ANNUAL REPORT 2022

Conservation and Survey Division
School of Natural Resources
University of Nebraska–Lincoln

130 YRS
CSD
1893-2023

CONSERVATION AND SURVEY DIVISION
School of Natural Resources

Conservation and Survey Division

Our Mission

The Conservation and Survey Division (Nebraska Geological Survey), the natural resource survey component of the School of Natural Resources, is a unique, multi-disciplinary research, service and data-collection organization established by state statute in 1921.

The Division's mission is to investigate and record information about Nebraska's geologic history, its rock and mineral resources, the quantity and quality of its water resources, land cover and other aspects of its geography, as well as the nature, distribution and uses of its soils.

Cover photo:
Jesse Korus (left) and Mohamed Aboushanab Kalil (right) conduct a geophysical survey on agricultural land near the Wildcat Hills in Scotts Bluff County. This survey provided groundwater information necessary for well design to local landowners.

Conservation and Survey Division

Annual Report 2022

March 2023

R.M. Joeckel
Director, Conservation and Survey Division
Senior Associate Director, School of Natural Resources

M.M. Waszgis
Geological Research Specialist
Conservation and Survey Division

University of Nebraska–Lincoln

CSD 2022 Accomplishments at a Glance

Extension contacts by CSD personnel:
3,123

Number of organizations/programs/ other entities served worldwide:
127

Requests for data and analysis fulfilled by CSD personnel:
5,101

Footage of test holes drilled and/or logged by CSD personnel:
5,702 ft

Automated groundwater-data entries overseen by CSD personnel:
127,400

Groundwater quality results processed by CSD personnel:
702

Teaching contribution of CSD personnel:
CSD faculty taught 163 students in 12 different courses in 3 different programs at UNL, producing 422 student credit hours

Students advised by CSD personnel:
4 undergraduate students and
16 graduate students

Students employed and gaining work experience in CSD:
16

Continuing education units for professionals (CEUs) generated by CSD personnel:
1,755

Total grant funding with which CSD personnel were associated:
>$3.7 million

Total scientific publications authored or coauthored by CSD personnel: 52

- **Peer-reviewed scientific journal articles: 26**
- **Book chapters: 2**
- **Conference proceedings papers: 2**
- **Geologic maps: 4**
- **Bulletins and technical reports: 4**
- **Published abstracts: 14**

Major field trips led or co-led by CSD personnel:
1

Presentations by CSD personnel:
55

Media interviews by CSD personnel:
6

Total CSD website page views:
187,322

Downloads of CSD publications from UNL Digital Commons:
604 CSD publications downloaded 7,497 times by users in 123 countries

Awards won by CSD personnel and their students:

CSD's Susan Lackey

- **Nebraska NRD Hall of Fame**
- **Maurice Kremer Groundwater Achievement Award (Nebraska Water Resources Association)**

UNL Soil Judging Team, co-coached by CSD's J.K. Turk:

- **One student placed 4th in the individual contest at the National Soil Judging Contest in Maryville, Ohio (April) and was awarded a place on the U.S. National Team at the International Soil Judging Contest in Sterling, Scotland.**
- **UN-L team placed 1st overall—and individual students placed 1st, 4th, 5th, 6th, and 9th— at the Regional Soil Judging Contest in Milford, Iowa (October).**

Publications Authored or Coauthored by CSD Personnel in 2022

Refereed Journal Articles

Birgand, F., Chapman, K., Hazra, A., **Gilmore, T.**, Etheridge, R., and Staicu, A.M., 2022. Field performance of the GaugeCam image-based water level measurement system. *PLoS Water,* 1 (7), e0000032.

Burbach, M., Eaton, W. M., Quimby, B., Babbitt, C., and Delozier, J. L., 2022. Longitudinal assessment of an integrated approach to large-scale common-pool water resource management: A case study of Nebraska's Platte River basin. *Ecology & Society,* 27(4), 30.

Chapman, K. W., **Gilmore, T.**, Chapman, C. D., Birgand, F., Mittelstet, A., Harner, M., Mehrubeoglu, and M., Stranzl, Jr, J. E., 2022. Open-source software for water-level Measurement in images with a calibration target. *Water Resources Research,* 58 (8), e2022WR033203.

Cherry, M.L., **Gilmore, T.E.**, Messer, T., Li, Y., and **Westrop, J.**, 2022. A Pivotal New Approach to Groundwater Quality Assessment. *Environmental Science and Technology - Water* 2 (12), 2297–2304.

Crago, R., Qualls, R., and **Szilagyi, J.**, 2022. Complementary Relationship for evaporation performance at different spatial and temporal scales. *Journal of Hydrology* 608, 127575. [https://doi.org/10.1016/j.jhydrol.2022.127575].

CUAHSI Board of Directors & Officers (incl. **Gilmore, T.**), 2022. COVID-19 Impacts highlight the need for holistic evaluation of research in the hydrologic sciences. *Water Resources Research,* 58 (2), e2021WR030930.

Eaton, W.M., Brasier, K.J., Whitley, H., Julia, B.C., Hinrichs, C.C., Quimby, B., and **Burbach, M.**, 2022. Farmer perspectives on collaboration: Evidence from agricultural landscapes in Arizona, Nebraska, and Pennsylvania. *Journal of Rural Studies* 94, 1–12.

Eaton, W.M., Burnham, M., Robertson, T., Arbuckle, J.G., Brasier, K J., **Burbach, M.**, 2022. Advancing the scholarship and practice of stakeholder engagement in working landscapes: A co-produced research agenda. *Socio-Ecological Practice Research* 4(4), 283–304.

Huang, X., Miao, X., Chang, Q., Zhong, J., Mason, J., **Hanson, P.**, Ou, X., Xu, L., and Lai, Z., 2022. Tibetan dust accumulation linked to ecological and landscape response to global climate change. *Geophysical Research Letters* 49 (1), 1, e96615 [https://

agupubs.onlinelibrary.wiley.com/doi/pdfdirect/10.1029/2021GL096615].

Humphrey, C.E., Solomon, D.K., Genereux, D.P., **Gilmore, T.**, Mittelstet, A., Zlotnik, V., Zeyrek, C., Jensen, C.R.,and MacNamara, M.R., 2022. Using Automated Seepage Meters to Quantify the Spatial Variability and Net Flux of Groundwater to a Stream. *Water Resources Research* 58 (6), e2021WR030711.

Jensen, C.R., Genereux, D.P., **Gilmore, T.**, Solomon, D.K., Mittelstet, A., Humphrey, C.E., MacNamara, M.R., Zeyrek, C., and Zlotnik, V., 2022. Estimating groundwater mean transit time from SF6 in stream water: field example and planning metrics for a reach mass-balance approach. *Hydrogeology Journal* 30 (2), 479-494.

Joeckel, R.M., **Korus, J.T.**, **Turk, J.K.**, Arps, C.C., Arps, N.V., **Howard, L.M.**, 2022. Strange stones of Skull Creek: Basalt glacial erratics and omars in eastern Nebraska. *Great Plains Research* 32, 1-20 [https://www.unl.edu/plains/publications/GPR/gpr.shtml].

Kennedy, S., **Burbach, M.**, 2022. Rancher attitudes toward managing for vegetation and landscape heterogeneity on rangelands. *Sustainable Agriculture Research, 11*(4), 1–15.

Khalil, M.A., Sadeghiamirishahidi, M**., Joeckel, R.M.**, Santos, F. M., Riahi, A., 2022. Mapping a hazardous abandoned gypsum mine using self-potential, electrical resistivity tomography, and frequency domain electromagnetic methods. *Journal of Applied Geophysics* 205 (104771), 1–21.

Khalil, M.A., Temraz, M.G., **Joeckel, R.M.**, Einaggar, O.M., Abuseda, H H., 2022. Estimating hydraulic conductivity from reservoir resistivity logs, northern Western Desert, Egypt. *Pure and Applied Geophysics* 179, 4489-4501. [https://link.springer.com/article/10.1007/s00024-022-03178-7].

Korus, J.T., and **Joeckel, R.M.**, 2022. Sandstone-body geometry and hydrostratigraphy of the northern High Plain aquifer system, USA. *Quarterly Journal of Engineering Geology and Hydrogeology* 55 (3) [https://doi.org/10.1144/qjegh2021-171].

Miao, X., Chongyi, E., Xu, S., Wang, Q., **Hanson, P.**, Chen, H., and Shi, Y., 2022. Age and source of coastal loess deposits in Shandong Province, Bohai Sea, China: Loess aggradation in response to sea-level change. *Aeolian Research* 54, 1-11 [https://www.sciencedirect.com/journal/aeolian-research/vol/54/suppl/C].

Nagy, E., **Szilagyi, J.**, Torma, P., 2022. Estimation of catchment response time using a new automated event-based approach. *Journal of Hydrology* 613(A), 128355 [https://doi.org/10.1016/j.jhydrol.2022.128355].

Quaggio, C. S., Gastmans, D., de Souza Martins, Veridiana Teixeira, and **Gilmore, T.**, 2022. Combined use of statistical Bayesian model and strontium isotopes deciphering the high complexity groundwater flow in the Guarani Aquifer System (GAS). *Applied Geochemistry,* 146, 105473.

Santarosa, L.V., Gastmans, D., **Gilmore, T.**, Boll, J., Betancur, S.B., and Gonçalves, V.F.M., 2022. Baseflow and water resilience variability in two water management units in southeastern Brazil. *International Journal of River Basin Management*, 14 p. [https://doi.org/10.1080/15715124.2021.2002346].

Szilagyi, J., 2022. Comment on "On the estimation of potential evaporation under wet and dry conditions" by Z. Tu and Y. Yang. *Water Resources Research* 58*(10)*, e2022WR033264. [https://doi.org/10.1029/2022WR033264].

Szilagyi, J., Ma, N., Crago, R., and Qualls, R., 2022. Power-function expansion of the polynomial complementary relationship of evaporation. *Water Resources Research* 58(11), e2022WR033095 [https://doi.org/10.1029/2022WR033095].

Turk, J., Graham, R. C. (2022). Microbial activity and temperature change affect growth of vesicular pores. *Geoderma* 423, 115957.

Westrop, J.P., Tomlinson, Z.D., Maples, B.M., Dee, K.T., Swindle, A.L., Hu, Q., Elwood-Madden, M.E., Elwood-Madden, A.S., 2022. Dissolution of Mn-bearing dolomite drives elevated Cr (vi) occurrence in a Permian redbed aquifer. *Environmental Science: Processes & Impacts,* 24 (12), 2419–2436.

Zeyrek, C., Mittelstet, A., **Gilmore, T.**, Zlotnik, V., Solomon, D.K., Genereux, D.P., Humphrey, E., Shrestha, N., 2022. Modeling groundwater transit time distributions and means across a Nebraska watershed: effects of heterogeneity in the aquifer, riverbed, and recharge parameters. *Journal of Hydrology*, 128891.

Zhang, L., Hu, Q., Hayes, M.J., **Burbach, M.**, Messer, T., Zhou, Y., and Tang, Z., 2022. Evaluating Nebraska's local comprehensive plans to achieve the national wetland conservation efforts of in the USA. *Ecosystem Health and Sustainability* 8(1), 2070550.

Book and Book Chapter

Jedd, T., Schutz, A., and **Burbach, M.**, 2022. Polycentric governance in Nebraska, U.S., for ground and surface water. In: *Water Resources Allocation and Agriculture: Transitioning from Open to Regulated Access*, p. 215-226. London: IWA Publishing.

Whitmer, W., Clark, L.B., Altherr, H., Bonilla-Anariba, S., Brasier, K J., and **Burbach, M.**, 2022. *Stakeholder Engagement in Natural Resources: A Guide to Concepts, Tools, and Strategies*. Penn State University, 107 pp. [https://sites.psu.edu/engagementguide/learn-online/chapter-10/topic-5/].

Conference Proceedings

Andrzejewski, K.A., Layzell, A.L., Ludvigson, G.A., **Joeckel, R.M.**, Möller, A., and Mandel, R.D., 2022. Unique insights to the Cretaceous OAE1d, Mid-Cenomanian Event, and OAE2 from long-line drillcores along the eastern cratonic margin of the Western Interior Basin. Proceedings of 38th Annual Gulf Coast Section SEPM Foundation, Perkins-Rosen Conference and Core Workshop. Houston, TX: Gulf Coast Section SEPM (Society for Sedimentary Geology) [https://sepm.org/gcssepm-perkins-rosen-conference].

Fielding, C. R., Hutsky, A. J., and **Korus, J.**, 2022. Cenomanian-Turonian sediment dispersal patterns in Utah and Wyoming: A product of spatially and temporally variable accommodation. Proceedings of 38th Annual Gulf Coast Section SEPM Foundation, Perkins-Rosen Conference and Core Workshop. Houston, TX: Gulf Coast Section SEPM (Society for Sedimentary Geology) [https://sepm.org/gcssepm-perkins-rosen-conference].

Geologic Maps

Hanson, P., **Reinier, C.**, **Howard, L.**, Baker, E., Carlson, C., 2022. Surficial Geology of the Fremont West 7.5' Quadrangle, Nebraska. University of Nebraska-Lincoln, School of Natural Resources. Conservation and Survey Division [https://snr.unl.edu/data/geologysoils/STATEMAP/index.aspx].

Joeckel, R.M., and **Howard, L.M.**, 2022. Surficial Geology of the Springview Quadrangle, Nebraska. University of Nebraska-Lincoln, School of Natural Resources. Conservation and Survey Division [https://snr.unl.edu/data/geologysoils/STATEMAP/index.aspx].

Lundstrom, S., Cowman, T., **Hanson, P.**, Holbrook, J., Mahan, S., Moreno-Ward, A., Paces, J., 2022. Geologic Map Geodatabase of the Valley Corridor of the 59-mile reach of the Missouri National Recreational River, South Dakota, Nebraska and Iowa: Gavins Point Dam to North Sioux City. United States Geological Survey [https://www.sciencebase.gov/catalog/item/624cb901d34e21f82765072b].

Young, A., **Cameron, K.**, **Howard, L.**, 2022. Surficial Geology of the Wilber 7.5 Minute Quadrangle [http://snr.unl.edu/data/geologysoils/STATEMAP/index.aspx].

Bulletins and Technical Reports

Burbach, M., **Joeckel, R.M.**, Matkin, G.S., and Mott, B., 2022. 2022 Nebraska Water Leaders Academy – Final report. University of Nebraska-Lincoln, School of Natural Resources. Conservation and Survey Division, Open-File Report 230, 68 p.

Trouba, E. C., Brasier, K. J., **Burbach, M.**, and Eaton, W. M., 2022. 2021 Agricultural Producer and household resident preliminary survey results: Central Platte Valley, Nebraska. Pennsylvania State University [water4ag.psu.edu].

Trouba, E. C., Brasier, K. J., **Burbach, M.**, Eaton, W. M., 2022. Agricultural Producer and household resident preliminary survey results: Central Platte Valley, Nebraska. Pennsylvania State University [water4ag.psu.edu].

Young, A., **Burbach, M.**, **Howard, L.**, **Lackey, S.**, **Joeckel, R.M.**, 2022. Nebraska Statewide groundwater-level monitoring report – 2021. Water Survey Paper 90. University of Nebraska-Lincoln, School of Natural Resources. Conservation and Survey Division, 25 p.

Published Abstracts

Baker, T., **Turk, J.K.**, and Kaiser, M. 2022. Predicting soil organic carbon from loss-on-ignition across four regions of Nebraska. *ASA, CSSA, SSSA International Annual Meeting Abstracts* [https://scisoc.confex.com/scisoc/2022am/meetingapp.cgi/Paper/145984]

Burbach, M., Kennedy, S., Eaton, W., and Brasier, K., 2022. A Mixed-methods exploration of cooperative extension as a boundary organization to enhance collaborative natural resource management. Abstracts of the 2022 IASNR Conference, San José, Costa Rica. [https://whova.com/embedded/session/RCydBQXpC5aHhBoe0IM4uKA6vzG@uS09AGhf49J0mzU=/2226279/?widget=primary].

Hanson, P., **Reinier, C.**, Bruihler, J., and **Joeckel, R.**, 2022. Dating the Platte: Luminescence Geochronology of the Alluvial History of an Iconic Braided Stream. New World Luminescence Dating Workshop.

Hanson, P., **Reinier, C.**, **Joeckel, R.**, Bruihler, J., **Young, A.**, 2022. Late Quaternary evolution of an iconic braided stream: Dating the alluvial fill of the Platte River, Nebraska, USA. International Association of Geomorphologists. [https://doi.org/10.5194/icg2022-675], 2022.

Hanson, P., **Reinier, C.**, **Joeckel, R.**, and **Turk, J.**, 2022. Stratigraphy and geochronology of the Todd Valley, an abandoned segment of the Platte River Valley, eastern Nebraska. Geological Society of America Abstracts with Programs 54 (5) [doi: 10.1130/abs/2022AM-382697].

Joeckel, R., **Hanson, P.**, and **Korus, J.**, 2022. The grain of the plains remains: Widespread northwest-southeast ridgelines and associated oriented landforms, northern interior Plains, USA. 10th International Association of Geomorphologists Conference on Geomorphology [https://doi.org/10.5194/icg2022-672].

Joeckel, R.M., Suarez, C., McLean, N.M., Moller, A., Ludvigson, G., Suarez, M. B., Kirkland, J.I., Andrew, J., Kiessling, S., and Hatzell, G., 2022. Valanginian carbon-isotpe excursion identified and dated in paleosol-bearing Yellow Cat Member, Cedar Mountain Formation, eastern Utah, USA. Geological Society of America Abstracts with Programs 54 (5) [https://gsa.confex.com/gsa/2022AM/webprogram/Paper377052.html].

Korus, J.T., and **Joeckel, R.M.**, 2022. Discovery of fluvial ridges on the Great Plains fills big data gap in Rocky Mountain-Gulf of Mexico source-to-sink systems. Geological Society of America Abstracts with Programs 54 (5) [https://gsa.confex.com/gsa/2022AM/webprogram/Paper378407.html].

Miao, X., Ee, C., Wang, Q., **Hanson, P.**, Chen, H., and Shi, Y., 2022. Age and source of coastal loess in the Shandong Peninsula, Bohai Sea, China. International Association of Geomorphologists [https://doi.org/10.5194/icg2022-279].

Oborny, S., Layzell, A.L., Hasiuk, F., Mulvany, P., Bridges, D., **Joeckel, R.M.**, Stanley, T., Eichler, C.M., Bancroft, A.M., and Clark,

R., 2022. Reconciliation of Pennsylvanian stratigraphic nomenclature in the Midcontinent, USA. Geological Society of America Abstracts with Programs 54 (5) [https://gsa.confex.com/gsa/2022AM/webprogram/Paper382965.html].

Tilahun, T., and **Korus, J.**, 2022. 3D hydrostratigraphic modeling using supervised machine learning: case study of the High Plains Aquifer, SW Nebraska. *Geological Society of America Abstracts with Programs* 54 (5) [https://gsa.confex.com/gsa/2022AM/webprogram/Paper379672.html].

Airori, A.J., and **Turk, J.K.** 2022. Evaluating Digital Color Sensors for Soil Organic Carbon Measurement in Nebraska. *ASA, CSSA, SSSA International Annual Meeting Abstracts* [https://scisoc.confex.com/scisoc/2022am/meetingapp.cgi/Paper/143387].

Turk, J.K. 2022. Deflation basin soils of the Todd Valley, eastern Nebraska: Analysis of soil morphology, micromorphology, and organic carbon. *ASA, CSSA, SSSA International Annual Meeting Abstracts* [https://scisoc.confex.com/scisoc/2022am/meetingapp.cgi/Paper/142117].

Turk, J.K., and Airori, A.J. 2022. Student estimates of soil organic carbon in a pedology class. *ASA, CSSA, SSSA International Annual Meeting Abstracts* [https://scisoc.confex.com/scisoc/2022am/meetingapp.cgi/Paper/142098]

Presentations by CSD Personnel in 2022

Airori, A.J., and **Turk, J.K.**, 2022. Evaluating Digital Color Sensors for Soil Organic Carbon Measurement in Nebraska. ASA-SSSA-CSSA International Annual Meetings, Baltimore, Maryland. November 6-9, 2022.

Baker, T., **Turk, J.K.**, and Kaiser, M., 2022. Predicting Soil Organic Carbon from Loss-on-Ignition across Four Regions of Nebraska. ASA-SSSA-CSSA International Annual Meetings, Baltimore, Maryland. November 6-9, 2022.

Burbach, M.E., 2022. Personal Empowerment. Nebraska State Irrigation Association. Nebraska Water Leaders Academy, Nebraska City, Nebraska. November 18, 2022.

Burbach, M.E., 2022. Longitudinal assessment of an integrated approach to large-scale common-pool water resource management: A case study of Nebraska's Platte River Basin. Platte River Basin Conference, Kearney, Nebraska. October 25, 2022.

Burbach, M.E., and W. Eaton, 2022. Social Learning Outcomes through participation in Collaborative processes: Evidence from stakeholder engagement in the Platte River, Nebraska, USA. Platte River Basin Conference, Kearney, Nebraska. October 25, 2022.

Burbach, M.E., K. Brasier, L. Fowler, W. Whitmer, and W. Eaton, 2022. Building and Researching Stakeholder Engagement for Water Quality and Quantity Management: The Water for Ag Project. Penn State University Sustainability Series, State College, Pennsylvania. October 5, 2022.

Burbach, M.E., 2022. Exploring How Nebraska Water Leaders Can Leverage Their Civic Capacity to Influence Their Communities. Nebraska Water Leaders Academy, Scottsbluff, Nebraska. July 14, 2022.

Burbach, M.E., 2022. Foundational conditions enabling collaborative resource management in two geographically and regulatorily different watersheds. VESPR Annual Retreat, Valentine, Nebraska. August 15, 2022.

Burbach, M.E., 2022. Niobrara National Wild and Scenic River, Water Leaders Academy, Valentine, Nebraska. September 15, 2022.

Burbach, M.E., 2022. A Mixed-Methods Exploration of Cooperative Extension as a Boundary Organization to Enhance Collaborative Natural Resource Management. 2022 IASNR Conference, San Juan, Costa Rica. June 27, 2022.

Burbach, M.E., 2022. Boundary Spanner: An Insider's Look at Enhancing Collaboration in Natural Resource Management. University Network for Collaborative Governance (UNCG) Conference 2022, Boise, Idaho. June 23, 2022.

Burbach, M.E., 2022. Social Learning Outcomes Through Participation in Collaborative Processes: Evidence from Stakeholder Engagement Arizona, Nebraska and Pennsylvania. 2022 IASNR Conference, San Juan, Costa Rica. June 28, 2022.

Burbach, M.E., 2022. Assessing an integrated approach to large-scale common pool water resource management: A case study of Nebraska's Platte River Basin. VESPR Social Science Committee Meeting (virtual). June 9, 2022.

Burbach, M.E., T. Jedd, G. Sixt, and A. Schutz, 2022. Natural Resources District Model for Groundwater Governance: Nebraska, U.S. Case Study. International Conference: "Groundwater, Key to the Sustainable Development Goals", Paris, France. May 18, 2022.

Burbach, M.E., 2022. A Guidebook for Practitioners and Researchers for Engaging Stakeholders in Natural Resource Management (panelist). USDA Water for Ag Workshop Series (virtual). May 18, 2022.

Burbach, M.E., 2022. Lessons Learned about Implementing and Assessing Stakeholder Engagement (in Arizona, Nebraska and Pennsylvania), (panelist). USDA Water for Ag Workshop Series (virtual). May 10, 2022.

Burbach, M.E., 2022. Personal Empowerment - Engaging Your Leadership Capacity. Indiana Watershed Leadership Academy (virtual). May 4, 2022.

Burbach, M.E., 2022. Assessing an integrated approach to large-scale common pool water resource management: A case study of Nebraska's Platte River Basin. USDA Water for Ag Brownbag Series (virtual). May 4, 2022.

Burbach, M.E., 2022. The Emergence of Boundary Spanners in Collaborative Policymaking: A case study. USDA Water for Ag Brownbag Series, Virtual. March 8, 2022.

Burbach, M.E., 2022. Full Range Leadership for Leaders in the Water Arena, Nebraska State Irrigation Association. Water Leaders Academy, Lincoln, Nebraska. January 20, 2022.

Burbach, M.E., 2022. Best Practices and Outcomes in Collaborative Approaches to Water Management: Integrating Research and Practice. Nebraska Water Leaders Academy, Kearney, Nebraska. March 24, 2022.

Burbach, M.E., 2022. Habitat Enhancement and Flow Augmentation Projects in the Central Platte and Republican Rivers. Nebraska Water Leaders Academy, Kearney, Nebraska. March 24, 2022.

Burbach, M.E., 2022. Testing Ag Performance Solutions (TAPS) Evaluation Program. UNL TAPS - Learn, Launch, Interact, Kearney, Nebraska. March 15, 2022.

Hallum, D.R., 2022. Hydrogeological information at the Spring Creek Headwaters. Water Riches Field Day, Keystone, Nebraska. April 26, 2022.

Hallum, D.R., 2022. Nebraska, Colorado, and the South Platte River Compact. West Central Research Extension and Education Center (WCREC). North Platte, Nebraska. February 4, 2022.

Hallum, D.R., 2022. Perspectives on Platte River: Groundwater System Panel, Platte River Basin Conference and 3rd Playa Research Symposium. Kearney, Nebraska. October 25, 2022.

Hanson, P.R., **Reinier, C.L.**, Bruihler, J.C., and **Joeckel, R.M.**, 2022. Dating the Platte: Luminescence Geochronology of the Alluvial History of an Iconic Braided Stream. New World Luminescence Dating Workshop, Palisade, Colorado. October 14, 2022.

Hanson, P.R., **Reinier, C.L.**, **Joeckel, R.M.**, Bruihler, J., and **Young, A.R.**, 2022. Late Quaternary evolution of an iconic braided stream: Dating the alluvial fill of the Platte River, Nebraska, USA. 10th International Association of Geomorphologists

Conference, Coimbra, Portugal. September 13, 2022.

Joeckel, R.M., 2022. If You Can't Grow It, You Have to Mine It: Mineral Resources, Mining, and Civilization, District. Future Problem Solvers (Aurora Public Schools), Lincoln, Nebraska (UN-L, City Campus Union). March 9, 2022.

Joeckel, R.M., 2022. The Conservation and Survey Division (CSD): Nebraska's Geological Survey . . .and Much More. Daugherty Water for Food Global Institute (delegation from Mato Grosso, Brazil), Lincoln, Nebraska. May 23, 2022.

Joeckel, R.M., 2022. Perspective on World (Ground) Water and a Geological Primer on Groundwater in Nebraska. Nebraska Water Leaders Academy, Lincoln, Nebraska. July 21, 2022.

Joeckel, R.M., **Hanson, P.R.**, **Korus, J.T.**, 2022. The Grain of the Plains Remains: Widespread Northwest-Southeast Ridgelines and Associated Oriented Landforms, Northern Interior Plains, USA. 10th International Association of Geomorphologists Conference, Coimbra, Portugal, September 16, 2022.

Joeckel, R.M., Suarez, C., McLean, N.M., Moller, A., Ludvigson, G., Suarez, M.B., Kirkland, J.I., Andrew, J., Kiessling, S., Hatzell, G., 2022. Valanginian Carbon-Isotope Excursion Identified and Dated in Paleosol-Bearing Yellow Cat Member, Cedar Mountain Formation, Eastern Utah, USA. GSA Connects: 2022 Geological Society of America Annual Meeting, Denver, Colorado. October 11, 2022.

Khalil, M.A., 2022. Applied Geophysics. Upper Niobrara-White Natural Resources District Chadron, Nebraska. August 22, 2022.

Khalil, M.A., 2022. Applied Geophysics. Nebraska Geological Survey Field Trip, Scottsbluff, Nebraska. July 27, 2022.

Khalil, M.A., 2022. Applied Geophysics for Agriculture. University of Nebraska-Lincoln Panhandle Research and Extension Center Field Day, Scottsbluff, Nebraska. August 23, 2022.

Khalil, M.A., 2022. The Role of Geophysics in Agriculture. Nebraska Department of Education, Educational Service Unit 13. Scottsbluff, Nebraska. February 21, 2022.

Khalil, M.A., 2022. Environmental and Engineering Geophysics. Nebraska Public Power District (NPPD), North Platte, Nebraska. June 7, 2022.

Khalil, M.A., 2022. International Student Presentation: Agricultural Geophysics. University of Nebraska-Lincoln Panhandle Research and Extension Center, Scottsbluff, Nebraska. March 10, 2022.

Korus, J.T., and **Joeckel, R.M.**, 2022. Discovery of fluvial ridges on the Great Plains fills big data gap in Rocky Mountain–Gulf of Mexico source-to-sink systems. Geological Society of America Annual Meeting (GSA Connects 2022), Denver, Colorado. October 11, 2022.

Korus, J.T., 2022. Cenozoic sandstones of the North American High Plains: Sandstone body geometry and regional alluvial architecture. Hydrogeology of Sandstones Conference Keynote Speaker, Hydrogeological Group of the Geological Society of London, London, UK. May 4, 2022.

Lackey, S., 2022. Potential Use of Groundwater as a Source for Utility: Cedar-Knox Rural Water Program, Crofton, Nebraska. May 11, 2022.

Lackey, S., 2022. Groundwater Quantity Management. Lewis and Clark Natural Resource District, Hartington, Nebraska. October 20, 2022.

Lackey, S., 2022. Groundwater Investigation Related to Management. Lewis and Clark Natural Resource District, Harington, Nebraska. December 20, 2022.

Lackey, S., 2022. Niobrara/Valentine Geological Field Trip (led and co-presenter). Nebraska Well Drillers Association/Nebraska Water Leadership Academy, Valentine, Nebraska. September 15, 2022.

Marxsen, M.J., 2022. CSD Drilling Program – Environmental Science Restoration Program Students Demonstration. School of Natural Resources, University of Nebraska-Lincoln, Lincoln, Nebraska. April 20, 2022.

Turk., J.K., Kemper, A., and Clarkson, R., 2022. Deflation Basin Soils of the Todd Valley, Eastern Nebraska: Analysis of Soil Morphology, Micromorphology, and Organic Carbon. ASA-SSSA-CSSA International Annual Meetings, Baltimore, Maryland. November 6-9, 2022.

Turk, J.K., and Airori, A.J., 2022. Student Estimates of Soil Organic Carbon in a Pedology Class. ASA-SSSA-CSSA International Annual Meetings, Baltimore, Maryland. November 6-9, 2022.

Turk, J.K., 2022. Using the literature circle discussion format to teach conceptual models of soil formation. Biennial Conference on Undergraduate Education in the Natural Resources (virtual). March 23-24, 2022.

Waszgis, M.M., 2022. Welcome Lower Platte South Natural Resources District (LPSNRD) to the CSD Geological Sample Repository. Repository tour at request of LPSNRD, Lincoln, Nebraska. April 2, 2022.

Waszgis, M.M., 2022. Bringing the Nehawka Core Home. Nehawka Library and Activity Center – Public Outreach, Nehawka, Nebraska. April 10, 2022.

Waszgis, M.M., 2022. This is Why We Preserve Core: The Nehawka Core - a Geological Resource 98 Years Later. 2022 American Association of State Geologists (AASG)/ U.S. Geological Survey (USGS), Butte, Montana. August 31, 2022.

Westrop, J.P., 2022. Uranium in Nebraska. Nebraska Water Industries Convention, Kearney, Nebraska. February 17, 2022.

Young, R.A. and **Turk, J.K.**, 2022. Jumbled Judging - Assessing the impact of a new inclusive learning activity at a regional collegiate soil judging competition. Biennial Conference on Undergraduate Education in the Natural Resources (virtual). March 24, 2022.

Young, A., 2022. Groundwater Resources of Nebraska: A Summary. Conservation Nebraska, Monthly Seminar Series (virtual). May 6, 2022.

Organizations for which CSD Personnel Fulfilled Requests for Information, Consultation or Services in 2022

4-H "Build-a-Hut" competition
Advanced Resources International Inc.
Agrosystems, Geosciences and Environment (journal)
Alliance for the Future of Agriculture in Nebraska
Anais da Academia Brasileira de Ciências (journal)
Aqua Africa
Arbor Links Golf Course
Argonne National Lab, Environmental Sciences Division
Ash Grove Cement Co.
Association of American State Geologists
Audubon Society
Bartlett & West
Battelle Memorial Institute
Berggren Architects
Bureau of Land Management
Catahoula Resources
Cedar Point Biological Research System
Cedar-Knox Rural Water Program
Central Nebraska Public Power and Irrigation District
Central Platte NRD
City of Allen, Nebraska
City of Emerson, Nebraska
City of Fullerton, Nebraska
City of Gering, Nebraska
City of Santee, Nebraska
Conundrum Geological Services LLC
Cornell University
Creighton University
Darrah Oil Co.
Daugherty Water for Food Global Institute
Earth Surface Processes and Landforms (journal)
Eastern Nebraska Water Resources Assessment
Environmental Monitoring and Assessment (journal)

Florida Department of Agriculture and Consumer Services
Geological Society of America
Geophysical Research Letters (journal)
Geosciences (journal)
Gore Oil Co.
Groundscapes, Inc.
Happy Hollow Golf Club
Hy-Terra
Idaho Geological Survey
Illinois State Geological Survey
Iowa Geological Survey Bureau
JEO Consulting Group, Inc.
Journal of American Water Resources Association
Journal of Cleaner Production
Journal of Hydrology
Kansas Geological Survey
Kearney High School (Outdoor Learning Area, KOLA)
Kiewit Imaginarium
KNEB Radio
KOLN News
Layne-Western Co.
Lewis and Clark NRD
Lincoln Northeast High School
Little Blue NRD
L-K Energy
Long Spring Consulting
Lower Big Blue NRD
Lower Elkhorn NRD
Lower Loup NRD
Lower Platte North NRD
Lower Platte South NRD
Martin Marietta Materials
Mattsen Ricketts Attorneys
Mid America Bio Energy
Miller & Associated Consulting Engineers, P.C.
Morrill County, Nebraska
National Ecological Observatory Network
Nebraska Department of Education, Educational Service Unit 13
Nebraska Department of Environment and Energy
Nebraska Department of Natural Resources
Nebraska Environmental Trust
Nebraska Forest Service
Nebraska GeoCloud
Nebraska Geological Society
Nebraska GIS Council
Nebraska Groundwater Quality Clearinghouse
Nebraska Oil and Gas Conservation Commission
Nebraska Public Power District
Nebraska State Irrigation Association
Nebraska Water Leaders Academy
Nebraska Water Resources Association
Norfolk Public Water Supply
North American Colleges and Teachers of Agriculture
North Platte NRD
Northdale Sanitary District, South Dakota
Papio-Missouri River NRD
Penn State University
Platte River Social Science Project, Playa Lakes Joint Venture
Research Development Fellows Program
River Research and Applications (journal)
Science of the Total Environment (journal)
Sedimentary Geology (journal)
Society & Natural Resources (journal)
Springer Publishing
Testing Ag Performance Solutions (TAPS)
Texas A&M University
The Nature Conservancy
The Weather Channel
The Well Watchers
Tsinghua University, China
Twin Platte NRD
U.S. Army Information Systems Command
U.S. Department of Agriculture, Natural Resources Conservation Service
U.S. Department of Agriculture: Water for Agriculture Multistate Research Project
U.S. Department of Agriculture: Agriculture Intensification Western Corn Belt 07/31/2024
U.S. Geological Survey, Nebraska Water Science Center
U.S. Geological Survey, Next Generation Water Observation System
U.S. Geological Survey, National Ground Water Monitoring Network
University of Bristol (England)
University of California, Los Angeles
University of Florida
University of Hong Kong
University of Maryland
University of Quebec
UNL School of Biological Sciences
UNL Study Abroad
UNL Undergraduate Creative Activities and Research Experiences
Upper Elkhorn NRD

Upper Loup NRD
Upper Niobrara-White NRD
U.S. Department of Agriculture,
Natural Resources Conservation Service
Vault 44.01 Ltd
Water for Agriculture Multistate Research Project
Watershed Science Education:
Multi-Agency Collaboration
Windy Hill Gas Storage Project

Selected Objectives in CSD for 2023

- 3D hydrogeology and hydrostratigraphy projects in Nebraska, including one for part of the Middle Republican NRD.
- Assess metals and radionuclides in the vadose zone in Nebraska.
- Building a conceptual model of the hydrogeology of the lower South Platte River.
- Carbon dynamics and hydromorphology in depressional wetland systems.
- Collaborate with other state geological surveys and U.S. Geological Survey to assess and map critical mineral deposits; engage in related scoping, strategic planning, and data provision.
- Complete research on Miocene and Pliocene fluvial fan depositional systems on the High Plains.
- Conduct and supervise research to increase our understanding of the human dimensions of natural resource management.
- Continued development of online CSD sample repository databases and make them accessible to stakeholders.
- CSD Test Hole Database
- Develop a water quality module for the 4-H Build-a-Hut competition.
- Develop a tour of the geological sample repository and related public outreach.
- Develop an educational module on airborne electromagnetic surveys in Nebraska.
- Discerning the record of global change and land use preserved in soils.
- Eastern Nebraska Water Resources Assessment (ENWRA) and regional groundwater recharge mapping.
- Engage with Western Nebraska Community College students in the areas of geology, groundwater, and geophysics.
- Examine the mineralogy and chemistry of ‘rust’ on irrigation center pivots.
- Geophysical survey of irrigation-canal leakage in western Nebraska.
- Improve the stratigraphic framework for understanding the High Plains aquifer system in the western half of Nebraska.
- Nebraska GeoCloud development and administration.
- Nebraska Youth Range Camp and Water Riches Field Day participation.
- Nebraska Water Leaders Academy—develop programming, facilitate sessions, and conduct evaluation.
- Ongoing revision of Pennsylvanian stratigraphy and stratigraphic nomenclature in eastern Nebraska and parts of adjacent states.
- Participation in Panhandle Research and Extension Center and Western Nebraska Research and Extension Center field days.
- Produce surficial geologic maps in Nebraska.
- Provide technical support for Norfolk Public Water System (PWS), Cedar-Knox and Logan East rural water, and the town of Craig, Nebraska.
- Real time monitoring of weather, water and soil data for farm and ranch decision-making.
- Study of linear dune ages and morphology in the Nebraska Sand Hills.
- Study of the relationship between color and organic carbon in Nebraska soils.
- Understanding of the origin of late Pleistocene loess adjacent to the White River Badlands.
- Understanding carbon-cycle perturbations and climate change in “greenhouse” conditions of the geologic past.

CONSERVATION AND SURVEY DIVISION

2022

5,702 feet of test holes drilled and/or logged

Involvement in

>$3.7 million

of ongoing external funding

3,123

STAKEHOLDERS

served by extension & outreach activities

52

PUBLICATIONS

including

26 peer-reviewed journal articles

14 published abstracts

2 book chapters

4 bulletins

4 maps

2 other

163

UNL students taught by CSD faculty in **12** academic courses within **3** different programs totaling **422 credit hours**

128 ORGANIZATIONS AND PROGRAMS SERVED

NE NRD Hall of Fame and GW Achievement Award winner Sue Lackey

UNL SOIL JUDGING TEAM

Judy Turk

- 1st overall - Regional
- Individual National Team member

1,755

CONTINUING EDUCATION UNITS (CEUs) generated for professionals

187,322

PAGE VIEWS related to CSD

604 CSD publications downloaded by **123** countries **7,497** times from Digital Commons

5,101

Requests for **DATA AND ANALYSIS** fulfilled

1

MAJOR FIELD TRIP

55

PRESENTATIONS

127,400

Groundwater level data entries

702

Groundwater quality results processed

6

MEDIA INTERVIEWS

CONSERVATION AND SURVEY DIVISION

School of Natural Resources

130 YRS CSD 1893-2023

http://csd.unl.edu

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