# Curriculum Vitae

College of Engineering
Promotion and Tenure

## 2018 – 2019 Academic Year Curriculum Vitae Format
**Approved by COE P&T Committee on January 31, 2018**

## Section 0

Candidate Name: Troy E. Gilmore
Candidate Title: Assistant Professor
Unit Name: School of Natural Resources and Biological Systems Engineering Dept.
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## Section 1 Education and Employment History

### Section 1.1 Education History

North Carolina State University, Ph.D., Biological and Agricultural Engineering, 2010-2015

*Dissertation Topic:* Groundwater transit times and the fate of aquifer nitrate: Observations from sampling in stream channels and well nests in an agricultural watershed, North Carolina, USA.

North Carolina State University, B.S., Civil Engineering, Water Resources Emphasis, 2008-2010, Summa Cum Laude

University of Akron, A.A.S, Mechanical Engineering Technology, 1996-2001

### Section 1.2 Employment History:

University of Nebraska, Lincoln, NE

- *Associate Professor of Groundwater Hydrology* (June 2021 – present)
  - School of Natural Resources, Conservation and Survey Div. (70%)
  - Biological and Agricultural Engineering Department (30%)
- *Assistant Professor of Groundwater Hydrology* (October 2015 – May 2021)
  - School of Natural Resources, Conservation and Survey Div. (70%)
  - Biological and Agricultural Engineering Department (30%)

## Section 2 Research Accomplishments

- **Section 2.1 Publication Record**

*The following subscripts to indicate UNL students for whom I serve/served as chair or co-chair of their advisory committee and UNL postdoctoral researchers who are/were under my direct supervision.*
*1: Undergraduate student*
*2: Masters student*
*3: Ph.D. student*
*4: Postdoctoral researcher*

Section 2.1.1 Numbered list (in reverse chronological order) of Peer Reviewed Journal Articles

1. Santarosa, L. V., Gastmans, D., Gilmore, T. E., Boll, J., Betancur, S. B., & Gonçalves, V. F. M. (*online version*, 2021). Baseflow and water resilience variability in two water management units in southeastern Brazil. *International Journal of River Basin Management*, *0*(ja), 1–37. https://doi.org/10.1080/15715124.2021.2002346
2. Eger, G. Z. S., Silva Junior, G. C., Marques, E. A. G., Leão, B. R. C., da Rocha, D. G. T. B., Gilmore, T. E., et al. (2021). Recharge assessment in the context of expanding agricultural activity: Urucuia Aquifer System, western State of Bahia, Brazil. *Journal of South American Earth Sciences*, *112*, 103601. https://doi.org/10.1016/j.jsames.2021.103601 (10%)
3. Gilmore, T., Cherry, M., Gastmans, D., Humphrey, E., & Solomon, D. K. (2021). The $^{3}H/^{3}He$ Groundwater Age-Dating Method And Applications. *Derbyana*, *42*. Retrieved from https://revistaig.emnuvens.com.br/derbyana/article/view/740 (75%)
4. Pétré, M.-A., Genereux, D. P., Koropeckyj-Cox, L., Knappe, D. R. U., Duboscq, S., Gilmore, T. E., & Hopkins, Z. R. (2021). Per- and Polyfluoroalkyl Substance (PFAS) Transport from Groundwater to Streams near a PFAS Manufacturing Facility in North Carolina, USA. *Environmental Science & Technology*, *55*(9), 5848–5856. https://doi.org/10.1021/acs.est.0c07978 (15%)
5. Shrestha, N., Mittelstet, A. R., Gilmore, T. E., Zlotnik, V., & Neale, C. M. (2021). Effects of drought on groundwater-fed lake areas in the Nebraska Sand Hills. *Journal of Hydrology: Regional Studies*, *36*, 100877. https://doi.org/10.1016/j.ejrh.2021.100877 (15%)
6. Shrestha, N., Mittelstet, A. R., Young, A. R., Gilmore, T. E., Gosselin, D. C., Qi, Y., & Zeyrek, C. (2021). Groundwater level assessment and prediction in the Nebraska Sand Hills using LIDAR-derived lake water level. *Journal of Hydrology*, *600*, 126582. https://doi.org/10.1016/j.jhydrol.2021.126582 (15%)
7. Wells, M.J.$_{2}$, **Gilmore, T.E.**, Nelson, N., Mittelstet, A., & Böhlke, J. K. (2021). Determination of vadose zone and saturated zone nitrate lag times using long-term groundwater monitoring data and statistical machine learning. *Hydrology and Earth System Sciences*, *25*(2), 811–829. https://doi.org/10.5194/hess-25-811-2021 (60%)
8. Kambhu A., Li, Y, **Gilmore, T.E.**, Comfort, S. (2021) Modeling the release and spreading of permanganate from aerated oxidant candles in a laboratory flow tank. *Journal of Hazardous Materials*, https://doi.org/10.1016/j.jhazmat.2020.123719 (5%)
9. Richards, G.$_{2}$, **Gilmore, T. E.**, Mittelstet, A. R., Messer, T. L., & Snow, D. D.

(2021). Baseflow nitrate dynamics within nested watersheds of an agricultural stream in Nebraska, USA. *Agriculture, Ecosystems & Environment*, *308*, 107223. https://doi.org/10.1016/j.agee.2020.107223 (40%)

10. Abimbola, O.P., A.R. Mittelstet and **T.E. Gilmore**. (2020) Geostatistical features of streambed vertical hydraulic conductivities in Frenchman Creek Watershed. *Hydrological Processes*, https://doi.org/10.1002/hyp.13823 (20%)
11. Korus, J., Fraundorfer, W., **Gilmore, T.E.**, Karnik, K. (2020) Transient streambed hydraulic conductivity in channel and bar environments, Loup River, Nebraska. *Hydrological Processes*, https://doi.org/10.1002/hyp.13777 (20%)
12. Solomon, D.K., Humphrey, E., **Gilmore, T.E.**, Genereux, D.P., Zlotnik, V. (2020) An Automated seepage meter for soft-bottom streams and lakes. *Water Resources Research: Technical Reports*, https://doi.org/10.1029/2019WR026983 (25%)
13. Abimbola, O. P., Mittelstet, A. R., **Gilmore, T. E.**, & Korus, J. T. (2020). Influence of watershed characteristics on streambed hydraulic conductivity across multiple stream orders. *Scientific Reports*, 10(1), 1–10. https://doi.org/10.1038/s41598-020-60658-3 (20%)
14. Cherry, M.3, **Gilmore, T.**, Mittelstet, A., Gastmans, D., Santos, V., & Gates, J. B. (2020). Recharge seasonality based on stable isotopes: Nongrowing season bias altered by irrigation in Nebraska. *Hydrological Processes*, 34(7), 1575–1586. https://doi.org/10.1002/hyp.13683 (60%)
15. **Gilmore, T. E.**, Zlotnik, V., & Johnson, M.2 (2019). Recognition of Regional Water Table Patterns for Estimating Recharge Rates in Shallow Aquifers. *Groundwater*, 57(3), 443–454. https://doi.org/10.1111/gwat.12808 (70%)
16. **Gilmore, T. E.**, Johnson, M.2, Korus, J., Mittelstet, A., Briggs, M. A., Zlotnik, V., & Corcoran, S.1 (2019). Streambed Flux Measurement Informed by Distributed Temperature Sensing Leads to a Significantly Different Characterization of Groundwater Discharge. *Water*, 11(11), 2312. https://doi.org/10.3390/w11112312 (70%)
17. Kirchheim, R. E., Gastmans, D., Chang, H. K., & **Gilmore, T. E.** (2019). The use of isotopes in evolving groundwater circulation models of regional continental aquifers: The case of the Guarani Aquifer System. *Hydrological Processes*, 33(17), 2266–2278. https://doi.org/10.1002/hyp.13476 (10%)
18. Mittelstet, A. R., **Gilmore, T. E.**, Messer, T., Rudnick, D. R., & Heatherly, T. (2019). Evaluation of selected watershed characteristics to identify best management practices to reduce Nebraskan nitrate loads from Nebraska to the Mississippi/Atchafalaya River basin. *Agriculture, Ecosystems & Environment*, 277, 1–10. https://doi.org/10.1016/j.agee.2019.02.018 (25%)
19. Wells, M.J.2, **Gilmore, T.**, Mittelstet, A., Snow, D., Sibray, S., (2018). Assessing Decadal Trends of a Nitrate-Contaminated Shallow Aquifer in Western Nebraska Using Groundwater Isotopes, Age-Dating, and Monitoring. *Water*, 10(8), 1047. https://doi.org/10.3390/w10081047 (70%)
20. Korus, J. T., **Gilmore, T. E.**, Waszgis, M. M., & Mittelstet, A. R. (2018). Unit-bar migration and bar-trough deposition: impacts on hydraulic conductivity and grain size heterogeneity in a sandy streambed. *Hydrogeology Journal*, 1–12. https://doi.org/10.1007/s10040-017-1661-6 (15%)
21. **Gilmore, T. E.**, Genereux, D. P., Solomon, D. K., Farrell, K. M., & Mitasova,

H. (2016). Quantifying an aquifer nitrate budget and future nitrate discharge using field data from streambeds and well nests. *Water Resources Research*, 52(11), 9046–9065. https://doi.org/10.1002/2016WR018976 (85%).

22. **Gilmore, T. E.**, D. P. Genereux, D. K. Solomon, and J. E. Solder (2016), Groundwater transit time distribution and mean from streambed sampling in an agricultural coastal plain watershed, North Carolina, USA, *Water Resour. Res.*, *52*(3), 2025–2044, doi:10.1002/2015WR017600. (80%)
23. **Gilmore, T. E.**, D. P. Genereux, D. K. Solomon, J. E. Solder, B. A. Kimball, H. Mitasova, and F. Birgand (2016), Quantifying the fate of agricultural nitrogen in an unconfined aquifer: Stream-based observations at three measurement scales, *Water Resour. Res.*, *52*(3), 1961–1983, doi:10.1002/2015WR017599. (80%)
24. Heilweil, V. M., D. K. Solomon, T. H. Darrah, **T. E. Gilmore**, and D. P. Genereux (2016), Gas-Tracer Experiment for Evaluating the Fate of Methane in a Coastal Plain Stream: Degassing versus in-Stream Oxidation, *Environ. Sci. Technol.*, *50*(19), 10504–10511, doi:10.1021/acs.est.6b02224. (10%)
25. Solomon, D. K., **Gilmore, T.E.**, Solder, J. E., Kimball, B., Genereux, D. P. (2015). Evaluating an unconfined aquifer by analysis of age-dating tracers in stream water. *Water Resources Research*, 8883–8899. doi:10.1002/2015WR017602 (15%)
26. Solder, J. E., **Gilmore, T.E.**, Genereux, D. P., Solomon, D. K. (2015). A Tube Seepage Meter for In Situ Measurement of Seepage Rate and Groundwater Sampling. *Groundwater*, 588-595. doi: 10.1111/gwat.12388 (30%)
27. **Gilmore, T.E.**, F. Birgand and K. Chapman. (2013). Source and magnitude of error in an inexpensive image-based water level measurement system. *Journal of Hydrology* 496: 178–186. doi:10.1016/j.jhydrol.2013.05.011 (80%)

Section 2.1.2 Numbered list (in reverse chronological order) of Peer Reviewed Journal Publications accepted for publication with or without revision. Note that papers with "re-review required" or equivalent should not appear in this category. The citation should include complete bibliographic citation including author names in order they appear on paper, full journal name, date of submittal, date of acceptance, and % of your contribution. An acceptance letter written on official letterhead of the journal or of the appropriate journal letter must be included in Appendix A.

1. Jensen, C.R., Genereux, D.P., Gilmore, T.E., Solomon, D.K., Mittelstet, A.R., Humphrey, E.C., MacNamara, M.R., Zeyrek, C., Zlotnik, V.A. (2022) Estimating Groundwater Mean Transit Time from $SF_6$ in Stream Water: Field Example and Planning Metrics for a Reach Mass-Balance Approach. *Hydrogeology Journal* [submitted 3/26/2021; accepted 10/23/2021; https://doi.org/10.1007/s10040-021-02435-8] (15%)

Section 2.1.3 Numbered list (in reverse chronological order) of Peer Reviewed Journal Publications submitted for review but not yet accepted or accepted with "re-review required" or equivalent. Include the name of journal, author list, date submitted and % of your contribution.

1. Chapman, K., Gilmore, T.E., Chapman, C., Birgand, F., Mittelstet, A.R., Harner, M., Mehrubeoglu, M., Stranzl, J. (2022) Technical Note: Open-source software for water-level measurement in images with a calibration target. *Water Resources Research* [submitted 12/6/2021; in review] (33%)
2. Humphrey, E.C., Solomon, D.K., Genereux, D.P., Gilmore, T.E., Mittelstet, A.R., Zlotnik, V., Zeyrek, C., Jensen, C., MacNamara, M.R. (2022) Spatial variability and estimation of groundwater flux from local discharge measurements. *Water Resources Research* [submitted 6/29/2021; in revision] (20%)
3. Chapman, K., Gilmore, T., Chapman C., Mehrubeoglu, M., Mittelstet, A. (2021 preprint). Camera-based water stage and discharge prediction with machine learning. *Hydrology and Earth Systems Science* [preprint] (70%) withdrawn from HESS, in revision for resubmission to different journal

Section 2.1.4 Numbered List (in reverse chronological order) of Books and Book Chapters, author list, publisher, year, and % of your contribution.

*Not Applicable*

Section 2.1.5 Numbered list (in reverse chronological order) of Conference Proceedings: Peer reviewed extended abstract or peer reviewed paper. Include full conference title, author names in order they appear on paper, dates of conference, location of conference, and page numbers (or number of pages).

*Not Applicable*

Section 2.1.6 Numbered list (in reverse chronological order) of Conference Proceedings: Other than peer reviewed. Include full conference title, author names in order they appear on paper, dates of conference, location of conference, and page numbers (or number of pages).

1. Mittelstet, A.R., **T.E. Gilmore** and D.R. Rudnick. July 2017. Development of multiple regression models to predict nitrate concentrations in Nebraska surface waters. ASABE Annual International Meeting, Paper No. 1700294, Spokane, WA. https://doi.org/10.13031/aim.201700294 (20%)

Section 2.1.7 Numbered list (in reverse chronological order) of Conference Presentations and/or

1. Humphrey, E.C., Solomon, D.K., Genereux, D.P., Gilmore, T.E., Mittelstet, A.R., Zlotnik, V.A., Zeyrek, C., Jensen, C.R., MacNamara, M.R. Spatial variability and estimation of groundwater flux from local discharge measurements. GSA Annual Meeting, Portland, OR. October 13, 2021. Oral Presentation. https://gsa.confex.com/gsa/2021AM/meetingapp.cgi/Paper/366988
2. Chapman, K., **T.E. Gilmore**, C.D. Chapman, M. Mehrubeoglu, and A.R. Mittelstet. Application of time-lapse imagery and machine learning to improve stream discharge monitoring. AGU Fall Meeting, Virtual. December 1-17, 2020. Poster presentation. https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/714982
3. Duboscq, S., D.P. Genereux, **T.E. Gilmore**, M.A. Pétré[1], D.K. Solomon, D. R. U. Knappe, Z.R. Hopkins and N.J. DeStefano. $^{3}H/^{3}He$ groundwater ages and discharge of PFAS from groundwater to a coastal plain stream in North Carolina. AGU Fall Meeting, Virtual. December 1-17, 2020. Oral presentation. https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/672542

4. Zeyrek, C.[3], **T.E. Gilmore**, A.R. Mittelstet, V.A. Zlotnik, D.K. Solomon, D.P. Genereux, E. Humphrey, M.R. MacNamara, and C.R. Jensen. A model-based study of the effects of spatial recharge patterns on groundwater transit time distributions in the Nebraska Sandhills. AGU Fall Meeting, Virtual. December 1-17, 2020. Oral presentation. https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/682502
5. Jensen, C.R., D.P. Genereux, **T.E. Gilmore**, D.K. Solomon, A.R. Mittelstet, E. Humphrey, M.R. MacNamara, C. Zeyrek[3], and V.A. Zlotnik. Estimating groundwater age in the Nebraska Sand Hills from $SF_6$ in stream water: An application of the reach mass-balance approach to groundwater mean transit time. AGU Fall Meeting, Virtual. December 1-17, 2020. Poster presentation. https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/674734
6. MacNamara, M., D.P. Genereux, **T.E. Gilmore**, D.K. Solomon, A.R. Mittelstet, E. Humphrey, C.R. Jensen, C. Zeyrek[3], and V.A. Zlotnik. Groundwater $^{14}C$ Age at the point of discharge in a groundwater dominated stream: Sampling below the streambed in nested watershed sin the Nebraska Sand Hills (USA). AGU Fall Meeting, Virtual. December 1-17, 2020. Poster presentation. https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/675554
7. Humphrey, E., D.K. Solomon, **T.E. Gilmore**, A.R. Mittelstet, V.A. Zlotnik, D.P. Genereux, C. Zeyrek[3], M.R. MacNamara, and C.R. Jensen. Using empirical transit time distributions to forecast stream water tracer concentrations. AGU Fall Meeting, Virtual. December 1-17, 2020. Poster presentation. https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/666576
8. Zlotnik, V. A., Solomon, D. K., **Gilmore, T. E.**, Genereux, D. P., and Humphrey, C. E.: 2020. Dynamic Seepage Meter: Theory with Application Examples, EGU General Assembly 2020, Online, 4–8 May 2020, https://doi.org/10.5194/egusphere-egu2020-3718
9. Cherry, M.3, **T.E. Gilmore**, A.R. Mittelstet, D. Gastmans, J.B. Gates and V. Santos. 2019. Recharge seasonality based on stable isotopes: Nongrowing season bias altered by irrigation in Nebraska. AGU Fall Meeting. San Francisco, CA. December 9-13. Poster presentation.
10. Shrestha, N., A.R. Mittelstet, O. Abimbola, V.A. Zlotnik, C. Neale and **T.E. Gilmore**. 2019. Exploring the correlation between drought and lake area of groundwater-fed lakes in the western Sandhills. AGU Fall Meeting. San Francisco, CA. December 9-13. Poster presentation.
11. Brennwald, M.S., A. Lighfoot, W. Mace, D. Genereux, **T.E. Gilmore**, A. Mittelstet, R. Kipfer and D.K. Solomon. 2019. Continuous analysis of dissolved noble gas concentrations to estimate air/water gas exchange rates in streams and other surface waters. Developments in Noble Gas Understanding and Expertise. Zurich, Switzerland. August 15-17, 2019. Oral presentation.
12. **Gilmore, T.E.**, Cherry, M.3, Mittelstet, R., Gastmans, D., Gates, J. 2019. Recharge Seasonality Based on Stable Isotopes. ASABE Annual International Meeting, Boston, MA. July 7-10, 2019.
13. Cherry, M.3, **T.E. Gilmore**, A. Mittelstet, D. Gastmans, J. Gates, 2019. Isotopic Composition of groundwater and precipitation in Nebraska, USA, Water For Food Global Institute Global Conference, Lincoln, NE, April 2019
14. Cherry, M.[3]**, Gilmore, T.E.**, Mittelstet, A.R., Gastmans, D., and J. Gates. 2018**.** Isotopic composition of groundwater and precipitation in Nebraska, USA, XX Congresso Brasileiro de Águas Subterraneas, Campinas, SP, Brazil.

November 7, 2018.

15. Cherry, M.$_3$, **Gilmore, T.E.**, Mittelstet, A.R., Gastmans, D., and J. Gates. 2018. Isotopic composition of groundwater and precipitation in Nebraska, USA, 2018 NIWR Regional Symposium, Lincoln, NE. Oct 24-26, 2018.
16. Richards, G.I.$_2$, **Gilmore, T.E**., and A.R. Mittelstet. 2018. Survey of groundwater transit times and nitrate delivery to Bazile Creek, 2018 NIWR Regional Symposium, Lincoln, NE. Oct 24-26, 2018.
17. Abimbola, O., A.R. Mittelstet, **T.E. Gilmore** and J. Korus. 2018. Spatial variability of streambed hydraulic conductivity across multiple stream orders. ASABE Annual International Meeting, Detroit, MI. July 29-August 1, 2018.
18. Abimbola, O., A.R. Mittelstet, **T.E. Gilmore** and J. Korus. 2018. Geostatistical features of streambed vertical hydraulic conductivity in the Frenchman Creek watershed in Western Nebraska. ASABE Annual International Meeting, Detroit, MI. July 29-August 1, 2018.
19. Wells, M.$_2$, **T.E. Gilmore**, N. Nelson, A.R. Mittelstet, D. Snow and S. Sibray. 2018. Utilizing $^3H/^3He$ age-dating tracers to model and evaluate influence of water resources management on groundwater quality, Dutch Flats, NE. ASABE Annual International Meeting. Detroit, MI, July 29-August 1, 2018.
12. **Gilmore, T.E.,** L. Pennisi, D. Martin, J. Korus, E. Ingram. 2018. Watershed Science Training: Perspectives and needs of locally-elected water resources managers. University Council on Water Resources Annual Water Resources Conference, Pittsburgh, PA. June 26, 2018.
13. **Gilmore, T.E.**, Zlotnik, V., Johnson, M. 2017. Increasing the utility of regional water table maps: a new method for estimating groundwater recharge. Poster presented at the American Geophysical Union Fall Meeting, New Orlean, LA, December 15, 2017.
14. A.R. Mittelstet, **T.E. Gilmore**. 2017. IANR-UNESP-Brazil Collaboration, Department of Biological Systems Engineering Colloquium Series, Lincoln, NE. November 15, 2017.
15. Wells, M.J.$_2$, **T.E. Gilmore**, S.S. Sibray, D.D. Snow, N.G. Nelson. 2017. Evaluating influence of water resources management and environmental factors on groundwater quantity and quality, Dutch Flats, NE. Poster presentation Nebraska Water Center Symposium, Lincoln, NE. October 26-27, 2017.
16. Johnson, M.J.$_2$, **T.E. Gilmore**, M. Briggs, and S. Corcoran$_1$. 2017. Comparison of informed and uninformed sampling using heat as a preliminary indicator of focused groundwater discharge. Poster presentation at Geological Society of America Annual Meeting, Seattle, WA. October 22-25, 2017.
17. Wells, M.J.$_2$, **T.E. Gilmore,** S.S. Sibray, D.D. Snow. 2017. Examining spatial and temporal patterns in groundwater as water resources management evolves: North Platte Natural Resources District, Nebraska. Oral presentation at American Society of Agricultural and Biological Engineers Annual International Meeting, Spokane, WA. July 16-19, 2017.
18. **Gilmore, T.E.,** J. Korus, L. Pennisi, D. Martin**.** 2017. Needs Assessment: Delivery of watershed science to locally-elected water resources managers. University Council on Water Resources Annual Water Resources Conference, Fort Collins, CO. June 14, 2017.
19. Wells, M.J.$_2$, **T.E. Gilmore,** S.S. Sibray, D.D. Snow. 2017. Examining spatial and temporal patterns of nitrate in groundwater as irrigation practice evolves.

Poster presentation at Water for Food Global Conference, Lincoln, NE. April 10-12, 2017.

20. Rhoades, MG, Howard, LM, Steele, CE, Shea, PJ, Beseler, CL, Raikes, HH, Wallman, JJ, Eskridge, KM, Mez,a JL, New-Aaron, MO, VanWormer, E, Barnes-Josiah, D**, Gilmore, T.E.,** Rosenquist, TH, Spalding, RF. 2017. Risk of Adverse Birth Outcomes associated with wells testing positive for nitrate and nitrosatable agrichemical compounds in Nebraska: An ecological study. Poster presentation at the National Council for Science and the Environment 17th National Conference and Global Forum on Science, Policy and the Environment. Arlington, VA. January 24-26, 2017.
21. Johnson, J.$_1$, **T.E. Gilmore**. 2016. Mapping groundwater surface water interactions, Poster presentation at Nebraska Summer Research Symposium, Lincoln, NE. August 10, 2016.
22. **Gilmore, T.E.**, C. Hobza, D. Hallum, J. Johnson$_1$. 2016. Going Live: web-based mapping of groundwater-surface water interactions in an irrigated landscape. Poster presentation at American Society of Biological and Agricultural Engineers Annual International Meeting, Orlando, FL. July 17-20, 2016.
23. **Gilmore, T.E.**, Hobza, C., Hallum, D. 2016. Groundwater-surface water connectivity: real-time monitoring for a dynamic system. Water for Food Institute Global Conference, Lincoln, NE. April 24-26, 2016.
24. **Gilmore, T.E.**, D.P. Genereux, D.K. Solomon, H. Mitasova, M. Burnette. 2016. Sampling wells versus sampling in streambeds: Observing and Predicting the Effects of a Groundwater Nitrate Legacy. Poster presented at the Nebraska Association of Natural Resources Districts Annual Legislative Conference, Lincoln, NE. January 25-27, 2016.

Section 2.1.8 Numbered list (in reverse chronological order) of Invited talks or Keynote Speeches. Indicate title of presentation, location, sponsor, and date.

1. **Gilmore, T. E.**, Johnson, M.$_2$, Korus, J., Mittelstet, A., Briggs, M. A., Zlotnik, V., & Corcoran, S.$_1$ Comparison of groundwater discharge estimates with and without guidance from FO-DTS. AGU Fall Meeting – FO-DTS Workshop, Virtual. December 11, 2021. Oral (virtual) presentation.
2. **Gilmore, T.E.**, Chapman, K., Stranzl, J., and Harner, M. Discussions on camera-based monitoring applications and data processing. United States Geological Survey Next Generation Water Observation System Sub-Program Managers and Scientists, December 7, 2021 (virtual).
3. **Gilmore, T.E.**, Harner, M., Stranzl, J., and Chapman, K. Advancing interdisciplinary watershed research with ground-based cameras and dedicated software. National Ecological Observatory Network Science Seminars, November 9, 2021 (virtual).
4. **Gilmore, T. E.**, Johnson, M.$_2$, Korus, J., Mittelstet, A., Briggs, M. A., Zlotnik, V., & Corcoran, S.$_1$ Comparison of groundwater discharge estimates with and without guidance from FO-DTS. AGU Fall Meeting – FO-DTS Workshop, Virtual. December 2, 2020. Oral presentation. https://agu.confex.com/agu/fm20/meetingapp.cgi/Session/101675
5. **Gilmore, T.E.**, M. J. Wells$_2$, N. Nelson, A.R. Mittelstet, J.K. Bohlke and D.D. Snow, 2018. Decadal changes in groundwater recharge and nitrate concentrations in a shallow aquifer under changing agricultural practices:

application of repeat sampling and machine learning approaches. Invited presentation at the American Geophysical Union Fall Meeting, Washington, D.C., December 13, 2018.

6. **Gilmore, T.E.** 2018**.** Age-dating young groundwater (presentation and panel discussion), XX Congresso Brasileiro de Águas Subterraneas, Campinas, SP, Brazil. November 7, 2018.
7. **Gilmore, T.E.** 2017. Groundwater: Age and Nitrate Sources. Nebraska Water Center Symposium, Lincoln, NE. October 26-27, 2017.
8. **Gilmore, T.E.** and A.R. Mittelstet. 2017. Groundwater in Nebraska, Presentation to Geological Survey of Brazil (CPRM) Novo Horizonte, SP, Brazil. October 2, 2017.
9. **Gilmore, T.E.** 2017**.** Groundwater-Surface Water Interaction in Agricultural Landscapes, Universidade Estadual Paulista de Rio Claro, Brazil. September 29, 2017.
10. **Gilmore, T.E.**, Wells, M.$_2$, Snow D., Sibray, S. 2017. Groundwater system response to water resources management in North Platte NRD. Nebraska Water Center Faculty Retreat and Daugherty Water for Food Global Institute Faculty Dialogue. Lincoln, NE. September 19, 2017.
11. **Gilmore, T.E.** 2017. Water Resources Management in Nebraska, Presentation to Chinese Delegation from USDA Foreign Agricultural Service 2017 U.S. - China Scientific Cooperation Exchange Program (SCEP). Lincoln, NE. August 7, 2017.
12. **Gilmore, T.E.** 2017. Groundwater Hydrology. Daugherty Water for Food Global Institute's Visiting Delegation from Bahia, Brazil, Lincoln, NE. April 6, 2017.
13. **Gilmore, T.E.** 2017. Assessment of aquifer nitrate from sampling in streambeds, Nebraska Department of Environmental Quality, Lincoln, NE. March 7, 2017.
14. **Gilmore, T.E.** 2016. Aquifer Nitrate: perspectives from streambed sampling. Nebraska Groundwater Monitoring Advisory Council and Nebraska Surface Water Monitoring Advisory Council Joint Meeting, Lincoln, NE. October 27, 2016.
15. **Gilmore, T.E.**, 2016. Environmental tracers in groundwater: applications for Nebraska, Invited oral presentation at the Nebraska Association of Resource Districts Annual Conference, Kearney, NE. September 26-27, 2016.
16. Solomon, D.K., **T.E. Gilmore**, D.P. Genereux, J. Georgek, V.M. Heilweil, J.E. Solder. 2016. Characterizing unconfined aquifers using seep- and stream-based measurements of groundwater age. Invited oral presentation at Geological Society of American Annual Conference, Denver, CO. September 25-28, 2016.

Section 2.1.9 Numbered list (in reverse chronological order) of Other Publications

- **Section 2.2 Research Funding Record**

  *In Appendix B, a copy of the project summary page from NUGrant and a copy of the award notification with SAP WBS Account Number are included for funded*

*grants. Documentation is provided in the same order as listed in Sections 2.2.1, 2.2.2 and 2.2.3.*

Section 2.2.1 Numbered list (in reverse chronological order) of Internally Funded Research Grants. Include the title of the project, funding agency, dates of project, PI and Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to you (as listed in NUGrant), SAP WBS Account Number.

| *Project Title* | *Sponsor* | *Role (PI or Co-PI)* | *Dates* | *Total Amount* *(no UNL cost share)* | *% Attributed to Candidate* *(no UNL cost share)* |
|---|---|---|---|---|---|
| Increasing the applicability of image-based water level measurement techniques | Research Council Grants-in-Aid (John C. and Nettie V. David Memorial Trust Fund) | PI | Jan 2022 – Dec 2022 | $10,000 | 80 |
| LTAR Research: Testing a Novel Groundwater Age-dating Technique in the Bazile Creek watershed | ARD | Co-PI | November 2019 – October 2020 (extended to 2021 due to COVID) | $33,648 | 30 |
| Influence of recharge patterns on the sustenance of groundwater-fed streams Year 1 and Year 2 | Daugherty Water for Food Global Institute | PI | July 1, 2019 – June 30, 2021 | $35,000 (2 years at $17,500/year) | 100 |
| Managing Water Resources at the U.S. Meat Animal Research Center | ARD & US MARC Research Collaborations | Co-PI | July 2017 – December 2019 | $83,612 | 20 |
| Streambed water flux dynamics at coupled groundwater-surface water monitoring stations Year 2 | Daugherty Water for Food Global Institute | PI | July 1, 2017 – June 30, 2018 | $16,000 | 100 |

| | | | | | |
|---|---|---|---|---|---|
| Risk of Adverse Birth Outcomes Associated with Maternal Exposure to Nitrate and Nitrosatable Compounds in Drinking Water | Food For Health Initiative | Co-PI | July 2017 – June 2019 | $149,964 | 15 |
| Application of isotopic tracers to determine water residence times in multi-scale water management | IANR-FAPESP-SPRINT | PI | April 2017 – March 2019 | $19,983 | 50 |
| Assessing the long-term water savings of reduced irrigation pumping in western Nebraska | Research Council Grants-In-Aid | Co-PI | (January 2017 – December 2017) | $10,000 | 30 |
| Streambed water flux dynamics at coupled groundwater-surface water monitoring stations Year 1 | Daugherty Water for Food Global Institute | PI | July 1, 2016 – June 30, 2017 | $16,000 | 100 |

1. Increasing the applicability of image-based water level measurement techniques (January 2022 – December 2022)
   *Sponsor*: Research Council Grants-in-Aid (John C. and Nettie V. David Memorial Trust Fund)
   *PI*: T.E. Gilmore (80%)
   *Co-I*: A. Mittelstet (20%)
   *Total Amount*: $10,000
   *SAP WBS Account Number*: 26-6238-9001-019
   Imagery of watershed scenes provides intuitive information about environmental change and human interaction with water resources. This type of information is crucial for understanding the resilience of human-impacted ecosystems and for water and food security. The visual nature of ground-based imagery makes it useful for science communication and education that supports greater science literacy around ecosystems and watersheds. Ground-based time-lapse imagery offers a more intimate view than aerial or satellite imagery that is routinely used to observe and quantify environmental change (i.e., remote sensing). The frequency and intimacy of ground-based imagery also allows observation of ephemeral environmental processes (e.g., intermittent streams) at spatial and temporal scales not easily observed by remote sensing. However, there is no robust cyberinfrastructure for routine extraction of environmental or hydrological information from land-based time-lapse imagery. This project expands on the capabilities of existing open-source software to allow routine extraction of hydrological data from imagery, including images available from the

National Ecological Observatory Network (NEON) and camera-equipped United States Geological Survey (USGS) stream gauges. We will build on prior open-source image-based water level measurement software (see https://gaugecam.org) now being used in industry (Idaho Power) and academia (e.g., University of Kansas). The new capabilities will accommodate the use of a wider range of image scenes for water-level measurement and provide guidance for future camera installation for hydrologic studies. The requested funding will support the PhD student developing the new software features as we continue submitting proposals to the National Science Foundation (NSF).

2. LTAR Research: Testing a Novel Groundwater Age-dating Technique in the Bazile Creek watershed (November 2019 – October 2020)
   *Sponsor:* ARD
   *PI:* T. Messer (50%)
   *Co-PI:* T.E. Gilmore (30%), A. Mittelstet (20%)
   *Total Amount:* $33,648
   *SAP WBS Account Number:* 25-6238-0915-002
   This study is a collaboration with USDA to test a new groundwater/surface water sampling technique for age dating. The new technique is based on pesticide degradates with limited years of manufacture, which allows for assessment of the approximate era that groundwater was recharged. The new method will be compared to established groundwater age-dating techniques.

3. Influence of recharge patterns on the sustenance of groundwater-fed streams
   Year 1 (July 1, 2019 – June 30, 2021)
   *Sponsor*: Daugherty Water for Food Global Institute
   *PI*: T.E. Gilmore (100%)
   *Total Amount*: $35,000 (2 years at $17,500/year)
   *SAP WBS Account Number:* 26-6811-0001-173
   Sandhills streams are critical for agriculture in Nebraska, starting in the headwaters where drainages flow from sub-irrigated hay meadows and meander through rangeland, to larger river channels that are diverted for irrigation before flowing to and sustaining the Platte River during drought years. Thus, the project is focused on a key source of water for the ecosystem, row-crop agriculture and for drinking water for downstream users such as Lincoln and Omaha. Furthermore, this research addresses fundamental questions regarding how to improve groundwater modeling to better predict the timescales over which groundwater contaminants will be flushed from aquifers to streams. These results will be directly applicable to many other areas in Nebraska where groundwater is contaminated by nitrate and pesticides, and stream water quality and ecosystems are threatened by the long-term discharge of legacy nutrients. Improved understanding of system lag times is critical for communicating with regulators and agricultural producers regarding (1) how long it may take for current actions, such as the implementation of best management practices, to improve water quality, and (2) the importance of patience and persistence in improving current management practices to avoid long-term storage of excess N in the subsurface.

4. Managing Water Resources at the U.S. Meat Animal Research Center (July 2017 – December 2019)
   *Sponsor*: ARD & US MARC Research Collaborations
   *PI*: A. Mittelstet (50%)
   *Co-PI*: T. Messer (30%), T.E. Gilmore (20%)
   *Total Amount*: $83,612
   *SAP WBS Account Number:* 25-6211-0020-010
   The U.S. Meat Animal Research Center removes water from May to October to irrigate 15 pivots from the Big Sandy Creek tributary at the discharge point (where treated groundwater is discharged into the channel) and reservoir (Figure 1). Six of ten dams along the channel have the capability to control the discharge by adding or removing stoplogs. Often, by October, there is not enough water to irrigate the crops. To better manage the water resources, a water balance of the tributary, Big Sandy Creek and reservoir is needed. The overall goal of this project is to identify water inputs and outputs, both temporally and spatially, to aid researchers at the Animal Research Center.

5. Streambed water flux dynamics at coupled groundwater-surface water monitoring stations (Year 2 renewal: July 1, 2017 – June 30, 2018)
   *Sponsor*: Daugherty Water for Food Global Institute
   *PI*: T.E. Gilmore (100%)
   *Total Amount*: $16,000
   *SAP WBS Account Number:* 26-6811-0001-143
   Direct observation of groundwater-surface water interaction is critical for evaluating the effectiveness of conjunctive management of water resources in Nebraska, but the task is difficult due to spatial and temporal limitations of current measurement tools. Current in-stream measurement tools such as reach mass-balance, seepage meter measurements, Darcian flux measurements, and temperature sensing, are limited spatially, temporally, or both. Continuous monitoring of surface water and near-stream groundwater elevation (i.e., coupled monitoring stations) is a more feasible long-term monitoring approach compared to in-stream measurements. However, the approach does not provide a direct estimate of water fluxes, or the spatial distribution of those fluxes, through the streambed. The goal of the proposed research is to evaluate relationships between groundwater-surface water signals from a monitoring station and actual streambed water fluxes measured near the station.

6. Risk of Adverse Birth Outcomes Associated with Maternal Exposure to Nitrate and Nitrosatable Compounds in Drinking Water (July 2017 – June 2019)
   *Sponsor*: Food For Health Initiative
   *PI*: P. Shea (25%)
   *Co-PI*: K. Eskridge (15%), J. Meza (15%), T.E. Gilmore (15%), H. Raikes (15%), D. Barnes-Josiah (15%)
   *Total Amount*: $149,964
   *SAP WBS Account Number:* 21-3218-0022
   Our proposed Food for Health Initiative Formed/Forming Team Seed Grant project focuses on exposure to chemical mixtures in water and food, and

pathways leading to adverse health outcomes, including developmental abnormalities and cancers. Water is the most important link between food and health. Nitrate and atrazine are widely-used agrichemicals found in U.S. drinking water. A more toxic compound, *N*-nitrosoatrazine (NNAT), can form *in vivo* after ingesting nitrate and atrazine. Our preliminary studies provide evidence that exposure to nitrate and nitrosatable compounds such as atrazine, and potentially other agrichemicals and pharmaceuticals, may lead to adverse health outcomes in particularly vulnerable individuals and populations, such as rural agricultural communities. Exploratory work suggests that nitrate and atrazine exposure in Nebraska drinking water is associated with increased risk of non-Hodgkin lymphoma and adverse birth outcomes. We also observed developmental abnormalities in avian embryos administered NNAT. Our research team is comprised of experts at the University of Nebraska in chemistry, toxicology, developmental biology, hydrology/hydrogeochemistry, epidemiology, geographic information systems (GIS), statistics and child development. We are further strengthening the team to include genetics, molecular biology and social science expertise. Understanding the underlying mechanism(s) and associated gene-environment interactions will provide new knowledge and help achieve the long-term goal of developing strategies that prevent or reduce adverse health outcomes from exposure to nitrate and nitrosatable compounds. The research team will design and test a case-control study to evaluate the association between maternal exposure to nitrate and nitrosatable compounds (focusing on atrazine) and risk of adverse birth outcomes. Participant perception will be studied to improve subject recruitment and retention. Research supported by the seed grant will increase our competitiveness for future federal funding, such as through the National Institute of Environmental Health Sciences, which has expressed preliminary support of the proposed project via program officer feedback.

7. Application of isotopic tracers to determine water residence times in multi-scale water management (April 2017 – March 2019)
   *Sponsor*: IANR-FAPESP-SPRINT
   *PI*: T.E. Gilmore (50%)
   *Co-PI*: A. Mittelstet (30%), J. Korus (20%)
   *Amount*: $19,983
   *UNL Cost Share*: $0
   *Total Amount*: $19,983
   *SAP WBS Account Number:* 21-6238-1055
   Sustainable use and management of aquifers and their interaction with rivers and lakes requires qualitative and quantitative assessment of aquifer hydrogeology and dynamics, and the use of conceptual and/or hydrologic models. Recently, isotope techniques such as groundwater age-dating (where age is the time between recharge and sampling), are being used to develop conceptual models of groundwater flow and provide information for model calibration. Such models are critical tools that water resources managers can use to create defensible policies for groundwater management. A wide number of isotopes can be used to estimate groundwater ages ranging from decades to thousands of years, and each tracer has advantages and disadvantages. Field sampling requirements for different tracers, as well as the

model assumptions and corrections necessary to estimate groundwater ages, are non-trivial, especially when applied in different climatic and hydrogeological settings. The goal of this project is to combine the expertise of the University of Nebraska-Lincoln Water Cluster research group (UNL-WC) in age-dating young groundwater with the expertise of scientists at Universidade Estadual Paulista (UNESP) in age-dating old groundwater to improve ongoing studies (including FAPESP-funded research).

8. Assessing the long-term water savings of reduced irrigation pumping in western Nebraska (January 2017 – December 2017)

   *Sponsor*: Research Council Grants-In-Aid
   *PI*: T. Franz (70%)
   *Co-PI*: T.E. Gilmore (30%)
   *Amount*: $10,000
   *UNL Cost Share*: $0
   *Total Amount*: $10,000
   *SAP WBS Account Number:* 26-6238-9001-016
   Global trends in consumptive water use indicate a growing yet unsustainable reliance on groundwater resources. Our long-term goal is to develop effective strategies to improve the efficiency of water use in irrigated agriculture. The goal of the proposed work is to quantify water savings from technology adoption in irrigation scheduling provided by a cost-share program. Our central hypothesis is that the water savings will only last during a finite window of time where near-surface activity impacting soil moisture will eventually propagate to the water table.

9. Streambed water flux dynamics at coupled groundwater-surface water monitoring stations (Year 1: July 1, 2016 – June 30, 2017)
   *Sponsor*: Daugherty Water for Food Global Institute
   *PI*: T.E. Gilmore (100%)
   *Total Amount*: $15,000
   *SAP WBS Account Number:* 26-6811-0001-143
   Direct observation of groundwater-surface water interaction is critical for evaluating the effectiveness of conjunctive management of water resources in Nebraska, but the task is difficult due to spatial and temporal limitations of current measurement tools. Current in-stream measurement tools such as reach mass-balance, seepage meter measurements, Darcian flux measurements, and temperature sensing, are limited spatially, temporally, or both. Continuous monitoring of surface water and near-stream groundwater elevation (i.e., coupled monitoring stations) is a more feasible long-term monitoring approach compared to in-stream measurements. However, the approach does not provide a direct estimate of water fluxes, or the spatial distribution of those fluxes, through the streambed. The goal of the proposed research is to evaluate relationships between groundwater-surface water signals from a monitoring station and actual streambed water fluxes measured near the station.

Section 2.2.2 Numbered list (in reverse chronological order) of Externally Funded Research Grants. Include the title of the project, funding agency, dates of project, PI and

Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to you, SAP WBS Account Number.

| *Project Title* | *Sponsor* | *Role (PI or Co-PI)* | *Dates* | *Total Amount* | *% Attributed to Candidate* |
|---|---|---|---|---|---|
| | | | | *(do not include UNL cost share)* | *(do not include UNL cost share)* |
| Image-Based Streamflow and Water Quality Modeling | USGS (via Nebraska Water Center) | PI | Oct 1, 2021 – Sept 30, 2022 | $20,000 | 50 |
| Planning Grant Engineering Research Center for ENgineered Solutions for rUral REsilience--ENSURE: Food, Energy, Environment, and Infrastructure | National Science Foundation | Co-PI | September 2019 – August 2020 | $99,907 (all to Kansas State Univ.) | 20 |
| Hydrological Science as a Key to Promote Effective Water Use and Conservation in Complex Productive Systems | CAPES-PRINT EDITAL 02 - NETWORK | Co-PI | September 2019 – August 2020 | $10,000 (approximate equivalent in US dollars; funds to UNESP-Rio Claro) | 20 |
| Groundwater age and PFAS concentration and PFAS Testing Network | North Carolina Policy Collaboratory – Challenge Grant | Co-PI | July 2018 – December 2020 | $31,136 | 30 |
| NASA Nebraska Space Grant Fellowship 2018-2019 Flynn | UNO-NASA Space Grant | PI | August 2018 – February 2019 | $4,000 | 100 |
| Isotopes of Nitrate in Bazile Creek Headwaters | Upper Elkhorn Natural Resources District | Co-PI | September 2018 – August 2019 | $4,162 | 50 |

| | | | | | |
|---|---|---|---|---|---|
| Collaborative Research: Groundwater transit time distributions: bridging the gap between advanced tracer techniques and numerical modeling | National Science Foundation – Hydrologic Sciences | PI | June 2018 – June 2021 | $387,030 | 45 |
| Upper Little Blue River Basin Hydrologic Monitoring | Tri-Basin NRD, sub-award from Nebraska Environmental Trust | Co-PI | July 2018 – June 2021 | $145,924 | 45 |
| Survey of Groundwater Transit Times and Nitrate Delivery to Bazile Creek | Nebraska Department of Environmental Quality | PI | June 2018 – May 2020 | $30,000 | 50 |
| Middle Republican NRD Observation Well Network | Middle Republican NRD | Co-PI | July 2017 – June 2019 | $70,500 | 33 |
| Using fiber optic distributed temperature sensing and point-scale measurements to quantify groundwater-surface water flux | Center for Transformative Environmental Monitoring Programs | PI | January 2017 - December 2017 | $1,700 | 100 |
| Spatial variability of streambed hydraulic conductivity across multiple stream orders | U.S. Geological Survey | Co-PI | March 2017 – February 2018 | $19,992 | 40 |
| Evaluation of changing irrigation management on ground water recharge and quality | U.S. Geological Survey | PI | March 2016 – February 2017 | $15,000 | 50 |

Section 2.2.3 Numbered list (in reverse chronological order) of External Research Grants that have been submitted through the University of Nebraska-Lincoln Office of Sponsored Programs. Include the title of the project, funding agency, dates of project, PI and Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to you, and date of submission.

1. CATALYTIC: Cyberinfrastructure to leverage ground-based image

libraries for ecohydrological studies ()
*Submitted:* August 16, 2021
*Sponsor:* National Science Foundation
*PI:* T.E. Gilmore
*Co-PIs*: Mary Harner (UNK), Andrew Harms, Ruby Mehrubeoglu (TAMU-CC), Aaron Mittelstet
*UNL Amount*: $692,615 (including sub-awards to UNK and TAMU-CC)
The functions of watersheds and aquatic ecosystems are fundamental to all life. Imagery of watershed features intuitively and powerfully communicates the dynamics, interconnectivity, beauty, and importance of water. Robust scientific communities and cyberinfrastructure (CI) have developed around remote sensing using satellite or airborne imagery, where imagery of major environmental change provides a common focal point for interdisciplinary researchers. Ground-based time-lapse imagery offers a more intimate view of watershed features at higher temporal frequency than other remote sensing imagery, thus capturing co-occurring, subtle, and fleeting (ephemeral) environmental phenomena. Ground-based imagery also can capture information across $10^{-3}$ to $10^{3}$ meter spatial scales for integration in multi-modal monitoring that overcomes weaknesses of traditional point-scale sensors. Because of these tantalizing features of ground-based imagery, large image archives exist, but these investments are severely under-utilized in quantitative ecohydrological studies. Under-utilization is largely due to the wide range of image types and the deep interdisciplinary expertise, including image analysis and programming skills, required to unlock scientific information in a timely and reproducible manner. The proposed CI will enable scientific discovery across many future image-based studies including single sites and scaling to watershed camera networks. Using the CI, we will improve image-based water level measurement techniques, use imagery to fill data gaps in National Ecological Observational Network (NEON) monitoring data, and make image-based measurements of ephemeral environmental phenomena that are relevant to water management for migratory species. Based on these example applications across large camera networks, we will identify critical image features that may improve ecohydrological studies. Our team, including industry CI development experts and a diverse stakeholder advisory board, will develop, test, and release open-source CI that seamlessly integrates data acquisition, image diagnostics, image feature calculation, data fusion, and machine learning. Training on the CI and applications, which leverage existing workflows and open-source libraries, will be delivered to the ecohydrological scientific community via webinars and workshops.

2. Image-Based Streamflow and Water Quality Modeling (October 1, 2021 – September 30, 2022)
*Submitted:* October 28, 2020
*Sponsor*: Ne Water Center-USGS
*PI*: T.E. Gilmore (50%)
*Co-PIs:*
Mary Harner (UNK), Andrew Harms, Michael Forsberg

*UNL Amount*: $20,000
*UNL Cost Share*: $43,617
*Total Amount*: $63,617
*SAP WBS Account Number:* TBD
Ground-based imagery of small streams contains large amounts of information about watershed function and streamflow conditions. This qualitative and quantitative information from images is a powerful complement to traditional environmental sensors. However, there are significant barriers to extracting information from imagery and incorporating that information in quantitative watershed studies. In this project, we are focused on the specific question of filling gaps in time series data from traditional sensors. We will use features calculated from daytime imagery captured by a watershed documentary project (www.plattebasintimelapse.com) and then combine those image features with in-stream sensor data to build and test machine learning models of stream discharge and stream water quality. The machine learning models will be used to fill simulated data gaps in sensor data from a small stream in the Nebraska Sand Hills region. Simulated data gaps in time series will range in length from days to months for stream stage and discharge, and hours to days for water quality (specific conductance, nitrate, and dissolved organic carbon). The developed workflows will be documented and streamlined for training graduate and undergraduate students in data management and analysis.

3. Groundwater age and PFAS concentration and PFAS Testing Network (July 2018 – December 2020)
   *Submitted:* March 22, 2019
   *Sponsor*: North Carolina Policy Collaboratory – Challenge Grant
   *PI*: T.E. Gilmore (30%)
   *UNL Amount*: $14,371
   *UNL Cost Share*: $0
   *Total Amount*: $14,371
   *SAP WBS Account Number:* 26-6238-0888-001

   **note*: funds for this project and the PFAS Testing Network were entered as the same contract in NUgrant
   In this project, funds are requested from the North Carolina Policy Collaboratory at UNC-CH (https://collaboratory.unc.edu/) to pursue research on the relationship between groundwater age and groundwater concentrations of PFAS (per- and polyfluoroalkyl substances) in North Carolina. The project builds on methodological and scientific advances from research carried out with related NSF funding, and also supports related tasks and inquiry under the separate PFAST project funding the NC Policy Collaboratory. Sampling will focus on an area of known PFAS contamination near the Chemours chemical plant in Bladen County NC. Groundwater samples will be collected and analyzed for PFAS in the Department of Civil, Construction, and Environmental Engineering at NC State, in a laboratory under the direction of Dr. Detlef Knappe. Analysis of groundwater age-dating tracers will be done at the University of Nebraska, in partnership with collaborator Dr. Troy Gilmore at the University of Nebraska.

4. NASA Nebraska Space Grant Fellowship 2018-2019 Flynn (August 2018 – February 2019)
   *Submitted:* July 11, 2018
   *Sponsor*: UNO-NASA Space Grant
   *PI*: T.E. Gilmore (100%)
   *UNL Amount*: $4,000
   *UNL Cost Share*: $0
   *Total Amount*: $4,000
   *SAP WBS Account Number:* 26-6238-0868-001
   Fellowship for Amanda Flynn, MS student. The goal of this project is to produce a map of groundwater areas that are likely to be impacted by anthropogenic contamination. Contamination of groundwater is a growing concern worldwide as more groundwater is being utilized for human consumption. NASA satellite data (https://earthobservatory.nasa.gov/GlobalMaps/?eocn=topnav&eoci=globalmaps) shows the impacts of human civilization and climate change, and one can see civilizations are growing into previously uninhabited areas. NASA is pioneering new initiatives to monitor water quality in surface water bodies (https://landsat.gsfc.nasa.gov/unesco-launches-a-pioneering-tool-to-monitor-water-quality/), but due to pollution pointed out in these studies, groundwater may be a better option for drinking water sources.

5. Isotopes of Nitrate in Bazile Creek Headwaters (September 2018 – November 2019)
   *Submitted:* August 30, 2018
   *Sponsor*: Upper Elkhorn Natural Resources District
   *PI:* Dan Snow (50%)
   *Co-PI*: T.E. Gilmore (50%)
   *UNL Amount*: $4,162
   *UNL Cost Share*: $0
   *Total Amount*: $4,162
   *SAP WBS Account Number:* 26-6211-0056-001
   We will sample Bazile Creek and tributaries seasonally (four times/year) and during different hydrologic conditions to gauge whether nitrate source changes substantially over time in tributaries or in the main channel. It is possible that during baseflow the source is groundwater-derived and therefore mostly from commercial fertilizer source. Under different hydrologic conditions, or during different seasons nitrogen could potentially shift toward more organic sources from runoff or from cattle having access to the stream.

6. Survey of Groundwater Transit Times and Nitrate Delivery to Bazile Creek. (June 2018 – May 2020)
   *Submitted:* November 10, 2017
   *Sponsor*: Nebraska Department of Environmental Quality
   *PI*: T.E. Gilmore (50%)
   *Co-PI*: A. Mittelstet, T. Messer
   *Amount*: $30,000
   *UNL Cost Share*: $20,000

*Total Amount*: $50,000
*SAP WBS Account Number:* 26-6238-0866-001
The proposed work is a first step toward the overall goals of (1) understanding groundwater contribution to these spatial and temporal trends in stream-water nitrate, and (2) gauging the magnitude and timing of future groundwater nitrate loadings to Bazile Creek. The specific objectives addressed by this project are (a) survey nitrate concentration in groundwater that discharges to Bazile Creek (b) quantify timescales for delivery of groundwater nitrate to Bazile Creek, and (c) compare solute concentrations in streams to solute concentrations in groundwater. Achievement of these objectives will improve estimates of timescales between implementation of best management practices and subsequent reductions in stream-water nitrate concentrations.

7. Upper Little Blue River Basin Hydrologic Monitoring (July 2018 – June 2021; no-cost extension to Dec 2021)
*Submitted:* August 30, 2017
*Sponsor*: Tri-Basin NRD/Nebraska Environmental Trust
*PI*: T.E. Gilmore (45%)
*Co-PI*: D. Divine (30%)
*Co-PI*: D. Martin (25%)
*Amount*: $145,924
*UNL Cost Share*: $184,800
*Total Amount*: $330,724
*SAP WBS Account Number:* 26-6238-0859-001
The Tri-Basin and Little Blue Natural Resources Districts (TBNRD and LBNRD, respectively) request funds to improve groundwater quality and quantity monitoring, and to promote coordinated groundwater management between the NRDs. The project consists of three major objectives, including hydrogeological characterization, (2) expansion of monitoring well networks in critical areas and (3) application of groundwater quantity and quality information, isotopes, and age-dating to evaluate groundwater movement in the vicinity of the groundwater mound in the TBNRD, and in areas of groundwater decline in the TBNRD and the LBNRD. The project will rely on age-dating of groundwater that discharges to the Little Blue River to help characterize water movement. Information from the project will enhance implementation of the Little Blue Basin Water Management Plan for the TBNRD and LBNRDs, in addition to the voluntary Integrated Management Plan currently in development. An educational component of the project will benefit the general public and water resources managers. Advancements from the project will provide a foundation for improved monitoring of water resources within and across NRD boundaries that will be useful for these and other NRDs for years into the future.

8. Collaborative Research: Groundwater transit time distributions: bridging the gap between advanced tracer techniques and numerical modeling (June 2018 – June 2021)
*Submitted:* May 19, 2017
*Sponsor*: National Science Foundation – Hydrologic Sciences
*PI*: T.E. Gilmore (45%)

*Co-PI*: A. Mittelstet (45%), V. Zlotnik (10%)
*UNL Amount*: $387,030
*UNL Cost Share*: $0
*Total Amount*: $387,030
*SAP WBS Account Number:* 25-6238-0862-001
*Total Amount of collaborative proposal award:* $880,944 *(including awards to collaborators at Univ. of Utah and North Carolina State Univ.)*:
Determination of groundwater transit time distributions (TTDs) is a critical component of any effort to forecast the effects of contaminated aquifer discharge on stream water quality. Currently, field studies that utilize groundwater sampling in streambeds and analysis of age-dating tracers show TTDs with far less young groundwater than is typically calculated from groundwater modeling studies. This discrepancy between field studies and modeling leads to very different forecasts of contaminant discharge from aquifers, which has important implications for stream water quality. The overall goals of this project are to (1) evaluate why there is currently a discrepancy between TTDs derived from measurements (i.e., field sampling of age-dating tracers in groundwater) and groundwater models, (2) determine what processes that drive the shape of the groundwater TTDs, and (3) how these processes may be better captured using field measurements in multiple stream orders and a watershed-scale groundwater model. We propose determination of groundwater TTDs across multiple stream orders in a watershed overlying the High Plains aquifer in the Nebraska Sand Hills, where groundwater accounts for approximately 90% of annual discharge. The TTDs will be determined using age-dating tracers for both young (e.g., 3H and 3He) and old (e.g., 14C and 4He) groundwater, coupled with discharge measurements in streams and groundwater discharge measurement in streambeds. The field-based TTDs will be compared to groundwater TTDs derived from particle tracking simulations in a numerical groundwater model (MODFLOW), at both the reach and watershed scale. A sensitivity analysis will be used to determine critical locations and level of detail necessary for refinement of geological and hydrologic variables in the model (with an initial focus on patterns of recharge in contributing areas and across the landscape), and the model will be recalibrated to evaluate how TTDs compare to field-based estimates after refinement.

9. Middle Republican NRD Observation Well Network. (July 2017 – June 2019)
*Submitted:* September 1, 2016
*Sponsor*: Middle Republican NRD
*PI*: J. Korus (45%)
*Co-PI*: T.E. Gilmore (33%), D. Hallum (22%)
*Amount*: $70,500
*UNL Cost Share*: $85,954
*Total Amount*: $156,454
*SAP WBS Account Number:* 26-6238-0828-001
Conservation and Survey Division (CSD) personnel will conduct a preliminary hydrogeologic assessment of the Middle Republican Natural Resources District (MRNRD) to identify target areas for observation wells. Spatial statistics (e.g. kriging) and other techniques will be used to identify

areas in which uncertainty in groundwater levels (i.e., aquifer storage), recharge rates, water quality, and potential for groundwater-surface water interaction is greatest in the MRNRD. Staff and graduate students will compile data, conduct a review of historical information, and create a database and GIS for hydrogeological information.

10. Spatial variability of streambed hydraulic conductivity across multiple stream orders (March 2017 – February 2018)
    *Submitted:* October 20, 2016
    *Sponsor*: U.S. Geological Survey
    *PI*: A. Mittelstet (60%)
    *Co-PI*: T.E. Gilmore (40%)
    *Amount*: $19,992
    *UNL Cost Share*: $40,091
    *Total Amount*: $60,083
    *SAP WBS Account Number:* 25-6211-0020-010
    A recent coupling of the Soil and Water Assessment Tool (SWAT) and MODFLOW – two powerful hydrological modeling tools that have historically only been used individually in Nebraska – presents an opportunity to more accurately represent the surface and groundwater processes. One key parameter for the SWAT-MODFLOW model is the streambed hydraulic conductivity (*K*). It is one of the most important parameters controlling the movement of water from the stream to the aquifer, and from the aquifer to the stream. To measure streambed *K* throughout the watershed is not feasible for most projects; therefore, modelers use literature values or limited measurements and assume streambed *K* doesn't vary across the watershed. We propose a method to estimate the variability of streambed *K* throughout a watershed using SSURGO data. Our central hypothesis is that streambed *K* will vary between the same and multiple stream orders as a function of soil type of the contributing watershed.

11. Evaluation of changing irrigation management on ground water recharge and quality (March 2016 – February 2017)
    *Submitted:* September 28, 2015
    *Sponsor*: U.S. Geological Survey
    *PI*: T.E. Gilmore (50%)
    *Co-PI*: D. Snow (25%)
    *Personnel*: Steve Sibray (25%)
    *Amount*: $15,000
    *UNL Cost Share*: $31,888
    *Total Amount*: $46,888
    *SAP WBS Account Number:* 25-6211-0020-003
    The proposed research is designed to evaluate the use of groundwater age-dating tracers, isotopes, and dissolved nitrogen measurement to quantify the impact of recent watershed-scale changes in irrigation management on groundwater recharge rates, source, and quality. The research will be conducted in an alluvial aquifer where groundwater recharge rates and quality were assessed in the 1990s, prior to a recent shift from flood to center pivot irrigation.

Section 2.2.4 Numbered list (in reverse chronological order) of External Research Grants that have been submitted through other institutions. Include the title of the project, where the proposal was submitted (e.g. university x, consulting company y), funding agency, dates of project, PI and Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to you, and date of submission.

1. Planning Grant Engineering Research Center for ENgineered Solutions for rUral REsilience--ENSURE: Food, Energy, Environment, and Infrastructure (September 2019 – August 2020)
   *Submitted:* June 3, 2019
   *Sponsor*: National Science Foundation
   *PI*: Stacy Hutchinson (award to Kansas State University)
   *Co-PI*: T.E. Gilmore (20%), J. Boll, M. Derby, N. Hendricks
   *UNL Amount*: $0
   *UNL Cost Share*: $0
   *Total Amount*: $99,907
   Kansas State University (KSU) will partner with the University of Nebraska (UNL) and Washington State University (WSU) to plan for the Engineering Research Center for ENgineered Solutions for rUral Resilience - ENSURE: Food, Energy, Environment, and Infrastructure. ENSURE seeks to create sustainable rural communities through engineering innovations and in partnership with rural stakeholders.

2. Hydrological Science as a Key to Promote Effective Water Use and Conservation in Complex Productive Systems (September 2019 – August 2020)
   *Submitted:* May 2019
   *Sponsor*: CAPES-PRINT EDITAL 02 - NETWORK
   *PI*: Didier Gastmans (award to UNESP-Rio Claro)
   *Co-PI*: T.E. Gilmore (20%), J. Boll (WSU)
   *UNL Amount*: $0
   *UNL Cost Share*: $0
   *Total Amount*: $10,000 (approximate equivalent in US dollars)
   This proposal for CAPES PRINT aim to support the development of an interdisciplinary and international network of scientists and graduate students to advance an exchange of knowledge, as well as a long-term research project, using hydrological science to promote water conservation in variable economic environments water dependent, such as agriculture and relates agroindustry, as well as ecosystems associated, in countries involved in this proposal. Together, all the participants attempt to understand the influences on hydrological cycle due to the main economic activities water dependent, such as corn and soya bean in USA, sugar cane in Brazil, and coffee in Costa Rica, and the role played by ecological conservations programs, integrating knowledge, data, and models from comparable study sites. Based on this initial integration our proposal will lead toward an intensive educational exchange program between graduate students from the universities involved in this proposal, based on the solution of practical problems related to water issues.

10. Using fiber optic distributed temperature sensing and point-scale measurements to quantify groundwater-surface water flux. (January 2017 - December 2017)
    *Submitted:* January 10, 2017
    *Sponsor*: Center for Transformative Environmental Monitoring Programs
    *PI*: T.E. Gilmore (100%)
    *Amount*: $1,700
    *UNL Cost Share*: $0
    *Total Amount*: $1,700
    Groundwater-surface water (GW-SW) flux measurement techniques, such as reach mass-balance, seepage meters, Darcian flux and temperature sensing can be applied simultaneously to provide multiple lines of evidence but challenges remain for directly linking results from different spatial and temporal scales of measurement. For smaller streams where groundwater discharge is a significant percentage of stream discharge into the reach (typically ≥10%), the integrated groundwater flux from point measurements can be compared to a larger-scale (i.e. $10^2$-$10^3$ m reach length) approach to confirm results. But for reaches in larger stream (river) systems, the stream-groundwater discharge ratio is usually much too large to use reach mass balance as a direct point of comparison. A promising approach for linking point measurements and testing interpolation techniques in large river systems is fiber-optic distributed temperature sensing (FO-DTS). FO-DTS uses a fiber- optic cable to detect groundwater discharge through the streambed along the length of the cable (typically ≤1km). This may be an effective way to "connect the dots" between point measurements of groundwater discharge in large systems, when other techniques like reach mass balance, are not feasible.

Section 2.2.5 Numbered list (in reverse chronological order) of External Research Grants Submitted through the University of Nebraska Lincoln Office of Sponsored Programs but not Funded. Include the title of the project, funding agency, dates of project, PI and Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to you, and date of submission.

1. Data CI Pilot: Facilitating quantitative image-based watershed research and education for non-CI experts (Oct 1, 2021 - Sept 31, 2023)
    *Submitted*: 3/16/2021
    *Sponsor*: NSF
    *PI*: T. Gilmore
    *Co-PI*: A. Harms, with sub-awards to M. Harner (UNK), R. Mehrubeoglu (TAMU-CC), F. Birgand (NCSU)
    *Amount*: $887,479
    *UNL Cost Share*: $0
    *Total Amount*: $887,479

2. Implications of Microplastic Contributions from Fertilizer Application Practices to the Nitrogen Cycle in Agroecosystems (August 1, 2020 - July 31, 2024)

*Submitted*: April 8, 2020
*Sponsor*: USDA-NIFA
*PI*: T. Messer
*Co-PI*: S. Bartlelt-Hunt, A. Schmidt, T.E. Gilmore (15%)
*Amount*: $498,548 *UNL*
*Cost Share*: $0 *Total*
*Amount*: $498,548

**3.** Ag Chemicals, Water, and Genetics (March 2017 – February 2018) *Submitted*: December 2, 2019
*Sponsor*: National Institutes of Health
*PI*: M. Rhoades
*Co-PI*: T.E. Gilmore (5%), D. Reynolds, R. Franco, P. Shea, K. Eskridge, T. Donohue, P. Bierman, C. Beseler, R. Finnell
*Amount*: $1,105,782
*UNL Cost Share*: $0
*Total Amount*: $0

4. Groundwater Age-dating with $^{39}$Ar (January 2020 – December 2020)
*Submitted*: October 15, 2019
*Sponsor*: UNL – Layman Award
*PI*: T.E. Gilmore (100%)
*Amount*: $0
*UNL Cost Share*: $0
*Total Amount*: $10,000

5. Multi-scale and multi-dimensional visualization and decision support for managing groundwater quality in agriculturally intensive regions (January 2020 – December 2024)
*Submitted*: August 7, 2019
*Sponsor*: Foundation for Food & Agriculture Research
*PI*: Jesse Korus
*Co-PIs*: T.E. Gilmore (10%), L. Bodnar, T. Franz, E. Haacker, D. Snow
*UNL Amount*: $517,504
*UNL Cost Share*: $520,759
*Total Amount*: $1,038,263

6. Groundwater Transit Time Distributions: Seasonality and Modeling Approaches from Multiple Age-dating Tracers at Municipal Supply Wells in the High Plains Aquifer (September 1, 2018 – August 31, 2021)
*Submitted*: June 15, 2018
*Sponsor*: Dept of Interior-GS
*PI*: C. Ray (0%)
*Co-PIs*: T.E. Gilmore (75%), J. Korus (25%)
*UNL Amount*: $250,000
*UNL Cost Share*: $250,465
*Total Amount*: $500,465

7. Nebraska Ecosystem Services Corridor Master Plan, Nebraska Environmental

Trust (July 2018 – June 2019)
*Submitted*: September 5, 2017
*Sponsor*: Nebraska Environmental Trust
*PI*: K. Lodl
*Co-PIs*: T.E. Gilmore (5%), D. Ferraro, E. Janning, L. Powell, S. Shepherd, E. VanWormer
*UNL Amount*: $163,500
*UNL Cost Share*: $158,105
*Total Amount*: $321,605

8. Advancing Smart Decision-Making:ReNU-UAble Water for Agriculture. (June 1, 2017 – May 2022)
*Submitted*: August 4, 2016
*Sponsor*: Dept of Agriculture-NIFA
*PI*: S. Bartelt-Hunt
*Co-PIs*: M. Dekraii, T.E. Gilmore (10%), X. Li, F. Munoz-Arriola, D. Rosenbaum, D. Snow, E. Thompson
*UNL Amount*: $4,999,555
*UNL Cost Share*: $0
*Total Amount*: $4,999,555

9. Sand Hills streamflow: more than a faucet? ( March 2017 – February 2018)
*Sponsor*: NE Water Center-USGS
*PI*: S. Thomas (40%)
*Co-PIs*: S. Thomas, T.E. Gilmore (30%), D. Gosselin, T. Messer
*UNL Amount*: $20,000
*UNL Cost Share*: $40,004
*Total Amount*: $60,004

Section 2.2.6 Numbered list (in reverse chronological order) of External Research Grants Submitted through other entities but not Funded. Include the title of the project, where the proposal was submitted (e.g. university x, consulting company y), funding agency, dates of project, PI and Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to you, and date of submission.

1. Pre-proposal to Kansas State University Sponsored Programs for EPSCOR Track 2: Harnessing Big Data for Water Solutions through Engineering and Computing Research and Integrated Training capacitY: Water SECuRITY (2020 – 2024)
*Submitted*:
*Sponsor*: National Science Foundation
*PI*: Melanie Derby (KSU)
*Co-PIs*: T.E. Gilmore (10%), S. Hutchinson, J. McMaine, S. Mohebbi
*Senior Personnel*: S. Bartelt-Hunt, S. Hutchinson, J. Vogel
*UNL Amount*: $1,700,000
*UNL Cost Share*: $0
*Total Amount*: $5,829,566

- **Section 2.3 Other (Non-Research) Funding Record**

Section 2.3.1 Numbered list (in reverse chronological order) of Internally Funded Non-Research Grants. Include the title of the project, funding agency, dates of project, PI and Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to you (as listed in NUGrant), SAP WBS Account Number.

| *Project Title* | *Sponsor* | *Role (PI or Co-PI)* | *Dates* | *Total Amount* *(do not include UNL cost share)* | *% Attributed to Candidate* *(do not include UNL cost share)* |
|---|---|---|---|---|---|
| 2018 American Geophysical Union Fall Meeting | ARD | PI | December 2018 | $500 | 100 |

1. 2018 American Geophysical Union Fall Meeting (December 2018)
   *Submitted*: October 24, 2018
   *Sponsor*: Agricultural Research Division (ARD)
   *PI*: T.E. Gilmore (100%)
   *Total Amount*: $500
   Travel award to support trip to the 2018 AGU Fall Meeting, where I gave an invited talk on groundwater nitrate and transit times.

Section 2.3.2 Numbered list (in reverse chronological order) of Externally Funded Non-Research Grants. Include the title of the project, funding agency, dates of project, PI and Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to the candidate, SAP WBS Account Number.

*Not applicable.*

Section 2.3.3 Numbered list (in reverse chronological order) of External Non-Research Grants that have been submitted through the University of Nebraska-Lincoln Office of Sponsored Programs. Include the title of the project, funding agency, dates of project, PI and Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to you, and date of submission.

*Not Applicable*

Section 2.3.4 Numbered list (in reverse chronological order) of External Non-Research Grants that have been submitted through other institutions. Include the title of the project, where the proposal was submitted (e.g. university x, consulting company y), funding agency, dates of project, PI and Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to you, and date of submission.

*Not Applicable*

Section 2.3.5 Numbered list (in reverse chronological order) of External Non-Research Grants Submitted through the University of Nebraska Lincoln Office of Sponsored Programs but not Funded. Include the title of the project, funding agency, dates of project, PI and Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to you, and date of submission.

*Not Applicable*

Section 2.3.6 Numbered list (in reverse chronological order) of External Non-Research Grants Submitted through other entities but not Funded. Include the title of the project, where the proposal was submitted (e.g. university x, consulting company y), funding agency, dates of project, PI and Co-PI's, sponsor amount, UNL Cost share amount, total amount, amount attributable to you, and date of submission.

*Not Applicable*

- **Section 2.4 Research Patents and Awards**

Section 2.4.1 Numbered list of Patents, including title, list of all inventors, date of publication and patent number

*Not Applicable*

Section 2.4.2 Numbered list of all National and International Research Awards and Recognition (*see documentation in Appendix D*)

1. University Council on Water Resources Ph.D. Dissertation Award – Honorable Mention, June 14, 2017.

Section 2.4.3 Numbered list of all Regional and Local Research Awards and Recognition

1. 2018 College of Engineering Recognition for Highly Impactful Research

- **Section 2.5 Other Research Accomplishments**

Section 2.5.1 Numbered list of Student Research Awards and Recognition

1. Galen Richards: Second place in Student Poster Contest, 2018 NIWR Regional Symposium ($300)
2. Galen Richards: Chancellor's Fellowship ($4,000/yr for 2 years), starting Fall 2018
3. Mikaela Cherry: Othmer Fellowship ($8,000/yr for 3 years), starting Fall 2018

Section 2.4.1 Numbered list of funded proposals for mentored students (**NOTE: these funded and/or proposed projects are not included in my total research funding calculations**)

1. Mapping groundwater and surface water interaction in western Nebraska
   *Sponsor*: Undergraduate Creative Activity and Research (UCARE, June 6, 2016 – August 12, 2016)
   *PI*: J. Johnson
   *Faculty Mentor*: T.E. Gilmore
   *Amount*: $2,400
   *UNL Cost Share*: $0
   *Total Amount*: $2,400
   This research will explore the relationship between groundwater and surface water in western Nebraska using existing data and infrastructure, specifically to identify gaining and losing streams and create an online tool which identifies them as trends change. It is hypothesized that streams alternate between states of gaining and losing depending on various factors, such as

time of year, weather patterns, and human activities. Identifying gaining and losing streams in real time will demonstrate and increase understanding of the dynamic nature of groundwater-surface water interactions.

2. Using isotopes and isotopomers to evaluate nitrate source and fate in the vadose zone and groundwater (May 15, 20917 – Sept 15, 2017)
   *Sponsor:* Indo-U.S. Science and Technology Forum (WARI Program)
   *PI:* A. Kumar
   *Co-Mentor*: D. Snow
   *Co-Mentor:* T.E. Gilmore
   *Amount:* $9,000 (3-month stipend plus travel expenses for PI)
   *UNL Cost Share*: $2,200 (3-month stipend plus lab fee stipend from WFI)

   *Total Amount*: $11,200 (**note**: this proposal was routed through WFI, not NUgrant)
   The only possible way to learn analysis of nitrate isotope is from internship outside India. Though India is rapidly advancing in field of research, still universities and institutes lacks the expertise to measure nitrogen and oxygen isotope of nitrate extracted from water. The University of Nebraska is a fully functional lab and has the expertise to extract and measure nitrate in water. Learning from the experts of University of Nebraska would ensure high quality training in this field. Apart from this, the technique for extraction and analysis of intramolecular distributions of $^{15}N$ in $N_2O$ (isotopomers) would also be investigated. This would help to tightly constraint the source and sink relation of $N_2O$ gas.

Section 2.4.2 Numbered list of Solicited Pre-Proposals/White Papers Submitted but not Funded

1. Platte River Recovery Implementation Program: Research Concepts for Test-scale Recharge Cells. Platte River Recovery Implementation Program (solicited pre-proposal, funding amount and dates are approximate; (**note**: this proposal was not routed through NUgrant)), $75,000, August 1, 2016 – July 31, 2017, PI
2. North Platte Natural Resources District Research Concepts. North Platte Natural Resources District (solicited pre-proposal, funding amount and dates are approximate; (**note**: this proposal was not routed through NUgrant)), $50,000, June 1, 2016 – December 31, 2017, PI

## Section 3 Teaching Accomplishments (other than classroom instruction)

*For Sections 3.1 through 3.6, only provide information for which the home university (e.g. UNL, other) officially recognizes your role.*

- **Section 3.1 Postdoctoral Researchers**

Section 3.1.1 Numbered list (in reverse chronological order) of Postdoctoral researchers supervised. Include designated co-supervisors (if any), affiliation (e.g. UNL or other institution), % funding that you provided to the researchers, and the start and end dates of their appointments. Information on their current employment is also encouraged.

*Not Applicable*

Section 3.1.2 Numbered list (in reverse chronological order) of Postdoctoral researchers currently in progress under your supervision. Include designated co-supervisors (if any), affiliation (e.g. UNL or other institution), % funding that you provide to the researchers, and the start and expected end dates of their appointments.

*Not Applicable*

- **Section 3.2 PhD Students**

Section 3.2.1 Numbered list (in reverse chronological order) of PhD students whom you have supervised as chair or co-chair of their doctoral committees. Include designated co-supervisors (if any), affiliation (e.g. UNL or other institution), dissertation title, % funding that you provided to the student, and graduation date. Information on their current employment is also encouraged.

1. Mikaela Cherry, 80% (co-advised with Jesse Korus, UNL), Fall 2021, "Assessment and visualization of controls on groundwater transport and nitrate contamination"; currently employed at United States Geological Survey, Lincoln, NE

Section 3.2.2 Numbered list (in reverse chronological order) of PhD students currently in progress whom you are supervising as chair or co-chair of their doctoral committees. Include designated co-supervisors (if any), affiliation (e.g. UNL or other institution), % funding that you provide to the student, and expected graduation date.

1. John Stranzl, 100%, 2026
2. Kenneth Chapman, 100% (tuition and fees), 2024
3. Caner Zeyrek, 100%, 2022 (co-advised with Aaron Mittelstet)
4. Griff Nuzzo, 50%, left PhD program Dec 2021 (co-advised with Aaron Mittelstet)

- **Section 3.3 MS Students**

Section 3.3.1 Numbered list (in reverse chronological order) of MS students (thesis option) whom you have supervised as chair or co-chair of their thesis committees. Include designated co-supervisors (if any), affiliation (e.g. UNL or other institution), thesis title, % funding that you provided to the student, and graduation date. Information on their current employment is also encouraged.

1. Martin Wells, 100%, Fall 2018, "Assessing the Relationship Between Groundwater Nitrate Concentrations and Environmental Variables Through Repeat Sampling and Statistical Machine Learning: Dutch Flats, Nebraska" Currently employed with USDA-NRCS in Washington State.
2. Galen Richards, 60% (co-advised with A. Mittelstet), Fall 2020, "Nitrate dynamics and source within nested watersheds of an agricultural stream, Nebraska, USA" Currently in PhD program, University of Idaho.

Section 3.3.2 Numbered list (in reverse chronological order) of MS students (thesis option) currently in progress whom you are supervising as chair or co-chair of their thesis committees. Include designated co-supervisors (if any), affiliation (e.g. UNL or other institution), % funding that you provide to the student, and expected graduation date.

1. Mason Johnson, 100%, completed all research and draft thesis, but unable to be re-admitted to graduate studies for final defense

Section 3.3.3 Total number of non thesis option graduate students advised

1. Dakota Altman, 0% (M. Forsberg funding), anticipated 2023

Section 3.3.4 Total number of graduate student independent research projects supervised

*Not Applicable*

- **Section 3.4 Undergraduate Students**

Section 3.4.1 Numbered list (in reverse chronological order) of undergraduate students supervised in independent research study. Include full name, year, semester and credit hours.

1. Joshua Johnson, Spring 2018 – Spring 2020 (undergraduate research in the Groundwater Lab and in field work)
2. Sydney Corcoran, Summer 2017 – 2019 lab and field work; includes advising for Environmental Studies capstone project in Spring 2019
3. Josiah Johnson, Fall 2015 and Summer 2016 (UCARE project for Groundwater Lab)

Section 3.4.2 Average number of undergraduate students advised per year: 1

- **Section 3.5 Visiting Scholars and Students**

Section 3.5.1 Numbered list (in reverse chronological order) of visiting scholars and students whom you have supervised during their official visit to UNL. Include the scholar/student's name, title (e.g. visiting PhD student, visiting professor), home affiliation, and dates of visit to UNL.

1. Glauco Eger, visiting PhD student, January-June 2020

- **Section 3.6 Graduate Student Committee Membership**

Section 3.6.1 Numbered list (in reverse chronological order) of UNL PhD students for whom you have served as a doctoral committee member. Include graduation date.

1. Nawaraj Shrethna (Summer 2021)
2. Femi Abimbola (Fall 2019)
3. Ann Kambhu (Fall 2018)
4. Justin Gibson (Fall 2018)

Section 3.6.2 Numbered list (in reverse chronological order) of UNL Masters thesis-option students for whom you have served as a masters committee member. Include graduation date.

1. Jacki Polashek (Fall 2019)
2. Wil Fraundorfer (Spring 2018)

Section 3.6.3 Numbered list (in reverse chronological order) of other PhD students at other universities for whom you have served as an external PhD reviewer. Include the student's home university and graduation date.

1. Craig Jensen, North Carolina State University, *in progress*

Section 3.6.4 Numbered list (in reverse chronological order) of other students at other universities for whom you have served as a graduate committee member. Include the student's home university and graduation date.

1. Markus MacNamara, MS, North Carolina State University, anticipated Spring

2022

- **Section 3.7 Teaching Awards and Recognition**

Section 3.7.1 Numbered list of International and National Teaching Awards and Recognition

*Not Applicable*

Section 3.7.2 Numbered list of Regional, Local and University Teaching Awards and Recognition

*Not Applicable*

- **Section 3.8 Other Teaching Accomplishments**

## Section 4 Service Accomplishments

- **Section 4.1 Professional Service**

Section 4.1.1 Numbered list (in reverse chronological order) of Journal Editorships or Associate Editorships including dates of service

*Not Applicable*

Section 4.1.2 Numbered list (in reverse chronological order) of Journals for which you have reviewed papers including number completed for that journal each year (e.g. 5 reviews in 2017).

1. Journal of Cleaner Production
    a. 2022 (1)
2. Geophysical Research Letters
    a. 2022 (1)
3. Agrosystems, Geosciences and Environment
    a. 2022 (1, included grad student as prof dev)
4. Science of the Total Environmental
    a. 2021 (3)
    b. 2018 (1)
5. Journal of Hydrology
    a. 2021 (1)
    b. 2019 (1)
    c. 2018 (3)
    d. 2017 (1)
6. Hydrological Processes
    a. 2021 (1)
    b. 2020 (1)
    c. 2019 (1)
7. Hydrology and Earth Systems Sciences
    a. 2021 (1, with graduate student as prof dev)
8. Groundwater
    a. 2020 (1)
9. American Society of Biological and Agricultural Engineers (ASABE)
    a. 2019 (2)
    b. 2017 (2)
10. Journal of Hydrology: Regional Studies

a. 2017 (2)

11. Hydrogeology Journal
    a. 2106 (1)
12. Water Resources Research
    a. 2017 (3)
    b. 2015 (2)

Section 4.1.3 Numbered list (in reverse chronological order) of Leadership Positions in International and National Organizations

1. Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI), Treasurer, 2021-2024
2. American Society of Biological and Agricultural Engineers, Standards Committee Member (2016-2021); NRES-25 (2015-2021); NRES-28 (2019-2021)
3. University Council on Water Resources (UCOWR), UNL Delegate, 2016 – present
4. Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI), UNL Representative, 2016 – 2021

Section 4.1.4 Numbered list (in reverse chronological order) of Leadership Positions in Regional and Local Organizations

1. Nebraska Onsite Wastewater Advisory Committee (2021-present)
2. Nebraska Water Resources Association advisory (non-voting) board member, Nov 2020-present

Section 4.1.5 Numbered list (in reverse chronological order) memberships in Professional Organizations

1. American Geophysical Union, 2012 – present
2. Geological Society of America, 2018 – present
3. American Society of Biological and Agricultural Engineers, 2010 – 2020
4. National Groundwater Association, 2012 – 2019
5. American Water Resources Association, 2018 – 2019

Section 4.1.6 Numbered list (in reverse chronological order) of National and International Service Awards

*Not Applicable*

Section 4.1.7 Numbered list (in reverse chronological order) of Regional and Local Service Awards

*Not Applicable*

Section 4.1.8 Numbered list (in reverse chronological order) of Research Review panels and dates of service

1. National Science Foundation Review Panel, April 19-21, 2021

- **Section 4.2 University Service**

Section 4.2.1 Numbered list of leadership positions on university wide committees. Include committee name, dates, and title.

*Not Applicable*

Section 4.2.2 Numbered list of membership positions on university wide committees. Include committee name, dates, and title.

*Not Applicable*

- **Section 4.3 College Service**

Section 4.3.1 Numbered List of leadership positions on college wide committees. Include committee name, dates, and title.

*Not Applicable*

Section 4.3.2 Numbered list of membership positions on college wide committees. Include committee name, dates, and title.

*Not Applicable*

- **Section 4.4 Unit Service**

Section 4.4.1 Numbered list of leadership positions on unit committees. Include committee name, dates, and title.

1. School of Natural Resources Community Engagement Committee, August 2018 – present, Secretary

Section 4.4.2 Numbered list of membership positions on unit committees. Include committee name, dates, and title.

1. School of Natural Resources Promotion and Tenure Committee, 2019 – present, Member
2. Biological Systems Engineering Department Faculty and Staff Success Committee, 2021 – present, Member
3. Biological Systems Engineering Computer Committee, 2018
4. School of Natural Resources Community Engagement Committee, 2017 – present, Member
5. School of Natural Resources Digital First Team (website evaluation and re-organization), 2016 – 2019, Member
6. School of Natural Resources Environmental Science Program Committee, October 2015 - present, Member
7. Biological Systems Engineering Department Awards Committee, 2015 – 2017, and 2019 – 2020, Member
8. School of Natural Resources Curriculum Review Committee, November 2015 - 2016, Member

- **Section 4.5 Other Service Accomplishments**

1. Conservation and Survey Division Social Media Coordinator, 2016 - 2020

## Section 5 Extension Accomplishments

*Note: This section was added to the standard COE C.V. template to account for my 30% Extension appointment.*

*Documentation for funded grants is included in Appendix C.*

- **Section 5.1 Extension Grantsmanship**

Section 5.1.1 Numbered list of Externally Funded Extension Grants. See also Appendix B.

1. Delivery of Watershed Science Education to Decision Makers: A Multi-Agency Collaboration (April 2019 – March 2022)
   *Sponsor*: Nebraska Environmental Trust
   *PI*: T.E. Gilmore (40%)
   *Co-PI*: K. Pekarek (15%), M. Taylor (15%), E. Ingram (15%), L. Pennisi (10%), J. Korus (5%)
   *Amount*: $225,204
   *UNL Cost Share*: $270,071
   *Total Amount*: $495,275

   A watershed science training program will be delivered to water resources decision makers in Nebraska. Programming will be delivered collaboratively, leveraging the strengths and educational missions of partner agencies. The program will provide environmental benefits through strengthened natural and water resources management, delivering approximately $112,500 in savings to Nebraskans (conservative estimate, details below). The initial audience is Natural Resources District (NRD) board members, building on a robust needs assessment and pilot materials delivered via www.NebraskaWatershedScience.org. We envision a much broader audience developing over time. The project consists of (1) assessing existing water resources education efforts from water resources entities in Nebraska to find synergies between programs (2) development of a watershed science training program for NRD board members and related adult stakeholders (e.g. elected officials, water users) which utilizes online module development and facilitated education with UNL Extension Educators and NRD staff, and (3) robust evaluation of learning outcomes and impact of the training program. The collaborative program involves the Nebraska Association of Resources Districts, individual NRDs, Nebraska Department of Environmental Quality, Nebraska Department of Natural Resources, and the University of Nebraska. Collectively, in-kind and monetary contributions account for >50% of the project budget.

2. A Pilot Watershed Management Curriculum for Water Resources Managers (January 2017 – December 2017)
   *Sponsor*: Nebraska Academy of Sciences
   *PI*: T.E. Gilmore (50%)
   *Co-PI*: J. Korus (50%)
   *Amount*: $3,000
   *UNL Cost Share*: $5,400
   *Total Amount*: $8,400
   Currently, there is no comprehensive Watershed Management training program for NRD board members, who are elected officials with a wide range of educational and professional experience. We propose a pilot Curriculum that is highly accessible for NRD board members and that is focused on basic watershed science. Evaluation of the pilot training program will be used to

improve the basic watershed science modules and to expand the curriculum to address more complex or site-specific issues faced by NRDs across Nebraska. This project includes collaborators in the Science Literacy Initiative (Cory Forbes and Erin Ingram), Human Dimensions research area (Lisa Pennisi), and Biological Systems Engineering Department (Derrel Martin).

Section 5.1.2 Numbered list of Internally Funded Extension Grants. See also Appendix B.

1. Watershed Science Curriculum: Training Resource for Water Resources Managers in Nebraska and Beyond (March 2017 – February 2018)
   *Sponsor*: Nebraska Extension
   *PI*: T.E. Gilmore (40%)
   *Co-PI*: J. Korus (25%), L. Pennisi (15%), D. Martin (10%), E. Ingram (10%)
   *Collaborators*: K. Pekarek, D. Divine, D. Hallum, S. Olafson-Lackey, S. Sibray, A. Young, J. Groskopf
   *Amount*: $10,000
   *External Matching Funds*: $2,500
   *Total Amount*: $12,500
   The proposed Watershed Science Training Program will use a blended learning approach (web-based + face-to-face) with training modules developed through construct-centered design. Currently, there is no readily accessible, comprehensive Watershed Science training program for Natural Resource District (NRD) board members in Nebraska. Individual NRDs must provide training materials or technical expertise for board members. The web-based program will be designed to meet the demands of learners with widely varying educational backgrounds and demographics, and it will provide an additional source of training beyond what NRD staff members can provide alone. Curriculum development includes a detailed plan for incorporating feedback from the learners. We propose a robust needs assessment and development of a curriculum that is highly accessible for NRD board members and that is focused on basic watershed science. Evaluation of the training program will be used to improve the basic watershed science modules and to expand the curriculum to address more complex or site-specific issues faced by NRDs across Nebraska. This program will be far-reaching. The NRD system is being studied by other states and countries, as water resources managers look for management models to improve water resource management. As a result, this program has the potential to be broadly applicable in Nebraska, in the United States, and globally.

Section 5.1.3 Numbered list of Extension Grant Proposals Submitted.

*Not Applicable*

- **Section 5.2 Extension Citizenship**

Section 5.2.1 Extension Issue Team Development and Implementation

1. Issue Teams #11 and #15 Joint Meeting on Water Quality in Nebraska, Fall 2018
2. Issue Team #11 (Water Use Efficiency) Planning Retreat, March 8-9, 2016, Aurora, NE.
3. Issue Team #11 Progress Report Video, August 29, 2016.

4. Issue Team #11 (Water Efficiency) Planning Sessions, Joint NCEA and UNL Extension Fall Conference, November 11-13, 2015.
5. Issue Team #15 (Water Quality) Planning Sessions, Joint NCEA and UNL Extension Fall Conference, November 11-13, 2015.

Section 5.2.2 Extension Committees and Planning Groups

1. 2021-2022 Aqua-Africa Water Curriculum Specialist
2. 2021 WICS Fall planning meeting, Kearney, Nebraska
3. 2021 National Envirothon Planning Committee (assisted with planning and grading for 2021 event)
4. 2020 Crops and Water Hub Planning, February 7, Kearney Nebraska
5. 2019 National Envirothon Planning Committee (developing content, scenarios, and assisting NRDs with preparation for the 2020 National Envirothon Competition in Lincoln, NE (*Summer 2020 event cancelled due to COVID-19*)
6. $H_2O$ Today Exhibit Committee (reviewing and developing content for the American Museum of Natural History – Smithsonian exhibit for Nebraska State Museum in Morrill Hall) (September 2019 – January 2020)
7. Bazile Groundwater Management Area committee meetings (occasional attendee/participant, 2018 – 2019)
8. UNL Nitrate Team
9. Water Web Content Manager (Co-Manager, J. Korus) for Groundwater content on www.water.unl.edu, October 2015 – present.
10. School of Natural Resources Extension Retreat, Spring and Fall meetings in 2016, Hardin Hall – UNL East Campus, Lincoln, NE.
11. Water Well Interference Ad-hoc Committee (UNL, LENRD, LPSNRD), 2 roundtable discussions in 2016, Lower Platte South Natural Resources District Office, Lincoln, NE.

- **Section 5.3 Extension Workshops and Field Training**

Section 5.3.1 Numbered list of Extension Workshops Conducted

1. **Gilmore, T.E.**, A Survey of Bazile Creek and Groundwater Nitrate, Bazile Creek Groundwater Management Area Field Day, Creighton, NE, September 9, 2021
2. Ingram, E., **Gilmore, T.E.**, Writing Nebraska's Water Management Story: Nebraska Watershed Science Collaborative Workshop, March 31, 2020 (virtual).
3. ***Gilmore, T.E.**, Korus., J., Groundwater and Sandhills Streams (presentation and field demonstration), Nebraska Ag Builders Meeting, Gudmundsen Sandhills Research Laboratory, Whitman, NE, July 23, 2019 (approx. 50 attendees).
4. **Gilmore, T.E.**, A. Mittelstet, G. Richards, Field demonstration of groundwater-surface water interaction measurement techniques, Creighton, NE, June 8, 2019 (approx. 15 attendees).
5. Cherry, M., **Gilmore, T.E.,** Field training on methods for groundwater age dating sample collection ($^3H/^3He$) and use of dissolved oxygen water quality probe. Tri-basin NRD and Little Blue NRD, Holdrege, NE. October 10, 2018. (4 attendees)**.**
6. **Gilmore, T.E.**, Groundwater recharge: techniques and challenges, Nebraska

Association of Resource Districts Vadose Zone Short Course, Kearney, NE. March 1, 2017. (50 attendees)

7. **Gilmore, T.E.**, J. Solder, J. Korus. Field workshop on methods for streambed and groundwater-surface water interaction measurement techniques. Platte River near Leshara, NE. June 24, 2016. (8 attendees)

- **Section 5.4 Extension Presentations**

Section 5.4.1 Numbered list of Extension Presentations

1. ***Gilmore, T.E.**, Mittelstet, A.R., Zlotnik, V., Harner, M., Zeyrek, C., Stranzl, J., Chapman, K. Water at GSL: Research Update. Gudmundsen Sandhills Laboratory Advisory Board Meeting, Whitman, NE, January 24, 2022 (hybrid, delivered via Zoom)
2. ***Gilmore, T.E.**, Challenge: Watershed Science for Citizens who Manage Nebraska's Natural Resources, WICS Faculty Meeting, Lincoln, NE, September 30, 2021
3. ***Gilmore, T.E.**, Cherry, M. Update on groundwater research in the Upper Little Blue Basin, Tri-Basin Natural Resources District and Little Blue Natural Resources District Joint Integrated Management Plan Meeting, Hastings, NE September 9, 2021
4. **Gilmore, T.E.**, Cherry, M. Stable isotopes, Tri-Basin Natural Resources District Meeting, August 18, 2021 (virtual)
5. *__Gilmore, T.E.__, Water at GSL (presentation and discussion with U.S. Congressman Adrian Smith), Gudmundsen Sandhills Laboratory, Whitman, NE, July 13, 2021
6. ***Gilmore, T.E.**, A survey of nitrate dynamics and groundwater age in Bazile Creek watershed, Nebraska Ground Water Monitoring Council, April 13, 2021 (virtual)
7. ***Gilmore, T.E.**, A survey of groundwater transit times and delivery of nitrate in Bazile Creek, April 1, 2021 (virtual)
8. ***Gilmore, T.E.** Groundwater hydrology and nitrate in Bazile Creek. Bazile Groundwater Management Area Virtual Winter Meeting, March 5, 2021 (virtual)
9. Powers, C. (organizer), **Gilmore, T.E.** (presenter), Cherry, M., Groundwater Recharge Seasonality Roundtable, June 22, 2020 (virtual).
10. **Gilmore, T.E.** Watershed Science Education: Needs Assessment and Development, North Central Agricultural and Natural Resources Water Academy, Omaha, NE, February 12, 2020.
11. *Divine, D., **Gilmore, T.E.**, Cherry, M., Interpretive Geologic Maps and Cross Sections for Phelps, Kearney, and Adams Counties in Nebraska, Joint Tri-Basin and Little Blue NRD Board Meeting at the Nebraska Legislative Conference, Lincoln, NE, January 29, 2020.
12. ***Gilmore, T.E.** Hydrology Update. Gudmundsen Sandhills Laboratory Advisory Board Meeting, Whitman, NE, December 20, 2019.
13. ***Gilmore, T.E.,** Watershed Science Educational Resources, Water Center Tour with Legislative Staff, Lincoln, NE, October 30, 2019.
14. ***Gilmore, T.E.** NRD Information and Education Staff Meeting, October 22, 2019.
15. ***Gilmore, T.E.**, Groundwater Age: A Tool for Understanding Aquifer

Impacts on Stream Water Quality 2019 North Central Region Water Network Webinar, October 9, 2019.

16. ***Gilmore, T.E.**, Groundwater: Primary Source of Sandhills Streamflow, Center for Grasslands Studies Seminar Series, Lincoln, NE, September 30, 2019.
17. **Gilmore, T.E.,** Korus, J., Pekarek, K., Pennisi, L., Ingram, E., Designing educational tools for locally-elected water resources directors, American Water Resources Association Spring Specialty Conference, Omaha, NE, March 25-27, 2019.
18. ***Gilmore, T.E.**, Recent Groundwater Recharge Studies, Nebraska Department of Natural Resources Brown Bag Seminar, Lincoln, NE, March 29, 2019.
19. ***Gilmore, T.E.,** Recent Groundwater Recharge Studies, 2019 Nebraska Water Industries Annual Convention, Kearney, NE, February 12, 2019.
20. **Gilmore, T.E.**, Groundwater and Sandhills Streams, Sandhills Symposium, Lincoln, NE, February 8, 2019.
21. ***Gilmore, T.E.**, Watershed Science Curriculum Concept, NRD Information and Educational Staff Meeting, Alma, NE, July 19, 2018.
22. ***Gilmore, T.E.**, Watershed Curriculum Update, NRD Managers Meeting, Gothenberg, NE, June 6, 2018.
23. ***Gilmore, T.E.**, Update on Watershed Science Curriculum, Upper Niobrara-White NRD Board of Directors Meeting, Chadron, NE, May 10, 2018.
24. ***Gilmore, T.E.**, Watershed Science Curriculum and Dutch Flats Groundwater Nitrate Studies, North Platte NRD Board of Directors Meeting, Scottsbluff, NE, May 10, 2018.
25. ***Gilmore, T.**E., Watershed Science Training: Evaluating a proof of concept, 2018 NRD Water Programs Conference, Kearney, NE, March 6, 2018.
26. ***Gilmore, T.E.,** Nebraska's Conservation Survey Division and Groundwater Hydrology Research, Agricultural and Groundwater Management Workshop, Barreiras, Bahia, Brazil, March 1, 2018.
27. ***Gilmore, T.E.,** and G.C. Silva, Groundwater management in Nebraska, Staff and Stakeholder meeting at the Minister of Economic Development Office, Salvador, Bahia, Brazil, February 28, 2018.
28. ***Gilmore, T.E.,** Groundwater resources in Nebraska and the High Plains Aquifer, Nebraska Independent Crop Consultant Association, Lincoln, NE. February 20, 2018.
29. ***Gilmore, T.E.,** Legacy nitrogen and lag times in the subsurface, Nebraska Agri-Business Association, Kearney, NE. February 14, 2018.
30. ***Gilmore, T.E.**, Watershed Curriculum Update, NRD Managers Meeting, Lincoln, NE, January 2018.

Section 5.4.2 Numbered list of Media Interviews or Articles

1. **Gilmore, T.E.**, The Nebraska WAVES programs aims to educate busy Nebraskan water citizens and Natural Resource District Directors on watershed management. (2021, July 29). Retrieved January 4, 2022, from https://northcentralwater.org/the-nebraska-waves-programs-aims-to-educate-busy-nebraskan-water-citizens-and-natural-resource-district-directors-on-watershed-management/
2. Jones, N., Groundwater recharge in Nebraska, 2019 Strategic Discussions for Nebraska, recorded February 14, 2019; released November 2019.

3. ***Gilmore, T.E.,** Groundwater recharge in Nebraska, UNL Market Journal video/television program, recorded November 19, 2018; released January 2019.
4. Schrage, S. Need a refill? New approach streamlines estimation of groundwater recharge. UNL Pocket Science, September 21, 2018. https://news.unl.edu/newsrooms/today/article/need-a-refill-new-approach-streamlines-estimation-of-groundwater-recharge/
5. Staff Writer, Husker-led team aims to track the age of groundwater. Nebraska Today, September 25, 2018. https://news.unl.edu/newsrooms/today/article/husker-led-team-aims-to-track-the-age-of-groundwater/

- **Section 5.5 Extension Publications**

Section 5.5.1 Numbered list of Non-Refereed Publications

1. **Gilmore, T. E.** (2019). Why does groundwater nitrate vary so much across Nebraska? UNL Water. Retrieved November 13, 2019, from https://water.unl.edu/article/groundwater/why-does-groundwater-nitrate-vary-so-much-across-nebraska (90%)
2. **Gilmore, T.E.**, M. Johnson. (2016) Groundwater age and transit times in Nebraska. University of Nebraska-Lincoln School of Natural Resources. Created June 2016, Revised February 4, 2019. http://snr.unl.edu/data/water/groundwater/GWAge/index.aspx. (80%)

Section 5.5.2 Numbered list of Educational Videos, Modules, and Research Stories (**Videos** are short (<5 min) trailers introducing water resources/management topics, **Modules** are interactive and provide deeper educational experience, while **Research Stories** translate research results for extension presentations and direct access for stakeholders and citizens of Nebraska)

1. **Gilmore, T.E.**, Richards, G., Mittelstet, A. R., Snow, D. D., & Messer, T. L. (2021, December 9). Research Story: Bazile Creek and Groundwater Nitrate. Retrieved January 4, 2022, from https://go.unl.edu/BCNitrate
2. McCullough, C., Pekarek, K., **Gilmore, T.E.**, Korus, J., and Ingram, E. (2021) Video: Integrated Management Plans – The Basics. https://nebraskawaves.org/managing-groundwater-resources-the-nebraska-way/
3. McCullough, C., Pekarek, K., **Gilmore, T.E.**, Korus, J., and Ingram, E. (2021) Video: Integrated Management Plans – The People. https://nebraskawaves.org/managing-groundwater-resources-the-nebraska-way/
4. Pekarek, K., McCullough, C., **Gilmore, T.E.**, Korus, J., and Ingram, E. (2021) Video: What is NPS?. https://nebraskawaves.org/managing-water-quality-the-nebraska-way/
5. Pekarek, K., McCullough, C., **Gilmore, T.E.**, Korus, J., and Ingram, E. (2021) Video: Why Manage for NPS?. https://nebraskawaves.org/managing-water-quality-the-nebraska-way/
6. **Gilmore, T.E.**, Ingram, E., Pekarek, K., and Korus, J. (2020). Video: Integrated Management Plans – The Process. https://nebraskawaves.org/managing-groundwater-resources-the-nebraska-way/ (80%)
7. **Gilmore, T.E.** (2019) Groundwater age, nitrate, and recharge. Interactive Educational Module for Natural Resources District Board Members and Staff,

University of Nebraska-Lincoln School of Natural Resources and Department of Biological Systems Engineering. Created November 2019. https://nebraskawatershedscience.org/curriculum/view/10 (90%)

8. **Gilmore, T.E.,** Korus, J., Ingram, E., Young, A. (2017) Groundwater Quantity. Interactive Educational Module for Natural Resources District Board Members and Staff, University of Nebraska-Lincoln School of Natural Resources and Department of Biological Systems Engineering. Created October 2017; revised October 2019. http://nebraskawatershedscience.org/module1/ (60%)
9. **Gilmore, T.E.,** Korus, J., Ingram, E. (2017) Groundwater-Surface Water Interaction. Interactive Educational Module for Natural Resources District Board Members and Staff, University of Nebraska-Lincoln School of Natural Resources and Department of Biological Systems Engineering. Created November 2017. http://nebraskawatershedscience.org/module2/ (60%)
10. **Gilmore, T.E.,** Korus, J., Ingram, E. (2017) Watershed Management Basics. Interactive Educational Module for Natural Resources District Board Members and Staff, University of Nebraska-Lincoln School of Natural Resources and Department of Biological Systems Engineering. Created November 2017. http://nebraskawatershedscience.org/module3/ (60%)

Section 5.5.3 Numbered list of Publications in Peer-Reviewed Journals

1. **Gilmore, T. E.,** Korus, J., Pennisi, L., Martin, D., & Pekarek, K. (2019). Needs Assessment: Watershed Science for Water Resources Directors. *Journal of Extension*, 57(4). Retrieved from https://www.joe.org/joe/2019august/rb7.php

Section 5.5.3 Numbered list of Publications submitted to Peer-Reviewed Journals

*Not Applicable*

- **Section 5.6 Extension Awards and Recognition**

Section 5.6.1 Numbered list of International and National Extension Awards and Recognition (*see documentation in Appendix D*)

1. American Society of Agricultural and Biological Engineers (ASABE) Educational Aids Blue Ribbon Award for Pilot Watershed Science Curriculum for Natural Resources Districts, ASABE Annual International Meeting, Detroit, MI. July 29-Aug 1, 2018. *Team members*: **T.E. Gilmore**, J. Korus, D. Martin, K. Pekarek, E. Ingram, L. Pennisi

Section 5.6.2 Numbered list of regional, local and University Extension Awards and Recognition

*Not Applicable*