AGRICULTURE'S CLEAN WATER **ALLIANCE**

CURRENT PROJECTS

In 2015, Agriculture's Clean Water Alliance (ACWA) continued to invest and support water quality improvements in the Boone, Raccoon and Des Moines rivers. Supporting the objectives outlined in the annual work plan, this year, ACWA launched a Water Quality Initiative (WQI) project, participated in an ag-urban tour and a farm tour, continued stream and expanded tile water monitoring efforts as well as delved into social media.

ELK RUN WQI

Acting on historical water monitoring data and local interest, ACWA received a grant for the Elk Run Watershed through the Iowa Department of Agriculture's WQI program in spring of 2015. This grant — matched with support from 16 partners — provides the watershed $713,000 to assist farmers in parts of Sac, Calhoun and Carroll Counties with implementing water conservation practices outlined in the Iowa Nutrient Reduction Strategy. Additionally, a dedicated water quality coordinator was hired to support farmers participating in the project.

The Elk Run Watershed WQI offers the opportunity to address nutrient losses and demonstrate a farmer-coordinated and partner-supported approach to conservation.

During the three-year project, outreach will highlight various technologies that reduce nutrient loss while maintaining productivity. Specific conservation practices to be implemented include bioreactors, saturated buffers, cover crops, nitrification inhibitors and drainage water management.

The Elk Run WQI strives to further awareness and ultimately adoption of water quality conservation practices, through evaluating present practices, collecting water samples, implementing practices and uniting farmers, partners and urban entities.

CALHOUN URBAN-AG TOUR

Building relationships between urban and rural constituencies is an essential part of addressing water quality issues in the state. In the spirit of rural-urban collaboration, ACWA participated in an Urban-Ag Conservation Tour in April 2015 hosted by the Calhoun County Soil and Water Conservation District (SWCD) visiting locations in Rockwell City, Lohrville and Twin Lakes. The tour showcased urban conservation practices and allowed for a discussion on how cities, communities, individual homeowners and units of government could help manage stormwater and implement practices that are beneficial for protecting water quality, reducing flooding and improving quality of life. Practices included permeable pavers, bioretention cells and native prairie, which collect and filter stormwater to reduce erosion, flooding and contaminants. On the tour, ACWA also took the opportunity to discuss the Elk Run WQI and its work to connect with other urban-ag projects in the region to promote efforts being made to improve water quality in both the urban and rural sectors.

CONSERVATION AT WORK – SMELTZER FARM TOUR

Capitalizing once again on the excellent layout and location of the Smeltzer Farm, ACWA took the opportunity to educate farmers about conservation practices by participating in a field day where 60 farmers gathered on September 2 to see "Conservation at Work." In addition to the many conservation practices — a restored oxbow, bioreactor, conservation tillage, buffer strips and a restored prairie — featured at the Smeltzer Farm, the event provided information on cover crops and watershed projects plus demonstrated drones and even an aerial cover crop application. Harry Ahrenholtz, ACWA chairman, presented and described the organization's role in the installation of one of the first bioreactors in the state as well as the ACWA-led Elk Run Watershed project. The event successfully presented conservation practices to farmers in the ACWA target watersheds and went one step further in presenting data and real-world experiences with cover crops. Farm-News and KWMT radio conducted onsite interviews with ACWA representatives.

WATER MONITORING

In 2015, ACWA continued its water monitoring support in the Boone, Raccoon and Des Moines rivers along with four targeted watershed projects including the Boone River WQI, Lyons Creek Watershed Project, Lizard Creek Watershed Planning Project and Black Hawk Lake Watershed Project. Additionally, two new targeted watershed projects were added — Elk Run WQI and Headwaters of the North Raccoon WQI.

Water samples obtained this year by ACWA in the Raccoon and Boone River watersheds reaffirm the need for continuous improvement and greater collaboration. Water monitoring is the cornerstone of ACWA, because it provides a benchmark for measuring progress. ACWA collected 2,500 water samples from 75 sites, which were analyzed for nitrate-nitrogen and turbidity, plus several hundred also were analyzed for coliform bacteria, alkalinity and total organic carbon.

Data this year showed more than half of the 45 Raccoon River water monitoring sites reported their highest average nitrate levels in 10 years of data collection. The Boone River also experienced high nitrate concentrations across 30 sample sites. These results were not unexpected, considering weather patterns during the past decade. This year's data reaffirms ACWA's focus and demonstrates the challenges that often arise when working with Mother Nature.

ACWA LAUNCHES FACEBOOK PAGE

Social media is a vital part of the growing communication landscape. ACWA determined its member organizations and audience could benefit from information being available on Facebook and launched a page in early 2016. Project updates and events, nutrient management facts and customer successes will be featured on the page at ***facebook.com/AgCleanWaterAlliance.***

LOOKING FORWARD TO 2016

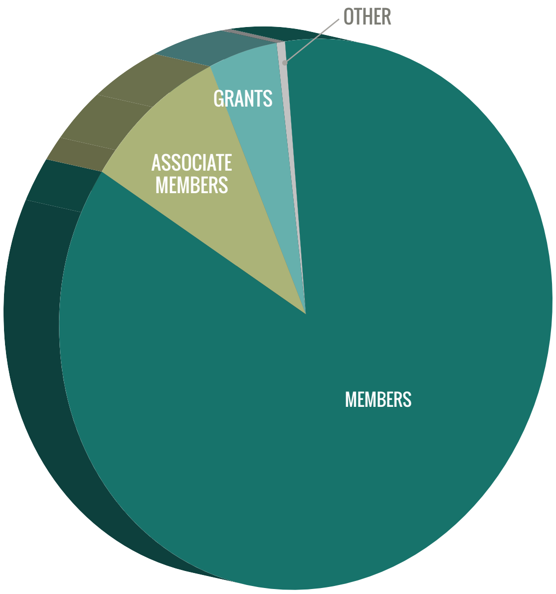
In 2016, ACWA looks forward to working within its realigned mission and objectives to have a greater impact on the Raccoon and Des Moines River watersheds and the environment. The new mission is "Helping agriculture identify and implement solutions that reduce nutrient loss to Iowa's waters." ACWA's 2016 objectives include expanded focus on tile line monitoring as well as establishing a research and development initiative focused on water management, tile line controls, bioreactors, saturated buffers and other new water quality technologies.

FINANCES

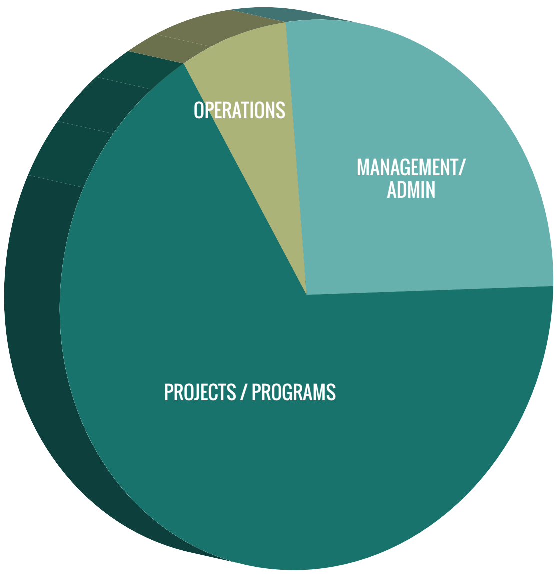
ACWA TOTAL REVENUE				
TYPE	**2001-2016**	**2001-2016**	**2016**	**2016**
MEMBERS	$257,871	60%	$3,024,493	86.04%
ASSOCIATE MEMBERS	$85,000	20%	$320,000	9.10%
GRANTS	$80,000	19%	$160,000	4.55%
OTHER	$3,600	1%	$10,800	.31%
TOTAL REVENUE	**$426,471**	**100%**	**$3,515,293**	**100%**

ACWA TOTAL EXPENSES				
TYPE	**2001-2016**	**2001-2016**	**2016**	**2016**
MANAGEMENT/COMMUNICATION	$1,081,045	33.42%	$98,100	26.83%
PROJECTS/PROGRAMS	$1,920,963	59.39%	$243,470	66.58%
OPERATIONS	$232,650	7.19%	$24,119	6.60%
TOTAL EXPENSES	**$3,234,658**	**100%**	**$365,689**	**100%**

ACWA TOTAL REVENUE



ACWA TOTAL EXPENSES



CURRENT PROJECTS

ACWA MEMBERS

Ag Partners LLC
Albert City, Iowa | www.agpartners.com

Crop Production Services
Wall Lake, Iowa | www.cpsagu.com

First Cooperative Association
Cherokee, Iowa | www.firstcoop.com

Gold-Eagle Cooperative
Goldfield, Iowa | www.goldeaglecoop.com

Heartland Co-op
West Des Moines, Iowa | www.heartlandcoop.com

Helena Chemical Company-Midwest Division
West Des Moines, Iowa | www.helenachemical.com

Key Cooperative
Roland, Iowa | www.keycoop.com

Landus Cooperative
Ames, Iowa | www.landuscooperative.com

NEW Cooperative, Inc.
Fort Dodge, Iowa | www.newcoop.com

Pro Cooperative
Pocahontas, Iowa | www.procooperative.com

Van Diest Supply
Webster City, Iowa | www.vdsc.com

ASSOCIATE MEMBERS

Calcium Products
Ames, IA | www.calciumproducts.com

Dow Agriscience
Indianapolis, IN | www.dowagro.com

Hagie Mfg.
Clarion, Iowa | www.hagie.com

Koch Fertilizer, LLC
Wichita, KS | www.Kochind.com

Verdesian Life Sciences
Cary, NC | www.vlsci.com

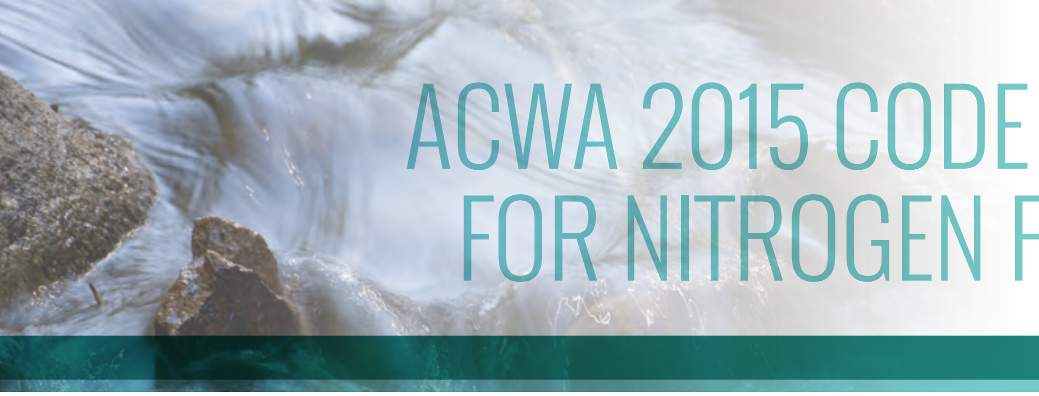
CONTRIBUTORS

Iowa Soybean Association | *www.iasoybeans.com*

The Nature Conservancy | *www.nature.org*

USDA Natural Resources Conservation Service | *www.nrcs.usda.gov*

Iowa Department of Agriculture and Land Stewardship | *www.iowaagriculture.gov*



ACWA 2015 CODE OF PRACTICE FOR NITROGEN FERTILIZATION

PURPOSE:

To establish reasonable and practicable guidelines for nitrogen fertilization applications to reduce nitrate loss from farm fields.

WHY:

Effective management of nutrients on farms in the watershed is one of the keys to enhancing both environmental quality and profitable crop production. Consistent with the Iowa Nutrient Reduction Strategy, this Code of Practice provides information about guidelines adopted by the ACWA members as a condition of membership.

APPLICATION GUIDELINES:

1. A nutrient budget for nitrogen, phosphorus and potassium shall be developed that considers all potential sources of nutrients including manure, legumes, etc. Nutrient recommendations shall be based on current soil test results, realistic yield goals, environmental impact and producer management capabilities.
2. Use the standardized county temperature and forecast maps found at ***extension.agron.iastate.edu/NPKnowledge/*** as part of the decision-making process for fall fertilizer application.
3. Delay fall anhydrous applications without a nitrification inhibitor until soil temperatures are:
   - 50° F, trending lower
   - Notify Association office of start of application for accountability documentation — email record to mwhitcomb@isamanagementsolutions.com.
4. Regardless of time of year application occurs, encourage use of other nutrient management technologies such as stabilizers, slow-release fertilizers, incorporation or injection, soil nitrate testing and other technologies that minimize loss to surface or ground water resources.
5. If producer is participating with USDA Conservation Programs, additional considerations for producer conformance with NRCS 590 Nutrient Management standard shall be followed. For guidance and requirements see standard: Iowa Nutrient Management Conservation Practice Standard Fact Sheet — What's New That Affects You in the Iowa 590 Standard?
6. Encourage use of other supporting practices where feasible:
   - Tile line denitrification bioreactor
   - Constructed wetland
   - Conservation stream buffer
   - Fall cover cropping system

IOWA NUTRIENT REDUCTION STRATEGY

In 2013, the Iowa Nutrient Reduction Strategy was adopted to move the state toward an overall 45 percent reduction in nitrogen and phosphorous loss. The plan, which was spurred by the 2008 Gulf Hypoxia Action Plan, set the goal of reducing nitrogen loss by 41 percent and phosphorous loss by 29 percent for nonpoint sources — including agriculture.

In order to achieve this goal, a variety of approaches and practices were identified for implementation across Iowa's farmland. Practices outlined in the plan include cover crops, land use changes, edge-of-field practices and nutrient management to help make the goal a reality.

As Iowa agriculture works to accelerate the pace and scale of voluntary practice implementation and adoption, an understanding of the impact of these practices is critical for all involved.

A valuable first step is to understand the categories individual practices fall into:

- **Management practices** are any activity that changes the approach to management of crop production including the timing and method of nutrient application and the use of cover crops or reduced tillage.
- **Land use practices** include ways agriculture is adjusting the utilization of specific types or plots of land in order to better fit the environment including perennial energy crops, extended rotations, grazed pastures and land retirement.
- **Edge-of-field practices** are those activities that can be placed next to or on the field border to mitigate unwanted affects and include drainage water management, wetlands, bioreactors, buffers, terraces and sediment control.

A science assessment was conducted during the development of the strategy to identify effective nutrient reduction practices in these three categories — nitrogen and phosphorus management, land use and edge-of-field. See the charts originally provided in the Iowa Nutrient Reduction Strategy on the following pages to gain an understanding of the ability of specific practices to reduce nitrogen and phosphorous loss.

Knowledge of the projected reduction can be a key factor to helping farmers identify the practices that will ultimately help them reach their individual goals for reduction.

IOWA STRATEGY TO REDUCE NUTRIENT LOSS: NITROGEN PRACTICES[1]

	PRACTICE	COMMENTS	% NITRATE-N REDUCTION +
			AVERAGE (SD*)
EDGE-OF-FIELD	Drainage Water Mgmt.	No impact on concentration	33 (32)
	Shallow Drainage	No impact on concentration	32 (15)
	Wetlands	Targeted water quality	52
	Bioreactors		43 (21)
	Buffers	Only for water that interacts with the active zone below the buffer. This would only be a fraction of all water that makes it to a stream.	91 (20)
	Saturated Buffers	Divert fraction of tile drainage into riparian buffer to remove Nitrate-N by denitrification.	50 (13)
LAND USE	Perennial	Energy Crops – Compared to spring-applied fertilizer	72 (23)
		Land Retirement (CRP) – Compared to spring-applied fertilizer	85 (9)
	Extended Rotations	At least 2 years of alfalfa in a 4 or 5 year rotation	42 (12)
	Grazed Pastures	No pertinent information from Iowa – assume similar to CRP	85
NITROGEN MANAGEMENT	Timing	Moving from fall to spring pre-plant application	6 (25)
		Spring pre-plant/sidedress 40-60 split compared to fall-applied	5 (28)
		Sidedress – Compared to pre-plant application	7 (37)
		Sidedress – Soil test based compared to pre-plant	4 (20)
	Source	Liquid swine manure compared to spring-applied fertilizer	4 (11)
		Poultry manure compared to spring-applied fertilizer	-3 (20)
	Nitrogen Application Rate	Nitrogen rate at the MRTN (0.10 N:corn price ratio) compared to current estimated application rate. (ISU Corn Nitrogen Rate Calculator – http://extension.agron.iastate.edu/soilfertility/nrate.aspx can be used to estimate MRTN but this would change Nitrate-N concentration reduction)	10
	Nitrification Inhibitor	Nitrapyrin in fall – Compared to fall-applied without Nitrapyrin	9 (19)
	Cover Crops	Rye	31 (29)
		Oat	28 (2)
	Living Mulches	e.g. Kura clover – Nitrate-N reduction from one site	41 (16)

+A positive number is nitrate concentration or load reduction and a negative number is an increase.
*SD = standard deviation. Large SD relative to the average indicates highly variable results.
[1]Source: Iowa Nutrient Reduction Strategy Nitrogen Practices Assessment https://store.extension.iastate.edu/Product/Reducing-Nutrient-Loss-Science-Shows-What-Works

IOWA STRATEGY TO REDUCE NUTRIENT LOSS: PHOSPHORUS PRACTICES[1]

	PRACTICE	COMMENTS	% P LOAD REDUCTION[+]
			AVERAGE (SD*)
EROSION CONTROL PRACTICES	**Terraces**		77 (19)
	Buffers		58 (32)
	Control	Sedimentation basins or ponds	85
LAND USE CHANGE	**Perennial Vegetation**	Energy Crops	34 (34)
		Land Retirement (CRP)	75
		Grazed pastures	59 (42)
PHOSPHORUS MANAGEMENT PRACTICES	**Phosphorus Application**	Applying P based on crop removal – Assuming optimal STP level and P incorporation	0.6[a]
		Soil-Test P – No P applied until STP drops to optimum or, when manure is applied, to levels indicated by the P Index[b]	17[c]
	Source of Phosphorus	Liquid swine, dairy, and poultry manure compared to commercial fertilizer – Runoff shortly after application	46 (45)
		Beef manure compared to commercial fertilizer – Runoff shortly after application	46 (96)
	Placement of Phosphorus	Broadcast incorporated within 1 week compared to no incorporation, same tillage	36 (27)
		With seed or knifed bands compared to surface application, no incorporation	24 (46)
	Cover Crops	Winter rye	90 (17)
	Tillage	Conservation till – Chisel plowing compared to moldboard plowing	33 (49)
		No till compared to chisel plowing	90 (17)

[+]A positive number is P load reduction and a negative number is increased P load.
[*]SD = standard deviation. Large SD relative to the average indicates highly variable results.
[a]Maximum and average estimated by comparing application of 200 and 125 kg P_2O_5/ha, respectively, to 58 kg P_2O_5 /ha (corn-soybean rotation requirements) (Mallarino et al., 2002).
[b]ISU Extension and Outreach Publication (PM 1688)
[c]Maximum and average estimates based on reducing the average STP (Bray-1) of the two highest counties in Iowa and the statewide average STP (Mallarino et al., 2011a), respectively, to an optimum level of 20 ppm (Mallarino et al., 2002). Minimum value assumes soil is at the optimum level.
[1]Source: Iowa Nutrient Reduction Strategy Phosphorus Practices Assessment https://store.extension.iastate.edu/Product/Reducing-Nutrient-Loss-Science-Shows-What-Works






IOWA NUTRIENT REDUCTION STRATEGY

EDGE-OF-FIELD PRACTICES

The Iowa Nutrient Reduction Strategy sets an aggressive goal for agriculture to reduce its nitrogen loss by 41 percent to meet the overall reduction of 45 percent. Nutrient management, cover crops, land use changes and edge-of-field practices are listed as ways to achieve this reduction.

While working with current production methods, edge-of-field practices show the biggest impact potential with more consistent performance in terms of nitrogen reduction. Edge-of-field practices targeted to reduce nitrogen from field tiles reaching streams often include bioreactors, Conservation Reserve Enhancement Program (CREP) wetlands, drainage water management and saturated buffers. Table 1 describes potential locations and impacts of conservation drainage practices and three edge-of-field practices.

TABLE 1. CONSERVATION DRAINAGE OPTIONS.

PRACTICE	LOCATION PRACTICE APPLIES	N REMOVAL % AVERAGE CONCENTRATION (SD*)[+]	CHALLENGES
Drainage Water Management (DWM)	Flat fields with 0.5%-1% grades. Can be installed on new tile or retrofitted to existing systems.	33 (32)	Difficult to retrofit unless previous tile was installed along field contours.
Shallow Drainage	New tile installations or when splitting lateral spacing.	32 (15)	Requires closer lateral spacing, increasing the cost compared to conventional.
Bioreactor	30-100 acre drainage areas with 6 in.-10 in. tiles. Not recommended for smaller drainages.	43 (21)	No economic benefit and requires periodic management.
Saturated Buffer	Non-incised channel and 30 ft. buffer minimum.	50 (13)	Site specific and minimal performance data.
CREP Wetlands	0.5%-2% wetland to drainage area and minimum 500 acre drainage area.	52	Large footprint and design time.

[*] SD = standard deviation
[+] Iowa Nutrient Reduction Strategy Nitrogen Reduction Practices Assessment

BIOREACTORS

Nitrogen in the form of nitrate is highly water-soluble and can be lost from the farm landscape as water moves through the soil profile and into tile systems.

A bioreactor is constructed to remove nitrate from tile systems, and is essentially an underground pit of woodchips. Water flowing through the tile line is redirected into the bioreactor's woodchips. Microorganisms colonize the woodchips and use them as a food source, convert the nitrate and expel it as nitrogen gas. Since the nitrogen is released as a gas, a bioreactor functions without becoming a sink for nitrogen.

Bioreactor systems are easy to construct, cost effective, take little or no land out of production and require minimal maintenance. When managed correctly, there are no adverse effects on crop production, and they are designed to avoid unwanted drainage restriction.

Iowa State University research estimates that 50-70 percent of total annual tile flow can be directed through a bioreactor. Iowa Soybean Association research has documented nitrate removal efficiency between 20-60 percent from on-farm bioreactors.

SATURATED BUFFERS

A saturated buffer removes nitrate from field tiles by intercepting the tile at the edge of the field and redistributes the water through the carbon-rich soil profile of the buffer or filter strip where denitrification occurs. A control structure is used to raise the water table and force the water through the lateral distribution lines, but allows water to bypass if the saturated buffer is at capacity.

Initial results indicate saturated buffers can remove nearly all of the tile water nitrate distributed through the system, and is only limited by the amount of water that bypasses. Annual nitrate load reductions of more than 60 percent have been reported.

OXBOWS

Oxbows are a meander of a river that has been cut off from present flow of water either by the process of a river's natural movement or as a result of channel straightening. Most oxbows are well suited to restoration because the land is usually marginal and not conducive for crop production.

Functioning oxbows provide numerous benefits to people including water filtration and flood storage. Oxbows also create habitat for wildlife, particularly birds, fish and amphibians. The slow-moving water found in oxbows is critically important for the endangered Topeka shiner, a minnow that requires off-channel habitat to complete its life cycle.

DRAINAGE WATER MANAGEMENT

The purpose of drainage water management (DWM) is to manage the water table with control structures to reduce drainage during periods when it is not needed. Water may be stored in the soil profile to be made available to the crop during portions of the year when water is scarce. Research by Skaggs et al. 2012 has reported 18-75 percent nitrate load reduction, based on system design, location, soil and site conditions. DWM nitrate load reductions are a result of reduced flow volumes.

CONSERVATION RESERVE ENHANCEMENT PROGRAM WETLANDS

The Conservation Reserve Enhancement Program (CREP) is a coordinated state and federal government financial assistance program available for farmers to establish constructed nutrient treatment wetlands. Iowa CREP wetlands collect tile water in a vegetated shallow pool to promote denitrification and vegetative assimilation of nitrogen as well as provide wildlife habitat. Nitrogen reduction varies based upon the size of wetland relative to its drainage or watershed area. According to the Iowa Nutrient Reduction Strategy, constructed nutrient treatment wetlands in Iowa have averaged 52 percent nitrate concentration reduction. CREP wetlands are strategically placed to provide the most water quality benefit — typically lower in the watershed landscape where the watershed feeds into the receiving stream or river. Through this positioning, wetlands receive a larger volume of tile water and correspondingly trap and treat more nitrate before the water moves downstream. CREP wetlands are placed in a position to not impede upslope drainage, but the wetland itself may remove land from production.

In order for the Iowa Nutrient Reduction Strategy to be successful, edge-of-field practices need to play a vital role. Research and dissemination of information regarding the effectiveness of both proven and innovative practices will be essential to future success.