

Web and Atlas Resources to Promote Constructed Wetlands and Carbon Bioreactors

Kelly Addy, Univ. of RI

Workshop at the 2012 Land Grant and
Sea Grant National Water Conference

May 23, 2012

THE
UNIVERSITY
OF RHODE ISLAND



Applying knowledge to improve water quality

National
Water Program

*A Partnership of USDA NIFA
& Land Grant Colleges and Universities*

Artificial N Sinks

Advancing constructed wetlands and carbon bioreactors to abate edge-of field nitrogen losses

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[Atlas](#)

[FAQs](#)

[Resources](#)

[Contacts](#)

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Welcome

Through this integrated research, extension and education project, we seek to advance the adoption and strategic placement of appropriate bioreactor and constructed wetland designs, tailored to spatial/geographic conditions and climate regimes while understanding limitations and uncertainties, to remove offsite losses of N from agriculture lands

[Check the about page!](#)

Resources

This site is being populated with online resources geared toward stakeholders.

For farmers and ag:

- Fact Sheets
- [Case Studies](#)

For researchers and installers:

- Research Summaries
- Guidance Documents

For Teachers:

Upcoming Events

Workshop on **May 23**, Portland, OR

Special Session at ASA-CSSA-SSSA Annual Conference, **Oct 21-24**, Cincinnati, OH

In the News

Iowa: [Wetlands initiative tests the ability to clean up runoff water](#)

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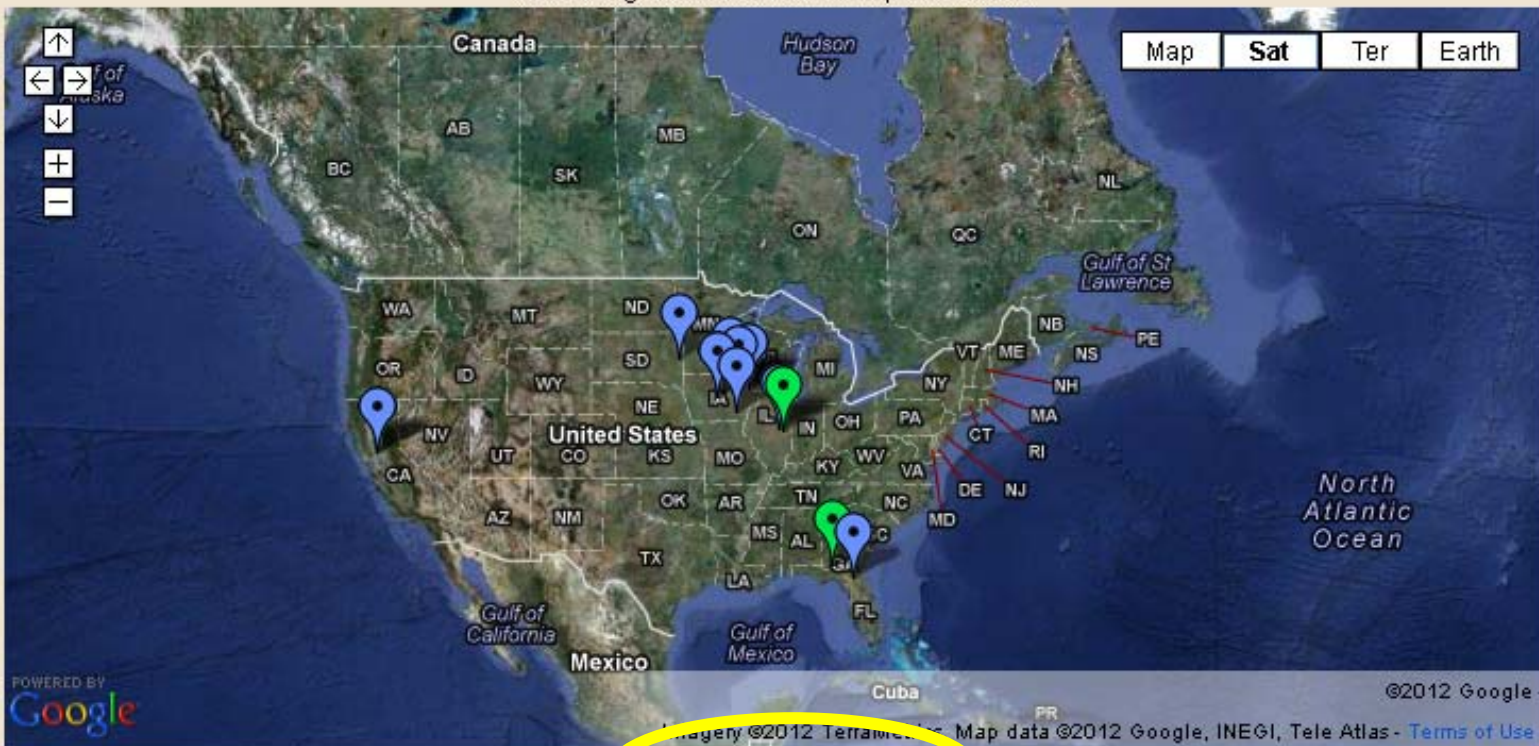
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International Atlas of Artificial N Sinks

This atlas will navigate around the world to show where carbon bioreactors and constructed wetlands are being researched and implemented.



[View Atlas in a larger window.](#)

Get directions

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Explore making custom maps in an [interactive tutorial](#).

Bioreactors and Constructed Wetlands in the U.S. and U.K

Bioreactor locations marked with blue place marks.
Constructed wetland locations marked in green.

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Ames, Iowa

Read Case Study Resources: Jaynes, D.B., T.C. Kaspar, T.B. Moorman, and T.B. Parkin. 2008. In situ bioreactors and deep drain-pipe installation to reduce nitrate losses in artificially drained fie...



DeLand, Illinois

Resources: Woli, K.P., M.B. David, R.A. Cooke, G.F. McIsaac, and C.A. Mitchell. 2010. Nitrogen balance in and export from agricultural fields associated with controlled drainage systems and denitrify...



South Dakota State University

Department of Agriculture and Biosystems Engineering



UC Davis- Dept. of Plant Sciences

Nitrogen Loss from Irrigated Fields Tim Hartz tkhartz@ucdavis.edu 530-752-1738



UC Davis- Dept. of Land, Air, and Water Resources

Read Case Study Resources: Diaz, F.J., A.T. O'Geen, and R.A. Dahlgren. 2012. Agricultural pollutant removal by constructed wetlands: Implications for water management and design. *Agricultural Wate...*



Hewitt Creek, Iowa

Researcher: Chad Ingels, Iowa State University



North Fork Maquoketa, Iowa

Researcher: Chad Ingels, Iowa State University



Lime Creek, Iowa

Researcher: Chad Ingels, Iowa State University



Alachua, Florida

Researcher: Casey Schmidt Read Case Study Photo credit: Schmic
Resources: Schmidt, C.A. and M.W. Clark. 2012. Efficacy of a

Nashua, Iowa
Updated 5 days ago

North East Research and Demonstration Farm Bioreactor

[Read Case Study](#)

Researcher: Laura Christianson, Ph.D.
Iowa State University

Resources: Christianson, L.E., A. Bhandari, and M.J. Helmers. 2011. Pilot-scale evaluation of denitrification drainage bioreactors: reactor geometry and performance. *Journal of*

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[Search](#)

Iowa State University Pilot Tests

Situation: Denitrifying bioreactors hold great promise to reduce nitrogen (N) loads to streams in tile-drained agricultural settings. One design challenge of these bioreactors is to balance the ability to treat substantial volumes of drainage flow and still maintain sufficient retention time for N transformations to take place over a range of temperatures and flow rates.

Actions: Researchers at Iowa State University examined the impact of bioreactor geometry, storm flows and nitrate-N concentration on N reduction in a series of pilot-scale bioreactors in tile drained agricultural settings with local hardwood woodchips.



Take-home message:

- Retention times of 4-8 hrs in a bioreactor can yield 30-70% N reduction from tile drainage waters.
- Design-estimated retention times under-estimated field observations, probably due to nonideal flow resulting from the design of the pipes within system.
- Stay tuned for more information on revisions in bioreactor size recommendations.

For more information:

- Christianson et al. 2011. Pilot-scale evaluation of denitrification drainage bioreactors: Reactor geometry and performance. *Journal of Environmental Engineering* 137.
- Email Dr. Laura Christianson at laurachristianson@gmail.com, Dr. Matthew Helmers at mhelmers@iastate.edu, or Dr. Alok Bhandari at bhandari@ksu.edu

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[Our Project](#)

[Atlas](#)

[FAQs](#)

[Resources](#)

[Contacts](#)

[Search](#)



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[Our Project](#)

[Atlas](#)

[FAQs](#)

[Resources](#)

[Contacts](#)

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Case Studies

Constructed Wetlands:

[Agricultural pollutant removal by constructed wetlands, UC Davis](#)

[Effectiveness of constructed wetlands in reducing nitrogen and phosphorus export from agricultural tile drainage, Univ. of Illinois](#)

[Multiyear nutrient removal performance of three constructed wetlands intercepting tile drain flows, New Zealand](#)

[Nutrient Management of Nursery Runoff Water using Constructed Wetland Systems, Clemson University](#)

Carbon Bioreactors:

[Alternative systems to reduce nitrogen from artificially drained fields, USDA-ARS](#)

[Comparing Carbon Substrates for Denitrification of Subsurface Drainage Waters, Iowa State University & USDA-ARS](#)

[Efficacy of a denitrification wall to treat continuously high nitrate loads, University of Florida](#)

[Nitrate removal and hydraulic performance of organic carbon for use in denitrification beds, New Zealand](#)

[Nitrate removal from three different effluents using large-scale denitrification beds, New Zealand](#)

[Pilot Tests, Iowa State University](#)

REMINDER:

Please fill out the survey
and return to me!

Thank you!

Panel discussion and meeting will follow formal presentations

- Location: Salon H
- Time: 10:15 to noon
- Purpose: To build a community of practitioners, researchers and technology transfer experts who contribute expertise and guidance to the project
- Panel includes:
 - Laura Christianson, Iowa State University
 - Casey Schmidt, University of Florida
 - Pat Willey, NRCS West National Technical Center
 - Keegan Kult, Iowa Soybean Association
 - Jeppe Kjaersgaard, South Dakota State University