McHenry County Farm Bureau

Summer 2020 Virtual Field Day

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McHenry County Conservation District

Illinois Extension
College of Agricultural, Consumer & Environmental Sciences

Speakers for the Virtual Field Day included:

Lauren Lurkins
Director of Environmental Policy, Illinois Farm Bureau (IFB)

Dan Volkers
Manager, McHenry County Farm Bureau

Elizabeth Kessler
Executive Director, McHenry County Conservation District

John Henning
President, McHenry County Conservation District Board of Trustees, and Former Vice President, McHenry County Farm Bureau

Gabe Powers
Natural Resources Projects Coordinator, McHenry County Conservation District

Brad Woodson
Natural Resources Manager, McHenry County Conservation District

Dr. Laura Christianson
Assistant Professor, Department of Crop Sciences, University of Illinois College of Agricultural, Consumer & Environmental Sciences

McHenry County Farm Bureau

McHenry County Farm Bureau (CFB) is a non-profit organization based in Woodstock, Illinois, that represents over 750 farm families on local, state, and national issues. An additional 7,700 associate members utilize services from McHenry CFB and support the organization in a variety of ways.

McHenry CFB provides members with legislative representations on trade, transportation, education, renewable fuels, land use, taxes, and government regulation. They also provide members the opportunity to participate in educational events, conferences, and seminars. Through their Ag in the Classroom program, the organization offers educational materials, programs, and institutes to 2,500 teachers.

Illinois Farm Bureau Nutrient Stewardship Efforts

Since 2015, IFB has contributed to an impressive statewide effort, the NLRS. Through leadership and participation from our farmer members across the state, IFB has been able to make meaningful contributions toward water quality improvements in Illinois. From 2016 to present, IFB has committed approximately $1.5 million of its own funding to build and maintain its sustainability programs.

The NLRS is a science-based framework for using research, technology and industry experience to assess and reduce nutrient loss to Illinois waters and to the Gulf of Mexico. The NLRS sets forth a plan to leverage existing programs to optimize nutrient loss reduction while promoting collaboration, research, and innovation among the private sector, academia, non-profits, wastewater treatment agencies, the agricultural sector, and state and local government. The primary goals include reducing nitrate-nitrogen losses by 15% and reducing total phosphorus losses by 25% by the year 2025 from established baseline conditions. The NLRS was released in July of 2015 after multiple years of stakeholder discussions in which IFB actively participated. Since 2015, IFB has continued its participation in NLRS meetings and work groups in order to strategically guide the effort. In addition, IFB created new programs in 2015 to support farmer implementation of best management practices (BMPs) to help Illinois meet the goals of the NLRS.

For the past several years, IFB has made it an organizational priority to lead on environmental issues, most notably, the NLRS. IFB's NLRS efforts focus in four priority areas: 1) education and outreach to farmers, landowners and the general public; 2) supporting research of best management practices to reduce nutrient loss from agricultural fields; 3) supporting farmer implementation efforts across the state; and 4) demonstrating progress toward the long-term goals of the NLRS. The IFB Board of Directors committed significant financial resources and support from staff to accomplish some ambitious goals, allowing IFB to tackle environmental challenges head-on. IFB will continue to prove that voluntary, incentive-based conservation, based on science, will move the needle on water quality improvements in our state.

The IFB Nutrient Stewardship Grant Program is one example of the many ways IFB is creating lasting impacts in implementing the NLRS across Illinois. This program funds CFB projects throughout the state focused on improving soil health and water quality. Since 2015, IFB has dedicated over $550,000 to CFBs to complete a wide range of unique projects, including planting test plots of cover crops, watershed planning, water testing, hosting education and outreach activities. For more information on IFB's environmental efforts, see www.ilfb.org/take-action/current-priorities/protecting-our-environment.

McHenry County Conservation District Farm Management Program

McHenry County Conservation District (District) manages over 25,600 acres of open space graced with woodlands, prairies, wetlands, and savannas. Within its holdings, the District also leases roughly 5,400 acres in farmland and currently works with 70 different farmers as part of its Farm Management Program. All of the farm tracts are managed with District-approved conservation plans that ensure adequate protection and conservation of natural resources. Whether it's District-owned parcels or fields of local farmers, both allow for scenic and cultural landscapes and provide relief from suburban sprawl. Agricultural land also helps to control flooding, protect wetlands and watersheds, absorb and filter nutrients, and provide groundwater recharge.

The District's Farm Management Program helps to preserve tracts of land as open space and keeps it set aside for future improvements without the threat of development. It also preserves a way of life in the county, provides jobs, and builds a partnership with local farmers. Leasehold taxes are paid on District Agricultural Lands to maintain revenue to schools and other local government agencies.

The District has implemented Best Management Practices (BMP's) such as field borders, filter strips, crop rotation, and grass waterways for many years. McHenry County, along with much of the Midwest, has experienced heavy rain events in recent years, which has led to an increase in erosion and flooding. The changing weather pattern, along with the goal of a more sustainable Agricultural program, has prompted the District to take a more aggressive approach to conservation. New leases require no fall tillage, and cover crops are required on highly erodible land. The District is conducting farm field assessments by measuring crop residue *(Figure 1)*, shovel probes for soil health *(Figure 2)*, and soil compaction *(Figure 3)* along with standard soil testing.

The recently implemented bioreactor project *(Figure 4)* is another step in proactively implementing a conservation practice. The bioreactor will not only treat drain tile water in a high-quality stream, but it will also give biologists and scientists an opportunity to study and correlate farm practices and environmental health.

We are ultimately tied to the land for food, water, wildlife, and clean air. Blending sustainable agricultural practices with natural areas gives the District the best chance for a healthy and productive landscape.

Figure 1. Measuring Crop Residue

Figure 2. *Cool Season Pasture Shovel Probe*

Figure 3. *Compacted Soil*

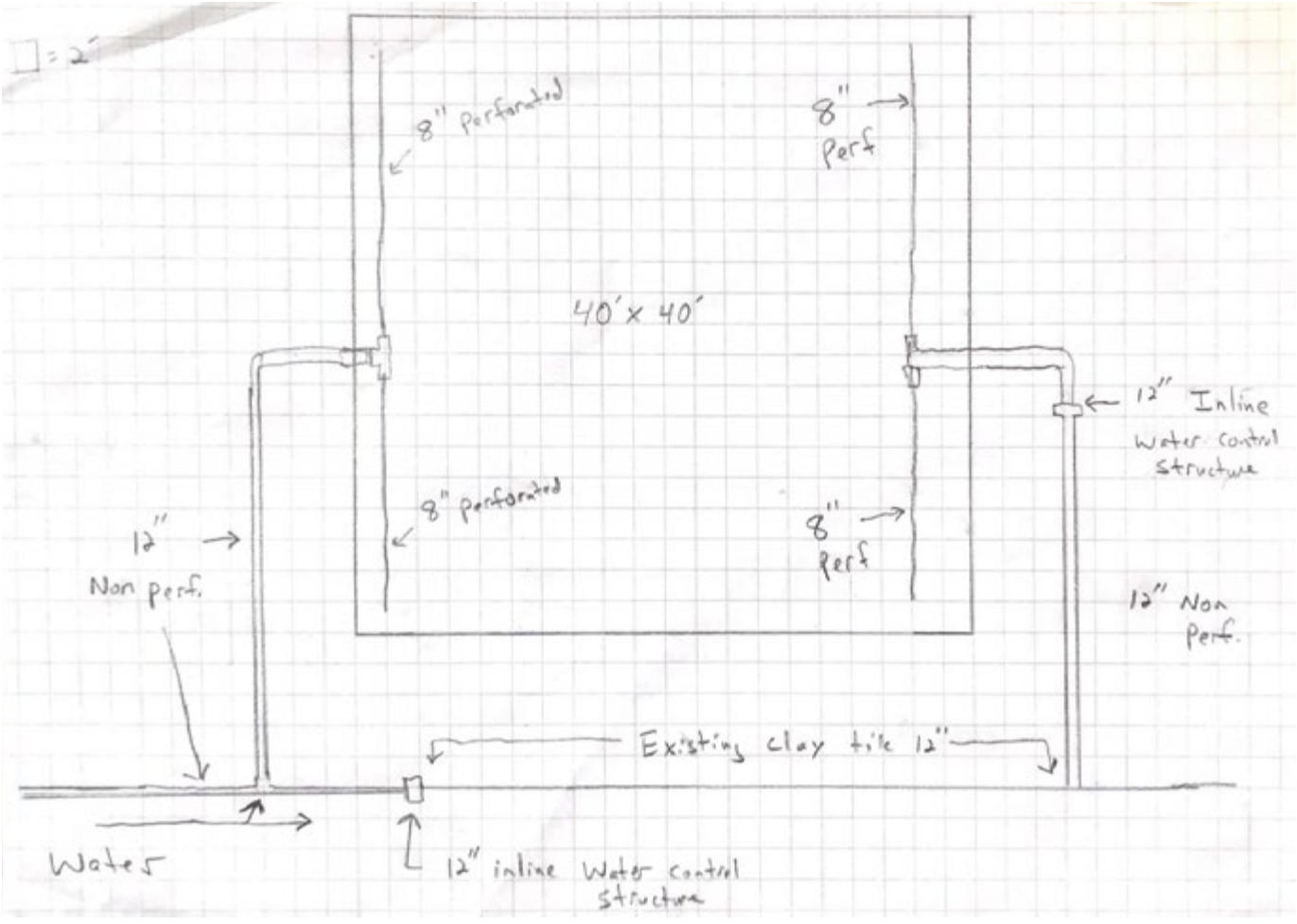


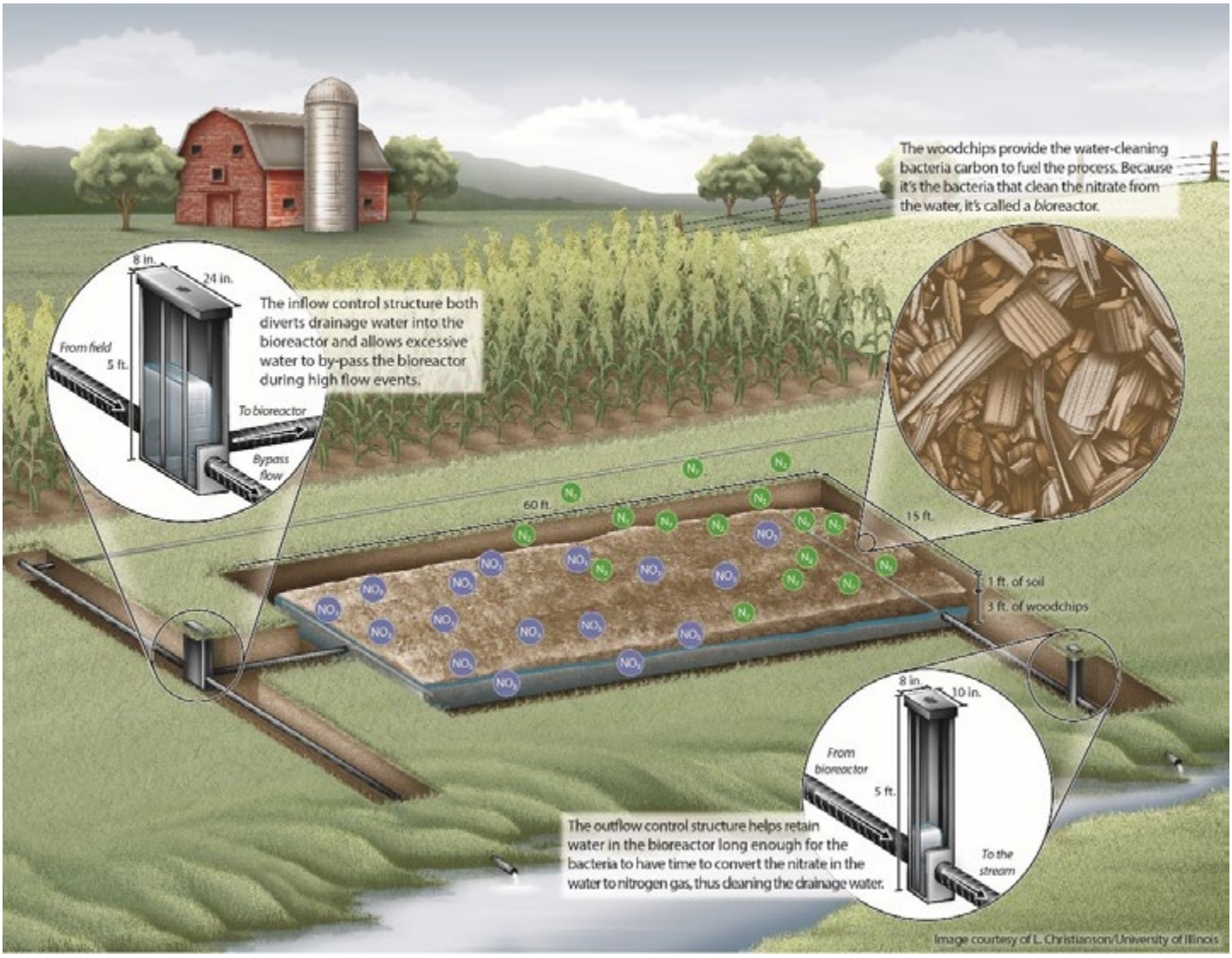
Figure 4. Woodchip Bioreactor Design Schematic

Woodchip Bioreactor Research

Content provided by Dr. Laura Christianson, Assistant Professor, University of Illinois College of Agricultural, Consumer & Environmental Sciences

Agricultural productivity in the US Midwest is underlain by a foundation of more than 48 million acres of tile drainage networks, with approximately 10 million tile-drained acres in Illinois alone. After more than 150 years of improving land drainage in this way, this practice is fully integrated into the economy and culture of our crop production. However, in changing how water leaves our fields by installing tile pipes, we have also changed how nutrients can leave our fields. Nitrate is a particularly tricky nutrient because it does not "stick" to soil and is thus highly susceptible to leaching. Edge-of-field practices like woodchip bioreactors allow us to keep our tile drainage systems functioning for good crop production while also cleaning nitrate out of drainage water before it moves downstream.

A woodchip bioreactor is a woodchip-filled trench that cleans nitrate from tile drainage water. Bioreactors clean nitrate from water using the process of denitrification, which is a natural part of the nitrogen cycle where nitrate in the soil or in water is converted into benign nitrogen gas. This process of denitrification has been happening for millions of years on its own, and in a bioreactor, ideal conditions are created to enhance this nitrate conversion. One of the important aspects of denitrification is that the process is performed by bacteria. These denitrifying bacteria are the work horses of converting the nitrate in the water to harmless nitrogen gas. In other words, inside a bioreactor, the nitrate doesn't stick to the woodchips or get physically filtered out of the water. It is biologically converted into nitrogen gas by these bacteria. It is this biological conversion of nitrate that lends the name "bio"-reactor.



Picture of previous woodchip bioreactor installation.

From a research perspective, there are two main pieces of information needed to estimate how much nitrate a woodchip bioreactor has removed. Firstly, researchers collect water samples at the inflow control structure and at the outflow control structure. The water samples are brought to a laboratory and are analyzed to determine their nitrate concentrations. There should be a lower nitrate concentration in the water, leaving the bioreactor compared to the water flowing in. That means the bioreactor is working. Oftentimes automated samplers are used to do the water sampling, so research staff doesn't have to be physically at the bioreactor to collect the samples over long periods of time.

However, simply collecting water samples does not provide the full picture of how well a bioreactor is working. The amount of water being treated in the bioreactor also needs to be quantified. The second component of bioreactor research is monitoring the water flow. Small hot-dog shaped pressure transducers are placed in the control structures to continuously record how much water is pushing down on them as the water flows through the structure. That water depth is logged and later related to a flow rate using an equation in the laboratory. A lot of water pushing down on the pressure transducer is related to a high flow rate, whereas relatively shallower depths of water pushing down on the pressure transducer are related to relatively slower water flow rates.

One of the most commonly asked questions about bioreactors is: "How long do the woodchips last?" Practical observation and research across the US Midwest have shown woodchips in a bioreactor last approximately 7-12 years before the woodchips need to be replaced (or, "recharged"). Another common question involves if the type of woodchip matters. The short answer is the tree species used to make the woodchips generally does not matter. All woods contain roughly the same amount of carbon, which is the fuel for the process of denitrification inside a bioreactor. Rather than the type of tree, it's the physical size and shape of the woodchips that are more important. Locally-available woodchips will be most cost-effective, but they must be clean from leaves or dirt. Ideally, the woodchips should have a square/ rectangular "chip shape" and be around 1" or more in size. There is a restriction on the use of oak woodchips due to concerns about leaching of tannins, although this is an area of active research.

Contact Information

You can contact the McHenry CFB at:

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To learn more about all other IFB Nutrient Stewardship Virtual Field Days, visit: www.ilfb.org/FieldDays

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