

## Indiana- MCCC State Report 2014

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Highlight (papers finally resulting from Princeton meeting in fall 2010, on potential for cover crop use across the Midwest and their potential impact on nitrate loadings to Gulf)  
Eileen Kladivko, Tom Kaspar, et al.

We assessed the potential for widespread adoption of cover crops across the states of Indiana, Ohio, Illinois, Iowa, and Minnesota, and the subsequent potential impact of that adoption on reducing nitrate losses to the Mississippi River and Gulf of Mexico. The analysis used data about current cropping and tillage systems in the region and then made some assumptions about where cover crops could be adopted with relatively modest changes in practice. A soil and water quality model were used to determine the effectiveness of the cover crops in reducing nitrate losses. Under the assumptions of our analysis, widespread adoption of cover crops could reduce nitrate loads to the Mississippi River by about 20%. This represents a significant portion of the target of 45% reduction for the region. The analysis suggests that cover crops could be a very important part of the region's nutrient reduction strategy, and expanded efforts should be made to help overcome the challenges and obstacles to cover crop adoption.

- Kladivko, E.J., T.C. Kaspar, D.B. Jaynes, R.W. Malone, J. Singer, X.K. Morin, and T. Searchinger. 2014. Cover crops in the upper midwestern United States: Potential adoption and reduction of nitrate leaching in the Mississippi River Basin. *J. Soil Water Cons.* 69:279-291.
- Malone, R.W., D.B. Jaynes, T.C. Kaspar, K.R. Thorpe, E. Kladivko, L. Ma, D.E. James, J. Singer, X.K. Morin, and T. Searchinger. 2014. Cover crops in the upper midwestern United States: Simulated effect on nitrate leaching with artificial drainage. *J. Soil Water Cons.* 69:292-305.

### Research

Ongoing studies by Dr. Eileen Kladivko and graduate students include:

- Effects of cover crops on soil health. This project began in fall 2012 as part of a Conservation Innovation Grant (CIG) project (see Extension listings). Research plots at three Purdue Agricultural Centers were started with oats/radish, cereal rye, and oats/radish/crimson clover/cereal rye mixes in replicated plots under both corn and soybeans. Measurements include a variety of soil health parameters including aggregation, penetration resistance, soil nitrate at time of biomass termination, biological soil health indicators, and soil moisture during the growing season. Selected measurements are also being made on 12 farmer cooperator sites. Sara Alford, Holly Hauenstein
- Corn Systems Coordinate Agricultural Project (CSCAP)—We are part of a large regional project on corn systems and climate, led by Dr. Lois Wright Morton at Iowa State. The

project includes 10 states and over 40 principal investigators. Cover crops are one of the practices being studied by about six of those states. The objectives are to determine the effect of rye cover vs. no cover, in both corn and soybeans, on the resilience of the system to climate stresses. This includes measurements of soil moisture content, soil quality measures, soil nitrate in fall and spring, and crop growth and yield. Rye was chosen as the cover crop because it was the most widely adaptable across the whole region in the project. Some states (like us) are also doing smaller studies with other cover crops, such as radishes (see below). Trevor Frank, Joe Rorick.

- Oilseed radish bicultures and their effects on nitrogen cycling. The objectives were to evaluate the effect of oilseed radish alone vs. oilseed radish mixed with oats or cereal rye, on N uptake in the fall and subsequent release the following spring/summer in a field growing corn. This is a one-year, one-site repetition of the MS work of Kaylissa Horton. Trevor Frank

Continuing work led by Dr. Shaun Casteel, Dept. of Agronomy ([scasteel@purdue.edu](mailto:scasteel@purdue.edu))

- Manure and cover crops. Ph.D. student Edwin Suarez, who did M.S. on slurry seeding.

Continuing work by Dr. Keith Johnson, Dept. of Agronomy ([johnsonk@purdue.edu](mailto:johnsonk@purdue.edu))

- Utilizing cover crops and summer annuals as double cropped forages following wheat (Ph.D. student John McMillan finishing up). The objective is to determine the suitability and forage quality of ten crop species at varying nitrogen application rates. The crops that are being investigated are; grain amaranth, BMR sorghum sudangrass, pearl millet, teff, foxtail millet, oat, chickling vetch, forage turnip, and oilseed radish.

Continuing work by Dr. Lori Hoagland, Dept. of Horticulture ([lhoaglan@purdue.edu](mailto:lhoaglan@purdue.edu))

- Developing best management strategies for organic hop production – We are evaluating different cover crop species and cover crop management practices in organic hopyards in WA and MI to determine their potential to improve soil health and provide supplemental nitrogen. Other collaborators on the project are evaluating whether these can suppress weeds and provide habitat for beneficial insects.

Some long-term or always ongoing work continues:

- Winter wheat cover crop used in tile drainage research project, where nitrate is measured in tile drainflow. This year flew on a 4-way mix into standing soybeans. Long-term (25+yrs) but no simultaneous comparison without cover crop. Could make more measurements related to N cycling, if regional collaboration.
- Biomass crops, new and old work (Miscanthus, switchgrass)
- Ongoing work on pest suppression (disease, nematode, weeds) and in vegetable production (Dept. of Botany and Plant Pathology; Dept. of Horticulture)
- Always ongoing work on forages for hay or grazing (Dr. Keith Johnson, Dept. of Agronomy, [johnsonk@purdue.edu](mailto:johnsonk@purdue.edu))

#### Extension/Education/Outreach/On-farm trials

Tremendous growth in interest in cover crops in Indiana has continued. All of the partners in the Indiana Conservation Partnership have seen the need for increased training and services related to cover crops. The Indiana Conservation Partnership includes NRCS, Soil and Water

Conservation Districts (SWCD), Conservation Cropping Systems Initiative (CCSI), Indiana State Department of Agriculture (ISDA), State Soil Board, and Purdue Extension. Highlights of major activities are given here:

1. Conservation Cropping Systems for Soil Health and Productivity--A Conservation Innovation Grant (CIG) was awarded to the Indiana Association of Soil and Water Conservation Districts (IASWCD) and partners of Purdue Extension, ISDA, NRCS, and others, starting in fall 2012. The project established four regional hubs around the state, for trainings and workshops on soil health. The major practices being discussed are cover crops and conservation cropping systems, especially no-till. Twelve farmer cooperators are involved in helping train-the-trainers and mentoring other farmers who want to transition to conservation cropping systems. Activities include strip trials of their current system vs. a new practice on their farms, workshops and field days on their farms, and field trials and trainings at regional university research farms. Train-the-trainer workshops have included Advanced Cover Crops and Advanced Conservation Cropping Systems, one of which was offered in each regional hub each year. Main presenters include the core team for the project, including Fisher, Kok, Towery, and Kladvko. At least three farmer workshops per regional hub are offered each year and include a variety of topics. Soil health sampling is accomplished by regional teams pulled from across the Partnership, strengthening ties among the participating agencies. Lisa Holscher is project coordinator ([lisa.holscher@in.nacdn.net](mailto:lisa.holscher@in.nacdn.net)). We are currently seeking other funds to continue this project.
2. Introduction to Soil Health workshops, as train-the-trainer opportunities, were offered again in February 2015. These were aimed at providing an introduction to soils and soil health, cover crops, and no-till, to new employees and to those wanting a refresher on some of the concepts being brought to farmers at soil health field days and workshops. Each session had around 10 participants, allowing for hands-on exercises and much discussion. The costs were covered by SARE funds allocated to the state through our SARE representative Roy Ballard (county Extension Educator).
3. Soil Health, in-depth 3-day training. This training is led by Barry Fisher, IN- NRCS, with assistance from Kok, Kladvko, and others. The main audience is NRCS but other participants include county Extension, SWCD, and ISDA field staff.
4. Purdue Extension working with colleagues in the MCCC, produced the second edition of the Cover Crop Pocket Guide. Since its Sept 2014 printing run of 20,000, about 15,000 copies have been distributed. A new ipad app, or iphone and android app, will be developed, after some further discussions and the hiring of our new MCCC program mgr.
5. We are making progress on broadening the base of faculty and Extension specialists involved with cover crop Extension publications and education. Currently we have two publications in process, as a consensus document on how to get started in cover crops, for example. Ongoing process.
6. Conservation Cropping Systems Initiative (CCSI)—this five year old initiative of the Conservation Partnership put two experienced people on the ground, for working with farmers interested in no-till, cover crops, and other conservation practices. (Hans Kok and Dan Towery). They worked with SWCDs, NRCS, and Extension to promote and educate. This program is now transitioning to an Extension employee at Purdue to fill

that role, and we are currently searching for a M.S.-level agronomist. See website <http://www.in.gov/isda/ccsi/>. Very involved in the CIG mentioned above.

7. Soil Health Partnership (SHP)—This new initiative by National Corn Growers, Monsanto, The Nature Conservancy, and Environmental Defense Fund, has many of the same objectives as the Indiana CCSI, but it has expanded the area to all three “I” states (Iowa, Illinois, Indiana). There are ongoing discussions to try to coordinate and collaborate between these two programs.
8. Jasper County SWCD Cover Crop Demonstration Program continued in 2014. This continues to be an excellent example of on-farm cover crop demonstrations, with many different farmers participating. Led by Dan Perkins, Watershed and Conservation Program Specialist ([www.jaspercountyswcd.org](http://www.jaspercountyswcd.org)). Other demonstration plots or on-farm trials occurred at various locations around the state, usually initiated by farmer interest but often facilitated by NRCS, SWCD, Extension, or agronomic consultants.
9. Discussion of cover crops as a way to reduce nitrate leaching to tile drains, is included as a standard part of Extension talks on tile drainage and water quality.