Written Testimony for the hearing on
"Supporting Careers in Conservation: Workforce Training, Education, and Job Opportunities"
May 25, 2022 – U.S House Agriculture Committee, Subcommittee on Conservation and Forestry

Margaret A. Holzer, PhD
Soil Science Society of America K-12 Committee

Chairwoman Spanberger, Ranking Member LaMalfa and Members of the Subcommittee, thank you for inviting me to speak to you today. My name is Dr. Margaret Holzer, and I serve on the K-12 Committee of the Soil Science Society of America K-12 Committee. For over 30 years, I taught secondary and higher education courses in Earth and space science, environmental science, and physical geography. Currently I am a science standards specialist at Great Minds PBC.

The Soil Science Society of America (SSSA) is an international scientific society that fosters the transfer of knowledge and practices to sustain global soils. Based in Madison, WI, and founded in 1936, SSSA is the professional home for 6,000+ members and 800+ certified professionals dedicated to advancing the field of soil science. The Society provides information about soils related to conservation, crop production, environmental quality, forestry, ecosystem sustainability, bioremediation, waste management, urban uses, mining and reclamation, and more. SSSA is dedicated to making soil a dinner table topic in every household. Members share the story of soil through the Soils Matter blog and through outreach to K-12 students and teachers in addition to supporting scientific knowledge exchange through an annual meeting and several scholarly journals.

Soils are more than the material under our feet; as a matter of fact, without soils, we would be "Hungry, Naked, Homeless, and Breathless," as a colleague on our committee stresses during his K-12 outreach programs. By acting out this little skit, students come to the "ah-ha" moment that soils are vital to our survival. We can no longer assume students will learn about the soil beneath their feet through the light touches found in textbooks and local curricula; we need to explicitly integrate soil science across all grade levels taking advantage of a variety of entry points in doing so. For more than 16 years, the Soil Science Society of America (SSSA) K-12 Committee has been on the frontline designing instructional resources, providing professional development for teachers, and supporting soil scientists who provide K-12 outreach. I am excited to share a little about our organization, our committee, our work, and some challenges ahead in encouraging our next generation of soil scientists and conservationists.

In July 2008, *Dig It! The Secrets of Soil* exhibition opened for an 18-month run at the Smithsonian Institution's National Museum of Natural History (of which SSSA was a Founding Sponsor). In preparation for the exhibit, SSSA was eager to build resources for those viewing the exhibit and resources for K-12 teachers. Thus, the SSSA K-12 Committee was formed in 2006 and is made up of a group of SSSA members passionate about telling the story of soils. Through my professional affiliations, I was asked to serve on this committee in 2006, and I have served on it ever since. Soil science has been a part of my life since I was a little girl when my father was a PhD candidate at Rutgers University studying soil science applications for his dissertation. Soil samples and soil sieves were regularly fixtures in our kitchen. Once I became a teacher, soil science was always a central part of my curricula.

The charge to our committee is to increase interest and awareness of soil science as a scientific pursuit and career choice, especially among K-12 teachers and their students and work to integrate more information on soil science into biology, chemistry, physics, and Earth science areas taught at multiple

grade levels. In addition, the American Society of Agronomy and Crop Science Society of America have also developed K-12 committees to provide teachers with resources for their classrooms and spark interest in their specific sciences as a pathway to career interest. Since the committee formed, we have developed:

- Three K-12 websites (with over 800,000 visits in 2020)
- Published four K-12 focused books (for use in formal or informal classrooms or at home)
- Developed two train-the-trainer workshops, two webinars, and two teachers guides
- Curated over 200 lessons, activities, and reading resources for K-12 teachers
- Developed state soil booklets for all 50 states and Guam
- Partnered with other organizations to develop and disseminate materials for K-12 teachers
- Produced I "Heart" Soil stickers in 15 languages and have distributed over 500,000 stickers
- And developed twelve 2-minute animated videos on various aspects of soil, as part of the 2015 International Year of Soils.

(Please see the Appendix for a detailed description of these activities.)

As impressive as our work is, there are challenges to overcome in building awareness of soil science and conservation, and the careers possibilities in each. I personally love soil science and connecting my students with the role soils play in every aspect of their lives. But how do we engage classrooms located where the landscape includes lawns, asphalt, and concrete, and agricultural products come in little cellophane covered trays? Fortunately, those who wrote the *A Framework for K12 Science Education* (2012)[1] and the subsequent standards adapted or adopted in 44 states and the District of Columbia (represents 71% of our students), included soil science in the Earth science core ideas for learning. Although Earth and space science is on equal footing with life and physical science in elementary and middle school, at the high school level, it has taken a backseat to biology, chemistry, and physics in many states. The intention is for all students to develop proficiency in all science standards, and therefore our high school biology, chemistry, and physics teachers must integrate teach Earth and space science topics in their courses, while having little to no training in the Earth and space sciences. The domino-effect of this course sequence is that our high school students are not introduced to fields of study such as soil science and conservation. A solution to this career barrier is to rethink our high school science course sequence such as combining physics and chemistry into one course, which will ensure students receive quality instruction in Earth and space science while in high school and build that awareness of career pathways in this field of study.

In my situation, it was easy to get my students outside to dig soil samples, and handle soil with the purpose of figuring out the role soils play in their existence, and to recognize that we need to conserve it through effective strategies in land-use development, forestry, and agriculture. However, for many teachers who would like to include soil science in their curriculums, there is a challenge in accessing outdoor spaces and laboratory materials needed to run basic soil labs in their classrooms. Our K-12 Committee efforts have most certainly played a role in this needed support, but those state and local entities that can share their expertise, provide access to soil samples, and basic laboratory supplies, their efforts are welcome too. Teachers need to know that these resources are available, and county extension offices might consider an awareness campaign to alert schools to the resources they may have to offer.

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[1] National Research Council. 2012. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.* Washington, DC: The National Academies Press. https://doi.org/10.17226/13165.

As much as the career pipeline for soil science and careers is in the forefront of our work on the K-12 Committee, there is a challenge to connect our efforts with the efforts elsewhere. Our instructional materials include careers; however, it is up to the classroom teacher to enact our materials. A workaround for this is to engage students in events that are extensions of the classroom. For example, the World Food Prize Global Youth Institute is a phenomenal opportunity for students from around and outside our country to discuss solutions for food security issues and learn about the extensive opportunities and careers available in agriculture. This awareness is especially impactful for those students who live in areas covered by lawns, asphalt, and concrete. Another impactful program is the national competition called Envirothon which has five topic areas, of which soils and land use is one. The mission of the Envirothon is as follows:

> "The Envirothon mission is accomplished by developing in young people an understanding of the principles and practices of natural resource management and ecology and through practice dealing with complex resource management decisions. The following goals and objectives should be used as a guide to develop effective curricula, educational resources, and testing scenarios."[2]

Students participating in this competition learn about available careers, while working directly with real issues that have meaning to their lives. In each of these competitions, mentors support students and are role models who could influence career choices of their mentees. Ongoing funding of programs such as these will ensure more students are engaging with soils and our environment.

While students are in high school, they are gravitating towards their initial college major and are considering colleges that house those majors. Students do not know what they do not know. For example, if they are unaware that they could major in soil science or are unaware of the myriad of career choices they would have, then they are not going to select a college to major in soil science. Similarly, if soil science is intertwined in an agriculture department in a university, and students are not interested in agriculture as a major, then they will not select that university. Solutions that may encourage additional majors in soils science and careers, are strategic marketing of higher-education soil science and conservation programs, connecting soil science professionals with high school students, build awareness in teachers of soil science and conservation careers, support for dual-credit programs that provide high school students with semester or year-long soil science and conservation courses and the college credit that goes with them, and provide high school student internships in conservation fields. These solutions could work for students who live in regions of our country where agriculture is prominent, or in regions of our country where urban and suburban landscapes are most prominent. However, the key is that we need to identify a portfolio of solutions since it is difficult to clearly identify what connects a student to a college or a career. For some students it may have been the dynamic teacher, or participating in a competition, or visiting a college soil science laboratory that provided that needed connection. We on the SSSA K-12 Committee are committed to finding and supporting the items found in a portfolio of solutions to help fill the pipeline with our next generation of soil science and conservation careers and stewards of our natural environment. We love soils, and we want others to love it too!

My intention was to provide an outline our committee work and highlight some career challenges and solutions through the lens of the K-12 arena. Our discussions today will bring to the table additional lenses as others share their experiences, and together we can build a robust portfolio of solutions to the soil science and conservation career pipeline issue. Thank you for the opportunity to testify before this panel. I would be glad to address your questions and I look forward to the discussion.

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[2] Envirothon webpage: https://envirothon.org/about-us/missions-goals-and-objectives/

Appendix:

Soil Science Society of America K-12 Committee
Additional Information

History

In July 2008 through December 2009, *Dig It! The Secrets of Soil* exhibition was presented at the Smithsonian Institution's National Museum of Natural History (of which SSSA was a Founding Sponsor). In preparation, the SSSA Board of Directors approved a K-12 Committee in 2006 and a group of SSSA members got to work. The charge to the committee was to increase interest and awareness of soil science as a scientific pursuit and career choice, especially among K-12 teachers and their students and work to integrate more information on soil science into biology, chemistry, physics, and Earth science areas taught at multiple grade levels. The American Society of Agronomy and Crop Science Society of America have also developed K-12 committees to provide teachers with resources for their classrooms and spark interest in their specific sciences as a pathway to career interest.

Activity Centers

Activities center around five areas:

- **Assessment and Standards** – connecting soil to state and national standards
- **Curriculum Development** – developing new curricula for K-12 instruction
- **Website Development** – enhancing the K-12 website resources
- **Books** – publish books relevant to the K-12 audience
- **Develop and Disseminate Soils Information** – for all audiences

Accomplishments

During the 16 years the SSSA K-12 Committee has been active, they have achieved an exceptional amount. Read on to learn more.

PUBLICATIONS AND LESSON PLANS

Soil! Get the Inside Scoop and supplemental Teachers Guide

The book explores the basics of soil and how soil is part of our life – the food we eat, the air we breathe, the water we drink, the houses we live in, and more. A free online teachers guide is available for each chapter of the book—with accompanying Powerpoints, definitions, activities, quiz questions, and more.

Know Soil, Know Life and supplemental Educators Guide

This 200-page book is targeted at high-school students. Chapters include Physical Properties of Soil and Soil Formation, Soil Ecosystems/Biology, Chemical Properties of Soil and Soil Fertility, Classification/Soil Mapping/Interpretation, Environmental Science/Soil Conservation/Land Use Management, Soils and Biomes, Soil in History and Modern Life, and Career Opportunities. An online educators guide is free for all educators to use, with overviews, Powerpoints, activities, standards integration, and worksheets.

Curated Collection of Resources

We've curated a collection of lessons, hands-on activities, labs, readings, and more - all about soils and topics related to soils - and in a searchable database. Some are posted directly by SSSA others we have reviewed and recommend. Searchable areas include by grade level, topic area, resource type, and NGSS standard. Over 200 resources are in the database. In addition, the SSSA K12 committee reviews submissions for the addition of resources to the database.

Soils Unit
Designed for middle-school, this soils-focused unit with lessons that provide students with a basic understanding of the fundamentals of soil science through the integration of disciplinary core ideas, science and engineering practices, and crosscutting concepts in the lessons, investigations, and activities

Coolbean the Soybean (Crop Science Society of America)
Coolbean the Soybean is a super bean! Find out how Coolbean became so special with the help of scientists, how to farm to help the environment, photosynthesis, how agronomists keep Coolbean safe, a soybean's life cycle, and how soybeans feed billions of people and are used for many products. All in alignment with common core standards for reading and science. Aimed at Grades 3-5.

Agronomy Grow with It! (American Society of Agronomy)
Explore the science of agriculture – Agronomy! Agronomy is the science we use to grow the crops that feed us, feed our livestock, and even fuel our cars. It's a science that tackles the big challenge of our future: How can we grow enough food to end world hunger—and, at the same time, adapt to a changing climate and protect our environment? Meet 20 real agronomists who face that challenge every day. Seven sections cover main topics in agronomy and align with basic science topics in the Next Generation Science Standards: Agronomists Feed the World • Crops: Sooo Much More than Food • Problems with Pests • Bringing Crops and Livestock to the Farm... Together • Water Matters! Getting Enough...Keeping it Safe • Soil: We Gotta Have It, But Will We? • Coping With Climate Change Audience: Aimed at Grades 6–8, of interest to older and younger students alike!

STATE SOIL BOOKLETS
An in-depth, easy to read booklet (4-8 pages each) with information on each state soil. The booklets include a brief history of the origin of the state soil, where the state soil is found, importance and uses, limitations, management, soil formation, ecoregions and land use, a glossary, and additional resources.

WEBINARS
The K12 committee has produced two webinars for K-12 educators, focused on soil science at different grade levels:

- Soils: Fundamental for Life
  This webinar focused on basics, formation, characteristics, and fertility (the ability of a soil to sustain plant growth by providing plant nutrients and favorable habitats for plant growth).
- Soil Physics, Chemistry, and Biology ... Oh My!
  Soil is so much more than what food is grown in, we walk on, or move out of the way to build houses or buildings on. It's complex, life-giving, and is critical for a balanced ecosystem. Attendees learned about each area, why each is important, and ideas for classroom activities. In addition, they heard about career opportunities in soil science.

PARTNERSHIPS
- **National Association of Conservation Districts (NACD)** – Stewardship Week on Soils (2009), review panel on scientific resources
- **National Science Teachers Association (NSTA)** – exhibiting, annual workshop
- **National Earth Science Teachers Association** – webinars, share-a-thons, articles, promotions
- **American Geological Institute (AGI)** - AGI hosts Earth Science Week in cooperation with sponsors as a service to the geoscience community. As an AGI member we develop a soil science activity for the annual calendar and contribute to the Earth Science Week kits which are

distributed to 10,000+ teachers. Earth Science Week is held annually in October with each year having a unique theme.

Dig It! Exhibition Activities

Two Train-the Trainer Workshops were conducted at the Smithsonian Exhibition – with over 60 teachers in the Washington DC area participating, January and June 2009, with Project Learning Tree members as the facilitators of the workshop.

The exhibit has also traveled to the Durham Museum, Omaha, NE, Northwest Museum of Arts and Culture, Spokane, WA and will be heading to the Bell Museum, St. Paul, MN. Staff and Members have participated in educational events (such as "Let's Get Dirty" day) and SSSA has provided educational materials, promotional items and books for giveaways and raffles.

OUTREACH ACTIVITIES

Websites

Soils for Teachers: Our teachers website features soils topic areas, lessons/activities collection, free classroom resources, definitions, an Ask a Soil Scientist feature. www.soils4teachers.org

Soils for Kids: Our kids website features areas including all about soil, fun with soil (activities), soil experiments, soil games, career exploration, and soil in your community. www.soils4kids.org

Agronomy for Teachers and Students: Our Agronomy and Crop Science K-12 website features sections on what is agronomy, understanding crops, pests and weeds, livestock, nutrients, water, soil health, climate change and provides lessons and activities – both for teachers and for students at various grade levels. It also features scientists in different careers. www.agronomy4me.org

Member Outreach Activities

- Developed an online Career Profiles format for members to tell their career story and have them upload to the SSSA websites.
- **Ask a Soil Scientist program online** – members volunteer, select regions and topic areas – answer questions from general public, students, and teachers. They may also volunteer to speak in classrooms. 135 Members have registered to date.
- A group of committee members participated in a NGSS standards review via the SSSA Science Policy Office.

International Year of Soils – 2015

The Soil Science Society of America played an integral part the success of the 2015 International Year of Soils! We worked on raising awareness of and promoting the sustainability of our limited soil resources. SSSA members, recognizing that we all have a valuable role in communicating vital information on soils, came together to develop new activities and pull together already developed resources to assist everyone interested in learning more about soils. All the resources on our site are available for use. Key components included:

- 12 monthly videos on various aspects of soil and associated activities.
- K-12 Educators kit of resources
- Coloring and Activity Book
- Careers in Soil Science Career Poster

I "Heart" Soil

https://www.soils.org/stickers

Fifteen "I Heart Soil" stickers in different languages – another fun way to get people excited about Soils!

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SUMMARY

Inquisitive Science Educator with expertise in research, curriculum development, professional development of teachers, philosophy, teaching, and technology. Excellent written, verbal, and organizational skills manifested in outstanding program planning, development, and delivery resulting in measured success. Sought out and well-received by administrators, colleagues, and students in both public education and collegiate learning environments. Highly motivated mentor and coach passionate about influencing the next generation of scientists and educators.

CURRENT

Great Minds PBC™, PhD Science®, Richmond, VA **2020-present**
Science Standards Specialist

EDUCATION

PhD, Science Education, Rutgers University, New Brunswick, NJ
Dissertation: *"Building Bridges to Climate Literacy through the Development of Systems and Spatial Thinking Skills"*
Committee: Rebecca Jordan (Chair), Eugenia Etkina, Ravit Golan Duncan, and Douglas Lombardi

MS, Geography, Rutgers University, New Brunswick, NJ
Thesis: *"Synoptic and Diurnal Characteristics of the Northern New Jersey Heat Island"*
Committee: Dave Robinson (Chair), Bob Hordon, and Allan Frei

MAT, Science Education, The College of New Jersey, Ewing, NJ

BS, Environmental Planning and Design, Cook College at Rutgers University, New Brunswick, NJ

SECONDARY TEACHING

CHATHAM HIGH SCHOOL, Chatham, NJ **1996-2020**
Science Teacher
Taught courses in *Earth & Space Science* (three levels), *AP Environmental Science, Dual-credit Honors Physical Geography, Marine Science,* and *Astronomy.*

- Lead teacher responsibilities managing budget and curriculum writing.
- Created dual-credit Honors Physical Geography program in partnership with Rutgers University.
- Applies current pedagogies focusing on introducing and sustaining data-rich instruction.
- Grant recipient for student projects.
- Partnerships with people and organizations to create innovative learning experiences.

MARGARET A. HOLZER, PhD

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NEW JERSEY PUBLIC SCHOOL CERTIFICATIONS

K-12 Supervisor
Teacher of Science, Highly Qualified in Earth Science

HIGHER EDUCATION TEACHING

NASA ENDEAVOR STEM TEACHING CERTIFICATE PROJECT
RYEBROOK, NY **2018-present**
Senior Instructor
Taught *Eyes on Earth* online graduate courses.

AMERICAN MUSEUM OF NATURAL HISTORY, New York, NY **2016-present**
Teaching Assistant
Taught *Seminars on Science* online graduate courses, *Climate Change* and *Earth: Inside and Out* reviewing highlights of museum current and historical records of animals, plants, fungi, ecosystems, geology, paleontology, and climatology.

RIDER UNIVERSITY, Lawrenceville, NJ **2016-present**
Adjunct Professor, Graduate School of Education
Designed and taught online graduate course *Teaching & Learning Earth & Space Science.*

RUTGERS UNIVERSITY, New Brunswick, NJ **1999-2020**
Adjunct Professor, Department of Geography **2021-present**
Designed and taught undergraduate, in-person, hybrid, and online *Earth Systems* course.

FAIRLEIGH DICKINSON UNIVERSITY, Madison, NJ **2004-2007**
Adjunct Professor, Graduate School of Education
Designed and taught *World of Science: Earth & Space Science* course.

ADDITIONAL RELEVANT EXPERIENCE

Science Teacher, Allentown High School, Allentown, NJ

Taught courses in General Science, Physical Science, Earth & Space Science, Chemistry, and Agriculture. Created Grade Nine Program supporting incoming ninth-grade students and established Student-of-the-Month Program.

PUBLICATIONS: *Research & Practitioner*

Criswell, B., Roemmele, C., and **Holzer, M.** (2022). Focusing the Lens of the Crosscutting Concepts on Secondary Science Learning. *The Science Teacher. 89*(4), pg. 58-65.

Medrano, J., Jaffe, J., Lombardi, D., **Holzer, M.**, and Roemmele, C. (2020). Students' Scientific Evaluations of Water Resources. *Water. 12*(7) 2048. doi:10.3390/w12072048

Holzer, M., Roemmele, C., and Bailey, J. M. (2020). Freshwater resources: The challenges of quantity and quality. *The Earth Scientist, 36*(3).

Roemmele, C., **Holzer, M.**, and Bailey, J. M. (2020). Assessing and applying students' understanding of the scientific practices and crosscutting concepts. *The Earth Scientist, 36*(3).

Holzer, M., Dere, A., Lindbo, D., Robinson, C., Wilson, T. Wyatt, B., and Engelmann, C. (2020). Soil: More than Dirt under your Feet. *The Earth Scientist, (36)*1.

Holzer, M., & Rennermalm, A. (2019), Arctic Happenings – Global Impacts of the Melting Greenland Ice Sheet and Melting Sea Ice. *The Earth Scientist, 35*(1).

Tillinghast, R., Mansouri, M., Kroth, W., Petersen, E., Powers, G., & **Holzer**, M. (2019), Bringing Geosciences to K-12 Classrooms: A Teacher Training Program Developed by Sterling Hill Mining Museum. The 9th IEEE Integrated STEM Education Conference (ISEC) Paper, 2019.

McLaughlin, J. A., Lombardi, D., **Holzer, M.**, Hopkins, J. D., Davatzes, A., Jaeger, A. J., & Shipley, T. F. (2018), What's hidden beneath? Using spatial sketching and feedback to help deepen students' understanding of Earth's subsurface. *The Science Teacher, 54*(3), 54-60.

Holzer, M., Jordan, R.C., & Lombardi, D. (unpublished dissertation manuscript), Connecting Local, Regional, and Global Causality in the Human Climate System. Intended journal: *International Research in Geographical and Environmental Education*

Holzer, M., Jordan, R.C., & Lombardi, D. (unpublished dissertation manuscript), Paving a Path to Conceptual Understanding of Complex Topics. Intended journal: *Science Education*

Holzer, M., Jordan, R.C., & Lombardi, D. (unpublished dissertation manuscript), Connecting Subsystems to Conceptualize the Human Climate System. Intended journal: *International Journal of Science Education*

Holzer, M., Lombardi, D., & Bailey, J. (2016), Wetlands: Good or bad? Evaluating Competing Models with a MEL Diagram. *The Earth Scientist, 32*(2).

Holzer, M. (2010), Low Budget Planetarium: A Classroom Model of the Night Sky. *The Earth Scientist, 26*(2).

Rowland, T., Chambers, L., **Holzer,** M., & Moore, S. (2009), Solar Radiation, Harnessing the Power. *The Science Teacher, 76*(9).

Holzer, M. (2007), Field Trip Excursion: Volcanoes of Nicaragua - Experiences of a Teacher in the Field. *MARGINS Newsletter,* No. 18.

Holzer, M. (2004), Data Loggers Help N.J. High School Deliver Inquiry-Based Science Instruction. *Technology Horizons in Education, 31*(9).

Holzer, M., Gordon, L., Tilling, R., & Katsu, C. (2003), This Dynamic Planet: Creating an Effective Use for a Global Teaching Tool. *Proceedings of International GeoScience Education IV Conference,* Calgary, Canada.

Royce, C. & **Holzer, M.** (2003), What Would It Be Like Without...? *The Science Teacher, 70*(4).

Duvall, C. **Holzer, M.,** & Robinson, D. (2002), Educational Opportunities in Weather and Climate for NJ Classrooms. *Proceedings of American Meteorological Society Annual Meeting,* Orlando, FL.

Holzer, M. (2002), Application of Inquiry Methods in Student's Original Research Projects. *Proceedings of American Meteorological Society Annual Meeting,* Orlando, FL.

Colangelo, E., Gross, G., & **Holzer, M.** (2001), *A Demo a Day in Earth Science.* Flinn Scientific, Ohio. (book)

Duvall, C. & **Holzer, M.** (2001), Inquiry-Based Weather Lessons Utilizing Real-Time Data. *Proceedings of American Meteorological Society Annual Meeting*, Albuquerque, NM.

Laubach, C., Royce, C., & **Holzer, M.** (2000), Teaching to the Power of Ten, *The Science Teacher, 67*(9).

CONFERENCE TALKS: ***Non-inclusive of 150+ practitioner presentations and workshops***

Holzer, M. and Kelly, S. (2016), Infusing Energy Topics in K-12 Curricula. National Energy Education Summit, Washington, D.C.

Holzer, M. (2016), Using PBL and Sustainability to Improve PARCC Outcomes. Invited oral presentation Fairleigh Dickinson University Conference, Florham Park, NJ.

Holzer, M. (2015), Paving a Path to Conceptual Understanding of the Climate System. Oral presentation for the National Association for Research in Science Teaching Teacher Researcher Day at the National Science Teachers Association Annual Conference on Science Education, Chicago, IL.

Holzer, M. and Heinz, M. (2015) Welcome to the Next Generation Science Standards. Keynote talk, The Alliance for New Jersey Environmental Education 30th Annual Conference, West Windsor, NJ.

Holzer, M. & Jordan, R. C., (2015), Paving a Pathway to Understanding Complex Systems. Oral Presentation at the National Council for Geographic Education Annual Conference, Washington, DC.

Holzer, M. & Jordan, R. C., (2015), Detecting Subsystem Interactions within the Climate System. Oral presentation at the Ecological Society of America Annual Meeting, Baltimore, MD.

Holzer, M. (2014), Systems Thinking in the Context of Climate Literacy. Oral presentation for the National Association for Research in Science Teaching Teacher Researcher Day at the National Science Teachers Association Annual Conference on Science Education, Boston, MA.

Holzer, M. and Moore, J. (2013), Making the Move: Enabling STEM Education in ALL Science Classes. Invited oral presentation for Fairleigh Dickinson University STEM Conference, Florham Park, NJ.

Winters, J.M., **Holzer, M.,** Jungblut, D., Catena, A., & Rubenstein, D. (2013) Field-Based Teacher Research: How Teachers and Scientists Working Together Answer Questions About Turtle Nesting Ecology while Enhancing Teachers' Research Skills. Oral presentation for American Geophysical Union Fall Meeting, San Francisco, CA.

Holzer, M. (2013), Beating the Challenges of Climate Literacy. Oral presentation for the National Association for Research in Science Teaching Teacher Researcher Day at the National Science Teachers Association Annual Conference on Science Education, San Antonio, TX.

Ruppert, J. **Holzer, M.,** & Shea, N., (2013), Exploring the Usefulness of Science in Daily Life. Poster presentation for the National Association for Research in Science Teaching Annual Conference, Puerto Rico.

Holzer, M. (2013), Seizing an Opportunity with Carefully Designed Geoscience Education Professional Development. *(Invited poster)* American Geophysical Union Fall Meeting, San Francisco, CA.

Holzer, M. (2012), Citizen Science and Science Literacy – Evaluating the Connection. Oral presentation for the National Association for Research in Science Teaching Teacher Researcher Day at the National Science Teachers Association Annual Conference on Science Education, Indianapolis, IN.

Holzer, M. (2012), Multiple External Representations: Bridges or Barriers to Climate Literacy? *(Invited oral)* American Geophysical Union Fall Meeting, San Francisco, CA.

Holzer, M., Zimmerman, T., Doesken, N., Reges, H., Newman, N., Turner, J., & Schwalbe, Z. (2011), CoCoRaHS (The Community Collaborative Rain, Hail and Snow Network): Lessons Learned from a Participant Survey of a Citizen Science Project. Citizen Science Symposium, Univ. of Maine, Orono, ME.

Holzer, M. (2011), Chandra EPO: Making the Invisible Universe and Accessible. Oral presentation, Astronomical Society of the Pacific/American Geophysical Union/Space Telescope Science Institute National Conference on Science Education and Public Outreach, Baltimore, MD.

Holzer, M. & Johnson. R., (2011), Climate Change Education Today in K-12: What's Happening in the Earth and Space Science Classroom? *Invited* talk for the American Geophysical Union Fall Meeting, San Francisco, CA.

Holzer, M., Reges, H., Doesken, N. J., Doesken, Cifelli, R., Schwable, & Z., Turner, J. (2010), Who is the citizen scientist? What have they learned from participating? Survey results from CoCoRaHS (the Community Collaborative Rain, Hail and Snow network). Poster presentation for the American Meteorological Society's Annual Meeting, Atlanta, GA.

Holzer, M. (2010), From Climate Change Research in the Arctic to Authentic Research in the Classroom. *(Invited oral)* National Science Teachers Association National Conference on Science Education.

Holzer, M., Zimmerman, T., Doesken, N., Reges, H., Newman, N., Turner, J., & Schwalbe, Z. (2010), CoCoRaHS (The Community Collaborative Rain, Hail and Snow Network): Analysis of Participant Survey Data to Uncover Learning through Participation. Poster Presentation for the American Geophysical Union Fall Meeting, San Francisco, CA.

Holzer, M., Laj, Carlo (2007) From Teacher-at-Sea to authentic Science in the Classroom. Oral presentation for the American Geophysical Union Fall Meeting, San Francisco, CA.

Holzer, M. (2004) Students Exploring Data. Poster presentation for the DLESE Data Services Workshop, Durham, NH.

Holzer, M., Gordon, L., Tilling, R., Katsu, C. (2003) This Dynamic Planet: Creating Effective Use for a Global teaching Tool. Poster presentation for the International Geoscience Education Conference IV, Calgary, Canada.

Duvall, C., **Holzer, M.,** Robinson, D. (2002) P1.20 Educational opportunities in Weather and Climate for NJ Classrooms. American Meteorological Society Annual Meeting, Orlando, FL.

Holzer, M. (2002) P1.19 Applications of Inquiry Methods in Student's Original Research Projects. Poster presentation, American Meteorological Society Annual Meeting, Orlando, FL.

Duvall, C., **Holzer, M.** (2001) P1.4 Inquiry-based Weather Lessons Utilizing Real-time Data. American Meteorological Society Annual Meeting, Albuquerque, NM.

Christensen, A., **Holzer, M.,** Schachel, S., Crocker, C., Kimmel, M., Witmer, J. (1996) Quantitative Literacy and Science Education. American Association for the Advancement of Science Annual Meeting, Baltimore, MD.

732.770.2171 **MARGARET A. HOLZER, PhD** missy.holzer@gmail.com

GRANTS, AWARDS, & SPECIAL PROGRAMS: *Education Practitioner*

2020 Certified American Meteorological Society Teacher (CAT)
2019 Jan and Stoney Lifetime Achievement Award, National Earth Science Teachers Association
SENCER Wm. E. Bennett Award for advancing SENCER in K-12 curriculum (team award)
2018 National Geographic Educator-Explorer Exchange Recipient
Soil Science Society of America Honorary Membership for service to the organization
2016 Citation Scroll Recipient, NJSTA
National Geographic Certified Teacher
2015 NSF Project Master Teacher: Model-Evidence-Link Project, University of Maryland/Temple University *(current)*
2014 NASA SOFIA Ambassador
2012 President of National Earth Science Teachers Association (2012-2014, Board member - *current*)
2011 Fellow of Teaching Excellence & Achievement Program (TEA) & International Leaders in Education Program (ILEP) administered through the US International Research & Exchanges Board & the US Department of State. Program placement in India
2010 Fellow of National Earth Science Teachers Association
President-elect of National Earth Science Teachers Association
2009 NJ Science Teachers Association Special Award Recipient
2008 PolarTREC Teacher to the Arctic - field research assistant for 5 weeks in Svalbard Norway
Re-elected Secretary of National Earth Science Teachers Association
2007 Fellow of the NJ Science Teachers Association
NJ Earth Science Teachers Association Teacher of the Year
IPEV Teacher at Sea - Invited participant on a 4-week international scientific deep-sea coring cruise on the R.V. Marion Dufresne off the coast of Southern Chile
2006 Elected Secretary of National Earth Science Teachers Association
Public Service Electric and Gas Environmental Grant recipient ($3500)
2005 Toyota TAPESTRY Grant Recipient ($10,000)
Chatham High School Teacher of the Year
2004 CPO/Delta Education Inquiry-Based Educator of the Year – National Award
2001 NOAA Teacher at Sea Program - 2.5-week cruise exploring hydrothermal vents at the Juan deFuca Ridge in the Pacific Ocean
2000 Fulbright Memorial Fund Program - Japan for a 3-week cultural/educational exchange.
1999 Radioshack/Tandy Scholars – Outstanding Teacher National Award
National Association of Geoscience Teachers Outstanding NJ Earth Science Teacher
School District of the Chathams Excellence in Education Award
1998 RadioShack/Tandy Scholars – Outstanding Teacher - Honorable Mention
1999 NEWMAST - Selected participant in a 2-week NASA Educational Workshop for at Goddard Space Flight Center, Maryland.
Phi Delta Kappa International Honor Society Initiation
1996 SEA Experience - Selected participant in 5-week marine science program
1996 Governor's Award for Excellence in Teaching
Teacher of the Year. Allentown High School
1995 Summer Sabbatical Recipient. Upper Freehold Regional School District

SERVICE & OUTREACH (*sample*)

2020 CLEAN (Climate Literacy and Energy Awareness Network) Ambassador *(current)*
2019 NJ Student Learning Standards for Science Review Team Member
2018 NSTA Exploravision Judge
2017 NJ Earth Science Teachers Association NGSS Peer Review Panel Leader
2016 NJ Dept of Education High School Capstone Model Curriculum Author

DuPont Challenge Competition Judge
NJ Geographic Alliance Advisory Board
National Geographic Education Advisory Board
Achieve NGSS EQuIP Peer Review Panel Member (2016-2020)
HHMI BioInteractive Ambassador *(current)*

2015 NJ Dept of Education Model Curriculum Author
MY NASA DATA Advisory Board *(2015-2020)*

2014 NJ Dept of Education Standards Correlation Team Member
NJ Dept of Education Model Curriculum Writer
NJ Dept of Education Assessment Item Team Leader
DuPont Challenge Competition Judge

2013 PBS-NOVA Advisory Board

2012 NJ Dept of Education Lead State Review Team for the Next Generation Science Standards
NJ Dept of Education HS Science Model Curriculum writing Team Leader for Environmental Science and Earth Systems Science
Merck Institute for Science Education (MISE) Instructional Team Leader

2011 Maitland P. Simmons Memorial Award Middle School Earth System Science Institute Leader

2010 NJ Dept of Education high school Earth System Science Course Description Team Leader
NJ Dept of Environmental Protection Curriculum Alignment Team Member
NSTA Conference on Science Education High School Level Invited Speaker
American Geophysical Union (AGU) Geophysical Information for Teachers (GIFT) Workshop Presenter

2009 NAEP Achievement Level Descriptor Team Member
Earth System Science Workshop Facilitator at Rutgers University
NJ Dept of Education Science Standards Revision Committee

2008 Liberty Science Center Teacher Connection Presenter
American Geophysical Union Geophysical Information for Teachers (GIFT) *(2017, 2018)*
Liberty Science Center Learning & Teaching Advisory Committee Member *(2009-2012)*
NJ Math Science Coalition Board of Governors, Executive Board Member *(2009-1014)*

2006 European Geosciences Union Geophysical Information for Teachers (GIFT) Workshop in Vienna, Austria Invited Presenter *(2006, 2008)*
Maitland P. Simmons Memorial Award Middle School Physical Science Institute Co-Presenter
Soil Science Society of America K-12 Committee Chair *(Chair 2019-2020; current)*

2005 Executive Board Member of New Jersey Science Teachers Association *(current)*

2004 National Association of Geoscience Teachers Northeastern Section State Councilor *(current)*

2002 Chandra Resource Agent Presenter and Curriculum Developer *(2002-2009)*

2001 Merck State Science Day co-chair *(2001-2015)*

1999 NSTA Area Convention session presenter *(1999-2001, 2010-13, 2019)*

1998 NSTA National Convention session presenter *(1997-present)*

1997 New Jersey Earth Science Teachers Association President *(2003-2004, 2016-2017)*
Conference Chair 2002, 2003, 2017; Executive Board Member *(current)*

1996 NJ Science Convention Session Presenter *(1996-present)*

1993 Middle States Accreditation Evaluator *(1993, 2000)*

REVIEWER

2022 NASA NSPIRES
CLEAN submissions
NSTA Journal manuscript
NSTA Conference proposals

2021 NSTA National Conference Proposals, Journal Papers
NAGT Journal of Geoscience Education Journal Papers

2020 NSTA Book Manuscript, Journal Papers, and Conference Proposals

2019 NSTA Book Manuscripts and Journal Papers
2018 NSTA Book Manuscript
2017 NARST 2018 Annual Conference Proposals
2016 Journal of Environmental Studies and Sciences
2015 Journal of Geoscience Education
NSTA 2015 Area Conference Proposals
NARST 2016 Annual Conference Proposals
2013 NSF DRK-12 Grant Proposal Review Panel
2012 NARST 2013 Annual Conference Proposals
2011 NSTA 2012 Annual Conference Proposals
2010 NARST 2011 Annual Conference Proposals
NASA Global Climate Change Education Grant Proposals
2009 NSTA 2010 Annual Conference Proposals
International Conference of the Learning Sciences Conference Proposals
NASA Global Climate Change Education Grant Proposals

PROFESSIONAL AFFILIATIONS

American Assoc. for the Advance. of Science
American Geophysical Union
American Meteorological Society
National Assoc. for Res. in Science Teaching
National Association of Geoscience Teachers
National Earth Science Teachers Association
National Science Ed Leadership Association
Assoc. for Supervision & Curriculum Dev.
Geological Society of America
Int. Society of the Learning Sciences
National Science Teachers Association
NJ Earth Science Teachers Association
NJ Science Teachers Association
Phi Delta Kappa

COMMUNITY SERVICE

Franklin Women's Club
Lower Raritan Watershed Partnership Board
Sterling Hill Mining Museum Trustee
Girl and Boy Scouts Merit Badge Assistance
SOFIA Mission Ambassador Outreach: Astronomy Clubs, Science Fairs, Nature Centers

Truth in Testimony Disclosure Form

In accordance with Rule XI, clause 2(g)(5)* of the *Rules of the House of Representatives*, witnesses are asked to disclose the following information. Please complete this form electronically by filling in the provided blanks.

Committee: Agriculture

Subcommittee: Conservation and Forestry

Hearing Date: 05/25/2022

Hearing Title :

"Supporting Careers in Conservation: Workforce Training, Education, and Job Opportunities"

Witness Name: Margaret A. Holzer, PhD

Position/Title: Past Chair, K-12 Committee of SSSA

Witness Type: ○ Governmental ● Non-governmental

Are you representing yourself or an organization? ○ Self ● Organization

If you are representing an organization, please list what entity or entities you are representing:

Soil Science Society of America

FOR WITNESSES APPEARING IN A NON-GOVERNMENTAL CAPACITY

Please complete the following fields. If necessary, attach additional sheet(s) to provide more information.

Are you a fiduciary—including, but not limited to, a director, officer, advisor, or resident agent—of any organization or entity that has an interest in the subject matter of the hearing? If so, please list the name of the organization(s) or entities.

N/A

Please list any federal grants or contracts (including subgrants or subcontracts) related to the hearing's subject matter that you, the organization(s) you represent, or entities for which you serve as a fiduciary have received in the past thirty-six months from the date of the hearing. Include the source and amount of each grant or contract.

USDA-NRCS Contribution Agreement NR183A750025C010, 9/28/2018-6/30/2021, $100,000.
Project title: Soil Science Educational Outreach Project

USDA-NRCS Contribution Agreement NR213A750025C001, 9/30/2021-9/30/2023, $75,000.
Project title: K12 Educator Training and Outreach Project

Please list any contracts, grants, or payments originating with a foreign government and related to the hearing's subject that you, the organization(s) you represent, or entities for which you serve as a fiduciary have received in the past thirty-six months from the date of the hearing. Include the amount and country of origin of each contract or payment.

N/A

Please complete the following fields. If necessary, attach additional sheet(s) to provide more information.

☑ I have attached a written statement of proposed testimony.

☑ I have attached my curriculum vitae or biography.

*Rule XI. clause 2(g)(5), of the U.S. House of Representatives provides:

(5)(A) Each committee shall, to the greatest extent practicable, require witnesses who appear before it to submit in advance written statements of proposed testimony and to limit their initial presentations to the committee to brief summaries thereof.

(B) In the case of a witness appearing in a non-governmental capacity, a written statement of proposed testimony shall include—(i) a curriculum vitae; (ii) a disclosure of any Federal grants or contracts, or contracts, grants, or payments originating with a foreign government, received during the past 36 months by the witness or by an entity represented by the witness and related to the subject matter of the hearing; and (iii) a disclosure of whether the witness is a fiduciary (including, but not limited to, a director, officer, advisor, or resident agent) of any organization or entity that has an interest in the subject matter of the hearing.

(C) The disclosure referred to in subdivision (B)(iii) shall include— (i) the amount and source of each Federal grant (or subgrant thereof) or contract (or subcontract thereof) related to the subject matter of the hearing; and (ii) the amount and country of origin of any payment or contract related to the subject matter of the hearing originating with a foreign government.

(D) Such statements, with appropriate redactions to protect the privacy or security of the witness, shall be made publicly available in electronic form 24 hours before the witness appears to the extent practicable, but not later than one day after the witness appears.