**APPENDIX D**

**SAES-422**

**Project/Activity Number:** NCERA3

**Project/Activity Title:** Soil and Landscape Assessment, Function and Interpretation

**Period Covered:** January 1, 2020 – December 31, 2020

**Date of This Report:** December 1st, 2021

**Annual Meeting Date(s):** October 1st-2nd, 2021

**Participants:**

The following participants attended the annual meeting on October 1st and 2nd, 2021, which was hosted in Crookston, MN, by Nic Jelinski (University of Minnesota).

Hopkins, David G., David.Hopkins@ndsu.edu, North Dakota - North Dakota State University

Jelinski, Nic, jeli0026@umn.edu, Minnesota - University of Minnesota

McSweeney, Kevin, mcsween@illinois.edu, Illinois - University of Illinois

Moorberg, Colby, moorberg@ksu.edu, Kansas - Kansas State University

Schulze, Darrell G., dschulze@purdue.edu, Indiana - Purdue University

Slater, Brian K., slater.39@osu.edu, Ohio - Ohio State University (Attended Remotely Via Zoom)

Turk, Judith, jturk3@unl.edu, Nebraska - University of Nebraska-Lincoln

Project Participants unable to attend

Burras, C. Lee, lburras@iastate.edu, Iowa - Iowa State University

**Brief summary of minutes of annual meeting**:

*Business Meeting: Friday October 1st, 2021*

1:00-1:10PM Convene

1:10-1:30PM Colby Moorberg (KSU) – Research and Teaching Updates

Open textbooks, Hydropedology and root ecology, wetland indicators, changes in pedology faculty at KSU.

1:35-2:00PM Judy Turk (UNL) – Research and Teaching Updates

Carbon dynamics in depressional wetlands (NE1938), Historical change in Nebraska soils, “Pedolagogy”, Scholarship of Teaching and Learning, Undergraduate research in soil judging.

2:05-2:25PM David Hopkins (NDSU) – Research and Teaching updates

Micromorphology laboratory, thin sections tour!

2:30-2:55PM Kris Osterloh (SDSU) – Research and teaching updates

Mineralogy study on K fertilization recommendations and rates, carbon mapping with a hyperspectral sensor.

3:00-3:10PM Break

3:10-3:30PM Brain Slater (OSU) – Research and Teaching updates

Research updates, National Soil Judging Contest, 2022

3:35-3:55PM Kevin McSweeney (UIUC) – Research and teaching updates

Land reclamation with Chinese collaborators (mine basins reclaimed with river sediment), teaching pits construction and lessons learned from the UIUC arboretum.

4:00-4:25PM Darrell Schulze (Purdue) – Research and Teaching updates

ISEE project updates, needed revisions for harmonization of parent materials map, visualizing soil profiles using machine readable data from OSDs

4:30-4:55PM Nic Jelinski (UMN) – Research and Teaching Updates

Cedar Creek biodiversity – soil development controlled study (25 years), Alaska non-NRCS data curation and harmonization

4:55-5:10PM Closeout

*Field Tour: Saturday, October 2nd, 8:00AM-4:00PM*

8:00-8:15AM Organizing vehicles and routes

8:15-9:30AM Travel to the Sand Hill Church, Climax, MN

9:15-9:30AM Area Orientation and Survey of Old Slumps/Maps

9:30-11:30AM Investigation of slump and soils at the Erickson Farm, Climax, MN

In late August, 2021, a portion of a field (currently in soybeans) on the Erickson farm north of Climax, MN on the Red River fell ~25ft in a rotational slump that occurred overnight. This received local and national attention in the media: https://www.southernminnesotanews.com/bean-field-collapses-in-northwestern-minnesota/ The slump sent sediment into the Red River and also created a long exposure of soil and glaciolacustrine sediments which can be viewed from the lower level of the slump.

11:30AM-12:00PM Drive to Climax, MN

12:00PM-12:45PM Lunch

12:45-1:00PM Drive to Hammond township, MN to view large Soil Judging Pits

1:00PM-4:00PM Tour of large soil judging pits in wheat field, Hammond Township, Section 25

Large pits remained open following the Region V Soil Judging contest south of Crookston, MN. The NCERA3 groups visited three of these pits, on a “toposequence” across a quarter section of lake plain formed in glaciolacustrine sediments. The first soil was on a rise (Vertic Calciudoll), the second soil was on a talf (also a Vertic Calciudoll, but with a slightly thicker A horizon and a \*bit\* more poorly drained), the third soil in a dip (an Oxyaquic Hapludert).

*Meeting adjourned*

**Accomplishments:**

All participants in the project are active contributors to the National Cooperative Soil Survey as participants on various national and regional committees, as contributors to soil survey activities in their respective states (see below metrics section for quantified impacts), and as educators training the next generation of soil scientists.

Despite significant challenges to education in 2020 due to COVID-19, participants generated innovative approaches to content delivery. Examples of these accomplishments include:

In the fall of 2020, virtual field trips were developed for our introductory soils course so that students could study the field trip narratives online and then visit the field sites on their own. An all-day field trip for the Soils and Landscapes class was developed in a virtual format using the Soil Explorer platform (<https://SoilExplorer.net>). (Purdue University).

Established 3 permanent soil pits at University of Illinois-Arboretum in 2020. Pits used for teaching/training: K-12, College & professional soil scientists. (University of Illinois).

Co-editing a Special Issue of *Natural Sciences Education* with contributions documenting innovative approaches to instructions during COVID-19 (special issue published in 2021, work completed in 2020): Mahler, R.L., M. Krzic, B. Garramon Merkle, C. Moorberg, E.C. Brevik. 2021. Natural sciences education in a COVID-19 world. Nat. Sci. Educ. In Print. doi.org/10.1002/nse2.20067. (Kansas State University)

Development of online sections of Basic Soil Science course, with engaging take-home laboratory kits and interactive lecture videos. (University of Minnesota).

Development of hybrid online/field course on soil and site evaluation for onsite wastewater treatment for resident and continuing education students. (Ohio State University).

All of the individuals involved with this project are contributors to the Soil Explorer project and have finalized, or are in the process of finalizing, Dominant Soil Parent Material maps for their respective states. These maps are available to anyone anywhere via a web browser (SoilExplorer.net) or via apps for iOS and Android devices. Support for the parent material maps was provided by a project titled, *Completion of the Isee Soils Database for the North Central Region*, funded by the Natural Resources Conservation Service ($100,000, 8/28/2017 – 8/27/2020). In addition, a new project titled, *Leveraging Soil Explorer for Soils and Ecological Training*, funded by the Natural Resources Conservation Service ($52,295, 8/28/2019 – 8/31/2021), was awarded to Purdue University to expand the maps available on Soil Explorer. This project is utilizing the entire US Soil Survey database (the SSURGO database) to produce maps for the entire area covered by the US Cooperative Soil Survey, which includes the conterminous U.S., Alaska, Hawaii, Puerto Rico, the US Virgin Islands and the Pacific island territories.

**Impacts:**

Project participants are actively publishing their research work in the scientific literature as indicate in the publication list below.

Project participants are actively involved in soil survey activities in conjunction with soil scientists from USDA-NRCS. This involvement includes research and consultation work in conjunction with soil survey activities in member states. This includes novel work on digital soil mapping techniques (Purdue, Minnesota, Iowa State, Ohio State), monitoring and benchmarking of soil carbon and soil moisture regimes (Kansas State, University of Nebraska-Lincoln, University of Minnesota), collaborative development of Ecological Site Descriptions (Kansas State), development and refinement of novel soil survey interpretations (Iowa State), and novel tools to digitally visualize soil profiles and soil morphology from descriptive text data (Purdue).

The SoilExplorer.net website and Soil Explorer app continue to be downloaded and utilized by thousands of people each year. The content on these apps was a collaborative effort of NCERA-3 members, led by Purdue University (Darrell Schulze, PI).

**Publications:**

Peer reviewed journal articles, book chapters, and books are reported for the 2020 calendar year.

Acree, A., Weindorf, D. C., Galbraith, J. M., Jelinski, N. A., & Paulette, L. (2020). Characterization of Gelolls in northern Alaska, USA. Soil Science Society of America Journal, 84(3), 818-832. https://doi.org/10.1002/saj2.20064

Brecheisen, Z., Hamp-Adams, N., Tomasek, A., Foster, E. J., Filley, T. R., Martín Villalta Soto, M., … Schulze, D. G. (2020). Using Remote Sensing to Discover Historic Context of Human-Environmental Water Resource Dynamics. *Journal of Contemporary Water Research & Education*, *171*, 74–92. <https://doi.org/10.1111/j.1936-704X.2020.3346.x>

Brevik, E.C., H. Dolliver, S. Edinger‐Marshall, D. Itkin, J. Johnson‐Maynard, C. Moorberg, Y. Sanchez-de Leon, and J. Steffan. 2020. Undergraduate degrees that train students for soil science careers at universities in the USA and its territories. Soil Science Society of America Journal. 84(6)1797-1807. doi: 10.1002/saj2.20140.

Jelinski, N. A., Perrone, S. V., Blair, H. K., & Fabian, M. L. (2020). Growing hearts and minds: Linking landscapes and lifescapes in a soils field course. Natural Sciences Education, 49(1), [e20018]. https://doi.org/10.1002/nse2.20018

Kidd, D., Searle, R., Grundy, M., McBratney, A., Robinson, N., O'Brien, L., Zund, P., Arrouays, D., Thomas, M., Padarian, J., Jones, E., Bennett, J., Minasny, B., Holmes, K., Malone, B., Liddicoat, C., Meier, E., Stockmann, U., Wilson, P., Wilford, J., Triantafilis, J., Payne, J., Ringrose-Voase, A., Bui, E., Slater, B., Odgers, N., Gray, J., van Gool, D., Andrews, K., Harms, B. Operationalising Digital Soil Mapping - Lessons from Australia. Geoderma Regional. 2020; 23(2020):article no e00335. <https://doi.org/10.1016/j.geodrs.2020.e00335>

Kyebogola, S., L. Burras, B. Miller, O. Semalulu, R. Yost, M. Tenywa, A. Lenssen, P. Kyomuhendo, C. Smith, M. Majaliwa, L. Goettsch, C. Colfer and R. Mazur. 2020. Comparing Uganda’s indigenous soil classification system with World Reference Base and USDA Soil Taxonomy to predict soil productivity. Geoderma Regional e00296, 10 p. https://doi.org/10.1016/j.geodrs.2020.e00296

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Minai, J., Z Libohova, and D. G. Schulze. 2020. Disaggregation of the 1:100,000 Reconnaissance soil map of the Busia Area, Kenya using a soil landscape rule-based approach. Catena 195:104806. <https://doi.org/10.1016/j.catena.2020.104806>

Moorberg C.J. An open annotated bibliography for soil and water conservation: A case study. Nat Sci Educ. 2020;e20014. doi.org/10.1002/nse2.20014

Mtama, J.G., C.L. Burras and B.M. Msanya. 2020. Equation chapter 1 section 1 corn suitability rating for Southern Highland Zone of Tanzania – a feasibility assessment at the TARI-Uyole, Mbeya, Tanzania. Am. J. Agric. For. 8:64-68. Doi:10.11648/j.ajaf.20200803.12

Ngunjiri, M. W., Z. Libohova, P. R. Owens, D. G. Schulze. 2020. Landform pattern recognition and classiﬁcation for predicting soil types of the Uasin Gishu Plateau, Kenya. Catena 188:104390. <https://doi.org/10.1016/j.catena.2019.104390>

Nicklay, J. A., Cadieux, K. V., Rogers, M. A., Jelinski, N. A., LaBine, K., & Small, G. E. (2020). Facilitating Spaces of Urban Agroecology: A Learning Framework for Community-University Partnerships. Frontiers in Sustainable Food Systems, 4, [143]. https://doi.org/10.3389/fsufs.2020.00143

Salas, E.A., Subburayalu, S.K., Slater, B., Zhao, K., Bhattacharya, B.K., Tripathy, R., Das, A., Nigam, R., Dave, R., & Parekh, P. (2019). Mapping crop types in fragmented arable landscapes using AVIRIS-NG imagery and limited field data. International Journal of Image and Data Fusion, 11, 33 - 56.

Schaetzl, R.J. K. Nyland, C.S. Kasmerchak, V. Breeze, A. Kamoske, S.E. Thomas, M. Bomber, L. Grove, K. Komoto, and B.A. Miller. 2020. Holocene, silty-sand loess downwind of dunes in northern Michigan, USA>. Phys. Geography 42:1-25. DOI:10.1080/02723646.2020.1734414

Turk, J. K., and R.C. Graham. 2020. Disturbance impacts on porosity and hydraulic properties of vesicular horizons. Soil Science Society of America Journal, 84(2), 543-555. doi:10.1002/saj2.20055

Turk, J. K. and R.A. Young. 2020. Field conditions and the accuracy of visually determined Munsell soil color. Soil Sci. Soc. Am. J. 2020; 84: 163– 169. <https://doi.org/10.1002/saj2.20023>

Wade, J., Maltais-Landry, G., Lucas, D. E., Bongiorno, G., Bowles, T. M., Calderón, F. J., Culman, S. W., Daughtridge, R., Ernakovich, J. G., Fonte, S. J., Giang, D., Herman, B. L., Guan, L., Jastrow, J. D., Loh, B. H. H., Kelly, C., Mann, M. E., Matamala, R., Miernicki, E. A., Jelinski, N.A., ... Margenot, A. J. (2020). Assessing the sensitivity and repeatability of permanganate oxidizable carbon as a soil health metric: An interlab comparison across soils. Geoderma, 366, [114235]. https://doi.org/10.1016/j.geoderma.2020.114235

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