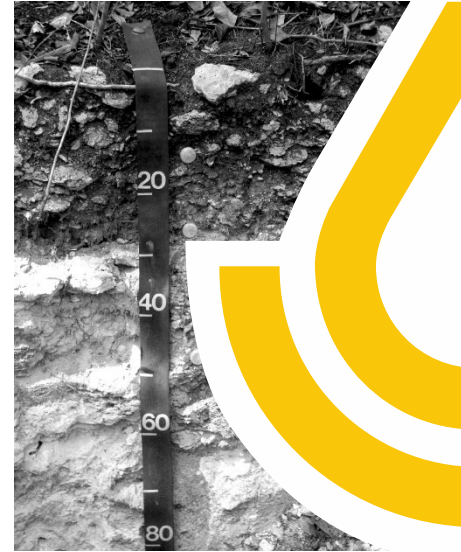




The History of American Women in Soil Science



Special Emphasis Program

**Natural
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Updated by Federal Women’s Special Emphasis Program Managers, March 2022

March is celebrated as National Women’s History Month. This year, the theme is “Women Providing Healing, Promoting Hope.” This theme is a tribute to caregivers during the COVID–19 pandemic and a recognition of the thousands of ways women have provided healing and hope throughout history.

The field of soil science has also been impacted by many notable women, and today we are delighted to see more and more women continue to drive the field forward. In celebrating National Women’s History Month, the Federal Women’s Special Emphasis Program Managers would like to share an updated version of the history of American women in soil science and their contributions to NRCS.

A very special “Thank you” to Maxine J. Levin, who played a significant role not only in the writing of this article but in her dedication to documenting and promoting equality for women in the field of soil science. Historical information is adapted from a personal interview with Maxine (2016) and her narrative “Women in Soil Science - 1895 to Present” written and published in 2001 on the website of the Association of Women Soil Scientists (AWSS).



The Pioneers: 1895–1965

1895 Miss Janette Steuart and Miss Sorena Haygood maintained laboratory and field records in Washington, DC, for the Soils Division of what was then the U.S. Weather Bureau of USDA.



- June 1901** Miss Julia Pearce was appointed to one of the first USDA Soil Survey field parties (Hanford, California) as an assistant to Macy Lapham for the Soil Survey of Crisscross Trails. She copied maps. A short time later, she was transferred to Washington to work in the physical laboratory.
- 1920s** Mary Baldwin, the wife of soil inspector Mark Baldwin (USDA Soil Survey, 1912–1944), described mapping with her husband in northern Wisconsin. She and her husband mapped during the summer months, camping and using a small boat to go from island to island.
- Mid-1930s** Charlotte Whitford (Coulton) graduated with a M.S. in botany from Ohio State University before taking a job as secretary for a Soil Conservation Service (SCS) field soils staff in Zanesville, Ohio. She was recruited to work as an assistant soil technologist in Washington, DC, on a series of soil erosion reports. She later worked as an editor on soil surveys and eventually became head of the publications staff of the SCS.
- 1937** Miss Lois Olson and Dr. Arthur Hall spoke on studies in erosion history as part of a series of research seminars to the SCS. Some of today's thinking on interpretations of the soil survey and field practices to control erosion is attributed to this series of lectures in 1936 and 1937. Miss Olson, a geographer by training, was the head of the SCS Erosion History Section.
- 1939** Ester Parsons Perry was the first woman to receive a Ph.D. in soil science in the United States. She received this degree from the University of California, Berkeley. Her thesis was titled "Profile studies of the more extensive primary soils derived from granitic rocks in California." From reading her thesis, Professor Gary Sposito of the University of California, Berkeley, thinks that she was one of the first students to use x-ray diffraction to look at the clay mineralogy structure in soils. From 1939 until her retirement in 1965, she worked in and ran the soil survey lab at the University of California at Berkeley.
- 1941** Dorothy Nickerson was a color technologist for USDA from the late 1920s through the 1940s. Dorothy was instrumental in developing the soil color standards for soil survey. She worked with T.D. Rice, Kenneth Kelly, and Albert H. Munsell to adapt the Munsell color chart system for describing soil color in the lab and the field. After extensive colorimetric testing by Nickerson in the lab and by soil scientists in the field, the Munsell color charts and a new set of color names were adopted by the American soil survey in 1949.
- 1946** Mary C. Baltz (Tyler) was officially the first SCS female soil scientist in the field. Mary graduated from Cornell University and joined the soil survey as a "junior soil surveyor" in Madison and Oneida Counties, New York. World War II labor shortages provided an opening for her to work in a job that, up to that time, appeared to be reserved for men. Mary worked for SCS until about 1965.



In the Classroom, in the Fields, and in the Labs (1965–1990s)

- 1950–1960s** Very few women received soil science degrees, taught, conducted research, or worked in the field during this period. The career counseling documents of the time focused on helping women plan for work and marriage. It wasn't until the 1970s that such documents began to discuss ways to channel women into nontraditional careers. Encouraging young women to enter nontraditional occupations continued as a theme into the 1980s.
- 1964** Title VII of the Civil Rights Act of 1964 prohibited sex discrimination in federal employment.
- 1965–1975** The women who had received a Ph.D. in soil science in the late 1950s and early 1960s were teaching soil science in U.S. universities during this period. They included Dr. Nellie Stark, University of Montana (1970–1992); Dr. Eva Esterman, San Francisco State University (1960–1982); and Dr. Jane I. Forsyth, University of Cincinnati, Miami University, University of California–Berkeley, Ohio State University, and Bowling Green State University (1956–1992).
- Mid- to late-1970s** Women were more commonly hired to work for the SCS as field soil scientists.
- 1980** The Women in Science and Technology Equal Opportunity Act in 1980 opened up more opportunities for women to receive support in the university setting.
- Early 1980s** The Association of Women Soil Scientists (AWSS) was started by a group of women soil scientists in the U.S. Forest Service.



- 1985** Dr. Elizabeth L. Klepper became the first woman ever to receive the prestigious Fellow Award from Soil Science Society of America (SSSA). Her research concentrated on



root growth and function under field conditions and plant-soil water relations. She is a recipient of Fellow awards from all three agronomic research societies: American Society of Agronomy (ASA), Crop Society of America (CSA), and Soil Science Society of America (SSSA). Other female SSSA fellows that have provided outstanding contributions to soil science are Mary Beth Kirkham (1987), Mary K. Firestone (1995), and Jean L. Steiner (1996).

- 1988** Carol Wettstein was the first female State soil scientist with SCS. She worked in Maryland from 1988 through 1989 and transferred to Colorado from 1990 through 1995. Carole Jett became State soil scientist in California in 1991, and Carol Franks became State soil scientist in Arizona in 1994.
- 1978** The Civil Service Reform Act of 1978 required that the federal work force reflect the nation's diversity.
- 1992** Mary West was executive committee chair of AWSS. Guest editors were Susan Samson, Jackie Pashnik, and Donna Duffy. The following committees were organized: Executive, Newsletter, Mentoring, Directory, Meetings, Current Issues, Membership, and Other Societies. AWSS conducted a discrimination/sexual harassment survey. An AWSS support group was formed. AWSS met at the ASA meeting in Minneapolis, Minnesota. The first AWSS meeting with SWCS took place in Baltimore, Maryland. Membership was 170.

The “Yes” Generation—1990 and On

Through the mid-1980s into the 1990s, there was a substantial increase in the number of female researchers and associate professors of soil science in U.S. universities. The workforce of the 1990s was named the “Yes” Generation by Newsweek. In 2000, there were three female pedology professors in the United States: **Dr. Mary Collins** (University of Florida), **Dr. Janice Boettinger** (Utah State University), and **Dr. Christine Evans** (University of New Hampshire). Female researchers and associate professors were active in all aspects of the soil sciences throughout the U.S. university system and research agencies. An associated paper documents many of these women's achievements. Many women presented their career highlights in a seminar at the Soil and Water Conservation Society meeting in 1999, and many other women were consistent in their performance and participation in SSSA meetings.

According to the Fall 1996 “Enrollment for Agriculture, Renewable Natural Resources and Forestry Report” by the Food and Agricultural Education Information System (FAEIS), between 1987 and 1996 soil science, education, and communication experienced the largest growth in percent female participation. Female participation increased from 16.2% in 1987 to 32% in 1996. General enrollment of students (B.S., M.S., and Ph.D.) in the soil sciences held relatively steady between 1987 and 1996, fluctuating between 1,200 and 1,500 students. In 1996, there were 228 female B.S. graduates in soil science, almost double the graduation rate of the previous 10 years. Also, about one-third of doctoral and masters’ candidates were female, also double from 10 years prior.



21st Century Women of Soil Science

From 1990 to the present, women in soil science and the NRCS¹ have made tremendous progress and contributions to the field. Women have assumed leadership roles at every level of the agency, including MLRA leaders, State soil scientists, and national leaders. One of the first women to join a soils staff at a State office was **Carol Jett**. She became State soil scientist of California in 1991. Later, she worked as associate Deputy Chief for Programs. She served on assignment as congressional staff with the House Agricultural Committee in 1999 and became the NRCS lead for implementation of the Conservation Title of the 2002 Farm Bill. For her efforts and dedication to the conservation of soil and water, she was awarded the Soil Conservation Society Norman A. Berg Conservation Legacy Award in 2009.

Many women have had the opportunity to lead their State's soils staff as State soil scientist over the years, including **Cory Owens** (Oregon), **Kim McCracken** (New Hampshire and Maine), **Deanna Peterson** (Florida then South Dakota), **Carmen Santiago** (Puerto Rico), **Francine Lheritier** (Colorado), **Kamara Holmes** (South Carolina, Minnesota, and the East National Technology Support Center) and **Astrid Martinez** (Wyoming). Astrid moved to the conservation side of NRCS and now serves as Wyoming's State Conservationist. **Diane Shields**, former assistant State soil scientist in Delaware, acted as State soil scientist when the offices for Massachusetts and Delaware combined. Today, nine of the U.S. States and territories have women leading the soils staff. These women are **Rebecca Fox** (Arkansas), **Amy Koch** (Hawaii), **Maggie Payne** (Massachusetts and Vermont), **Kristine Ryan** (South Carolina), **Jennifer Smith** (Wisconsin), and **Debbie Surabian** (first female State soil scientist for Connecticut and Rhode Island). **Olga Vargas** is currently acting State soil scientist of New York.

Once the door was opened for women to serve in more leadership roles, many women began to take on management positions at the NRCS national technical centers and female representation in NRCS became noticeably more pronounced. **Sharon Waltman** worked on the staff of the National Soil Survey Center (NSSC) in the Soil Business Services, Geospatial Research Unit, as a soil scientist-spatial data analyst before her retirement. **Linda Scheffe** served on the NSSC Technical Soil Services staff as Agronomist before her retirement. **Susan Andrews** was the national leader for ecosystem services at the NSSC. She identifies herself as an "agroecologist," understanding and advocating for the combined agricultural and ecosystem services that soils offer. **Susan Southard** worked on the Interpretations Staff as a soil scientist and liaison to the National Park Service while residing in California. **Maxine Levin** is a pioneer in the field of soils. She has been an active soil scientist since early in her career, taking on a variety of leadership roles at different levels of the agency. She was appointed national program manager for the Soil Survey Division in 2000 and served as the National Leader for Soil Survey Interpretations at the NSSC before her retirement. She is a passionate advocate for women's success in the field of soil science and is one of the founding members of the Association of Women Soil Scientists (AWSS).

Today, some of the NRCS technical leadership and National Headquarters positions are occupied by female soil scientists. **Cathy Seybold** started her soils career in the field. She then earned her Ph.D. in soil physics and worked on the NSSC Soil Survey Interpretations Staff. **Lenore Vasilas** is a technical soils specialist on the NSSC Technical Soil Services Staff. She specializes in hydric soils and serves as the chair for the National Technical Committee for Hydric Soils. **Skye Wills** is currently the National Leader of the Soil Science Research Branch at the NSSC. Previously, she served as a research soil scientist on the NSSC Soil Quality and Ecosystems Staff. Her research focused on dynamic soil

¹ The Soil Conservation Service (SCS) officially became the Natural Resources Conservation Service (NRCS) in 1994.



properties and soil carbon. **Pam Thomas** served as State soil scientist in South Carolina before starting her new role as associate director of soil survey programs for the NRCS Soil and Plant Science Division.

Some women have taken their experience in the field and applied it to their research. **Carol Franks** was one of the first female State soil scientists, holding the position in 1994 in Arizona. Carol later went on to assume the position of research soil scientist, conducting her research on soil biology and soil health at the Kellogg Soil Survey Lab in Lincoln, Nebraska. **Rebecca Burt**, a research soil scientist at the lab, is credited for creating the “Kellogg Soil Survey Laboratory Methods Manual.” This publication outlines the methodology for analytical procedures and serves as a reference for laboratory analysts. She wrote some of these methods and was the technical editor of the publication.

Women have assumed essential roles in some of the more specialized branches of the NRCS. **Bianca Mobius-Clune**, Ph.D., became the director of the Soil Health Division (SHD) in 2014 and now leads the American Farmland Trust. **Diane Stott** served as a national soil health specialist for the SHD; today, this position is held by **Rachel Seman-Varner**. **Betty McQuaid** served as a soil ecologist with the NRCS Watershed Science Institute in Raleigh, North Carolina. **Carrie Ann Houdeshell** is the regional modeling unit coordinator at Davis, California. **Panola Rivers** worked as the leader of the Digital Soil Survey Team at the Geospatial Technology Branch of the NRCS National Geospatial Center of Excellence (NGCE) before she passed away in 2016. **Jennifer Sweet** is a soil scientist on the Soil Geodatabase Team of the Geographic Sciences Branch of the NGCE in Ft. Worth, Texas. She also served as the acting national leader for the Soil Business Systems Branch.

Currently, three of the eight regional directors of the NRCS Soil Survey Division are women. **Dr. Cynthia Stiles** paved her way to becoming director of Soil Survey Region 2 in California by first working as a research soil scientist, a supervisory soil scientist, and assistant State soil scientist in Hawaii. **Jessica Lene** started her career as soil scientist and project leader in Texas before becoming the senior regional soil scientist in Alabama. She taught soil survey techniques to soil scientists from Haiti before assuming her current role as the regional director of Alaska. As part of the Soils 2026 Initiative, Jessica is leading the soil survey initial mapping efforts for the largest portion of the country that remains unmapped.





Eva Muller: Soil Scientist of the Year 2001.

2001: First Female Soil Scientist of the Year

Eva Muller directs Region 4 in Montana after an impressive history as a soil data quality specialist. For her exemplary efforts, she was presented the prestigious *Soil Scientist of the Year* award in 2001—the first woman to ever receive the award. **Cathy McGuire** became the director of Region 8 in Arizona.

Deborah Anderson was the director of Region 3, in North Carolina, before her retirement in 2021. In 2017, Debbie became the first and only female recipient of the *NCSS Scientist Achievement Award*.

Since 2001, several other women have been chosen as Soil Scientist of the Year. In 2010, **Caryl Radatz** was named Soil Scientist of the Year. She was one of the first woman MLRA leaders and later served as leader of MRLA Region 10 and State soil scientist of Minnesota. Again in 2013, the award was presented to a notable woman: **Lindsay Hodgman**, who serves as the assistant State soil scientist of New Hampshire and Maine. In 2017, **Suzann Kienast-Brown**, soil scientist and GIS specialist from Montana, received the award. She has had an extensive career working with GIS and digital soil mapping (DSM) techniques, including writing the DSM chapter for the 2017 update of the “Soil Survey Manual.” Suzann was a key developer and is a lead instructor for the NRCS Employee Development Center (EDC) courses “Introduction to Digital Soil Mapping” and “Remote Sensing for Soil Survey Applications.” Suzann was also awarded “Best Oral Presentation” for her work “Soils 2026 and Digital Soil Mapping – A Foundation for the Future of Soils Information in the United States” at the 2019 Joint Workshop for Soil Mapping and Global Soil Map held in Chile. In 2018, **Jennifer Mason**, MLRA soil survey leader from Tennessee, was awarded as Soil Scientist of the Year.





Maggie Payne: Soil Scientist of the Year 2020.

In 2020, **Maggie Payne**, the current State soil scientist of Massachusetts and Vermont, received the prestigious award when she was working as resource soil scientist in Massachusetts. Maggie is one of the pioneers who completed the first coastal and subaqueous soil survey in the nation and the first inland freshwater soil survey in Rhode Island. In 2021, **Carla Rebernak**, soil scientist and MLRA office leader in Idaho, became the latest recipient of the Soil Scientist of the Year Award. Carla has mapped soils in remote areas. She also designed the Borah Sharp Shooter, which replaces the heavier Montana Sharp Shooter shovel in the Midwest. Carla and her work have been featured in the Idaho Public Television series *Outdoor Idaho*, *Jobs Without Walls*, and as a guest scientist on *Science Trek*.

Women in Coastal Zone Soil Survey and Digital Soil Mapping

As soil science continues to evolve, new surveying and data analysis techniques have been developed and integrated into Agency activities. Women in NRCS have been making great contributions to the development of these technologies. **Suzann Kienast-Brown**, **Jessica Philippe**, and **Tiffany Allen** made great contributions to the digital soil survey mapping products that NRCS recently developed.

Susan Demas, **Debbie Surabian**, and **Maggie Payne** have been among the pioneers of the Coastal Zone Survey Initiative in the Agency and started the initial coastal zone soil survey mapping in the 2000s. The coastal zone soil survey is a male-dominated field, and these women paved the way for the ongoing coastal mapping of the country. **Olga Vargas**, **Yiyi Wong** (former grad student, NC State University), and **Debbie Surabian** helped map Jamaica Bay in New York. These women opened the door to younger generations of female soil scientists to take leading roles and leave their footprint in the coastal zone work. **Stacey Kloesel** is mapping Galveston Bay in Texas and is leading the coastal zone soil survey projects in her region. **Rachael Heisey**, a national winner of the Soil Judging Team Competition in 2019, joined NRCS in 2020 and is already leaving her footprint in the coastal zone of Louisiana and North Carolina. She has been taking leadership roles for the coastal zone soil survey initial mapping in her region.





Stacey Kloesel during coastal zone soil survey activities in Texas.

Women Who Left their Legacy in the Soils Division

Some women made a significant impact within the NRCS and later had an even greater impact on the field of soil science through other methods. **Marissa Theve** is a soil scientist for the Bureau of Land Management in Oregon. She previously worked as soil scientist in NRCS, and her research with tidal soils of the Connecticut River helped with the development of the electric conductivity 1:5 method for tidal marshes. **Stephanie Connolly** has worked in West Virginia since 2001 as forest soil scientist in the Monongahela National Forest. Stephanie has been an advocate for soil science within the USDA Forest Service and is an ambassador for soil survey programs in West Virginia within the National Cooperative Soil Survey. She also worked as the national leader for climate change at the Climate Change Program Office of the USDA Office of the Chief Economist. **Carolyn Olson** was the national leader for research at the National Soil Survey Center. She was also a president of the Soil Science Society of America. **Susan Casby-Horton**, geomorphologist at Temple, Texas, is now an NRCS Earth Team volunteer, NCSS cooperator, and adjunct professor of soils at Texas Tech University. She is known for her research on gypsiferous soils. **Sheryl Kunickis**, a former field soil scientist and GIS specialist in the national office, worked as director of the Office of Pest Management Policy for the USDA Agricultural Research Service before her retirement in 2021. **Arlene Tugel** was a soil scientist with the NRCS Soil Survey Division and liaison to the USDA Agricultural Research Service. In previous positions, Arlene was a founding member of the former NRCS Soil Quality Institute, served as soil scientist for interpretations at the West National Technical Center (Portland, Oregon), and was State soil correlator and a soil survey project leader in California. She was one of the first resource soil scientists in the country and was a strong supporter of state-and-transition models. She developed the manual for dynamic soil properties.

Association of Women Soil Scientists

Influential women in the NRCS also had an impact within the Association of Women Soil Scientists (AWSS), which was an organization with the purpose of establishing and maintaining high standards for professional women soil scientists. Many women were able to flourish and receive additional support and



encouragement in their careers through involvement with the AWSS. **GayLynn Kinter**, a very active resource soil scientist in Michigan, was responsible for many significant contributions to the success of this organization. **Laura Craven**, soil survey leader in Pueblo, Colorado, served as secretary and treasurer. She coordinated a joint effort in AWSS, co-hosting a soil conference in Illinois and Wisconsin in 2008. **Dena Anderson** is a resource soil scientist in Indiana and served as president of the AWSS for a number of years. **Margie Faber**, a former assistant State soil scientist of Connecticut, is one of the founding mothers of the association. She served as the AWSS historian before her retirement. Even though the Association of Women Soil Scientists is no longer active, the former members of this organization deserve thanks for their efforts and their impact on the soil sciences.

The brilliant women mentioned in this narrative are just a few of the pioneers and role models that have paved the way for equality in this field, which was once dominated by men. The outlook for women in soil science is encouraging; the trend towards equality continues as more and more women pursue an education in natural resources and engage their passion for soil and water conservation. Women will continue to have a positive influence through work in the field; research, private consulting, and education; and leadership roles. We can expect to see even more female trailblazers create significant change and leave a resounding impact, not just on women's history, but on the progress of conservation as a whole.





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