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# ANNUAL REPORT



CONSERVATION AND  
SURVEY DIVISION

*School of Natural Resources*

# 2024



# Conservation and Survey Division

School of Natural Resources  
Institute of Agriculture and Natural Resources  
**University of Nebraska-Lincoln**

R.M. (Matt) Joeckel, *Director and State Geologist*  
Mark Burbach, *Human Dimensions of Natural Resource Management*  
Kathleen Cameron, *Hydrogeologist*  
Troy Gilmore, *Hydrologist*  
Doug Hallum, *Hydrogeologist*  
Paul Hansen, *Quaternary Geologist*  
David Hansen, *Geological Sample Processing Technician*  
Mohamed Khalil, *Groundwater Geoscientist*  
Jesse Korus, *Groundwater Geologist*  
Susan Olafsen Lackey, *Hydrogeologist*  
Matt Marxsen, *Field Service Coordinator*  
Nakita Nouth-Chea, *Geological Research Specialist*  
Nawaraj Shrestha, *Geospatial Science Specialist*  
Colleen Steele, *Quality-Assessed Agrichemical Contaminant Database Coordinator*  
Judith Turk, *Pedologist*  
Michele Waszgis, *Geological Research Specialist & CSD Geological Sample Repository Curator*  
Jeffrey Westrop, *Assistant Geoscientist*  
Justin Williams, *Drilling Assistant*  
Aaron Young, *Geologist*

## 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.

# Conservation and Survey Division

## Annual Report 2024

April 2025

**R.M. Joeckel, Ph.D.**

Director, Conservation and Survey Division  
Associate Director, School of Natural Resources  
Nebraska State Geologist

**M.M. Waszgis, P.G.**

Geological Research Specialist,  
Conservation and Survey Division

University of Nebraska-Lincoln

*Front Cover*

*A wetland persistence map (left) is a special type of map that illustrates the frequency at which wetlands vary in extent during a given period of time. Areas where wetland vegetation are always present are shown in yellow, while areas where wetland vegetation show up less often are shown in dark blue. Figure on the right is a false color composite showing vegetation in red color in USGS NAIP image.*

# University of Nebraska–Lincoln

Rodney Bennett, Ph.D., Chancellor, University of Nebraska–Lincoln

Michael J. Boehm, Ph.D., NU Vice President and IANR Harlan Vice Chancellor

Larkin Powell, Ph.D., Director, School of Natural Resources

R.M. Joeckel, Ph.D., Nebraska State Geologist and Director of Conservation and Survey Division;  
Senior Associate Director, School of Natural Resources

The Conservation and Survey Division of the University of Nebraska–Lincoln is the agency designated by statute to investigate and interpret the geologically related natural resources of the State, to make available to the public the results of these investigations, and to assist in the development and conservation of these resources. It consists of program areas in geology, water, soils, and remote sensing-geographic information systems.

The Division is authorized to enter into agreements with federal and state agencies to engage in cooperative surveys and investigations of the State. Publications of the Division and the cooperating agencies are available through the Conservation and Survey Division, 101 Hardin Hall, University of Nebraska–Lincoln, Lincoln, NE 68583-0961. Contact the address above, phone: (402) 472-3471, or e-mail [snrsales@unl.edu](mailto:snrsales@unl.edu). The Conservation and Survey Division web site is: <http://snr.unl.edu/csd/>.

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May 2025

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# Conservation and Survey Division

## Annual Report 2024

### Overview of Accomplishments

<b>5,500</b>	<b>CSD Drilling Program Footage</b>
<b>\$6.5M</b>	<b>Geoscientific Research Grant Funding</b>
<b>116</b>	<b>Public and Private Entities Served</b>
<b>4,646</b>	<b>Extension Contacts</b>
<b>3,513</b>	<b>Outreach Contacts</b>
<b>584</b>	<b>Data and Analysis Requests Fulfilled</b>
<b>305</b>	<b>Continuing Education Units Generated for Professionals</b>
<b>61</b>	<b>Presentations</b>
<b>5</b>	<b>Field Trip</b>
<b>26</b>	<b>Media Interviews</b>
<b>446,890</b>	<b>Automated Groundwater-Level Measurements Overseen</b>
<b>58</b>	<b>Manual Groundwater-Level Measurements Processed</b>
<b>3,208</b>	<b>Groundwater Quality Results Processed</b>

# Conservation and Survey Division

## Annual Report 2024

### Overview of Accomplishments

## EDUCATION

### Conservation and Survey Division Faculty & Staff

**Instructed 195** University of Nebraska-Lincoln students  
enrolled in **14** courses, which resulted in  
**411** student credit hours

**Advised 23** students including  
**4** undergraduate students &  
**19** masters, PhD candidates

**Employed** and provided real-world work experience for  
**14** University of Nebraska-Lincoln Students

**Engaged with 110** K-12 Students in Educational Outreach

## PUBLICATIONS

### Conservation and Survey Division Faculty & Staff

Authored or Coauthored **55** scientific publications including

Peer-Reviewed Journal Articles **18**

Published Abstracts **19**

Book & Book Chapter **2**

Technical, Open-File Reports & Publications **8**

Research Papers **2**

Geologic Maps **3**

Data Releases **2**

Peer-Reviewed Educational Video **1**

# Conservation and Survey Division

## Annual Report 2024

### Overview of Accomplishments

## DISTINCTIONS

### Conservation and Survey Division Faculty

**Judy Turk** Student-Nominated Faculty Inspiration Award

UNL Soil Judging Team Co-Coach  
2024 National Soil Judging Awards  
2<sup>nd</sup> Place Overall, 2<sup>nd</sup> Place Group Judging,  
3<sup>rd</sup> Place Individual, 1<sup>st</sup> Place Alternates Team,  
1<sup>st</sup> Place Alternate, 3<sup>rd</sup> Place Alternate

**Jesse Korus** Editors' Choice Article, Hydrogeology Journal

**Paul Hanson** Invited Professor, University Paul Sabatier &  
University of Toulouse, Toulouse, France

**Robert Diffendal** Wisherd Award for Outstanding Service to  
the University of Nebraska-Lincoln

**Mark Burbach** SNR Extended Service Award

## ONLINE

### Conservation and Survey Division Faculty & Staff

**899** Works downloaded **9,300** times within **113** countries  
from DigitalCommons@University of Nebraska-Lincoln

**463+ Million** groundwater data queries

**9,787** Interactive Maps and CSD pages

# Conservation and Survey Division

## Annual Report 2024

### Publications

#### Peer-Reviewed Journal Articles

Anderson, A.D, Burras, C.L., **Turk, J.**, Young, R., Jelinski, N., Moorberg, C., Presley, D., Osterloh, K., Dere, A., Clark, K. 2024. An updated method for identifying the formative factors in soil structure. Soil Science Society of America Journal, Volume 88, 2363-2369. [[doi.org/10.1002/saj2.20771](https://doi.org/10.1002/saj2.20771)].

**Burbach, M.E.**, Kennedy, S., Rudnick, R.R., Stockton, M., Burr, C.A., and Rhoades, K., 2024. The influence of a real-life farm management competition on how non-agricultural producers relate to producers with implications for collaborative natural resource management. Socio-Ecological Practice Research, 6(2), 455-467.

**Burbach, M.E.**, Moncure, S.L., Kennedy, S.M., and Smith, J.M., 2024. The effect of default options on choice of electricity utility at grid parity: A mixed methods study. Journal of Management and Sustainability, 14, 21-31 [<https://doi.org/10.5539/jms.v14n1p212024> Publications].

Chapman, K. W., Gilmore, T. E., Mehrubeoglu, M., Chapman, C. D., Mittelstet, A. R., and Stranzl, J. E., 2024. Stage and discharge prediction from documentary time-lapse imagery. PLOS Water, 3(4), e0000106. [[doi.org/10.1371/journal.pwat.0000106](https://doi.org/10.1371/journal.pwat.0000106)].

Gebriel, A., **Khalil, M.**, **Joeckel, R.M.**, and Rose, J., 2024. Analysis of legacy gravity data reveals sediment-filled troughs buried under Flathead Valley, Montana, USA. Near Surface Geophysics 22 (3), 402-317 [<https://doi.org/10.1002/nsg.12295>].

Gibson, J., Franz, T. E., **Gilmore, T.**, Heeren, D., Gates, J., Thomas, S., and Neale, C.M.U. (2024). Groundwater recharge response to reduced irrigation pumping: Checkbook irrigation and the Water Savings Payment Plan. Water, 16(20), Article 20. [[doi.org/10.3390/w16202910](https://doi.org/10.3390/w16202910)].

**Hanson, P.R.**, **Joeckel, R.M.**, **Howard, L.M.**, 2024. Locating and Assessing Oregon Trail Ruts with Aerial Stereophotographs, Satellite Imagery and LiDAR. Great Plains Research 34 (2): 67–3.

Humphrey, C. E., Solomon, D. K., **Gilmore, T. E.**, MacNamara, M. R., Genereux, D. P., Mittelstet, A. R., Zeyrek, C., Zlotnik, V. A., and Jensen, C. R., 2024. Spatial Variation in Transit Time Distributions of Groundwater Discharge to a Stream Overlying the Northern High Plains Aquifer, Nebraska, USA. Water Resources Research, 60(2), e2022WR034410. [[doi.org/10.1029/2022WR034410](https://doi.org/10.1029/2022WR034410)].



# Conservation and Survey Division

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### Publications

#### Peer-Reviewed Journal Articles (continued)

Jensen, C. R., Genereux, D. P., Solomon, D. K., Knappe, D. R. U., and **Gilmore, T. E.**, 2024. Forecasting and Hindcasting PFAS Concentrations in Groundwater Discharging to Streams near a PFAS Production Facility. *Environmental Science & Technology*, 58(40), 17926–17936. [doi.org/10.1021/acs.est.4c06697].

**Khalil, M.**, Barrick, D., and **Joeckel, R.M.**, 2024. Characterization of seepage in an earthfill dam by the integration of geophysical surveys and geotechnical data. *Journal of Applied Geophysics* 220, no. 105273 [https://doi.org/10.1016/j.jappgeo.2023.105273].

Kolarik, N. E., **Shrestha, N.**, Caughlin, T., and Brandt, J. S., 2024. Leveraging high resolution classifications and random forests for hindcasting decades of mesic ecosystem dynamics in the Landsat time series. *Ecological Indicators*, 158, 111445.

**Korus, J.T.**, **Joeckel, R.M.**, Mittelstet, A.R., **Shrestha, N.**, 2024. Multiscale characterization of splays produced by a historic, snow–detonated flood on a large, braided stream (Platte River, Central USA). *Earth Surface Processes and Landforms* 49 (14) 4788–4807 [https://doi.org/10.1002/esp.5997].

Kawo, N., **Korus, J.T.**, Kishawi, Y., Haacker, E., and Mittelstet, A., 2024. Three-dimensional probabilistic hydrofacies modeling using machine learning. *Water Resources Research* 60, E2023WR035910. [https://doi.org/10.1029/2023WR035910].

Layzell, T., Andrzejewski, K., Mandel, R.D., **Hanson, P.R.**, 2024. Landscape and paleoenvironmental change in stream valleys of the central Great Plains, North America during Marine Isotope Stage 3 (ca. 59-27 ka). *Quaternary Science Reviews* 338, 10830, [doi.org/10.1016/j.quascirev.2024.108830].

Schmidt, C., Halter, T., **Hanson, P.R.**, Ulianov, A., Putlitz, B., King, G.E., and Kreutzer, S., 2024. Zircon luminescence dating re-visited. *Geochronology* 6, 665–682, [doi.org/10.5194/gchron-6-665-2024].

**Shrestha, N.**, Kolarik, N. E., and Brandt, J. S. (2024). Mesic vegetation persistence: A new approach for monitoring spatial and temporal changes in water availability in dryland regions using cloud computing and the sentinel and Landsat constellations. *Science of the Total Environment*, 917, 170491.

# Conservation and Survey Division

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### Publications

#### Peer-Reviewed Journal Articles (continued)

Smith, J.J., **Joeckel, R.M.**, Field, H.L., Ludvigson, G.A., Möller, A., Layzell, A., and Tucker, S.T., 2024. Integrated geochronological and chemostratigraphic study of middle Miocene strata (Ogallala Group) at the eastern margin of the North American Great Plains. *Evolving Earth* [<https://doi.org/10.1016/j.eve.2024.100050>].

Whitley, H., Engle, E., Brasier, K.J., Eaton, W.M., **Burbach, M.E.**, Fowler, L.B., Bonilla Anariba, S., Butzler, E., Dixon, K., Chaudhary, A. K., and Whitmer, W., 2024. Stakeholder engagement in water resource management: A systematic review of definitions, practices, and outcomes. *Journal of Environmental Planning and Management*, 1-22 [<https://doi.org/10.1080/09640568.2024.232361>].

#### Book

Solomon, D. K., and **Gilmore, T. E.**, 2024. Age Dating Young Groundwater. *The Groundwater Project* [[doi.org/10.21083/LIU2727](https://doi.org/10.21083/LIU2727)].

#### Book Chapter

**Joeckel, R.M., Reinier, C.L., Hanson, P.R., Korus, J.T., Gilmore, T., and Young, A.R., 2024.** Physical Setting of the Sandhills in maps, p. 60–73 in Norby, M.M., Diamond, J., Sutherlen, A., Fritz, S.C., Hachiya, K., Norby, D.A., Forsberg, M., *The Nebraska Sandhills*, University of Nebraska Press, Lincoln, NE.

#### Technical Reports & Publications

**Gilmore, T.E., and Korus, J.T.**, 2024. Groundwater In Nebraska. University of Nebraska-Lincoln, Conservation and Survey Division, Earth Science Notes ESN-11, 2 pp.

**Khalil, M., Hallum, D.R., and Joeckel, R.M.**, 2024. Joint interpretation of ERT and Self-Potential data to characterize the subsurface geology and hydrodynamics along the Sutherland Supply Canal and Paxton Siphon inlet, Paxton, Nebraska, 2024. University of Nebraska-Lincoln, Conservation and Survey Division, Report of Investigations 14, 46 pp. [<https://digitalcommons.unl.edu/conservationsurvey/847>].

# Conservation and Survey Division

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### Publications

#### Technical Reports & Publications (continued)

Paronish, T., Pohl, M., Parker, A., Schmitt, R., Moore, J., Spaulding, R., Haljasmaa, I., Crandall, D., Smith, V., Duguid, A., and **Joeckel, R. M.**, 2024. Computed Tomography Scanning and Geophysical Measurements of the Integrated Mid–Continent Stacked Carbon Storage Hub Sleepy Hollow Reagan Unit 86A Well; DOE/NETL–2024/4808 Technical Report Series; U.S. Department of Energy, National Energy Technology Laboratory: Morgantown, WV [chrome-extension://efaidnbmninnibpcajpcgclclefindmkaj/https://netl.doe.gov/projects/files/ComputedTomographyScanGeophysMeasurlIntegMidContStackCarbStorHubSleepyHolloReaganUn86AWell\_091524.pdf].

Roberson, B., Córdova, C., and **Turk, J.**, 2024. Soil Color Chart to Estimate Organic Matter concentrations for Eastern Nebraska. University of Nebraska-Lincoln, Conservation and Survey Division, Earth Science Notes ESN-12, 2 pp.

**Young, A.R., Burbach, M.E., Lackey, S.O., Joeckel, R.M., Shrestha, N., and Westrop, J.P.**, 2024. Nebraska statewide groundwater-level monitoring report – 2023. School of Natural Resources, University of Nebraska-Lincoln, Water Survey Paper 92.

#### Published Abstracts

Baldauf, P., Baker, G.S., Burkhart, P., Grimley, D.A., **Hanson, P.R.**, Renshaw, C., Nichols, J., 2024. Paleoenvironmental significance of the last Glacial Red Dog Loess, a Peoria Loess equivalent, White River Badlands, South Dakota, USA. Geological Society of America Abstracts with Programs Vol 56, No. 5.

Burberry, C.M., **Joeckel, R.M.**, and **Waszgis, M.M.**, 2024. Microscale deformation of SE Nebraska basement: Insights into the Precambrian evolution of the Midcontinent, USA. Geological Society of America Abstracts with Programs 56 (3), doi: 10.1130/abs/2024NC–398978 [https://gsa.confex.com/gsa/2024NC/meetingapp.cgi/Paper/398978].

Freese, E., Harner, M., Lundgren, M., **Gilmore, T.**, Forsberg, M., 2024. Leveraging imagery to build community and increase understanding of a watershed. AWRA, UCOWR, NIWR Joint Water Resources Conference. St. Louis, MO. October 2024 [https://events.rdmobile.com/Sessions/Details/2458416].

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### Publications

#### **Published Abstracts (continued)**

**Gilmore, T. E.**, Stranzl, J., Harner, M., Johnson, K., Terry, C., Bajelan, J., Wells, M., Smith, M., Chapman, K., 2024. Water Segmentation for Water Level Determination using USGS HIVIS Imagery. Poster presented at the American Geophysical Union Annual Meeting. Washington, DC. December 2024 [<https://agu.confex.com/agu/agu24/meetingapp.cgi/Paper/1680857>].

**Gilmore, T.**, Stranzl Jr., J., Harner, M., Terry, C., Bajelan, J., Smith, M., Guggilla, P., Chapman, K., Johnson, K., 2024. GRIME-AI: Open-Source Software to Facilitate Ecohydrological Research and Education with Ground-Based Time-Lapse Imagery. AWRA, UCOWR, NIWR Joint Water Resources Conference. St. Louis, MO. October 2024 [<https://events.rdmobile.com/Sessions/Details/2458416>].

**Hanson, P.R., Joeckel, R.M., Nouth-Chea, N.**, 2024. OSL dating of Rainwater Basins in south-central Nebraska confirms development coeval with Late Pleistocene Loess Deposition. New World Luminescence Dating Workshop, June 2024, Reno, NV.

Harner, M., **Gilmore, T.**, Johnson, K., Bajelan, J., Chapman, K., Guggilla, P., Smith, M., Stranzl Jr., J., Terry, C., Wells, M., and Wetovick, K., 2024. Interdisciplinary training opportunities for students enabled by camera networks. AWRA, UCOWR, NIWR Joint Water Resources Conference. St. Louis, MO. October 2024 [<https://events.rdmobile.com/Sessions/Details/2458416>].

Harner, M., **Gilmore, T.**, Johnson, K., Bajelan, J., Chapman, K., Guggilla, P., Smith, M., Stranzl Jr., J., Terry, C., Wells, M., and Wetovick, K., 2024. Applications of Ground-based Cameras for Ecohydrological Monitoring and Student Training at an Outdoor Learning Area. Poster presented at the American Geophysical Union Annual Meeting, Washington, DC. December 2024 [<https://agu.confex.com/agu/agu24/meetingapp.cgi/Paper/1733231>].

**Joeckel, R.M.**, Ludvigson, G.A., McLean, N.M., Möller, A., 2024. Minimum duration of Valanginian “Weissert Event”—the first major perturbation of the Cretaceous global carbon cycle—constrained by new high-precision U–Pb dates from terrestrial sediments in Utah, USA. SEPM International Sedimentary Geosciences Congress, Flagstaff, AZ. SEPM International Sedimentary Geosciences Congress, Flagstaff, AZ. International Sedimentary Geoscience Congress Abstract Book. SEPM Miscellaneous Publication 24, p. 39.



# Conservation and Survey Division

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### Publications

#### Published Abstracts (continued)

**Korus, J.T., and Joeckel, R.M., 2024.** Mechanisms of sediment storage and recycling on the Great Plains: Implications for the Rocky Mountain–Gulf of Mexico S2S system (Late Miocene–Pliocene). SEPM International Sedimentary Geosciences Congress, Flagstaff, AZ. International Sedimentary Geoscience Congress Abstract Book. SEPM Miscellaneous Publication 24, p. 11.

Kreutzer, S., Schmidt, C., Kadereit, A., **Hanson, P.R., 2024.** Tracking dune blowouts to constrain prehistoric droughts in the Nebraska Sand Hills (Great Plains, USA). European Geosciences Union General Assembly, April 2024, EGU 24-1804  
[<https://meetingorganizer.copernicus.org/EGU24/EGU24-11804.html>].

Layzell, T., Andrzejewski, K., Mandel, R.D., **Hanson, P.R., 2024.** Landscape and paleoenvironmental change in stream valleys of the central Great Plains, North America during Marine Isotope Stage 3 (ca. 59-27 ka). Quaternary Science Reviews 338, 10830, [doi.org/10.1016/j.quascirev.2024.108830].

Loope, H., Antinao, J.L., **Hanson, P.R.,** Huot, S., Jacobs, P., Grimley, D., 2024. Age and luminescence properties of Marine Isotope Stage 2 glaciofluvial and eolian deposits, White River drainage basin, Indiana, USA. New World Luminescence Dating Workshop, June 2024, Reno NV.

Ludvigson, G., Palafox, E., Montañez, I., Möller, A. McLean, N., Suarez, M., and **Joeckel, M., 2024.** The utility of cathodoluminescence imaging for LA–ICP–MS uranium–lead dating of calcite cements in pedogenic–palustrine carbonates. SEPM International Sedimentary Geosciences Congress, Flagstaff, AZ. International Sedimentary Geoscience Congress Abstract Book. SEPM Miscellaneous Publication 24, p. 110.

Möller, S., McLean, N., Suarez, M., Ludvigson, G., **and Joeckel, M., 2024.** A new bracketing approach to determine depositional ages and paleoclimate markers by combined U–Pb geochronology from cryptotephra and diagenetic carbonate concretions. SEPM International Sedimentary Geosciences Congress, Flagstaff, AZ. International Sedimentary Geoscience Congress Abstract Book. SEPM Miscellaneous Publication 24, p. 14.

Reed, O., Andrzejewski, K., Möller, A., **Joeckel, R.,** Ludvigson, G., Layzell, A., Kalbas, J.L., 2024. Assessing deposition age of Dakota Fm. paleosols in SE Nebraska through detrital zircon U–Pb dating. Geological Society of America Abstracts with Programs 56 (3), doi: 10.1130/abs/2024NC-398969 [<https://gsa.confex.com/gsa/2024NC/meetingapp.cgi/Paper/398969>].

# Conservation and Survey Division

## Annual Report 2024

### Publications

#### Published Abstracts (continued)

Stranzl, J., **Gilmore, T. E.**, Harner, M., Terry, C., Chapman, K., Johnson, K., Richardson, A. D., Bajelan, J., Guggilla, P., 2024. GRIME-AI: Open-source Software for Ecohydrological Discovery Using Ground-based Time-lapse Imagery. Poster presented at the American Geophysical Union Annual Meeting, Washington, D.C. December 2024  
[<https://agu.confex.com/agu/agu24/meetingapp.cgi/Paper/1708400>].

**Turk, J.**, 2024. The Development of Vesicular Pores in Field and Laboratory Settings. ASA-CSSA-SSSA International Annual Meetings. San Antonio, TX. Nov. 12, 2024.

**Turk, J.**, Baker, T., and Hernandez, W. Soil Erosion and Carbon Stock Change over 63 Years in eastern Nebraska Croplands. ASA-CSSA-SSSA International Annual Meetings. Nov. 13, 2024.

#### Research Papers

Bathke, D.J., Hunt, E., Akin, H., Basche, A., Bell, J., DiLeo, D., Dixon, R.D., Durr, M., Hay, J., Haigh, T., McMillan, N., Kintziger, K., Miller, H., Powers, C., Roy, T., Sonsthagen, S., Spurgeon, J., Tang, Z., Wishart, W.R., and **Young, A.**, 2024. Understanding and Assessing Climate Change: Preparing for Nebraska's Future. University of Nebraska-Lincoln  
[[https://snr.unl.edu/download/research/projects/climate impacts/2014 climate change.pdf](https://snr.unl.edu/download/research/projects/climate%20impacts/2014%20climate%20change.pdf)].

Chavez, A., Hayes, M. J., **Burbach, M. E.**, Durr, M. E., 2024. Towards usable science: A case study with the Santee Sioux Nation. Available at SSRN [<http://dx.doi.org/10.2139/ssrn.4632812>].

#### Open-File Reports

**Burbach, M.E.**, **Joeckel, R.M.**, and Akin, H., 2024. 2024 Nebraska Water Leaders Academy – Final report. University of Nebraska-Lincoln, School of Natural Resources, Open-File Report 259.

**Khalil, M.**, **Korus, J.**, **Hallum, D.**, and **Joeckel, R.M.**, 2024. Subsurface Investigation of the Hideaway Hills Subdivision in Blackhawk, South Dakota Using Electric Resistivity Tomography (ERT) and Self-Potential (SP) Surveys. School of Natural Resources, University of Nebraska-Lincoln, Open-File Report 255.

**Korus, J.T.**, **Cameron, K.**, and **Waszgis, M.**, 2024. Transient electromagnetic (TEM) survey for targeted drilling on the Kurtzhals Property, Cedar County, Nebraska. University of Nebraska-Lincoln, School of Natural Resources, Open-File Report 258.

# Conservation and Survey Division

## Annual Report 2024

### Publications

#### Geologic Maps

**Hanson, P.R., Shrestha, N., and Reinier, C.L.**, 2024. Surficial geology of the Belgrade SE 7.5' Quadrangle, Nebraska. Conservation and Survey Division, School of Natural Resources.

**Hanson, P.R., Shrestha, N., Girard, M., Joeckel, R.M., and Reinier, C.L.**, 2024. Surficial geology of the Central City West 7.5' Quadrangle, Nebraska. Conservation and Survey Division, School of Natural Resources.

**Young, A., Gilmore, T.E., and Shrestha, N.** 2024. Surficial geology of the Hire SW 7.5' Quadrangle, Nebraska. Division, School of Natural Resources.

#### Data Releases

Lundstrom, S.C., McBeth, J.L., Alexander, J., **Hanson, P.R.**, and Mahan, S.A., 2024. Geologic map of the valley corridor of the Niobrara National Scenic River, Nebraska: U.S. Geological Survey Data Release [doi.org/10.5066/P1RVSXF4].

Paronish, T., Pohl, M., Parker, A., Moore, J., Spaulding, J., Haljasmaa, I., Crandall, D., Smith, Rhianon (Schmitt) Tempke, V., Duguid, A., and **Joeckel, R.M.**, 2024. Sleepy Hollow Reagan Unit 86A Well Data, 7/16/2024, U.S. Department of Energy Office of Scientific and Technical Information [https://edx.netl.doe.gov/dataset/sleepy-hollow-reagan-unit-86a-well-data, DOI: 10.18141/2403321].

#### Peer-Reviewed Educational Video

**Korus, J.T.**, 2024. Subsurface Data for Water Management: Airborne Electromagnetic (AEM) Surveys. Nebraska WAVES (Water Aquifer Virtual Education System) Program [https://youtu.be/L1bPnkXyfn].

# Conservation and Survey Division

## Annual Report 2024

### Presentations

Baldauf P., Baker G.S., Burkhart P., Grimley D.A., **Hanson P.R.**, Renshaw C., Nichols J., 2024. Paleoenvironmental Significance of the Last Glacial Red Dog Loess, a Peoria Loess Equivalent, White River Badlands, South Dakota, USA. GSA Connects 2024 (Geological Society of America Annual Meeting), Anaheim, CA. September 23, 2024.

Burberry, C.M., **Joeckel, R.M.**, and **Waszgis, M.M.**, 2024. Microscale deformation of SE Nebraska Basement: Insights into the Precambrian Evolution of the Midcontinent, USA. Joint North-Central and South-Central Sections Meeting, Geological Society of America, Springfield, MO. April 23, 2024.

**Burbach, M.E.**, 2024. Full Range Leadership for Leaders in the Water Arena. Nebraska State Irrigation Association, Nebraska Water Leaders Academy, Lincoln, NE. January 18, 2024.

**Burbach, M.E.**, 2024. Behavioral Impacts of TAPS on Participants. TAPS Collaboration Meeting, February 13, 2024.

**Burbach, M.E.**, 2024. Boundary Spanning Skills for Effective Stakeholder Engagement. Nebraska State Irrigation Association, Nebraska Water Leaders Academy, Kearney, NE. March 22, 2024.

**Burbach, M.E.**, 2024. An Assessment of Nebraska's Integrated Water Resource Management in the Platte River Basin: Identifying Opportunities. Nebraska State Irrigation Association, Nebraska Water Leaders Academy, Kearney, NE. May 17, 2024.

**Burbach, M.E.**, 2024. Discerning Differences in Attitudes Toward River Management between Agricultural Producers in the Upper and Lower Colorado River Basin. 2024 IASNR Conference, Cairns, Queensland, Australia. June 24, 2024.

**Burbach, M.E.**, 2024. TAPS: An Innovative and Interactive Real-world Farm Management Competition Promoting Knowledge Sharing between Diverse Stakeholders. 2024 IASNR Conference, Cairns, Qld, Australia. June 24, 2024.

**Burbach, M.E.**, 2024. Exploring How a Community Can utilize the Community Capitals Framework – The Case of the Gering-Ft. Laramie Irrigation Tunnel Collapse. Nebraska Water Leaders Academy. July 11, 2024.



# Conservation and Survey Division

## Annual Report 2024

### Presentations (continued)

**Burbach, M.E.**, 2024. A Comparison of Upper and Lower Colorado River Basin Agricultural Producers' Attitudes Toward River Management. Rural Sociological Society Annual Meeting, Madison, WI. July 25, 2024.

**Burbach, M.E.**, 2024. Niobrara National Wild & Scenic River – Outstandingly Remarkable Values. Nebraska Water Leaders Academy, Valentine, NE. September 11, 2024.

**Burbach, M.E.**, 2024. Discerning Differences in Attitudes Toward River Management between Agricultural Producers in the Upper and Lower Colorado River Basin. Nebraska Department of Natural Resources, Brown Bag Series, Lincoln, NE. October 2, 2024.

**Burbach, M.E.**, 2024. Personal Empowerment - Engaging Your Leadership Capacity. Nebraska State Irrigation Association, Nebraska Water Leaders Academy, Lincoln, NE. November 21, 2024.

**Cameron, K.A.**, 2024. Eastern Nebraska Water Resources Assessment (ENWRA) Update. ENWRA Spring Meeting, Wahoo, NE. June 13, 2024.

**Cameron, K.A.**, 2024. Eastern Nebraska Water Resources Assessment (ENWRA) Accomplishments and Budget. Lower Platte South Natural Resources District Water Subcommittee Meeting, Lincoln, NE. May 7, 2024

**Cameron, K.A.**, 2024. Geology of Southeast Nebraska. Nebraska Water Center 2024 Water and Natural Resources Tour, Nemaha Natural Resources District, Tecumseh, NE. June 17, 2024.

**Cameron, K.A.**, 2024. Eastern Nebraska Water Resources Assessment (ENWRA) Update. Lower Platte North Natural Resources District Water Committee Meeting, Wahoo, NE. October 2, 2024.

**Cameron, K.A.**, 2024. Eastern Nebraska Water Resources Assessment (ENWRA) Update. Lower Elkhorn Natural Resources District Committee of the Whole Meeting, Norfolk, NE. November 14, 2024.

**Cameron, K.A.**, 2024. Airborne Electromagnetic Survey Review for Eastern Seward County. Lower Platte South Natural Resources District Zoom Meeting, Lincoln, NE. December 6, 2024.

# Conservation and Survey Division

## Annual Report 2024

### Presentations (continued)

**Cameron, K.A.**, 2024. Eastern Nebraska Water Resources Assessment (ENWRA) Update. Lower Platte South Natural Resources District Water Subcommittee Meeting, Lincoln, NE. October 9, 2024.

Córdova, C., **Turk, J.** 2024. Soil Health Assessment Toolkit for Croplands. Soil Health and Cover Crop Field Day. Mead, NE. Aug. 28, 2024.

Elwood-Madden A.S., **Westrop J.P.**, Swindle A.S., Dee K.T., Fox B.R., Sexton M.R., 2024. Do Colloid Extracts from Sedimentary Rocks Reflect Active 'Dissolved' Colloidal Phase in Deep Castic Aquifers? Goldschmidt 2024 Conference, Geochemical Society and European Association of Geochemistry. Chicago, IL. Aug 19, 2024.

Feit, B., Kaiser, M., **Turk, J.**, Young, B. 2024. The Soil Carbon Cycle - 4 Activities for Lincoln Northeast High School Students. Dec. 2, 2024.

Freese, E., Harner, M., Lundgren, M., **Gilmore, T.**, Forsberg. M., 2024. Leveraging imagery to build community and increase understanding of a watershed. AWRA, UCOWR, NIWR Joint Water Resources Conference. St. Louis, MO. October 2024.

**Gilmore, T. E.**, Stranzl, J., Harner, M., Johnson, K., Terry, C., Bajelan, J., Wells, M., Smith, M., Chapman, K., 2024. Water Segmentation for Water Level Determination using USGS HIVIS Imagery. Poster presented at the American Geophysical Union Annual Meeting. Washington, DC. December 2024.

**Gilmore, T.**, Stranzl Jr., J., Harner, M., Terry, C., Bajelan, J., Smith, M., Guggilla, P., Chapman, K., Johnson, K., 2024. GRIME-AI: Open-Source Software to Facilitate Ecohydrological Research and Education with Ground-Based Time-Lapse Imagery. AWRA, UCOWR, NIWR Joint Water Resources Conference. St. Louis, MO. October 2024.

**Gilmore T.E.**, Cherry M.L., **Westrop J.P.**, 2024. Center Pivot Irrigation Systems as Subsurface Redox Indicators. American Chemical Society - Midwest Region Annual Meeting. Omaha, NE. Oct 13, 2024.

**Hanson P.R.**, 2024. Paleoenvironmental Change and Dune Movement in Response to Prehistoric Droughts in the Nebraska Sand Hills, Paul Sabatier University, Toulouse, France, October 10, 2024.

# Conservation and Survey Division

## Annual Report 2024

### Presentations (continued)

**Hanson P.R.**, 2024. Age, Bedding and Morphology of Paired Dunes in the Nebraska Sand Hills, University of Wisconsin-Eau Claire, April 12, 2024.

**Hanson P.R., Joeckel R.M., Nouth-Chea, N.**, 2024. OSL Dating of Rainwater Basins in South-Central Nebraska Confirms Development Coeval with Late Pleistocene Loess Deposition. New World Luminescence Dating Workshop, Reno, NV, June 12, 2024.

Harner, M., **Gilmore, T.**, Johnson, K., Bajelan, J., Chapman, K., Guggilla, P., Smith, M., Stranzl Jr., J., Terry, C., Wells, M., and Wetovick, K., 2024. Interdisciplinary training opportunities for students enabled by camera networks. AWRA, UCOWR, NIWR Joint Water Resources Conference. St. Louis, MO. October 2024.

Harner, M., **Gilmore, T.**, Johnson, K., Bajelan, J., Chapman, K., Guggilla, P., Smith, M., Stranzl Jr., J., Terry, C., Wells, M., and Wetovick, K., 2024. Applications of Ground-based Cameras for Ecohydrological Monitoring and Student Training at an Outdoor Learning Area. Poster presented at the American Geophysical Union Annual Meeting, Washington, DC. December 2024.

**Joeckel, R.M., Waszgis, M.M.**, 2024. Interactive Geology Exercise. Calvert Elementary/Calvert Recreation Center Geology Club, Lincoln, NE. January 29, 2024.

**Joeckel, R.M., Marxsen, M.**, 2024. Drilling Equipment Demonstration. Calvert Elementary/Calvert Recreation Center Geology Club, Lincoln, NE. March 5, 2024.

**Khalil, M.**, 2024. Seepage detection in hydraulic structures from self-potential and electrical resistivity tomography, PHREEC-Field Day presentation, August 22, 2024.

**Khalil, M.**, 2024. Applied Geophysics, Nebraska Oil and Gas Conservation Commission, Sidney, September 25, 2024.

**Korus, J.T.**, 2024. Mechanisms of sediment storage and recycling on the Great Plains: Implications for the Rocky Mountain-Gulf of Mexico S2S system (late Miocene-Pliocene). SEPM International Sedimentary Geosciences Congress, Flagstaff, AZ. May 7, 2024.

# Conservation and Survey Division

## Annual Report 2024

### Presentations (continued)

**Korus, J.T.**, 2024. Exhumed Cenozoic Fluvial Deposits on the North American Great Plains: A Diverse Catalogue of Mars Analogs, Imperial College of London Planetary Geology Research Group (invited virtual presentation). January 26, 2024.

**Korus, J.T.**, 2024. Hydrogeology of Nebraska, National Groundwater Association, Hydrogeology of the States Webinar Series (invited virtual presentation). July 25, 2024.

**Joeckel, R.M.**, 2024. World (Ground) Water 2024 and an Introduction to Geology and Groundwater in Nebraska. Nebraska Water Leaders Academy 2024. Lincoln, NE. January 19, 2024.

**Joeckel, R.M.**, 2024. Nebraska's Groundwater Resources. Delegation from Sao Paulo State, Brazil, Daugherty Water for Food Global Institute, Lincoln, NE. March 15, 2024.

**Joeckel, R.M.**, 2024. Conservation and Survey Division: Groundwater and Geoscience in Nebraska. Delegation from Mato Grosso State, Brazil, Daugherty Water for Food Global Institute, Lincoln, NE. April 22, 2024.

**Joeckel, R.M.**, Ludvigson, G.A., McLean, N.M., Möller, A., 2024. Minimum duration of Valanginian “Weissert Event”—the first major perturbation of the Cretaceous global carbon cycle—constrained by new high-precision U–Pb dates from terrestrial sediments in Utah, USA. SEPM International Sedimentary Geosciences Congress, Flagstaff, AZ. May 5–8, 2024.

**Joeckel, R.M.**, Bear with Me, Please: How to Ruin a Perfectly Good Float Trip with Science. Nebraska Water Leaders Academy, Middle Niobrara NRD, Valentine, NE. September 11, 2024.

**Joeckel, R.M.**, 2024. Geology of Lancaster County for Lincoln and Parks and Recreation Employees. Pioneers Park Nature Center, Lincoln, NE. December 17, 2024.

Kreutzer S., Schmidt C., Kadereit A., **Hanson P.R.**, 2024. Tracking Dune Blowouts to Constrain Prehistoric Droughts in the Nebraska Sand Hills (Great Plains, USA). European Geosciences Union General Assembly, Vienna, Austria. April 18, 2024.

**Lackey, S.O.**, 2024. Nebraska Groundwater. Preferred Pump Open House, Grand Island, April 6, 2024.



# Conservation and Survey Division

## Annual Report 2024

### Presentations (continued)

Loope H., Antinao J.L., **Hanson P.R.**, Huot S., Jacobs P., Grimley D., 2024. Age and Luminescence Properties of Marine Isotope Stage 2 Glaciofluvial and Eolian Deposits, White River Drainage Basin, Indiana, USA. New World Luminescence Dating Workshop, Reno NV, June 12, 2024.

Ludvigson, G., Palafox, E., Montañez, I., Möller, A. McLean, N., Suarez, M., and **Joeckel, M.**, 2024. The utility of cathodoluminescence imaging for LA-ICP-MS uranium-lead dating of calcite cements in pedogenic-palustrine carbonates. SEPM International Sedimentary Geosciences Congress, Flagstaff, AZ. May 5-8 2024.

Möller, S., McLean, N., Suarez, M., Ludvigson, G., and **Joeckel, M.**, 2024. A new bracketing approach to determine depositional ages and paleoclimate markers by combined U-Pb geochronology from cryptotephra and diagenetic carbonate concretions. SEPM International Sedimentary Geosciences Congress, Flagstaff, AZ. May 5-8, 2024.

Reed, O., Andrzejewski, K., Möller, A., **Joeckel, R.**, Ludvigson, G., Layzell, A., Kalbas, J.L., 2024. Assessing deposition age of Dakota Fm. paleosols in SE Nebraska through detrital zircon U-Pb dating. Geological Society of America Abstracts with Programs 56 (3), doi: 10.1130/abs/2024NC-398969 [<https://gsa.confex.com/gsa/2024NC/meetingapp.cgi/Paper/398969>].

Roberson, B., Córdova, C., **Turk, J.**, 2024. Color Chart for Estimating Organic Carbon in Nebraska Soils. Nebraska Cooperative Soil Survey Conference (Virtual). April 2, 2024.

**Shrestha. N.**, Brandt. J., Kolarik. N., 2024. Mesic Vegetation Persistence: Assessing spatiotemporal water availability in the drylands. Water Science Conference, Minnesota, June 24-27, 2024.

Stranzl, J., **Gilmore, T. E.**, Harner, M., Terry, C., Chapman, K., Johnson, K., Richardson, A. D., Bajelan, J., Guggilla, P., 2024. GRIME-AI: Open-source Software for Ecohydrological Discovery Using Ground-based Time-lapse Imagery. Poster presented at the American Geophysical Union Annual Meeting, Washington, DC. December 2024.

**Turk, J.** 2024. The Development of Vesicular Pores in Field and Laboratory Settings. ASA-CSSA-SSSA International Annual Meetings. San Antonio, TX. Nov. 12, 2024.

# Conservation and Survey Division

## Annual Report 2024

### Presentations (continued)

**Turk, J., Baker, T., Hernandez, W., 2024.** Soil Erosion and Carbon Stock Change over 63 Years in eastern Nebraska Croplands. ASA-CSSA-SSSA International Annual Meetings. Nov. 13, 2024

**Turk, J., 2024.** Basic Soils. Nebraska Water Industries Convention, Kearney, NE. February 13, 2024.

**Turk, J., Roberson, B., Waszgis, M., 2024.** Soil Science. Calvert Elementary/Calvert Recreation Center Geology Club, Lincoln, NE. February 26, 2024.

**Turk, J., 2024.** Soil Color and Organic Matter for Junior Master Gardeners, Weeping Water, NE. Jul. 22, 2024.

**Westrop, J.P., 2024.** Occurrence of Common Groundwater Contaminants and Options for Treatment. Nebraska Water Industries Annual Convention. Kearney NE. February 13, 2024.

**Westrop, J.P., 2024.** A Pivotal New Method for Predicting Concentrations of Redox Sensitive Elements in Agricultural Aquifers. Goldschmidt 2024 Conference, Geochemical Society and European Association of Geochemistry. Chicago, IL. August 20, 2024.

**Young, A., Marxsen, M., Cameron, K., Joeckel, R.M., 2024.** Outdoor Drilling Demonstration for Technical Delegation from Parana, Brazil. Conservation and Survey Division, School of Natural Resources, Lincoln, NE. September 26, 2024.

**Young, A., Cameron, K., 2024.** Groundwater Interactive Kit Demonstrations. Calvert Elementary/Calvert Recreation Center Geology Club, Lincoln, NE. February 5, 2024.

# **Conservation and Survey Division**

## **Annual Report 2024**

### **Agencies, Partners & Public and Private Entities Served**

American Association of Petroleum Geologists  
American Chemical Society  
Argonne National Laboratory  
Audubon Great Plains  
Boise State University  
Central Nebraska Public Power and Irrigation District  
Central Platte Natural Resources District  
Chadron State College  
City of Hastings (Nebraska)Utilities  
Climate Engine  
Colorado School of Mines  
Cornell University  
Daugherty Water for Food Global Institute  
Denver Museum  
Department of Agronomy and Horticulture, UNL  
Department of Earth and Atmospheric Sciences, UNL  
Deutsche Forschungsgemeinschaft  
Eastern Nebraska Water Resources Assessment  
Fulbright U. S. Student Program and Marshall Scholarship  
Geoderma Regional  
Geological Society of Minnesota  
Hitchcock County (Nebraska) Historical Society  
IANR West Central Research, Extension and Education Center  
Iowa Nutrient Research Center  
Kansas Department of Health and Environment  
Kansas Geological Survey  
Knox County Rural Water  
Lens of Time (Sierra Magazine)  
Lewis and Clark Natural Resources District  
Lincoln County (Nebraska) Historical Museum  
Lincoln Public Schools  
Logan East Rural Water System

Lower Big Blue Natural Resources District  
Lower Elkhorn Natural Resources District  
Lower Elkhorn Natural Resources District staff  
Lower Platte North Natural Resources District  
Lower Platte South Natural Resources District  
Middle Republican Natural Resources District  
Missouri Geological Survey  
Montana Tech University  
Natural Resources Conservation Service  
Nebraska Association of Resources Districts  
Nebraska College of Technical Agriculture  
Nebraska Department of Agriculture  
Nebraska Department of Environment and Energy  
Nebraska Department of Natural Resources  
Nebraska Extension  
Nebraska GIS Council  
Nebraska Independent Film Projects  
Nebraska Legislature  
Nebraska Oil and Gas Conservation Commission  
Nebraska Public Power District  
Nebraska Science Olympiad  
Nebraska State Climate Office  
Nebraska State Irrigation Association  
Nebraska Water Leaders Academy  
Nemaha Natural Resources District and Lower Platte South Natural Resources District  
Nitrate Writing Group  
North Platte Natural Resources District  
Papio-Missouri River Natural Resources District  
Pioneer Village Museum  
Sandia National Laboratory  
Seward County (Nebraska) Commissioners  
Testing Ag Performance Solutions (TAPS) program  
Twin Platte Natural Resources District  
Tri-Basin Natural Resources District  
U. S. Bureau of Land Management  
U. S. Department of Agriculture, Natural Resources Conservation Service  
U. S. Department of Energy, National Energy Technology Laboratory

U. S. Department of the Interior, National Park Service  
U. S. Air Force  
U. S. Geological Survey  
University of California, Santa Barbara  
University Corporation for Atmospheric Research  
University of Kansas Department of Geology  
University of Nebraska State Museum  
University of Nebraska-Lincoln, Office of Research and Economic Development  
University of Wyoming  
Upper Big Blue Natural Resources District  
Upper Loup Natural Resources District  
Upper Niobrara-White Natural Resources District  
Village of Niobrara (Nebraska)  
American Association of Petroleum Geologists  
American Chemical Society  
Audubon Great Plains  
Boise State University  
Central Nebraska Public Power and Irrigation District  
Central Platte Natural Resources District  
Chadron State College  
City of Hastings (Nebraska) Utilities  
Climate Engine

PLUS 25 private companies

## What's New at CSD

***Please check out our online compendium of CSD news stories from 2024! <https://go.unl.edu/csdnews>***



- “Diffendal receives Wisherd award for university service.”
- “CSD's Korus talks Groundwater on RFD-TV.”
- “Turk Earns National Science Foundation Faculty Early Career Development Program Award.”
- “Faculty Spotlight: Nawaraj Shrestha.”
- “Turk Earns National Science Foundation Faculty Early Career Development Program Award.”
- “Groundwater levels continue to decline after several years of prolonged drought.”
- “Lab boosts understanding of water bodies, creates student opportunities.”
- “CSD scientists deepen understanding of ancient rivers.”







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