TESTIMONY OF DR. MARTY MATLOCK,
EXECUTIVE DIRECTOR, OFFICE FOR SUSTAINABILITY,
PROGRAM DIRECTOR, CENTER FOR AGRICULTURAL AND RURAL SUSTAINABILITY,
UA DIVISION OF AGRICULTURE, UNIVERSITY OF ARKANSAS, FAYETTEVILLE, AR

BEFORE THE SUBCOMMITTEE ON WATER AND WILDLIFE
US SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

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Honorable Chairman Cardin and Ranking Member Boozman, distinguished Members of the Subcommittee, and diligent staff, thank you for this opportunity to provide testimony to the Senate Subcommittee on Water and Wildlife on the subject of nutrient trading for protecting water quality throughout the United States. I have spent the past 20 years of my career chasing nutrients as they move through the watersheds of this country, identifying phosphorus and nitrogen sources, measuring impacts, and designing mitigation strategies. I have worked with agricultural producers, industries, and municipalities, as well as USEPA regional offices, to better understand and define solutions to issues associated with nutrient enrichment of our waterways.

Through this process I have come to believe that if we are to achieve increased productivity from the land and improved water quality for future prosperity we need a new way to manage nutrients from all sources in the watershed. One of the greatest obstacles is finding adequate funding for land-based best management practices (BMPs) on the land for nutrient transport prevention. Nutrient trading provides a promising strategy for overcoming this obstacle and achieving both these goals. We all live in watersheds. Nutrient enrichment in watersheds is a predictable outcome from all human activities. We all contribute to nutrient enrichment, either through our direct actions in our watersheds or indirect actions through the food we consume and products we purchase. The nutrient problem belongs to all of us, and so should the solutions.

In the past our approach to reducing undesirable outcomes from nutrient enrichment has focused on finding blame rather than solutions. Our history of pollution prevention and reduction has been based on the notion that the polluter pays. For conventional pollutants this approach has resulted in reduction of pollution from point sources, creating fishable and swimmable water bodies across the US. However, nutrients are not conventional pollutants; rather, they are both critical for ecosystem function at low levels and disastrous for ecosystem health at high levels. No single practice, technology, or approach will protect our waters from the impacts of nutrient enrichment. We must develop a more comprehensive, watershed-based, community-led approach.

Reducing nitrogen and phosphorus loads through nutrient trading within watersheds makes sense, but presents scientific, economic, and social challenges. Point sources such as municipalities and industries can partner with nonpoint sources such as row crop, specialty crop, and animal agriculture producers to find the most effective and affordable strategies for managing nutrient loads. This approach requires

quantifying nutrient credits from individual parcels of lands, finding economic advantages in nutrient load reductions with BMPs on those parcels, creating a market that provides equity across agents, and an adequate level of certainty of compliance with nutrient reduction goals. I worked with colleagues from Texas A&M University and the World Resources Institute more than a decade ago to develop NutrientNet, an online educational and demonstration program designed to support nutrient trading. Through this process we identified several key criteria necessary for successful nutrient trading programs: 1) a commonly understood nutrient concentration limit within the target streams; 2) an economic advantage for distributed, land-based BMPs over point source technologies to achieve those limits; 3)a broker to create and implement trades; and 4) regulatory certainty for National Pollutant Discharge Elimination System (NPDES) permit holders.

It is my judgment that the primary barrier to nutrient trading implementation is the uncertainty associated with compliance for NPDES permit holders. This uncertainty creates a perception of risk that stifles innovative solutions. Reducing this uncertainty may require a different approach to water quality permitting than the traditional NPDES compliance framework. We can never know with certainty the sources of nutrients across the landscape, and therefore must tolerate some level of uncertainty in land-based reductions of nutrient loads. Flexibility for innovation within the regulatory framework is necessary for developing and implementing effective nutrient trading strategies. USEPA has worked very hard over the past 20 years to develop and pilot a framework for nutrient trading. I strongly support USEPA's strategy for developing these regulatory innovations. Thank you for your time and interest.

Biography of Marty Matlock, Ph.D., P.E., B.C.E.E.

Professor of Ecological Engineering
Executive Director, University of Arkansas Office for Sustainability
Program Director, Center for Agricultural and Rural Sustainability
Biological and Agricultural Engineering
Room 233 Engineering Hall
University of Arkansas
Fayetteville, AR 72701
E-Mail: mmatlock@uark.edu

Office: 479/575-2849
Fax: 479/575-2846
Cell: 479/935-6013

Dr. Matlock is a Professor in the Biological and Agricultural Engineering Department at the University of Arkansas. He is a registered professional engineer, a Board Certified Environmental Engineer, and a Certified Ecosystem Designer. He serves as Executive Director of the UA Office for Sustainability and is a Program Director in the Center for Agricultural and Rural Sustainability. Dr. Matlock has authored or edited three books, more than 30 peer reviewed manuscripts, and has been awarded two US patents and five international patents.

The focus of Dr. Matlock's research has been on metrics that inform sustainable practices in design. He uses life cycle assessment to quantify metrics for sustainability. He applies ecological and environmental risk assessment and decision engineering to optimize design, management, and sustainability strategies. He coordinates academic, research, outreach, and facilities efforts in sustainable systems across the UA

campus. He serves as Chair of the Cherokee Nation Environmental Protection Commission, and as science advisor for sustainability for 12 food and agricultural product companies.

EDUCATIONAL BACKGROUND

Ph.D. Biosystems Engineering, 1996. Oklahoma State University, Stillwater, Oklahoma.
M.S. Plant Physiology (Department of Botany), 1989. Oklahoma State University, Stillwater, Oklahoma.
B.S. Soil Chemistry (Department of Agronomy), 1984. Oklahoma State University, Stillwater, Oklahoma.

PROFESSIONAL EXPERIENCE

Executive Director, Office for Sustainability (July 1, 2012 – Present) University of Arkansas, Fayetteville, Arkansas.

Area Director, Center for Agricultural and Rural Sustainability, UA Division of Agriculture (November 2007-Present) University of Arkansas, Fayetteville, Arkansas.

Professor of Ecological Engineering, Biological and Agricultural Engineering Department (July 2009-Present) University of Arkansas, Fayetteville, Arkansas.

Associate Professor of Ecological Engineering, Biological and Agricultural Engineering Department (August 2003-June 2009) University of Arkansas, Fayetteville, Arkansas.

Assistant Professor, Biological and Agricultural Engineering Department (August 2001-2003) University of Arkansas, Fayetteville, Arkansas.

Assistant Professor, Agricultural Engineering Department, (May 1996-August 2001) Texas A&M University, College Station, Texas.

PROFESSIONAL CERTIFICATIONS

- **Professional Engineer**, License Number 88864, Texas Board of Professional Engineers, Austin, TX, 2001 – Present.
- **Certified Ecological Designer,** American Ecological Engineering Society, 2011-2016
- **Board Certified Environmental Engineer**, American Academy of Environmental Engineers, 2011-Present

SELECT PEER REVIEWED/REFEREED JOURNALS

Leh, M., M. Matlock, E. Cummings, & L. Nalley, 2013. Quantifying and mapping multiple ecosystem services change in West Africa. Agriculture, Ecosystems & Environment, 165: 6-18.

Matlock, M., G. Thoma, E. Cummings, J. Cothren, M. Leh, and J. Wilson. 2012. Geospatial analysis of water use, water stress, and eutrophication impacts from US dairy production. International Dairy Journal.

Leh, M., M. Matlock, E. Cummings, G. Thoma, and J. Cothren. 2012. Measuring Ecosystem Service Change- A Case Study from a Northwest Arkansas Dairy Farm. International Dairy Journal.

Ludwig, A., M. D. Matlock, B. Haggard, I. Chaubey. 2012. Periphyton nutrient limitation and maximum potential productivity in the Beaver Lake Basin, USA. Journal of the American Water Resources Association. 48(5):896-908.

Morgan, R. and M. Matlock, 2008. A collaborative learning matrix for combining science with stakeholder involvement to prioritize watershed implementation in Arkansas' nonpoint source state management plan. Journal of Environmental Assessment Policy and Management. 10(3):1-25.

Rodriguez, A. and M. Matlock, 2008. Measuring Temporal Variability in Algal Nutrient Response in the Lake Waco/Bosque River Watershed. Journal of Biological Engineering. 2:1 (11Jan2008).

Ludwig, A., M. D. Matlock, B. Haggard, M. E. Matlock, E. Cummings. 2008. Identification and evaluation of nutrient limitation of periphyton growth in headwater streams in the Pawnee Nation, Oklahoma. Journal of Ecological Engineering. 32(2008): 178-186.

Sen, S., B.E. Haggard, I. Chaubey, K.R. Brye, T.A. Costello, and M.D. Matlock. 2006. Preliminary

investigation into sediment phosphorus release at Beaver Reservoir, Northwest Arkansas, 2002-3. Water, Air, & Soil Pollution, 179:67-77.

Ekka, S., B. Haggard, M. Matlock, and I. Chaubey. 2006. Dissolved phosphorus concentrations and sediment interactions in effluent-dominated Ozark streams. Biological Engineering 26:375-391.

White, K., B. Haggard, M. Matlock, J. Kim. 2005. Periphytic chlorophyll-a response to triclosan exposure: application of a passive diffusion periphytometer. Applied Engineering in Agriculture. 21(2):307-311.

Haggard, B., S. Ekka, M. Matlock, I. Chaubey. 2004. Phosphate equilibrium between stream sediments and water: Potential effect of chemical amendments. Transactions of ASAE, 47(4):1113-1118.

Paul, S., P. Haan, M. Matlock, S. Mukhtar, and S. Pillai. 2004. Analysis of the HSPF Water Quality Parameter Uncertainty in Predicting Peak In-Stream Fecal Coliform Concentrations. Transactions of ASAE. 47(1): 69-78.

Matlock M. D., D. E. Storm, M. D. Smolen and M. E. Matlock. 1999. Determining the lotic ecosystem nutrient and trophic status of three streams in eastern Oklahoma over two seasons. Journal of Aquatic Ecosystem Health and Management. 2(2): 115-127 .

Matlock M. D., D. E. Storm, M. D. Smolen, M. E. Matlock, A. McFarland and L. Hauck. 1999. Development and application of a lotic ecosystem trophic status index. Transactions of ASAE. 42(3): 651-656.

Matlock M. D., M. E. Matlock, D. E. Storm, M. D. Smolen and W.J. Henley. 1998. Limiting nutrient determination in lotic ecosystems using a quantitative nutrient enrichment periphytometer. Journal of the American Water Resources Association. 35 (5): 1141-1147.

Hession W.C., D. E. Storm, C. T. Haan, S. L. Burks and M. D. Matlock. 1996. A watershed-level ecological risk assessment methodology. Journal of the American Water Resources Association. 32(5): 1039-1054.

Matlock M. D., D. E. Storm, G.J. Sabbagh, S. L. Burks, M. D. Smolen and C. T. Haan. 1994. An ecological risk assessment paradigm using the Spatially Integrated Model for Phosphorus Loading and Erosion (SIMPLE). Journal of Aquatic Ecosystem Health. 3:1-8.

BOOKS

Popp, J., M. Jahn, N. Kemper, and **M. Matlock,** Eds. 2012. *The Role of Biotechnology in Feeding 9.25 Billion People*. Cambridge University Press, Cambridge, MA. ISBN: 978-0-521-19234-7.

Matlock, M. and R. Morgan, 2011. *Ecological Engineering Design: Restoring and Conserving Ecosystem Services.* John Wiley and Sons, NY, NY. 410 pgs. March 2011. ISBN-10: 0470345144

Luoni, S., J. Huber, K. **M. Matlock**. 2010**. Low Impact Development: a design manual for urban areas.** UA Press. UA Community Design Center, Fayetteville, AR. ISBN**:** 978-0-9799706-1-0.

Sabatier, P., W. Focht, M. Lubell, Z. Tracthenberg, A. Vedletz, and **M. Matlock**, Eds. 2005. *Swimming Upstream: Collaborative Approaches to Watershed Management*. Publisher: MIT Press, Boston, MA. ISBN: 0-262-19520-8; March 2005.

PATENTS

Osborn, G. S., **M. D. Matlock**, S. S. Teltschik. 2012. U.S. Patent 8,276,888. System and Method for Dissolving Gases in Fluids and for Delivering of Dissolved Gases. U.S., Issued 10/2/12. Patentee– The Board of Trustees of the University of Arkansas.

Osborn, G. S., **M. D. Matlock**, S. S. Teltschik. 2007. U.S. Patent 7,255,332, "System and Method for Dissolving Gases in Liquids" issued 8/15/07. Patentee– The Board of Trustees of the University of Arkansas.

MEMBERSHIP IN PROFESSIONAL SOCIETIES

AAEES – American Academy of Environmental Engineers and Scientists

AEES– America Ecological Engineering Society – Past-President 2008-2009; President, 2007-2008;

ASABE – American Society of Agricultural and Biological Engineers

ASCE - The American Society of Civil Engineering – Environmental Engineering Committee

APPOINTMENTS AND SERVICE

US Secretary of Agriculture's AC21 Committee for the Future of Agriculture in the US, 2011-Present

Field to Market Alliance for Sustainable Agriculture. Executive Committee, 2010 – Present.

The Cherokee Nation Environmental Protection Commission Chair, October 2005 - Present.

Board of Directors, BlueInGreen, LLC, 2004-Present, Fayetteville AR (Owner/Founder)