Celebrating Ten Years of Leadership & Commitment to Clean Water

10TH ANNIVERSARY

1999-2009

ACWA

How do you Measure Opportunity?

Every year, Des Moines Water Works treats about 15 billion gallons of water from the Des Moines and Raccoon Rivers and the shallow groundwater wells heavily influenced by them.

Water sourced from the Des Moines and Raccoon is consumed by approximately

500,000

people — that's around 17% *of Iowa's population. In the Upper Midwest, only Lake Michigan, the Mississippi River, and the Missouri River supply water to more people from a surface water resource.*

Water. It's a critical resource.

RIVER STEM

Des Moines Headwaters
Acres: 790,000
Percent Row Crop: 78
Sample Sites: 2
2009 Average Nitrate Concentration at Outlet: 3.2 mg/L

West Fork Des Moines
Acres: 703,000
Percent Row Crop: 81
Sample Sites: 12
2009 Average Nitrate Concentration at Outlet: 4.1 mg/L

East Fork Des Moines
Acres: 843,000
Percent Row Crop: 86
Sample Sites: 18
2009 Average Nitrate Concentration at Outlet: 7.7 mg/L

Boone
Acres: 583,000
Percent Row Crop: 88
Sample Sites: 30
2009 Average Nitrate Concentration at Outlet: 7.8 mg/L

Des Moines
Acres: 1,091,000
Percent Row Crop: 76
Sample Sites: 25
2009 Average Nitrate Concentration at Outlet: 6.2 mg/L

North Raccoon
Acres: 1,594,000
Percent Row Crop: 81
Sample Sites: 31
2009 Average Nitrate Concentration at Outlet: 8.8 mg/L

South Raccoon
Acres: 727,000
Percent Row Crop: 67
Sample Sites: 14
2009 Average Nitrate Concentration at Outlet: 6.7 mg/L

President's Report

It's a pleasure for me to write this year's ACWA president's report, as we mark the 10th Anniversary of our organization. It's amazing how we've grown as a group of ag retailers brought together for the single cause of reducing nutrient loss, particularly nitrates, from entering the watersheds we serve.

Many key people were involved in the formation of this endeavor in 1999. Individuals like L.D. McMullen (Des Moines Water Works) and Dr. Jerry Hatfield (USDA's National Soil Tilth Laboratory) pointed us toward a serious environmental issue and engaged our help to understand the fundamentals of the Raccoon River watershed, to postulate and implement long-term solutions. We thank all those who had the foresight and initiative to bring this group together and direct us to what we are today.

The organization began with the simple premise of collecting data via a certified water sampling effort. Just as we use agronomic data to predict agronomic performance, ACWA believes we need good environmental data to predict sound environmental practices. Water sampling remains the backbone of our work. As ag retailers, we are aware of our dual mission to help farmers improve agronomic performance in the field while supporting environmental performance beyond the field's edge. In 2009, ACWA adopted a detailed Quality Assurance Project Plan (QAPP) approved by the Department of Natural Resources. The plan assures ongoing validity and support for ACWA's water monitoring data.

ACWA continues taking steps toward water quality remediation. In partnership with Sand County Foundation, Madison, WI, we moved forward with the construction of four tile-line bioreactors, designed to remove nitrate from subsurface water before it is released into tributary streams. The results have been exemplary! We are excited about the implications of this project for ACWA to achieve its long-term goal of preventing nitrates from entering our water system.

ACWA's reputation has gained us a place representing agriculture with other organizations and agencies engaged in various water quality improvement projects. We are participating with several partners in a variety of projects that have received or are seeking funding from state and federal agencies and private foundations.

Agriculture still has much to do to meet the public's approval for environmental responsibility. Our efforts in ACWA represent a positive step; however, we must continue to educate the public about our work if we want long-term support. ACWA reached out this past year with presentations to civic groups and others interested in our efforts. We hope to engage the 80-plus Certified Crop Advisers affiliated with our ag dealerships to help us tell this story. We are also expanding our presence with the recruitment of new members and sponsors.

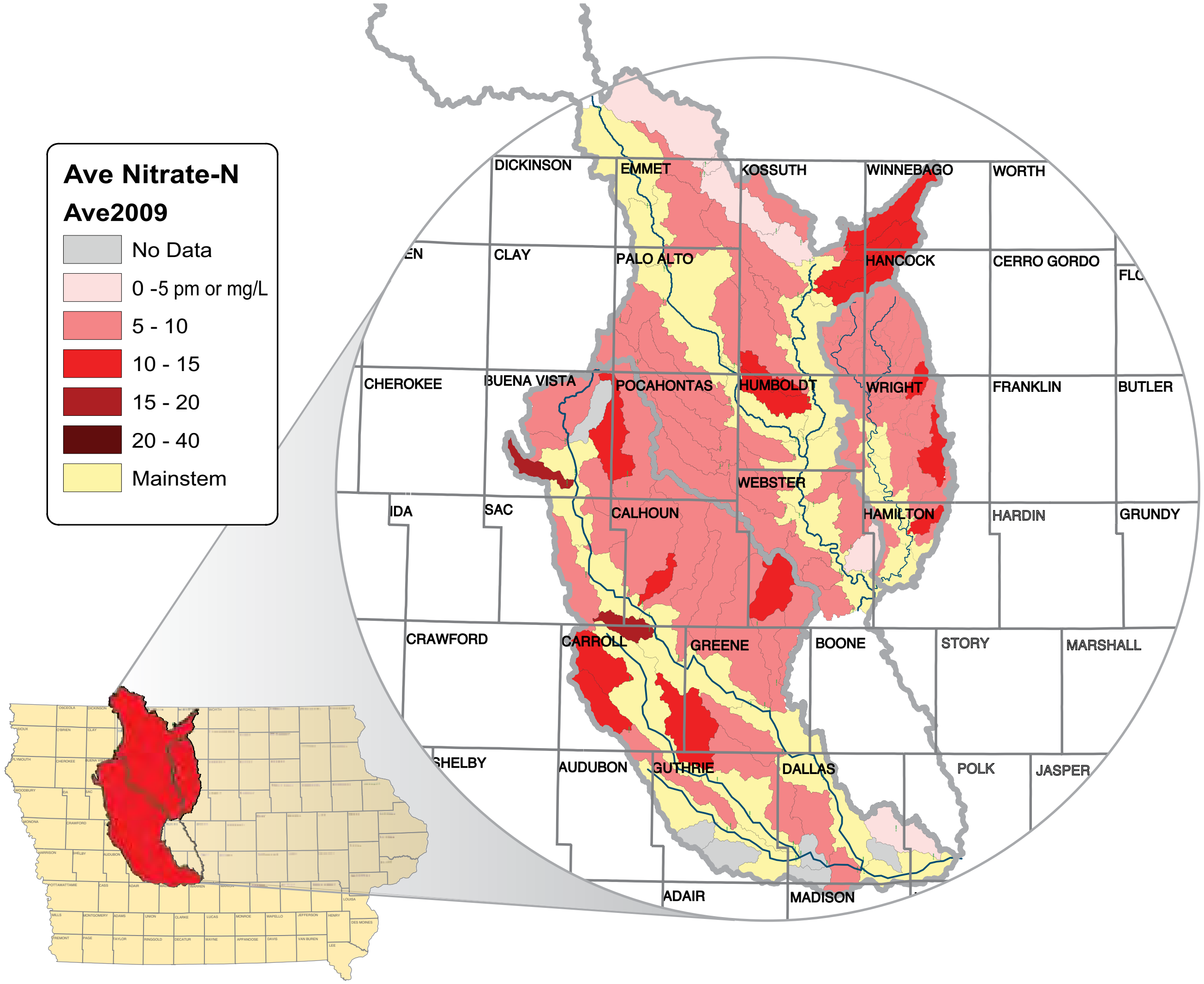
In the words of Roger Koppen, CEO, FC Cooperative, a founding father of ACWA, "The historical mission of ag retailers is to help farmers prosper… and do what individual farmers cannot do for themselves. ACWA puts us on the cutting edge of environmental planning and helps us understand where agriculture and the environment are going in the future." We look forward to a prosperous 2010.

Dave Coppess, Heartland Co-op
President, ACWA

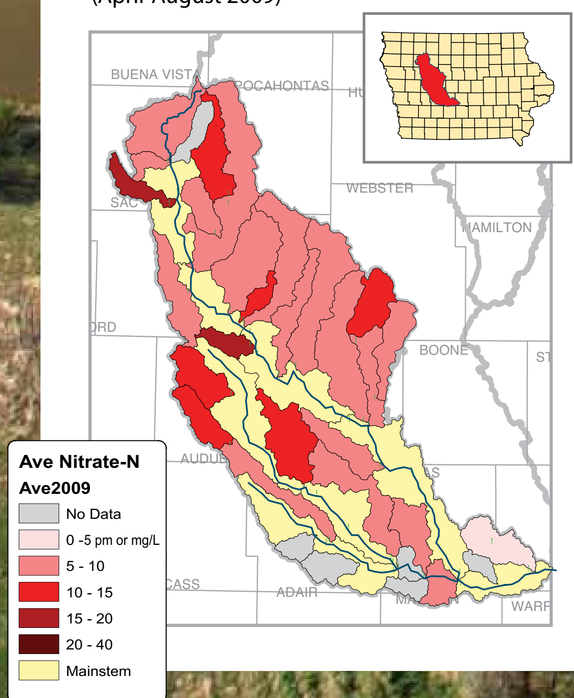
In addition to reading this annual report, we encourage you to check out our updated Web site at www.acwa-rrws.org

Water Monitoring

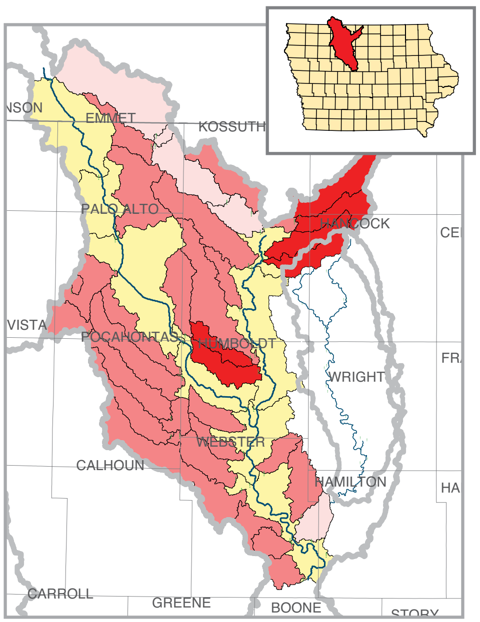
Normal to dry conditions this year resulted in lower than typical nitrate concentrations at most sites. At least some of the higher levels are due to the influence of point source discharges such as wastewater treatment plants and industrial uses.



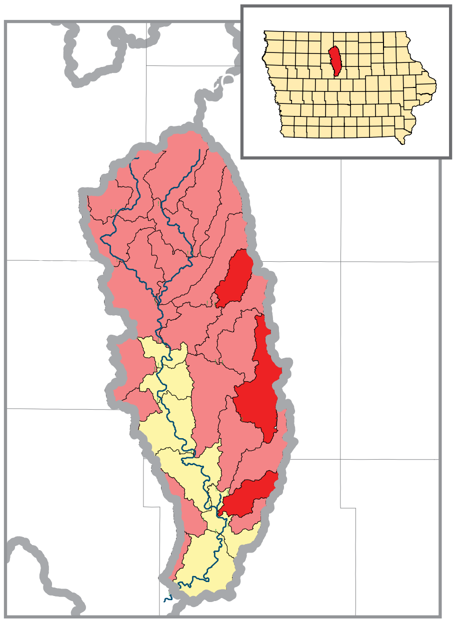
Average Nitrate Concentration of 25 Subwatersheds in Raccoon River Watershed (April-August 2009)



Average Nitrate Concentration of 35 Subwatersheds in Upper Des Moines Watershed (April-August 2009)



Average Nitrate Concentration of 25 Subwatersheds in Boone River Watershed (April-August 2009)



Certified Samplers

Since it was formed in 1999, ACWA has been committed to establishing a comprehensive database of water quality monitoring information. The data that has been gathered is now proving valuable in determining priority projects and also in giving scientific support when applying for grants and other funding.

In the spring of 2009, the Quality Assurance Project Plan (QAPP) was updated by ACWA according to the U.S. Environmental Protection Agency's requirements for quality assurance plans and was approved by the Iowa Department of Natural Resources. The document, which fills a binder, prescribes detailed guidelines for collecting credible water quality data in the Upper Des Moines and Raccoon River watersheds.

ACWA Watershed Management Specialist Anthony Seeman, who oversees the water sampling activities, calls the plan an important document to assure consistent training of all certified samplers.

"When we train our certified samplers, the QAPP clearly details the expectations for how sampling is done, so we can be sure everyone is following the same protocols. Also, as we broaden our methods and parameters, we document the changes to make sure the data is useable by the scientific community."

To validate the samples, duplicate samples are used as a check.

"The results of our duplicate samples continue to affirm that our certified samplers are doing an outstanding job," Seeman says. "These results help verify that our data is credible."

Year and Type	Number	Average Relative Percent Difference for Nitrate-N
1999 Sample Duplicates	62	2.2
2008-2009 Field Duplicates	10	1.7

Duplicate samples validate the accuracy of sampling methods by showing results that are consistent within 2 percentage points.

Overall, 2009 was another success with 27 samplers collecting 1,421 of 1,424 scheduled samples from 130 sites.

"I know what I do affects what happens at Des Moines Water Works."

Craig Fleishman is a farmer from Minburn who has devoted a great deal of time as a certified sampler for the ACWA monitoring program. Fleishman says, as a farmer, he has a natural concern for the water in his area.

"I live in the watershed where I'm sampling so I care about water there," Fleishman says.

"I farm land right next to Slough Creek, which flows north into Beaver Creek and then into the Des Moines River. I also like to canoe, and I have seen where the Beaver Creek goes into the Des Moines River. I know what I do impacts what happens at Des Moines Water Works. "

Fleishman became a certified sampler to see for himself what is happening and gain firsthand knowledge about water quality.

"The value of this project is that it puts numbers on the contaminants in water, making it possible to scientifically measure the impact of what is being done wrong or right," Fleishman says. "It also shows how events like rainfall affect the color of water and how water differs from location to location."

Seeman praises the work that certified samplers like Fleishman are doing. "The fact that ACWA data has been incorporated into TMDLs (Total Maximum Daily Loads) and used to calibrate models from IDNR and ISU's Center for Agriculture and Rural Development (CARD) speaks for itself," Seeman says. "There is no substitute for real world data to address these issues over time."

Bioreactor Demonstration Project

Since October of 2008, ACWA, partnering with the Sand County Foundation, has funded the Bioreactor Demonstration Project. A bioreactor is a practice intended to reduce the amount of nitrate-nitrogen transported by tile lines from reaching surface waters.

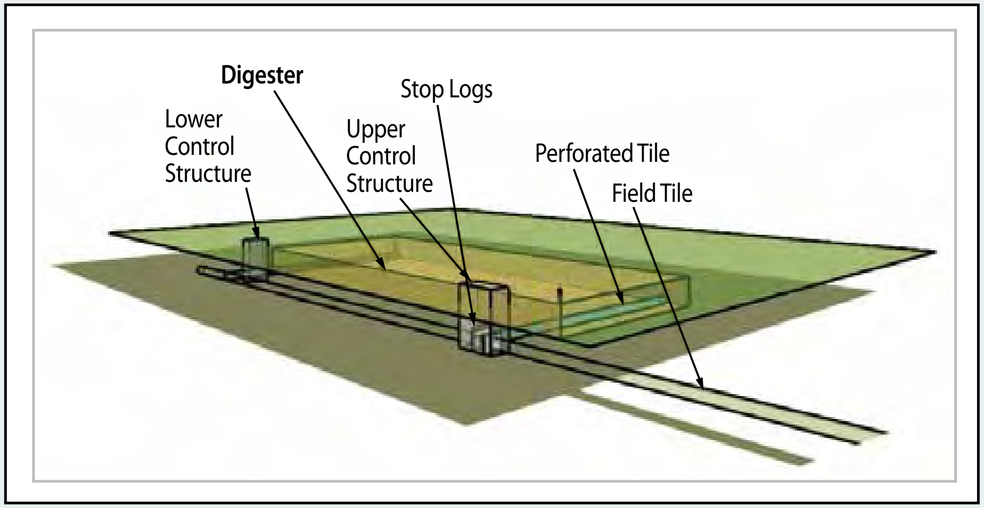
It is estimated that 25 to 35 percent of Iowa is artificially drained, including as much as 75 percent of the Des Moines lobe, where both the Raccoon and Des Moines River Watersheds are located. Due to the solubility of nitrate-nitrogen, high loads are transported annually through tile lines. Increased nitrate-nitrogen concentrations in drinking water cause impairments and have been linked to hypoxic conditions in the dead zone in the Gulf of Mexico.

A bioreactor is an underground chamber filled with wood chips through which an existing tile line's water flow is diverted. Structures from Agri Drain Corporation are used to control the amount of water diverted; excess water is allowed to bypass the bioreactor in order not to restrict field drainage. The carbon in the wood chips is utilized by soil microorganisms as an energy source, and under the anaerobic conditions created, the soil microorganisms reduce the incoming nitrates from the tile water to metabolize the carbon. The nitrate-nitrogen is then converted to a gas and released.

To date, four bioreactors have been installed. (Figure1 shows the status and location of installed bioreactors.)

Performance of the bioreactor is evaluated by taking water samples before the water enters the bioreactor and again as the treated water exits the bioreactor. The water samples are analyzed for nitrate-N, nitrite-N, sulfate and dissolved oxygen concentrations, as well as temperature and pH. Periodically, samples are analyzed for dissolved organic carbon, ammonia and total nitrogen concentrations. Flow measurements are also taken to determine load reduction. The Greene County bioreactor has returned the most data, as it was installed in August of 2008. The Hamilton, Hancock and Webster County bioreactors are also starting to provide results. They were installed during the summer of 2009, when the tiles were not flowing; tiles started flowing again during October of 2009.

Figure 2 shows the recorded nitrate reductions from the Greene County bioreactor over the past



This schematic details the major components of the bioreactor including both upper and lower control structures. These structures contain a series of baffles that allow control of waterflow through the bioreactor.

Status of ACWA Bioreactor Installations

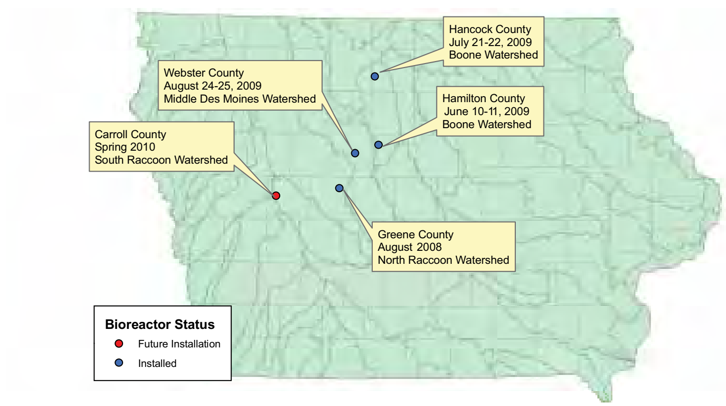


Figure 1. Status of ACWA bioreactor installations.

Green County Bioreactor Oct. 2008-Nov. 2009

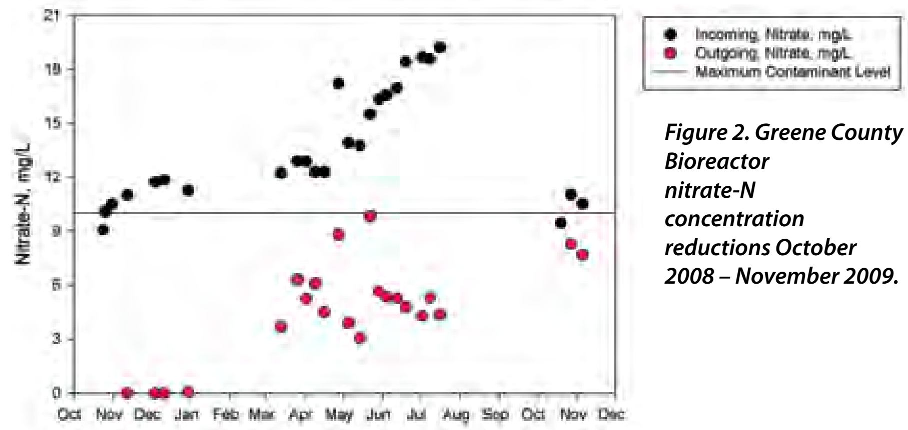


Figure 2. Greene County Bioreactor nitrate-N concentration reductions October 2008 – November 2009.

The purpose of the demonstration project is to determine the effectiveness of tile line bioreactors as a means of reducing nitrate loads reaching streams. ACWA works collaboratively with researchers from the Iowa State University Department of Agriculture and Biosystems Engineering on design specifications.

year. Overall, the bioreactor has been performing well. The figure shows the amount of reduction increases as the temperatures rise during the summer months. Retention time within the bioreactor also factors into how much reduction there is between the incoming and outgoing concentrations. Retention time is determined by the flow of the water and the head pressure created by managing the stop logs in the control structures. Full nitrate reduction occurred during the fall of 2008 because the flow of the water through the bioreactor was very low.

Figure 3 demonstrates the nitrate load reduction that occurred as a result of the Greene County bioreactor. The solid dark green bars represent the amount of nitrate-N that would have been released to the stream if the bioreactor had not been in place. The light green bar with diagonal markings shows the actual amount of nitrate-N released to the stream. Without the bioreactor, 430 kg (946 lbs) of nitrate-N would have been released. The bioreactor reduced this total by 164 kg (362 lbs), meaning that only 266 kg (584 lbs) of nitrate-N was released. In other words, the bioreactor reduced the nitrate by a rate of 38 percent.

Some concerns being investigated regarding the bioreactor practice include the presence of high concentrations of dissolved organic carbon (DOC) in treated water when the bioreactor first begins to flow. These elevated concentrations receded to ambient conditions in about a month. The next concern is the conversion of nitrate (NO_3) to nitrite (NO_2). Nitrite is toxic to aquatic life even at low concentration levels. The EPA maximum contaminent level standard for drinking water is as low as 1 ppm. There have been a few instances exceeding that level in the Greene County bioreactor. In most samples there have been detectable nitrite levels, but below the 1 ppm standard.

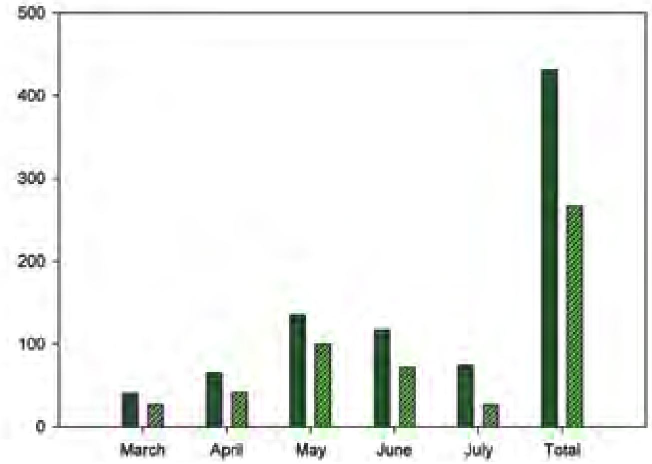


Figure 3. Greene County Bioreactor nitrate-N load reductions during the 2009 growing season. August and September are not depicted since there was no tile flow during these months.

"Conditions in the bioreactors exist for the complete **reduction of nitrate,** and other studies have shown that nitrous oxide production is **not occurring** because of bioreactors," Kult says.

Iowa Soybean Association Watershed Management Specialist Keegan Kult says anytime there is nitrate reduction occurring, there is a possibility of producing the potent, greenhouse gas nitrous oxide (N_2O).

Studies conducted by Tom Moorman, Colin Greenan, Tim Parkin, Tom Kaspar and Dan Jaynes at USDA Agricultural Research Service's National Laboratory for Agriculture and the Environment (formerly the National Soil Tilth Lab), indicate that the level of N_2O emitted from the bioreactor process was 0.003 percent — well below most natural systems and less than would be emitted had the nitrate removed in the bioreactor been transported to the river system. Instead, the bioreactor environment allows the nitrate to pass through the N_2O stage to be emitted as nitrogen gas (N_2), which makes up 78 percent of Earth's atmosphere. Still, ACWA will work to verify these results.

"Plans are in place to sample ACWA bioreactors for N_2O in the future," Kult says.

Another potential concern with bioreactors is the production of methylmercury.

"Methylmercury is a concern because it can be absorbed by aquatic organisms and it bioaccumulates as it moves up the food chain," Kult says. "Mercury has been known to be methylated with the presence of sulfate-reducing bacteria. Sulfate reduction occurs if the flow through the bioreactor is too slow. Stop logs in the control structures are being managed for lower retention times so complete nitrate reduction and sulfate reduction do not occur."

Designs of bioreactors have also changed, making the floor of the bioreactor no lower than the depth of the tile to prevent stagnant water.

The ACWA Bioreactor Demonstration Project has helped serve as a guideline for the interim Natural Resources Conservation Services (NRCS) standard written for denitrifying bioreactors (Interim Code 747). The standard calls for a bioreactor design that treats base flow using either a minimum drainage coefficient of 0.125 inches or a minimum of 20 percent of peak flow. The bioreactor is to be designed for a life expectancy of 10 years, unless plans have been made for periodic renewal.

Continued monitoring of current installations will help answer questions on design and sizing. The length of the bioreactor is crucial in determining the retention time of the tile water within the bioreactor. If nitrate reduction rates remain high in the initial ACWA bioreactors, future installations may be reduced in size, accommodating lower retention times.

The four operational bioreactors are distributed through both the Raccoon and Des Moines River watersheds. The first bioreactor, installed in Greene County, has shown a 38 percent reduction in nitrate-N coming from the treated tile line. Because more is known about the management of the control structures, 45 percent reduction would not be out of the question for next year. Three bioreactors installed in Hamilton, Hancock and Webster County began flowing in the later part of the fall of 2009. Data collection has begun.

Kult feels the bioreactor demonstration project should be considered a success for 2009.

The bioreactor demonstration project, funded by ACWA and the Sand County Foundation, has generated an enormous amount of interest. The NRCS interim standard informed by this project makes bioreactors an eligible practice for EQIP cost share. Because ACWA has contributed greatly to the advancement of the practice, the organization has gained significant recognition.

Special thanks go to the generous landowners for their cooperation in the project. Without their participation, this project would not have been possible.

For more information or to watch video of a bioreactor installation, go to www.acwa-rrws.org/bioreactordemonstration.html

Addressing Cyanobacteria

While agriculture contributes significant nutrients to surface water, the factors that cause acute events of compromised water quality include climate, geography, hydrology and human interactions on the land and in the stream.

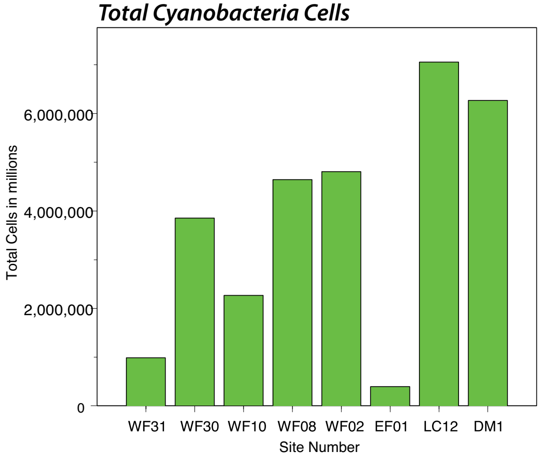
ACWA's mission to reduce nutrient loss from farm fields is two-fold. First, farmers want to efficiently manage fertilizer inputs to get as much as possible into the crop; the last thing they want is to invest in fertilizer and let it leach out of the field to the river. Second, when those nutrients do enter waterways, they enrich the aquatic environment, creating an inbalance. This lack of balance is seen when large algae blooms take over a water body, causing decreased water clarity, foul odors and low dissolved oxygen that can cause fish kills. Some of these algae blooms are dominated by cyanobacteria (blue-green algae), which can produce toxins harmful to people and livestock.

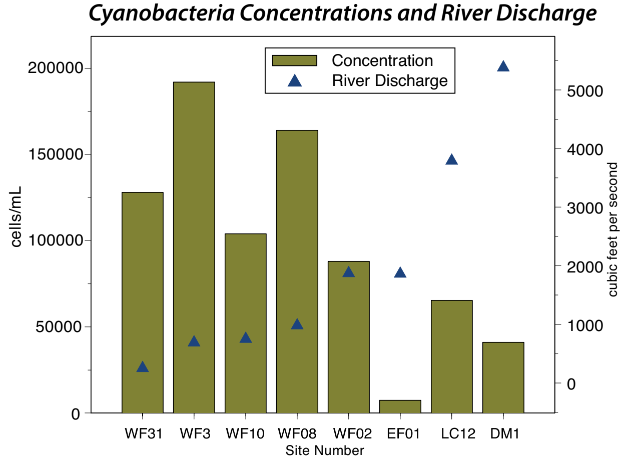
In late 2008, a cyanobacteria bloom occurred in the Raccoon River, presenting Des Moines Water Works (DMWW) with treatment challenges. The small size and shape of certain species allowed them to flow through the sand filters and cause cloudiness in the finished water. Though the ACWA sampling season was over, ACWA dedicated its network and resources to help locate the source of the bloom. What was unusual was that large algae blooms are generally found in lakes and other stagnant water, not the moving water of rivers. Initially it was thought the cyanobacteria could be coming from farm fields throughout the watershed, or that low flow conditions in late fall allowed the algae to bloom within the river. Either way, the large amount of agricultural activity in the watershed seemed to be a major factor. After several rounds of investigative ACWA monitoring, it was determined a large cyanobacteria bloom in Blackhawk Lake in Sac County was entering the North Raccoon River, and algae were surviving the several-day journey to the Fleur Drive treatment plant. Although there are agricultural activities in the Blackhawk Lake watershed, the city of Lakeview, Iowa, is also a possible source of nutrients. The bloom in the Raccoon River subsided by the beginning of December.

In 2009, ACWA and DMWW increased monitoring for cyanobacteria and algae in both the Des Moines and Raccoon Rivers to better understand the factors that allow them to survive in the rivers. Once again, in 2009, a bloom appeared in the Raccoon River and was traced to Blackhawk Lake. It again coincided with low water levels and warm weather toward the end of summer. DMWW recorded the highest cyanobacteria concentration on the Raccoon ever, about twice as high as 2008.
A warning regarding swimming at Blackhawk Lake beach was posted due to increasing levels of microcystins (toxins produced by certain cyanobacteria species), but the beach was never closed because the levels weren't high enough to be a contact hazard.

ACWA learned about the role of hydrology in this location. Blackhawk Lake has rarely been high enough in the late summer to discharge into the North Raccoon, but the last two years have been exceptions. While blooms have been occurring there for some time, they rarely leave the lake. Another factor seems to be the large amount of phosphorus coming from Outlet Creek above Sac City. Two wastewater treatment plants discharge above the point where Blackhawk overflows to the North Raccoon. Since phosphorus is generally the limiting nutrient in river systems, this helps the cyanobacteria survive (and perhaps bloom) in the river. The levels of dissolved phosphorus declined rapidly where algae were present. ACWA also documented cyanobacteria leaving Storm Lake and Lake Panorama, although

Cyanobacteria Photograph by Dennis Hill, Des Moines Water Works





Moving downstream, concentrations generally drop as discharge increases. Total load shows a more consistent pattern because the effect of dilution is removed. Note that East and West Forks of the Des Moines River combine above LC12.

they were lower levels and had different major species than were seen at the treatment plant.

Since the Raccoon River is the preferred source water for DMWW, cyanobacteria in the Des Moines River is a lesser concern. Blooms in the Des Moines have typically been observed later in the year and are of a lesser magnitude than in the Raccoon, usually attributed to Saylorville Lake or Big Creek Lake near Des Moines. This year, ACWA did extensive monitoring throughout the Des Moines River watershed, with interesting results. Significant concentrations occurred in the Minnesota reaches of the West Fork Des Moines River in early June, declining as the water moved downstream; however, like the Raccoon, the total number of cells seemed consistent as they moved downstream, indicating some survival or continued blooming in the river. The East Fork Des Moines River showed less contamination with algae; however, Lake Tuttle, where the river originates, had a large bloom this year as well. This could indicate a similar hydrologic phenomenon as Blackhawk Lake, with rising water levels causing discharge.

At times, the concentrations peaked in Iowa, suggesting more sources than just the lakes in Minnesota or an influx of phosphorus from wastewater or industrial inputs. In November, a bloom was confirmed in Saylorville Lake that affected water quality at the DMWW intake. How much influence sites further away may have on localized blooms is an important question because, at other times, Big Creek Lake has discharged large amounts into Saylorville as well. Occasionally, high levels were seen in other main streams, though less frequentely than in the rivers. When concentration results passed a threshold (100,000 cells/ml), analysis was done on microcystin toxins produced by certain cyanobacteria. These results were more variable, which may give insight into in-stream dynamics along the river length. At times, large amounts of die-off can elevate toxin levels, while at other times, bloom events produce large amounts of toxins. In 2010, ACWA will again work with DMWW and other water quality partners to document and try to understand cyanobacteria dynamics as they relate to the Raccoon and Des Moines Rivers.

Having an established partner contributing financial and human resources has helped DMWW to forecast problems before they reach the intake, allowing them to make changes in source water or treatment to ensure the residents of Des Moines and the surrounding communities have safe drinking water. This is an example of how collection and analysis of water monitoring data help identify the unique set of factors that cause degraded water quality. Using this approach, benefits both agriculture and its downstream neighbors.

This type of work illustrates the value of ongoing water monitoring at a high resolution scale.

Brushy Creek Watershed

Brushy Creek, a tributary of the Raccoon River and a regular source of drinking water for more than 500,000 Iowans, has been regularly monitored by ACWA and Des Moines Water Works (DMWW) since 2000. ACWA data originally identified water quality issues in the area, and over many rain events, has shown the stream to be highly impaired for coliform bacteria and nitrate.

Due to a fish kill in 2005 resulting in Iowa Department of Natural Resources enforcement actions against several livestock producers in the watershed, Brushy Creek was placed on the 303(d) impaired water body list. At the time, no formal watershed group existed. To help watershed improvement efforts, DMWW applied for and obtained a Watershed Improvement Review Board (WIRB) grant in 2008.

The purpose of the program is to award grants to improve water quality and flood prevention.

Local watershed improvement committees, soil and water conservation districts, county conservation boards and public water supply utilities are among the eligible applicants for the grants. The Iowa Legislature makes yearly appropriations to the Watershed Improvement Fund, which is administered by the WIRB.

The watershed planning effort is being led by ACWA (Dedham Co-op leadership and communications) and DMWW (monitoring, communications and project coordination), along with the local Natural Resources Conservations Service office (working directly with producers and financial coordination) and the Iowa Soybean Association (sampling, water monitoring and communications).

The goals of Brushy Creek watershed project include:

- Enhanced nutrient and manure management to reduce agricultural inputs to the stream. Agricultural land use in the Upper Brushy Creek Watershed exceeds 90 percent of the total acreage with rolling hills susceptible to runoff. Cooperation with livestock producers to improve their operations and manure management will enhance water quality.
- Water monitoring. Monitoring of the Brushy Creek and Raccoon River water basins will illustrate the relative effectiveness of various programs, practices and structures to enhance water quality.
- Assessment of the impact of untreated human waste originating in Roselle and other dwellings on Brushy Creek water quality. Approximately 50 percent of the dwellings in Roselle discharge untreated human waste into the Brushy Creek watershed. The impact of this waste on water quality is not well known, and monitoring will attempt to quantify the impact.
- Increased awareness in the watershed of the stream's role as a source of drinking water and recreation. Participating groups will work to establish a functioning Watershed Improvement Association led by local residents to help ensure future progress.

Roger Shaw, general manager of Dedham Cooperative Association in Dedham, Iowa, has been with the Brushy Creek project since the beginning. While it is still a young program, Shaw says many projects are in the works.

*“Until we get a local partnership, the program won’t take off and run like it should. Any good program **starts at grassroot levels**, and to take it to the next level, we need strong **leadership from producers.**”*

“Right now, we are selecting leadership projects for the fall of 2010,” Shaw says. “We are working on conservation projects and putting bioreactors in the upper end of Brushy Creek’s watershed. We are also doing stalk nitrate testing.”

Stalk nitrate testing evaluates the availability of nitrogen to the corn crop. By measuring the amount of nitrogen that remains after grain fill, a determination can be made as to how much extra nitrogen was left in the plant above what was needed for optimal grain yield. Remote sensing and soil survey information are used to characterize differences in the field likely to change nitrogen availability to the corn crop. This information is used to locate points in the field where several stalk samples will be taken. In Brushy Creek for 2009, 76 samples were collected across 19 fields from 10 participating producers.

Shaw says some of the biggest obstacles the project faces are finances and finding local leadership. Shaw feels the work done in Brushy Creek will help show farmers’ commitment to performance.

“If this project is done right in Brushy Creek, it could lead to bigger things in ag,” Shaw says. “It will get the ball rolling, which will shed a better light on producers and the environment. Hopefully, with small steps, we can make a fairly big impact.”

According to Pat Corey, soil conservationist at the Natural Resources Conservation Services (NRCS) in Carroll County, $43,174 of Environment Quality Incentives Program funding was allocated for Comprehensive Nutrient Management Plans (CNMP) and upland treatment this year. CNMP is a conservation plan developed in accordance with NRCS planning protocol that addresses all resource aspects of an animal feeding operation. When implemented, this grouping of conservation practices and management activities will ensure both production and natural resource protection goals are achieved. Two CNMPs and three solid settling basins have been completed, and approximately 40 producers in the area signed on to participate next year.

In the last 10 years, AWCA has collected nearly 5,000 samples in the Raccoon River watershed basin and has brought attention to problems identified in watersheds. As a result, producers and those who live in the watershed are able to receive resources like WIRB assistance to resolve local resource concerns and continue monitoring water quality.

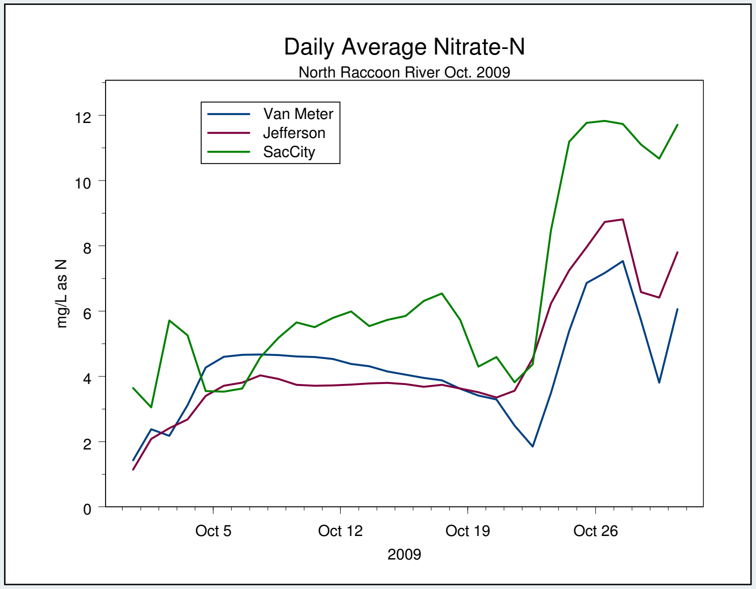
Real-Time Nitrate Monitors

The success demonstrated by ACWA with the first nitrate monitor installed at Van Meter has illustrated the value of real-time water quality data synchronized to streamflows.

In 2006, ACWA purchased the first real-time monitoring device in the Raccoon River Watershed for $10,000. The Iowa Department of Natural Resources (DNR) and Des Moines Water Works (DMWW) contributed operational and maintenance support. The U.S. Geological Survey (USGS) provided the site, near the Van Meter bridge, just below the confluence of the North, Middle and South Raccoon branches.

Chris Jones, laboratory supervisor at DMWW, says the benefits of the nitrate monitors are many, including:

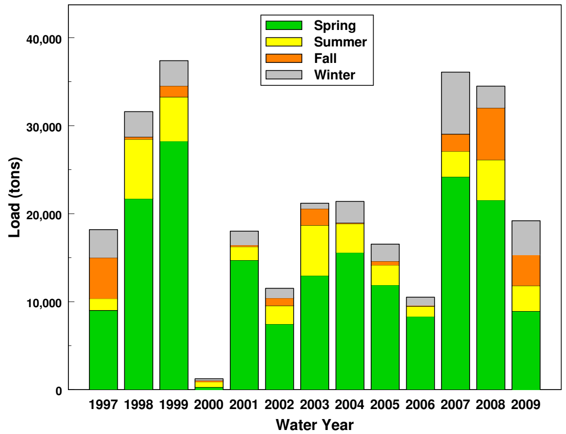
- An accurate assessment of Raccoon River nitrate levels when grab sampling is not conducted (during the winter);
- A mechanism to estimate relative nitrate loads from the South and North Raccoon watersheds;
- An estimate of the relative nitrate loads in tile water versus runoff water;
- Advance information for DMWW about upstream nitrate levels;
- A visible demonstration to the public and regulators of the commitment to monitoring and characterization of water quality;
- A mechanism to establish working relation-



Increased variability at Sac City during October is a combination of low flow and upstream point source inputs. As flows increased following rains, nitrate increased at all sites uniformly. This helps to determine where in the watershed most nitrate originates.

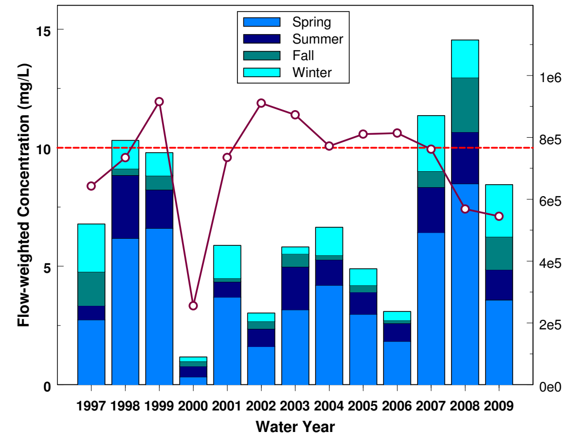
"Innovative projects like this will be critical if Iowa is to protect its natural resources while maintaining a vibrant agricultural economy," Jones says.

Annual Nitrate-Nitrogen Load at DMWW



Compared to the floods of 2008, 2009 was a relatively calm year on the Raccoon River. Total water discharge for the year was roughly equal to the April-June period last year. Nitrogen loading was about average for the1997-2009 period. Flow-weighted nitrate concentration was exceptionally low this year. One possible cause is lower precipitation, with less chance for nitrate leaching. Another contributing factor could be the large amount of water during 2008 "flushing" excess nitrate from the landscape with a lag before soil and tile nitrate levels return to pre-flood conditions. This was observed in some locations in Iowa following the floods of 1993.

Annual Nitrate-N Concentration and Total Flow at DMWW



ships with public agencies, including the USGS, Dallas County and the Iowa DNR;

- Credible evidence that ACWA is a leader in developing innovative monitoring and water quality improvement strategies.

Researchers at Iowa State University, the University of Iowa, USGS and Louisiana University's Marine Consortium have all recognized the benefits of this approach. Based on the success of the Van Meter device, USGS purchased two nitrate monitors for the North Raccoon River, one at Sac City and one at Jefferson. The Sac City monitor will remain in the river through the winter (like the Van Meter monitor); however, the Jefferson monitor has been pulled for the winter over concerns about possible damage that may result from "freezing in." In addition, a researcher at the University of Iowa is deploying 10 of the devices in the Mississippi River to evaluate nutrient loads there.

Fall Nitrogen Application Code of Practice in 2009

ACWA members reaffirmed their fall nitrogen Code of Practice in 2009 and made one change from previous years.

The Code is an agreement that each entity will not distribute anhydrous ammonia for fall application until soil temperatures reach 50 degrees F at a depth of four inches, with a forecast of cooling soil temperatures. For anhydrous ammonia with a nitrification inhibitor, soil temperatures must drop to 60 degrees F, with a cooling forecast, and no distribution will take place before October 15.

The specification to wait until after October 15 for anhydrous with a nitrification inhibitor is the only change from previous years. This change makes the Code of Practice consistent with manufacturers' recommendations and lessens the chance of a soil temperature increase that might occur with earlier application.

ACWA uses the county soil temperature and forecast maps compiled by Iowa State University (ISU) that are available at http://extension.agron.iastate.edu/NPKnowledge as a reference point for soil temperatures. According to ISU observations, soil temperatures cooled to below 50 degrees F at varying dates during the past few years. Statewide soil temperatures cooled to below 50F on Nov. 7 in 2008, Nov. 1 in 2007, Nov. 29 in 2006, Nov. 14 in 2005, Nov. 21 in 2004 and Oct. 28 in 2003, though there were periods of warming in southern areas until Nov. 21.

*The Code of Practice was **established in response** to **water quality concerns** associated with the practice of applying nitrogen in the fall for the following crop year.*

ACWA members have held to their commitment to the ACWA Code of Practice in the past, even in the face of many unknowns shared by dealers and their farming customers. Over the years, this voluntary approach to fall N application by the industry and the farmers they serve has received good reviews from the public, regulators, producers and dealers alike.

Celebrating Ten Years of Leadership
& Commitment to Clean Water

To reduce the nutrient loss – specifically nitrates from farm fields – and to keep the nutrients from entering the Des Moines and Raccoon Rivers and their tributaries.

ACWA Membership
Ag organizations working for better water quality

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

Dedham Cooperative Association, Dedham, Iowa

Farmers Cooperative Company, Ames, Iowa
www.fccoop.com

First Coop Association, Cherokee, Iowa
www.first.coop

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

Heartland Cooperative, West Des Moines, Iowa
www.heartlandcoop.com

Heart of Iowa Cooperative, Roland, Iowa
www.hoic.com

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

New Cooperative, Inc., Fort Dodge, Iowa
www.newcoop.com

Pro Cooperative, Gilmore City, Iowa
www.procooperative.com

UAP/CPS, Wall Lake, Iowa, www.uap.com

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

West Central, Ralston, Iowa
www.westcentral.coop

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