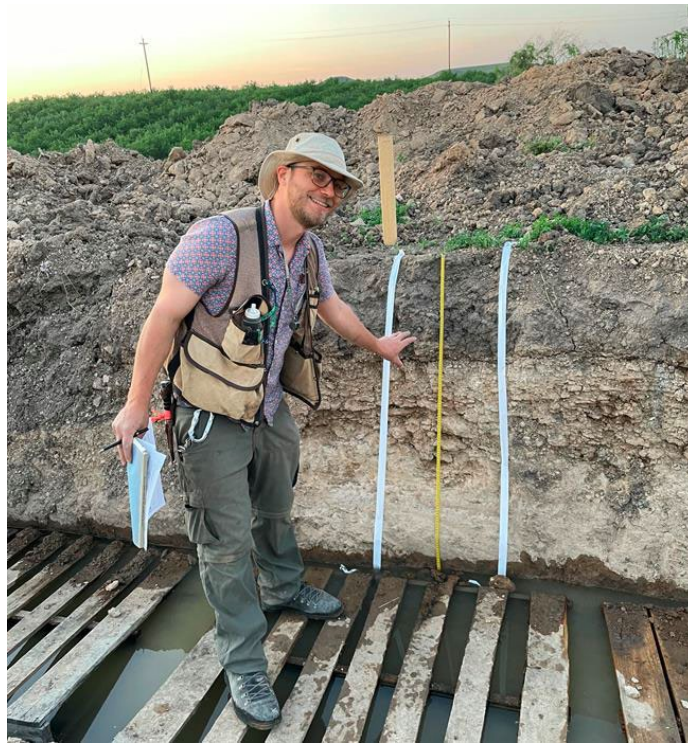


Figure 4. Andrew Brown, SPSD soil scientist, examining a “profound change in landscape evolution” observed in one of the contest soil pits. This soil profile was described as having clayey alluvial material overlying a highly fractured duripan, overlying nearly impermeable, consolidated Pliocene-age pyroclastic material derived from the Merhten formation. The duripan restricts roots and water. Behind and to the left of Brown, deep ripping tore through the soil before planting of walnut trees, which have since been removed. As seen in the photo, recent heavy rainfall ensured the pits were wet when dug, and several inches of water remained in the bottom of the pit at time of the contest. Photo courtesy of Phil Smith.

This was an unprecedented opportunity for NRCS staff (both above and below the state level) to work together to inspire a new generation of soil scientists. Local NRCS offices now have experience implementing regional and national soil judging contests using both Soil Science Society of America and NACTA rules. All involved were reminded of the great things that come from cooperation between our offices in the field.