

Matthew J. Helmers

Department of Agricultural and Biosystems Engineering
Iowa State University

Contact Information

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Education

Ph.D.	2003	University of Nebraska-Lincoln, Agricultural and Biological Systems Engineering
M.S.	1997	Virginia Polytechnic Institute and State University, Civil Engineering
B.S.	1995	Iowa State University, Civil Engineering

Professional Roles and Responsibilities

**Director, Iowa Nutrient Research Center, Iowa State University, Ames, IA
September 2019–present**

Responsible for maintaining the Iowa Nutrient Research Center (INRC), a Regent's Center administered by the Dean of the College of Agriculture and Life Sciences: working with a legislated advisory council on the strategic direction for INRC, gathering input from stakeholders and faculty regarding research priorities, developing and issuing Request for Proposals to Regents' University faculty, supervising staff, communicating to the state legislature and general public the impact of INRC-funded research, facilitating activities of the Iowa Nutrient Reduction Strategy Science Team, and working to communicate the impact of Iowa State University's impact on water quality.

Faculty, Agricultural and Biosystems Engineering Department, Iowa State University, Ames
Professor August 2014–present
Associate Professor July 2009–July 2014
Assistant Professor August 2003–June 2009

Responsible for maintaining a scholarly research and extension program leading to national and international recognition in the areas of water resources including drainage and water quality management. This includes attracting grants, mentoring students, publishing findings, developing extension programs, and providing state and national leadership as appropriate.

Supervisor: Dr. Steven Mickelson, Phone 515-294-1434

**Dean's Professor, College of Agriculture and Life Sciences, Iowa State University, Ames
July 2013–present**

Endowed faculty position; appointed by former Dean Wendy Wintersteen

**Associate Chair for Research and Extension, Agricultural and Biosystems Engineering
Department, Iowa State University, Ames, IA
August 2011–August 2018**

Responsible for convening ABE Research Council to identify research priorities and opportunities for increased productivity, maintaining communication with ABE Extension Group

**USDA National Needs Graduate Fellow, Agricultural and Biological Systems Engineering Department, University of Nebraska-Lincoln, Lincoln, NE
July 1999–July 2003**

Responsible for conducting research on performance of vegetative filter strips

**Staff Engineer, URS Greiner Woodward-Clyde, Santa Ana, CA; Denver, CO
August 1997–June 1999**

Responsible for geotechnical engineering design and monitoring of earthwork construction activities

**Eisenhower Graduate Research Fellow, Civil Engineering Department, Virginia Polytechnic Institute and State University, Blacksburg, VA
August 1995–June 1997**

Responsible for conducting research on lateral loading of drilled shaft sound wall foundations.

Select Honors and Awards

- ISU College of Agricultural and Life Sciences Outstanding Achievement in Extension Award, 2018
- ISU College of Agricultural and Life Sciences Dean Lee R. Kolmer Award for Excellence in Applied Research, 2017
- ASABE G.B. Gunlogson Countryside Engineering Award, 2014
- ISU College of Agriculture and Life Sciences Dean’s Citation for Extraordinary Contributions, Team Award, 2013
- ASABE Nolan Mitchell Young Extension Worker Award, 2009
- Iowa State University Early Achievement in Extension, 2007
- ISU College of Agriculture Early Achievement in Extension, 2007

Professional Affiliations

- ASABE – The Society for Engineering in Agricultural, Food, and Biological Systems
- Soil and Water Conservation Society
- Soil Science Society of America

Selected Service to State Government, Commodity Groups, Industries or other Stakeholders

- Iowa Soybean Association Research Committee 2018-present
- EPA Science Advisory Board – Agricultural Science Committee, Appointee 2016-2018
- Tulane University Nitrogen Reduction Grand Challenge Advisory Committee 2016-2018
- 10th International Drainage Symposium Planning Committee 2015-2016
- University of Nebraska Department of Biological Systems Engineering External Advisory Committee 2013-present
- North American Fertilizer Industry 4R Research Fund Technical Advisory Group 2013-present
- Cedar River Watershed Technical Team 2011-2017

- Agricultural Drainage Management Systems (ADMS) Task Force (now Conservation Drainage Network) 2004-present
- Raccoon River Basin Water Quality Master Plan Expert Panel 2010-2011
- Iowa Dept. of Agriculture and Land Stewardship Cedar River TMDL working group 2007-2011
- Raccoon River TMDL working group – College of Agriculture Representative 2006-2008
- USDA-NRCS ad-hoc committee on Vegetative Treatment Systems for Open Lot Runoff 2004

Selected Peer-reviewed Journal Articles (129 total articles)

*MS, Ph.D., Post Doc, or Research Associate supervised by Helmers

1. Waring, E.R., A. Lagzdins, C. Pederson, and **M.J. Helmers**. Accepted. Influence of no-till and winter rye cover crop on nitrate losses from tile-drained row-crop agriculture in Iowa. *Journal of Environmental Quality*.
2. Dougherty, B.W., C. Pederson, A.P. Mallarino, D.S. Anderson, M.L. Soupir, R.S. Kanwar, and **M.J. Helmers**. Accepted. Midwestern cropping system effects on drainage water quality and crop yields. *Journal of Environmental Quality*.
3. Reinhart B.D., J.R. Frankenberger, C. H. Hay, and **M.J. Helmers**. 2019. Simulated water quality and irrigation benefits from drainage water recycling at two tile-drained sites in the US Midwest. *Agricultural Water Management* 223.
4. Castellano, M.J., S.V. Archontoulis, **M.J. Helmers**, H.J. Poffenbarger, and J. Six. 2019. Sustainable intensification of agricultural drainage. *Nat Sustain* 2:914–921. <https://doi.org/10.1038/s41893-019-0393-0>
5. Daigh, A.L.M., W.A. Dick, **M.J. Helmers**, R. Lal, J.G. Lauer, E. Nafziger, C.H. Pederson, J. Strock, M. Villamil, A. Mukherjee, and R. Cruse. 2018. Yields and yield stability of no-till and chisel-plow fields in the Midwestern U.S. Corn Belt. *Field Crops Research* 218:243-253. DOI: 10.1016/j.fcr.2017.04.002.
6. Christianson, R., L. Christianson, C. Wong, **M.J. Helmers**, G. McIsaac, D. Mulla, and M. McDonald. 2018. Beyond the nutrient strategies: Common ground to accelerate agricultural water quality improvement in the Upper Midwest. *Journal of Environmental Management* 206:1072-1080. DOI: 10.1016/j.jenvman.2017.11.051.
7. Schulte, L., J. Niemi, **M.J. Helmers**, M. Liebman, J. Arbuckle, D. James, R. Kolka, M. O’Neal, M. Tomer, J. Tyndall, H. Asbjornsen, P. Drobney, J. Neal, G. Van Ryswyk, and C. Witte. 2017. Prairie strips improve biodiversity and the delivery multiple ecosystem services from corn-soybean croplands. *Proceedings of the National Academy of Sciences of the United States of America* 114:11247-11252. DOI: 10.1073/pnas.1620229114.
8. Schott, L.*, A. Lagzdins, A.L.M. Daigh, K. Craft, C. Pederson, G. Brenneman, and **M.J. Helmers**. 2017. Effects of drainage water management on yield, drainage, water table, and volumetric water content in Southeast Iowa. *Journal of Soil and Water Conservation* 72(3): 251-259.
9. Daigh, A.L., X. Zhou, **M. Helmers**, C. Pederson, R. Horton, M. Jarchow, and M. Liebman. 2015. Subsurface drainage nitrate and total reactive phosphorus losses in bioenergy-based prairies and corn systems. *Journal of Environmental Quality* 44(5): 1638-1646.
10. Kladivko, E.J., **M.J. Helmers**, L.J. Abendroth, D. Herzmann, R. Lal, M. Castellano, D.S. Mueller, J.E. Sawyer, R.P. Anex, R.W. Arritt, B. Basso, J.V. Bonta, L. Bowling, R.M. Cruse, N.R. Fausey, J. Frankenberger, P. Gassman, A.J. Gassmann, C.L. Kling, A. Kravchenko, J.G. Lauer, F.E. Miguez, E.D. Nafziger, N. Nkongolo, M. O’Neal, L.B. Owens, P. Owens, P. Scharf,

- M.J. Shipitalo, J.S. Strock, and M.B. Villamil. 2014. Standardized research protocols and database development for transdisciplinary understanding of corn systems and climate. *Journal of Soil and Water Conservation* 69(6): 532-542.
11. Daigh, A.L., X. Zhou, **M.J. Helmers**, C.H. Pederson, R. Horton, and R. Ewing. 2014. Subsurface drainage flow and soil water dynamics of reconstructed prairies and corn rotations for biofuel production. *Vadose Zone Journal* doi:10.2136/vzj2013.10.0177.
 12. Zhou, X.*, **M.J. Helmers**, H. Asbjornsen, R. Kolka, M. Tomer, and R. Cruse. 2014. Nutrient removal by prairie filter strips in agricultural landscape. *Journal of Soil and Water Conservation* 69(1): 54-64.
 13. Christianson, L.*, J. Tyndall, and **M.J. Helmers**. 2013. Financial comparison of seven nitrate reduction strategies for Midwestern agricultural drainage. *Water Resources and Economics* 2-3: 30-56.
 14. Christianson, L.*, A. Bhandari, **M.J. Helmers**, K. Kult, T. Sutphin, and R. Wolf. 2012. Performance evaluation of four field-scale agricultural drainage denitrification bioreactors in Iowa. *Trans. ASABE* 55(6): 2163-2174.
 15. **Helmers, M.J.**, X. Zhou*, H. Asbjornsen, R. Kolka, M.D. Tomer, and R. Cruse. 2012. Sediment removal by perennial filter strips in row-cropped ephemeral watersheds. *Journal of Environmental Quality* 41(5): 1531-1539.
 16. Lawlor, P.A.*, **M.J. Helmers**, J.L. Baker, S.W. Melvin, and D.W. Lemke. 2011. Comparison of liquid swine manure and ammonia nitrogen application timing on subsurface drainage water quality in Iowa. *Trans. ASABE* 54(3): 973-981.
 17. Qi, Z.*, **M.J. Helmers**, R. Malone, and K. Thorp. 2011. Simulating long-term impacts of winter rye cover crop on hydrologic cycling and nitrogen dynamics for a corn-soybean crop system. *Trans. ASABE* 54(5): 1575-1588.
 18. Qi, Z.*, **M.J. Helmers**, R.D. Christianson, and C.H. Pederson. 2011. Nitrate-nitrogen losses through subsurface drainage under various agricultural land covers. *Journal of Environmental Quality* 40: 1578-1585.
 19. Dosskey, M. G., **M.J. Helmers**, and D. E. Eisenhauer. 2011. A design aid for sizing filter strips using buffer area ratio. *Journal of Soil and Water Conservation* 66(1): 29-39.
 20. Stenback, G., W. Crumpton, K. Schilling, and **M.J. Helmers**. 2011. Rating curve estimation of nutrient loads in Iowa rivers. *Journal of Hydrology* 396: 158-169.
 21. Zhou, X.*, **M.J. Helmers**, H. Asbjornsen, R. Kolka, and M. Tomer. 2010. Perennial filter strips reduce nitrate levels in soil and shallow groundwater after grassland-to-cropland conversion. *Journal of Environmental Quality* 39(6): 2006-2015.
 22. Schilling, K. E., and **M.J. Helmers**. 2008. Effects of subsurface drainage tiles on streamflow in agricultural watersheds: exploratory hydrograph analysis. *Hydrological Processes* 22(23): 4497-4506.
 23. Lawlor, P. A.*, **M.J. Helmers**, J. L. Baker, S. W. Melvin, and D. W. Lemke. 2008. Nitrogen application rate effects on nitrate-nitrogen concentrations and losses in subsurface drainage. *Trans. ASABE* 51(1): 83-94.
 24. **Helmers, M. J.**, D. E. Eisenhauer, M. G. Dosskey, T. G. Franti, J. Brothers, and M. C. McCullough. 2005. Flow pathways and sediment trapping in a field-scale vegetative filter. *Trans. ASAE* 48(3): 955-968.
 25. Dosskey, M. G., **M.J. Helmers**, D. E. Eisenhauer, T. G. Franti, and K. D. Hoagland. 2002. Assessment of concentrated flow through riparian buffers. *Journal of Soil and Water Conservation* 57(6): 336-343.

Published Databases (1)

1. Abendroth, L.J., D.E. Herzmann, G. Chighladze, E.J. Kladvko, M.J. Helmers, L. Bowling, M. Castellano, R.M. Cruse, W.A. Dick, N.R. Fausey, J. Frankenberger, A.J. Gassmann, A. Kravchenko, R. Lal, J.G. Lauer, D.S. Mueller, E.D. Nafziger, N. Nkongolo, M. O'Neal, J.E. Sawyer, P. Scharf, J.S. Strock, and M.B. Villamil. 2017. Sustainable Corn CAP Research Data (USDA-NIFA Award No. 2011-68002-30190). National Agricultural Library - ARS - USDA. <https://dx.doi.org/10.15482/USDA.ADC/1411953>.

Selected Book Chapters (7 total)

1. Liebman, M., **M.J. Helmers**, and L. Schulte Moore. 2011. Integrating conservation with biofuel feedstock production. In: M. Schnepf (ed.), *Managing Agricultural Landscapes for Environmental Quality II*. Soil and Water Conservation Society of America, Ankeny, IA.
2. Comito, J. and **M.J. Helmers**. 2011. The language of conservation. In: L. Wright Morton and S.S. Brown (eds.), *Pathways for Getting to Better Water Quality: The Citizen Effect*. Springer Science +Business Media.
3. Strock, J.S., G.R. Sands, and **M.J. Helmers**. 2011. Subsurface drainage design and management to meet agronomic and environmental goals. In: J.L. Hatfield and T.J. Sauer (eds.), *Soil Management: Building a Stable Base for Agriculture*. American Society of Agronomy and Soil Science Society of America.
4. **Helmers, M. J.**, T. Isenhardt, M. Dosskey, S. Dabney, and J. Strock. 2008. Buffers and vegetative filter strips. Chapter 4 in *Final Report: Gulf Hypoxia and Local Water Quality Concerns Workshop*. American Society of Agricultural and Biological Engineers, St. Joseph, MI. [Invited Oral Presentation at Workshop- Helmers]
5. Baker, J. L., **M.J. Helmers**, and J. M. Laflen. 2006. Water management practices: rain-fed cropland. Chapter 2 in *Evaluating the Environmental Benefits of Agricultural Conservation Practices- The Status of our Knowledge*. Soil and Water Conservation Society, Ankeny, IA.

Selected Extension Publications (9 total)

1. Frankenberger, J. B. Reinhart, K. Nelson, L. Bowling, C. Hay, M. Youssef, J. Strock, X. Jia, **M. Helmers**, and B. Allred. 2017. [Questions and Answers About Drainage Water Recycling in the Midwest](#). Purdue University Extension. West Lafayette, IN.
2. Christianson, L., J. Frankenberger, C. Hay, **M.J. Helmers**, and G. Sands. 2016. Ten ways to reduce nitrogen loads from drained cropland in the Midwest. Pub. C1400, University of Illinois Extension.
3. Schulte, L.A., H. Asbjornsen, R. Atwell, C. Hart, **M. Helmers**, T. Isenhardt, R. Kolka, M. Liebman, J. Neal, M. O'Neal, S. Secchi, R. Schultz, J. Thompson, M. Tomer, and J. Tyndall. 2008. A targeted conservation approach for improving environmental quality: Multiple benefits and expanded opportunities. PMR 1002 Iowa State University Extension.

Selected Grants and Contracts

Total funding as PI or Co-PI: \$62,842,517

Total funding as PI: \$13,181,792

Project Title	Name of Grantor	Participants	Period	Role	Grant Amount
Biogeochemical consequences of updating an aging agricultural infrastructure	USDA-NIFA	M. Castellano et al. including M.J. Helmers	07/01/19 – 06/30/22	Co-PI	\$498,768
Prairie strips for healthy soils and thriving farms	FFAR	Cruse et al. including M.J. Helmers	03/01/19 – 02/28/22	Co-PI	\$1,492,408
Estimating the effect of conservation research program contour strips on nutrient retention, water quality, grassland birds, soil health and farm finances	USDA-FSA	L. Schulte Moore et al. including M.J. Helmers	08/01/18 – 07/31/21	Co-PI	\$699,958
Transforming drainage demonstration project	IDALS	M.J. Helmers , W. Crumpton, T. Isenhardt, and C. Hay	07/01/18 – 12/31/21	PI	\$624,346
Drainage water recycling: Evaluation of crop production and water quality benefits	Iowa Nutrient Research Center	M.J. Helmers and Chris Hay	01/01/18 – 12/31/20	PI	\$241,870
Stripping Antibiotic Resistance with Strips: Evaluating Prairie Buffer Strips to Mitigate Resistance Gene Dissemination from Manure-Amended Fields	USDA-NIFA	M. Soupir et al. including M.J. Helmers	01/01/18 – 12/31/21	Co-PI	\$1,200,000
Water and nutrient research: In-field and offsite strategies	IDALS	M.J. Helmers and W. Crumpton	01/01/18 - 12/31/22	PI	\$3,165,104
Coordinated Site Network for Studying the Impacts of 4R Nutrient Management on Crop Production and Nutrient Loss	Foundation for Agronomic Research and FFAR	M.J. Helmers and J. Sawyer – investigators at ISU	10/01/17 - 09/30/20	PI	\$147,076 (ISU Portion of \$2 million)
Evaluation of Water Quality Benefits of Prairie Strips in Iowa	USDA-FSA	M.J. Helmers , M. Liebman, and L. Schulte-Moore	09/22/16 - 09/21/18	PI	\$122,558

Project Title	Name of Grantor	Participants	Period	Role	Grant Amount
Drainage Water Quality Impacts of Agricultural Management Practices: Timing of Manure Application and Use of Winter Cereal Rye Cover Crops	National Pork Board	Helmers , Mallarino, Andersen, Sawyer, Soupir	01/1/17 - 12/31/17	PI	\$57,995
Managing Water for Increased Resiliency of Drained Agricultural Landscapes	USDA-NIFA	Frankenberger, et al, including Helmers	12/01/14 - 11/30/19	Co-PI	\$5,000,000
Prairie Strips as an Innovative Agroecosystem Practice to Enhance Ecosystem Services from Farmers' Fields	USDA-NIFA	Schulte-Moore, Helmers , Harris, Liebman, Tyndall, Kolka, Westra, Tomer	01/01/15 - 12/31/17	Co-PI	\$498,966
Extending Field Scale 4R Nutrient Management to Watershed Scale Outcomes	USDA-NRCS	M.J. Helmers , Crumpton	09/17/14 - 12/31/17	PI	\$74,865
Impacts of 4R Nitrogen Management on Crop Production and Nitrate-Nitrogen Loss in Tile Drainage	Fertilizer Institute-4R Nutrient Stewardship	M.J. Helmers , Sawyer	01/01/15 - 12/31/17	PI	\$167,546
Soil and Water Quality Benefits from Integrating Prairie Strips into Corn-Soybean Production Acres	McKnight Foundation	M.J. Helmers , Liebman, Schulte-Moore	07/01/14 - 06/30/17	PI	\$69,580
Nutrient use and land management: A component of the Iowa landscape systems initiative	Iowa Corn Promotion Board	M.J. Helmers and W. Crumpton	01/01/14 - 12/31/14	PI	\$36,657
Climate change, mitigation, and adaptation in corn-based cropping systems	USDA-NIFA-AFRI-CAP	L.W. Morton et al. including M.J. Helmers	02/01/11 - 12/31/16	Co-PI	\$19,992,144

Project Title	Name of Grantor	Participants	Period	Role	Grant Amount
Hydrologic impacts of drainage systems	Iowa Dept. of Economic Dev.	R. Cruse, B. Simpkins, K. Franz, and M.J. Helmers	01/01/11 - 12/31/13	Co-PI	\$299,532
Learning and teaching with experimental watersheds: Evaluation of ecosystem services in mixed annual-perennial agroecosystems	USDA-AFRI	M.J. Helmers , H. Asbjornsen, M. O'Neal, M. Liebman, L. Schulte, J. Tyndall, J. Arbuckle, N. Grudens-Schuck, and M. Harris	01/01/10 - 12/31/12	PI	\$499,996
Mixing reconstructed prairie with cropland to balance food and biofuel production with environmental quality	NCR-SARE	M.J. Helmers , H. Asbjornsen, M. O'Neal, M. Liebman, and L. Schulte	10/01/09 - 09/30/12	PI	\$174,819
Multi-state vegetative treatment system technology implementation	USDA-NRCS-CIG	R. Burns, L. Moody, J. Lawrence, and M.J. Helmers	01/01/08 - 12/31/09	Co-PI	\$899,616
Potential benefits of wetland filters for tile drainage systems: Impact on nitrate loads to the Mississippi River subbasins	USDA	W. Crumpton, J. L. Baker, M.J. Helmers , and S. W. Melvin	12/01/03 - 03/01/05	Co-PI	\$100,000

Extension Meetings and Events Organized

Total number of events: 52

Number of individuals reached (approx.): 3,551

Extension Presentations

Total in Iowa: 549; Number of individuals reached (approx.): 33,533

Total Regional: 86; Number of individuals reached (approx.): 5,589

Selected Invited Research Presentations (35 total)

1. **Helmers, M.J.** 2019. Challenges and opportunities of nitrate reduction in Iowa. Presented at Global Water for Food Conference
2. **Helmers, M.J.** 2019. Challenges and opportunities of Iowa's nutrient reduction strategy. Presented at University of Kansas Environmental Engineering Conference

3. **Helmers, M.J.** 2018. What is the payoff on water quality goals? Presented at the Wisconsin Discovery Farms Annual Conference
4. **Helmers, M.J.** 2018. Nitrate-N reduction in the Upper Mississippi River Basin in the USA: From farm to regional scale. Presented at Nitrogen Attenuation Workshop at Massey University in Palmerston North, NZ
5. **Helmers, M.J.** 2016. Iowa Nutrient Reduction Strategy. Big 12 Water Conference.
6. **Helmers, M.J.** 2016. Monitoring nutrient reduction. National Water Monitoring Conference.
7. **Helmers, M.J.** 2014. Iowa Nutrient Reduction Strategy. Soil and Water Conservation Society Fellows Forum.
8. **Helmers, M.J.** 2014. Iowa Nutrient Reduction Strategy. University of Minnesota Water Resources Seminar.
9. **Helmers, M.J.** 2013. Iowa nutrient reduction strategy. Presented at the 4R Nutrient Stewardship Summit in Des Moines,
10. **Helmers, M.J.** 2013. Iowa nutrient reduction nitrogen science assessment. Presented at the Heartland Regional Water Quality Workshop
11. **Helmers, M.J.** 2013. Managing to reduce sediment and nutrient movement to river and stream systems in the Upper Mississippi River Basin. Soil and Water Distinguished Lecture Series at the ASABE Annual meeting in Kansas City, MO.
12. **Helmers, M.J.** 2012. Iowa nutrient reduction nitrogen science assessment. Presented at the Building Science Assessments for State-Level Nutrient Reduction Strategies Workshop
13. **Helmers, M.J.** 2009. Riverine nutrient export in Iowa watersheds and relations to landscape properties and agricultural land use. Presented at Science to Solutions: Reducing Nutrient Export to the Gulf of Mexico.
14. **Helmers, M.J.** 2009. Sediment loading and control in crop and livestock agriculture in the Midwest. Presented at From Dust Bowl to Mud Bowl: Sedimentation, Conservation Measures and the Future of Reservoirs.
15. **Helmers, M.J.** 2005. Buffers and vegetative filter strips. Presented at Gulf Hypoxia and Local Water Quality Concerns Workshop

Teaching and Advising Activities

- Served as Major or Co-Major Professor for 24 students
- Served as Program of Study Committee Member for 86 graduate students
- Created and funded eight post-doctoral research positions