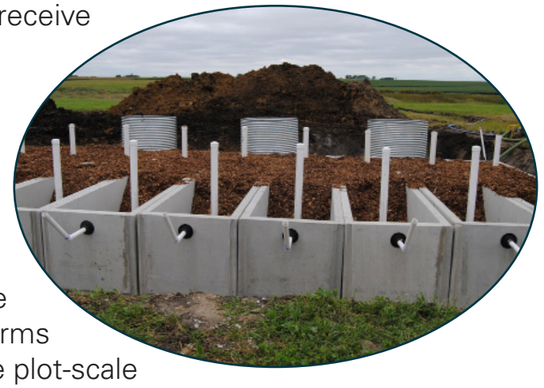
IOWA NUTRIENT RESEARCH CENTER

Selected Research Progress Highlights

Cover crops and seedling disease: It's in the timing. (ISU)

The most common cover crop grown in Iowa is winter rye. Under some conditions, farmers have seen a drop in corn yield following winter rye. Research has uncovered one possible explanation: seedling disease. Field and lab studies show that the timing between ending the winter rye crop and planting corn must be carefully considered to blunt the impact of seedling disease. Answering questions like these for crop growers is important because research has shown that cover crops can limit nutrient loss and improve nutrient cycling in corn-soybean rotations. In recent years the acres of cover crops planted have increased dramatically, although still well short of the millions of acres needed to reach goals outlined in the Iowa Nutrient Reduction Strategy.

A more comprehensive picture of bioreactors emerging. (ISU)



Bioreactors are edge-of-field systems that receive water from drainage tiles. As that water passes through woodchips, nitrogen is converted to a harmless gas by microbes. Studies show bioreactors can reduce from 15 to 60 percent of a field's annual nitrate load. To more closely study the performance of bioreactors, the Iowa Nutrient Research Center partnered with Iowa State University Research and Demonstration Farms to build a bioreactor research site with nine plot-scale bioreactors. ISU researchers are working to determine best practices and the ideal combination of fill material to customize bioreactors. They are able to compare a control bioreactor to bioreactors with variables including different water flow rates and types of woodchips. The research system is unique in that water from a large drainage area is pumped into the bioreactor, making it no longer weather dependent. These controlled variables provide a more comprehensive picture of how to create more ideal bioreactors.

Putting the pieces together in the Cedar River (UNI)

Two years and 28 sites later, researchers have achieved a more comprehensive understanding of the dynamics between nutrient distribution, transport and biogeochemical transformation in the Cedar River watershed. Field data collected on total P, dissolved N, total suspended solids, total dissolved solids, turbidity and dissolved O provide essential information to quantify the impact of soil runoff and high intensity rainfall on a watershed.

Stacked best management practices: A totem of conservation (UI)

A side by side comparison of two sub-watersheds shines a light on the effectiveness of stacked nutrient reduction practices. The first phase of the project included installing sensor technology in both sub-watersheds to monitor discharge and nitrate concentrations. The second phase involved working with landowners to install stacked practices in the treatment sub-watershed.

Science of saturated buffers. (ISU)

Riparian buffers are a proven conservation tool for reducing the movement of nutrients from surface runoff and shallow, subsurface water flow. Sometimes water bypasses this zone through drainage tile. Research shows that one promising approach to intercept this water is by installing a saturated buffer. Additional plumbing is added under riparian buffer areas to divert some water from field tiles into a streamside saturated buffer. As water moves through the saturated buffer, microorganisms and plant roots process the nitrate. The saturated buffer concept came from an ISU – USDA joint research project. The first farm-scale saturated buffer was installed in September 2014 in Tama County as part of the Benton/Tama Nutrient Reduction Demonstration Project. A second saturated buffer is scheduled for installation this spring (2016) in Black Hawk County as part of the Miller Creek Water Quality Improvement Project. Saturated buffers are now under consideration for approval as a statewide cost-shared nitrate removal practice.

Conservation and profit though precision technology. (ISU)

Using precision technology, scientists can show farmers and landowners locations where implementing conservation practices make the most sense — and the most dollars. Efforts to reduce nutrient losses may be hampered by perceived economic costs. In some cases, farmers have not seen a clear economic incentive to change land management in ways proven to reduce nutrient losses. Farmers are shown where incorporating management practices like prairie or wetlands would save them money on crop inputs on low-yielding areas of the field and how they would improve water quality.

Nutrient trading: An alternative incentive. (UI)

Financial incentives are one way to encourage landowners to implement nutrient management practices. Researchers are studying another means of adoption by creating a framework of tradable credits. Contributors of N and P could generate tradable credits by implementing conservation practices that reduce nutrient levels below required levels. Those who collect credits could then sell them to point source contributors downstream who also need to meet required nutrient levels or reductions. This way, the credits provide an additional source of revenue to the sellers that could cover the cost of conservation implementation and potentially provide additional profit.

Modeling the history of the Raccoon River. (UI)

Researchers designed a statistical model based on climate, agriculture and the economy to determine the seasonal concentration of nitrogen in the Raccoon River at Van Meter over a time span of four decades. The development of this model will allow the investigation of the sensitivity of nitrate loads and concentrations to different combinations of human and nonhuman predictors.

One size does not fit all: Nutrient reduction benefits at field-scale. (UI)

The Iowa Nutrient Reduction Strategy identifies the nutrient reduction potential of several best management practices largely at plot scale. There has been a lack of data and tools available to assess how individual and bundled management practices act in large watersheds. This project aims to develop a numerical tool that will quantify the benefits of soluble nutrient reduction strategies at multiple scales, from the field scale to the larger watershed.

Watershed impacts across landscapes. (ISU)

One size does not fit all in nutrient management, which is why scientists are working on ways to better assess water quality impacts across landscapes and using multiple nutrient management practices. For most of the cultivated cropland in Iowa, researchers believe the most appropriate scale for assessing nutrient concentration is between five hundred and a thousand acres. From this scale, they will be able to better understand how implemented conservation practices work in combination across the landscape.

Training on custom seed mixes for prairie strips. (UNI)

Two sites planted with 10% prairie strips serve as a teaching tool for comparing establishment costs and vegetation attributes of general versus customized prairie seed mixes. For landowners to consider adopting the practice, they need to see examples in fields similar to theirs. A highly successful prairie planting can be achieved when carried out by experienced practitioners using a custom seed mix.

Remote sensing to map progress of nutrient management practices. (ISU)

Using satellite images, Iowa Nutrient Research Center researchers are developing a way to more clearly measure the adoption of many conservation practices. For some practices, such as crop rotations, satellite sensor data has been readily available. Researchers are working to determine and refine the best way to collect data for other conservation practices such as cover crops, residue cover, riparian buffers, flow or erosion control structures. By taking a systematic approach in inventorying in-field and edge-of-field nutrient management practices, scientists hope to map the progress of conservation adoption.

Scaling up prairie strips to document water quality benefits. (ISU)

Building on a long running research project, scientists are now evaluating the water quality benefits when prairie strips are installed on a full farm field scale. The Science-based Trials of Rowcrops Integrated with Prairie Strips (STRIPS) project at the Neal Smith National Wildlife Refuge near Prairie City has documented water quality benefits since 2007. By integrating tallgrass prairie vegetation into row-cropped watersheds, the diverse mix of plants reduces erosion and runoff by slowing water and holding soil in place. The STRIPS research team has helped implement prairie strips on 20 farms in Iowa and one in Missouri.

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The Iowa Nutrient Research Center was established in 2013 by the State Board of Regents in response to legislation passed by the Iowa Legislature and signed by Governor Branstad.

For more infomation: www.cals.iastate.edu/nutrientcenter

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