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## **Cleaning Up Agricultural BMP Efficiencies to Clean Up the Upper Mississippi**

The Center is wrapping up work that has taken our experience in the Chesapeake Bay watershed with implementation of a regional TMDL and applied it in a new location and to a different source sector. Working from our new Champaign, Illinois office, the Center evaluated state plans for achieving the nutrient reduction goals identified in EPA's Gulf Hypoxia Action Plan. This plan calls for the 12 states within the Mississippi River basin to produce agricultural nutrient loss reduction strategies to reduce nutrients to the Gulf of Mexico by 45%, primarily through implementation of agricultural best management practices (BMPs). The Center reviewed three such plans—for Iowa, Illinois, and Minnesota—and initiated regional discussions on the nutrient reductions assigned to agricultural BMPs in these plans, to ultimately provide funders and regulators with the ability to quantify the benefits from funds spent on nutrient reduction in the Upper Mississippi basin.

The project involved a one-day workshop to convene Walton Family Foundation (WFF) stakeholders—who are interested in a standard set of numbers to measure the success of their funding efforts in the basin—and development of a white paper summarizing the BMP efficiencies and per-acre costs from each state plan. While each strategy must account for statewide differences in local climate and agricultural practices, achieving general agreement on the pollutant removal associated with each BMP will allow WFF and other multi-state funding programs to uniformly measure progress and to prioritize their limited restoration dollars. Members of the Gulf Hypoxia Task Force, State representatives who develop the nutrient reduction strategies and the North Central Region Water Network have also expressed interest in greater consistency across state BMP efficiencies to facilitate tracking of cumulative effectiveness towards the Gulf Hypoxia nutrient reduction goal. The results may also provide State nutrient trading programs with consistent trading currencies.

Table 1 presents the BMP efficiencies found in the state strategies reviewed. While there is a great deal of similarity across the states, some exceptions include cover crops, land retirement, nitrogen management and bioreactors. In some cases these are due to regional differences or design factors, as is likely the case with bioreactors. Bioreactors are a newer agricultural BMP, so the body of literature supporting the efficiencies also tends to be limited and standard designs are just being introduced. Limited or inconsistent data sources played a role in the variability of efficiencies for the other BMPs.



**Table 1. Nutrient Removal Efficiencies for Agricultural BMPs in State Nutrient Reduction Strategies**

Practice	Nitrogen Reduction			Phosphorus Reduction		
	Iowa	Minnesota	Illinois	Iowa	Minnesota	Illinois
<b>Wetlands</b>	52%	50%	50%	0%	0%	0%
<b>Buffers</b>	91%	95%	90%	58%	58%	50% (25%*)
<b>Cover Crops</b>	31% (28%^)	51% (10%&)	30%	29%	29%	30% (50%®)
<b>Perennial Energy Crops</b>	72%	95%	90%	34%	34%	90% (50%*)
<b>Land Retirement</b>	85%	83%	NI	75%	56%	NI
<b>Grazed Pasture or Hayland</b>	85%	95%	NI	59%	59%	NI
<b>Controlled Drainage</b>	33%	33 to 44%	NI	NA		
<b>Nitrification Inhibitor</b>	9%	14%	10%			
<b>Nitrogen Management</b>			+			
>Timing & rate reduction	NI	26%	NI			
>Timing	6%	NI#	15 to 20%			
>Sidedress	5%	NI#	NI			
>Split application	NI	NI	15 to 20%			
<b>Maximum Return to Nitrogen (MRTN)</b>	10%	16%	10%			
<b>Bioreactor</b>	43%	13%	25%			
<b>Conservation Tillage</b>	NA					
<b>Soil Test Phosphorus (STP)</b>				17%	17%	7%
<b>Phosphorus Banding</b>				24%	24%	NI

\* Reduced efficiency on tile drained land.

^ Oats have a slightly lower efficiency than rye.

& For cover crops planted after corn or soybeans grown for grain

@ Used with extended rotation (corn-soybeans-wheat)

NI = Not included in strategy.

NA = Not applicable.

+ The larger number is applicable to central and southern Illinois.

# Included in the "Stacked" number

† If moving to no-till from chisel tillage.

Since the overall goal is to quantify benefits from dollars spent in the Upper Mississippi, one of the next steps is to discuss whether the differences among states need to be reconciled to assist with gross tracking and general decision-making. The comparison of these three state strategies representing the Upper Mississippi will help other states begin the dialog on how the respective approaches can be better aligned and to identify gaps in knowledge as well as focus areas for future research.

This work was funded by the Walton Family Foundation. For more information, contact Reid Christianson at [rdc@cwpc.org](mailto:rdc@cwpc.org).

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## Help Define the Center's Research on Source Water Protection – take our short survey!

This year, the Center identified six priority research topics and asked our members and our audience of stormwater and watershed practitioners to help us decide which one should be the focus of a new fundraising campaign. Through our March Mayhem competition, Protecting Drinking Water at its Source was selected.

*Millions of people in the U.S. get their drinking water from public water supplies. While each State has assessed their water supply watersheds for potential threats to drinking water quality, many water utilities struggle with source water protection because the authority to make local land use decisions lies instead with municipal government leaders. A 2015 survey of water suppliers showed that 57% of utilities own less than 2% of the land in the source drainage area. The proposed research seeks to help bridge this fundamental disconnect between water resource management and land use planning and regulation.*

Over the coming year, the Center will be working on a capital fundraising campaign so that we can begin to tackle this important topic. To help us get started, we've created a short survey designed to identify the challenges, needs and successful examples of local land use planning and regulation agencies protecting drinking water supplies.

[Take the Survey](#)

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## Restoration Research Grant Award

The Center is starting up a new research project with Carroll County, Maryland Bureau of Resource Management on "The self-recovery of stream channel stability in urban watersheds due to BMP implementation." Carroll County was recently awarded a grant for this work through the Chesapeake Bay Trust's Restoration Research Program.

Decades of research have improved the scientific understanding of urban hydrology and stream processes, including hydraulics, that have informed the way stormwater is regulated and managed. This scientific-based understanding of stormwater runoff, including its quality, quantity and downstream impacts, has advanced the innovative design of best management practices (BMPs) to better protect water resources. However, the degree to which upland BMPs can mitigate flows that contribute to excessive stream bed and bank erosion remains a needed area of research.

Recent observations and modeling from Carroll County point to the potential for headwater streams to self-repair unstable banks when upland BMPs that treat nearly 100% of the drainage area are present. This research will evaluate the hydrogeomorphic response of BMP implementation in headwater stream drainage areas to determine if reductions in stream energy facilitate self-recovery of stream channel stability.

The research will use a paired watershed study design to evaluate the effect of BMPs on stream channel protection in downstream receiving waters. Six candidate stream reaches have been selected with similar land cover characteristics, contributing drainage areas, and stream order. The results will provide recommendations for crediting flow-controlling BMPs as a hydrogeomorphic stream stabilization technique within the framework of the Chesapeake Bay total maximum daily load. Work is expected to begin this summer. For more information, contact Dr. Neely Law at [nll@cwpc.org](mailto:nll@cwpc.org).



## CWPA Member Highlight:

### *Carolyn White, Harris County, TX Flood Control District*



Carolyn White works for the Harris County Flood Control District's Stormwater Quality Department and finds the CWPA membership invaluable in staying connected with watershed management resources and practices used throughout the U.S. As a Phase I MS4 permittee, in an area where most waterways are impaired for bacteria, the District looks to many sources for ideas on how to better implement its Stormwater Management Program, including the bacteria reduction plan.

While implementing local flood damage reduction projects, the District incorporates stormwater quality enhancement features, where practicable. Typical stormwater detention basins are designed as wet bottom detention basins to accommodate stormwater treatment wetlands. Ms. White has worked with consultants to prepare a guidance manual<sup>1</sup> for District engineers that outlines the benefits of wetlands, provides planning level considerations, and steps through engineering design, construction, revegetation, and operations and maintenance of stormwater treatment wetlands in detention basins.

Once in place, several of these detention basins have been included in a regional best management practice monitoring program. Using the International BMP Database criteria as its basis, Ms. White managed development of the Southeast Texas Stormwater Quality BMP Database ([www.bmpbase.org](http://www.bmpbase.org)), which provides a mapping interface, on-the-fly queries, statistical analysis, and a mapping interface to allow the public and District managers to access the data and learn about regional BMP effectiveness.

Ms. White is currently working with a multi-disciplinary team at the District to develop a Natural Stable Channel Design Guidance Manual that will bring principles of fluvial geomorphology into local flood conveyance projects. For more information, visit [www.hcfcd.org](http://www.hcfcd.org).

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<sup>1</sup> [https://www.hcfcd.org/media/1757/designguidelineswetbottombasins\\_final.pdf](https://www.hcfcd.org/media/1757/designguidelineswetbottombasins_final.pdf)

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## Center Announcements

- Next Webcast: Incentivizing BMP Installation in Communities with Stormwater Utilities; September 14, 2016, 1-2:30 PM EST; [Click here to register for the webcast](#)
- The Watershed Science Bulletin is seeking article submissions that present applied research in watershed and stormwater management. Articles for this peer-reviewed, online journal are accepted on a rolling basis. [Click here for submission requirements.](#)
- Center for Watershed Protection 2015 Annual Report Now Available: [Click here to see what we accomplished in 2015!](#)