Illinois/Iowa Watershed Projects Lead the Way

UMR Efforts Demonstrate Environmental Impact

by Mike Tidman

America's Working River: The Mississippi

The Mississippi River runs through the heart of America and is, in many ways, our most important river. Some 30 million Americans live in the Mississippi River basin, half of which rely on the river for drinking water.

The Upper Mississippi River is home to a large fraction of the nation's best farmland. It is also a critical transportation artery for approximately half of the corn and soybeans produced in the U.S. The Mississippi River watershed also provides habitat for a large and remarkably diverse list of plants, invertebrates, amphibians, reptiles, mammals and fish species.

There are many stakeholders in the river system's health, and the environmental impact of human activity on the Mississippi River is an important issue for environmentalists, regulatory agencies, the people who get drinking water from it and the farmers farming the land.

Allocating Environmental Resources: Studying and Having an Impact on Water Quality

Resources for studying and improving the environment are scarce. Many stakeholders have discovered trying to get their arms around the entire Mississippi River is too large an enterprise. They feel success will come in small steps that originate in the upper reaches – in subwatersheds in places like the Mackinaw River in Illinois and Lyons Creek, a tributary to the Boone River in Iowa.

Wetland tour at Franklin demonstration farm in the Mackinaw River Watershed at Lexington, Illinois.

PHOTO COURTESY OF TIMOTHY T. LINDENBAUM/TNC.

Working at smaller scales allows for concentration of resources and effort and could possibly lead to greater impact. Organizations like The Nature Conservancy (TNC) are working with farmers and other stakeholders in Illinois and Iowa to design and implement projects based on that philosophy.

The Nature Conservancy: Impact in Key Areas

Vince Shay is director of the Upper Mississippi River Program for TNC. Shay says TNC's Upper Mississippi River project is focused on having an impact in areas of concern and where key ecological attributes reside.

"We realize that large landscape change is an unattainable goal, so we have to work within the current landscape practices to improve ecological condition and target our energies to those parts of the landscape where investments will provide the greatest benefit," Shay says.

"For example, if nitrogen loading is the issue being addressed, and it is known that 80 percent of the loading is coming from 20 percent of the land in a specific watershed, working in that watershed is going to be a more effective application of our resources," Shay continues.

"What's working for TNC is to present a suite of practices that are acceptable to farmers in terms of productivity and economics. We also help farmers address impediments to implementation by helping them find and access cost-share. And that's key – whatever we're doing, we need to leverage resources, public and private."

Mackinaw River: Central Illinois

Shay points to the work of TNC with farmers in the Mackinaw River

ISA staff Todd Sutphin and Anthony Seeman install an automated water quality monitor in the Boone River watershed.

PHOTO COURTESY OF MIKE TIDMAN.

watershed, a 740,000-acre watershed north of Bloomington in central Illinois, as an example of how declines in water quality can be reversed and the vitality of watersheds can be restored by working with farmers and other stakeholders.

"Central Illinois is home to some of the most productive farmland in the United States, with over 90 percent of it farmed," Shay says. "Yet the Mackinaw River watershed is a critical natural resource, providing habitat for 66 fish species, 31 species of mussels, nine species of crayfish and 264 of the 299 bird species that regularly occur in Illinois.

"For more than 15 years, TNC has focused efforts on reversing the impact of tributary channelization and a severe loss of habitat here working side-by-side with farmers, conservation groups and government agencies," Shay continues. "The result is the Mackinaw River Watershed Plan, a blueprint for protecting the area's ecological integrity."

Shay says TNC's efforts in the Mackinaw watershed have included a six-year paired watershed study and sharing the results of conservation practices with others.

"Our outreach efforts there – informative meetings and agricultural demonstrations – have encouraged farmers to implement additional conservation practices such as grass waterways, stream buffers and conservation tillage," Shay says.

Lyons Creek: A Partnership Model in North-Central Iowa

The Iowa Soybean Association (ISA) and TNC are working in the Lyons Creek watershed in Iowa. Lyons Creek is an 11,000-acre watershed nested in the Boone River watershed in north-central Iowa.

Roger Wolf, ISA director of Environmental Programs, says the work in Lyons Creek is helping stakeholders better understand the responsiveness of agricultural and hydrologic systems in the Upper Mississippi River watershed.

"Our plan in the Lyons Creek watershed is to develop individual management evaluation plans for stakeholder producers and then link back what those plans mean to the aggregate scale," Wolf says. "If we achieve a reduction in nutrient loading, we can then ask how the farmer plans related to that."

ISA has also implemented a paired watershed study in Lyons Creek watershed. Paired watershed design compares differing management in microwatersheds, areas of around 1,000 acres, to see if changing management results in a water quality response.

"The vision is for the two activities, in-field evaluation and adaptive management on the farm and water quality monitoring, to converge in the Lyons Creek watershed," Wolf says. "Ultimately, the goal is to find ways to keep farmers productive and profitable and find ways to protect and improve water quality."

Mackinaw River and Lyons Creek Watersheds: Modeling a Successful Approach

Organizations like ISA and TNC support a common vision and have been successful in generating multiple sponsorships. TNC's work in the Mackinaw River is supported by partnerships with Cargill and Pioneer Hi-Bred, a DuPont company. ISA's work in the Boone River is supported with an investment by the soybean checkoff, which has leveraged a U.S. Department of Agriculture Natural Resources Conservation Services Conservation Innovation Grant. Both groups are actively seeking new sponsors for additional work. Wolf says the synergy developing between TNC, ISA, funding partners and farmers is critical.

"Both ISA and TNC recognize the leadership role of farmers in planning and implementing these projects," Wolf says. "What we can do is support them by adding capacity and leveraging their projects into a network of initiatives that everyone can learn from. The data, relationships and information generated by this work – from the field to the watershed scales – are informing broader discussions on hypoxia and helping agriculture interface with EPA (Environmental Protection Agency) and other agencies. We see projects like this giving birth to the next generation of watershed and environmental leadership in the Upper Mississippi River watershed."

TNC's Shay agrees. "Working with local partners, like farmers, at priority conservation sites gives us a great way to successfully address ecological concerns, which is the goal of our organization," Shay says. "These broad partnerships will give us a successful model to replicate elsewhere within the region."

ACWA Tile Line Bioreactor Installed

by Mike Tidman

Agriculture's Clean Water Alliance (ACWA) has completed the installation of its first tile line bioreactor pilot project in Greene County in the Raccoon River watershed in central Iowa. ACWA is a group of agricultural retailers organized to reduce nutrient loss from farm fields in the Raccoon River and Des Moines River watersheds. The scope and scale of this bioreactor make it the largest known installation in the U.S.

The bioreactor is modeled on work pioneered by Dr. Richard Cooke, associate professor in the department of agricultural and biological engineering at the University of Illinois. Cooke has supervised and is researching the installation of bioreactor projects including those placed near Decatur, Ill., for the 2006 Conservation Expo. The study includes installation and research on two trench-type bioreactors, as well a 20' x 20' pit design bioreactor. Cooke is comparing the effectiveness of pit design versus the effectiveness of trench designs, as well as the overall effectiveness of the practice.

Cooke says the systems work, but we don't completely understand how.

"The bioreactor system, although effective, is not fully understood." Cooke says. "The identity and community dynamics of microorganisms participating in denitrification in tile drain bioreactors is unknown. Our findings show both bacterial and fungal species are important to the process. We surmise the fungi break the cellulose in the wood into smaller organic molecules, which the bacteria then use in their metabolic processes."

In Iowa, Matt Helmers, an agricultural systems engineer with Iowa State University, says ACWA's bioreactor is designed to remove nitrogen from the water flowing through tile lines.

"Nitrogen is highly water-soluble, so as water moves off the farm landscape, it carries nitrogen from the soil and fertilizer with it," Helmers says. "This tile line bioreactor is essentially an underground trench or pit filled with a carbon source – in this case, wood chips. Water flowing through the tile line is redirected into the bioreactor's wood chips. Microorganisms colonize the wood chips and use them as a food source, break down the nitrate in the water and expel it as a gas. Since the nitrogen is released as a gas, a bioreactor functions without becoming a sink for nitrogen."

Excavation of the processing section of the bioreactor. The sides have been lined with plastic to limit seepage of groundwater into the bioreactor system, and the organic media – in this case, wood chips – are being put in the bioreactor's processing section. For more photos, go to www.isafarmnet.com/ep/bioreactordemo.html.

Helmers estimates there is the potential to route 50 to 70 percent of total annual tile flow through this bioreactor.

"It's a new enough technology there are no design standards," Helmers says. "Early research has found nitrogen removal efficiency near 50 percent. That's one of our primary research questions – how to maximize the performance of the system and amount of water treated."

In the ACWA project, a satellite system will monitor the depth of water entering and leaving the structure. There will also be water samples pulled every week in the tile line, above and below the bioreactor itself in order to determine what nitrate reduction is occurring as water moves through the system.

ACWA will also observe nitrate levels in its water-monitoring network above and below the site to evaluate the performance of the bioreactor and the impact it has on water in the stream. If the bioreactor shows potential to be a beneficial practice in the Raccoon River watershed, this site could become one of several integrated solutions and practices for improved water quality. Further study could help establish a bioreactor practice standard for public cost-share programs.

Dave Coppess, of Heartland Co-op, is president of ACWA. Coppess says ACWA is providing a share of the funding for the bioreactor project as a natural extension of the ACWA mission.

"The installation of the bioreactor here signals an exciting transition for ACWA," Coppess says. "With this project, we're moving from collecting data and investigating solutions to doing actual project implementation and scientific research.

"Those of us who work in agriculture want others to know we are focused on finding solutions to water quality issues, taking those solutions to farmers and implementing them," Coppess says. "We recognize there is a lot more to do, and we feel it's going to take a commitment to total watershed management to get the job done. But that's our ultimate objective – to keep nutrients from getting into the water."

After being filled with organic media, the bioreactor is covered with landscape fabric to prevent dirt from filling the processing section and to allow grasses to grow over the top of the system.

The installation of the bioreactor system is complete, and John Jordison of Agri-Drain is installing automated monitoring and sensing equipment.

ACWA Bioreactor

Result of Partnership Effort

Roger Wolf, Iowa Soybean Association director of Environmental Programs, serves as executive director for ACWA. Wolf says the successful installation of the ACWA bioreactor is the result of a broad partnership effort.

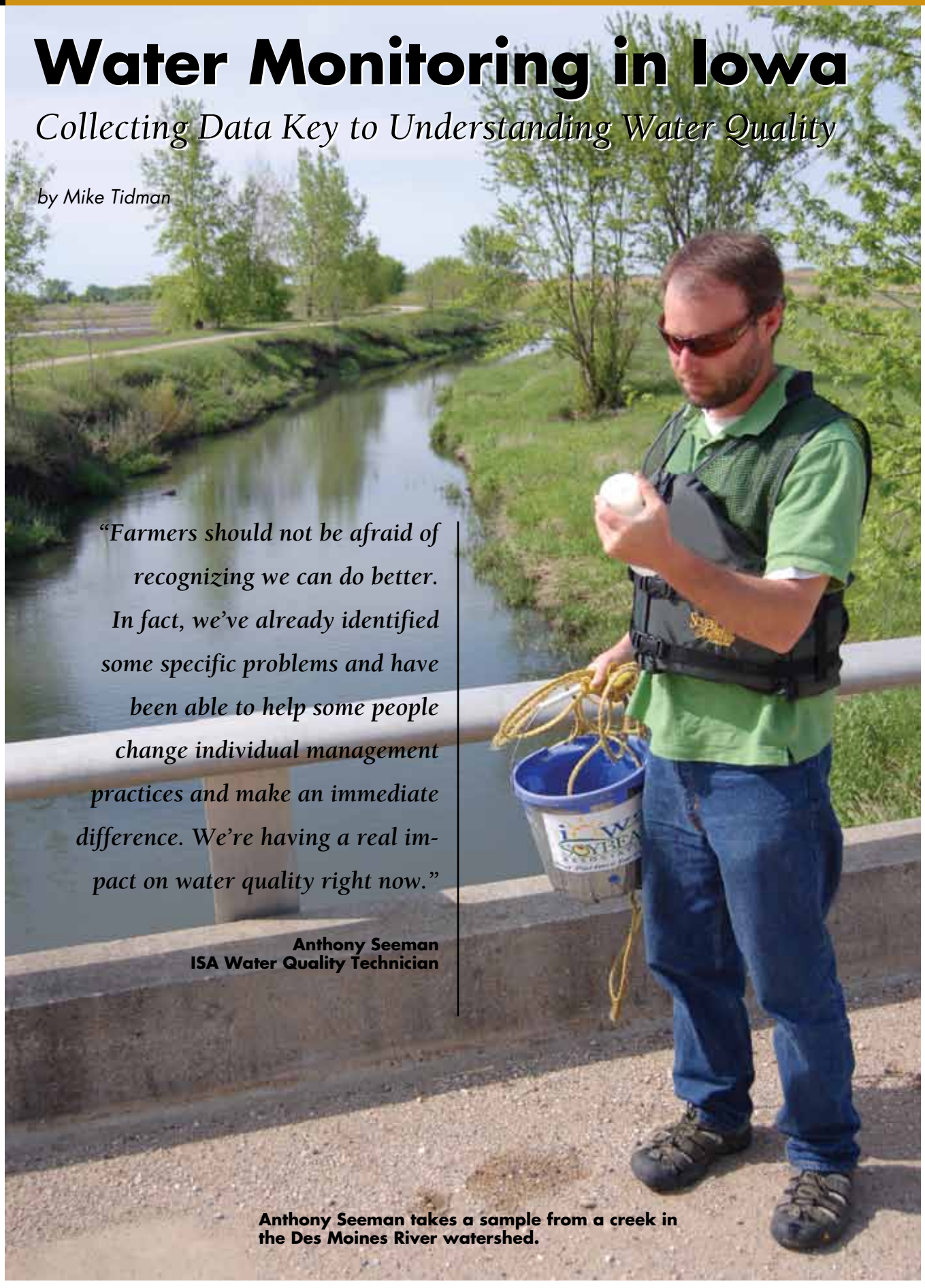
"ACWA and Sand County Foundation have led the way by sharing the cost of this project, but other partners have worked hard on making the bioreactor project a reality," Wolf says. "From our contractor, John Pemble of Pemble Digging & Drainage Service Inc., and his crew, who did a great job working on a different kind of project, to Greene Soil and Water Conservation District, Iowa State University, the City of Perry, with its donation of wood chips, and Mike Bravard, the farmer who provided us the opportunity to put this project on a working farm landscape."

PHOTOS COURTESY OF MIKE TIDMAN.

Water Monitoring in Iowa

Collecting Data Key to Understanding Water Quality

by Mike Tidman



"Farmers should not be afraid of recognizing we can do better. In fact, we've already identified some specific problems and have been able to help some people change individual management practices and make an immediate difference. We're having a real impact on water quality right now."

Anthony Seeman
ISA Water Quality Technician

Anthony Seeman takes a sample from a creek in the Des Moines River watershed.

"If you don't measure it, you can't know it, and, ultimately, you can't manage for it," says Roger Wolf, Iowa Soybean Association (ISA) director of Environmental Programs.

ISA and a partner group called Agriculture's Clean Water Alliance (ACWA) are investing considerable effort in water quality monitoring in Iowa to gather data on what's in Iowa's streams and rivers. Wolf says the goal is to accumulate, understand, process, and use water quality monitoring data to begin the process of measurably improving water quality.

"Ultimately, our goal is to keep farmers productive and profitable," Wolf says "But the reality is that we can't stick our heads in the sand when it comes to environmental issues – we need to take action."

Together, ISA and ACWA coordinate a broad water-sampling network – 18 certified samplers and ISA staff pulling samples from 129 sites in the Raccoon River and Des Moines River watersheds.

Anthony Seeman, ISA water quality technician, oversees the sampling activities and says the effort resulted in the collection of 1,352 of 1,364 scheduled grab samples in 2008.

"Those numbers represent a huge success," Seeman says. "Especially with the tremendous challenges of weather and logistics this year. The data is helping ISA be thoughtful in how we understand environmental issues. It helps us identify and enter the places that give us the best opportunities to show improvement, considering the limited environmental resources that exist.

"Farmers should not be afraid of recognizing we can do better," Seeman continues. In fact, we've already identified some specific problems and have been able to help some people change individual management practices and make an immediate difference. We're having a real impact on water quality right now."

In addition to identifying hotspots, the water monitoring effort works alongside large-scale ISA efforts to help farmers evaluate management practices in farm fields through the ISA Watershed Program and CEMSA (Certified Environmental Management Systems for Agriculture). As monitoring data accumulates and farmers evaluate their management practices, linkages may emerge between environmental performance and management decisions made on the farm.

Chris Jones, of the Des Moines Water Works, is one of the water quality monitoring partners, providing lab analysis and other assistance. He sees immediate value in the effort because it helps the Des Moines Water Works better understand the issues they face in using the Raccoon and Des Moines rivers as source water.

"In 2008, we saw some specific issues come up with ammonia when the snow melted and cyanobacteria in late summer 2008," Jones says. "The water quality monitoring done by ISA and ACWA was essential in better understanding these issues. It will help us identify solutions as well. That's what we see as the value of being involved with ag groups like ISA and ACWA. We need to be able to have open and honest conversations, and we think ISA and ACWA are helping us do that. We want them to take action, and they are."

Roger Wolf and Anthony Seeman survey a site for installation of an automated water monitor.

PHOTOS COURTESY OF MIKE TIDMAN.

Matt Carlson, certified sampler from Lake City, Iowa, takes a sample from the Raccoon River.

Certified Sampler

Matt Carlson of Lake City, Iowa

"I help with monitoring water quality because we need to have an idea of what is in our rivers for our health and other reasons. My hope is that the people who live here have the information found in these tests made available to them in layman's terms and that we use it."

Water Monitoring

An Integrated Approach

Water quality monitoring is at the foundation of a multiscale and integrated approach to improving water quality.

Level One

Data Collection in Large Watersheds

Identify baseline conditions throughout larger watersheds and help target sub-watersheds for Phase II monitoring and program implementation.

Level Two

Scaling Down the Focus

Identify specific water quality concerns, gather data more intensively in a targeted watershed and look at possible management change.

Level Three

Identifying and Implementing Solutions

Paired microwatershed analysis begins – evaluating the environmental performance of different management strategies in pairs of similar 600- to 1,000-acre microwatersheds.

Get Soybean Information 24/7

Profit Makers Get ISA Resources Online

by Karen Simon

Farming isn't a 9-to-5 job, so providing information about growing soybeans shouldn't be limited to those hours either. A new online resource puts a variety of information at your fingertips 24/7.

The Iowa Soybean Association (ISA) has assembled a number of online resources designed to help you produce soybeans more profitably. Located at www.iasoybeans.com/productionresearch/, the site includes publications that can be downloaded or read online, podcasts and video. The publications are, for the most part, a cooperative effort between ISA and Iowa State University (ISU), reporting the results of checkoff funded research. However, some publications have been produced by the North Central Soybean Research Program or other sources.

"ISA recognizes that soybean producers want information in a variety of formats," says Brian Kemp, soybean grower from Sibley, Iowa. "That's why we provide information via radio, newspaper, magazines and the Internet. The goal is to provide soybean growers with the information they need, whether it's while they're combining or sitting at their desk after a hard day in the field."

Those who make timely management decisions are likely to make the greatest profit, and the information available on this Web site can help growers make those tough decisions, according to David Wright, ISA director of contract research.

"During the 2008 growing season, it was clear those who responded quickly to aphid infestations saved an average of seven to 10 bushels an acre, compared to those who waited too long," Wright says.

Soybean cyst nematode (SCN) is Iowa's No. 1 yield robber. The Web site offers several SCN decision aids to help soybean producers manage this pest more effectively. For example, you can read or download the new SCN pocket guide, or find out how you can order your own paper version. You can also listen to podcasts about proper soil sampling techniques, management of SCN, or watch a video featuring Dr. Greg Tylka, ISU nematologist, demonstrating the proper way to check soybean roots for SCN.

In addition, ISA introduced a series of soybean management podcasts this year. The podcast topics range from glyphosate stewardship to learning to recognize the early warning signs of bean leaf beetle and soybean aphid, and either can be downloaded to an MP3 player or can be listened to via your computer.

The site also contains links to ISU crop performance tests to assist you in selecting high-yielding varieties for your farm as well as other resources to help you identify and manage soybean pests.

ISA's Production Research Web site includes publications that can be downloaded or read online as well as podcasts and video.

Information is added to the site regularly, so check often for updates.

Guidelines to Proper Handling of Biodiesel

Biodiesel use among Iowans has expanded greatly in recent years. Like conventional diesel fuel, biodiesel and biodiesel blends should be handled properly to ensure equipment runs well. As the weather turns colder, users, distributors and blenders of biodiesel must take action to prevent future problems.

Cold weather can cloud or gel any diesel fuel, and especially biodiesel blends, as they can slightly increase cold flow properties – including cold filter plugging, cloud and pour points. Taking certain steps can ensure that biodiesel blends up to B20, a blend containing 20 percent biodiesel, can be used successfully in cold weather. The first step is to identify the cloud point and cold filter plugging point of the diesel fuel and biodiesel fuel in use. If an outside blender is used, make sure he or she is accountable for the winter operability requirements.

Common winterizing practices include adding No. 1 grade diesel or kerosene to the diesel fuel, as well as introducing cold flow additives, which help to lower the cold filter plugging point of the fuel. Currently B100, pure biodiesel, cannot be treated successfully with conventional winter fuel additives as none are available commercially, though they are in experimental development.

With up to a B5 blend, there is no difference between biodiesel and diesel as to what additives need to be introduced for the fuel to function at low temperatures. Anything above B5 and up to B20 will need two to three times more cold flow additives for the fuel to operate successfully at low temperatures. The combination of diesel fuel, biodiesel and a winterizing agent will perform the necessary modification to effectively use up to a B20 biodiesel blend in most cold weather environments.

Storage Tank Maintenance and Ensuring Biodiesel Storage Quality

When storing biodiesel or petroleum diesel, it is important to follow practical tank management steps. Both petroleum-based diesel fuel and biodiesel need to be protected in order for their quality to be maintained. Protecting fuel can be accomplished by following these basic, but crucial, fuel quality guidelines:

1) The fuel should be stored in a clean, dry and dark environment. Acceptable storage tank materials include aluminum, steel, fluorinated polyethylene, fluorinated polypropylene and Teflon. Copper, brass, lead, tin and zinc should be avoided.

2) Keep a storage tank topped off. This will eliminate the headspace in the tank and ultimately reduce interior condensation, especially in the winter months.

3) Monitor and eliminate water or condensation by inspecting the fill and vapor caps for damage and missing gaskets, checking and replacing hoses that appear to be cracked or leaking, or by using a desiccant dryer or filter on vent pipes to limit moisture contamination.

PHOTO COURTESY OF THE UNITED SOYBEAN BOARD/SOYBEAN CHECKOFF.

4) Additives can be used to bring the fuel up to the cold flow standards in which you wish to use the fuel. Additives should not be used once a fuel hits 10 degrees Fahrenheit above the cloud point. Do not add additives to previously treated fuel; using more additives is not always beneficial. Follow the guidelines of reputable fuel distributors.

5) It is very important to monitor the filters on a diesel storage tank that has been switched over to biodiesel, particularly if the tank is old and has not been cleaned.

6) It is a good idea when storing fuel to have a lab run a microbiological evaluation of the fuel at least once per year to ensure that no contamination exists in the tank. It is also a good idea to have an analytical lab run tests on any kind of fuel occasionally to ensure that it is up to ASTM standards.

7) Usually, it is recommended to not store biodiesel longer than six months or, at most, a year. This recommendation is similar to diesel fuel storage periods. If storage of higher blends, more than B20, is intended beyond six months, it is recommended that you add a fuel stabilizer. A biodiesel fuel stabilizer can be obtained through a reputable, experienced fuel additive supplier.

8) Lastly, be prepared. Ultimate success in purchasing, storing, blending, using and shipping biodiesel starts with knowing what is bought, keeping supply sources accountable for upholding quality and learning about biodiesel basics.

To receive a complete copy of the Biodiesel Fuel Quality and Performance Guide, contact the Iowa Soybean Association at 800-383-1423 or log on to ISA's Web site at www.iasoybeans.com or www.soybiodiesel.com. More information is also available at www.biodiesel.org, www.iowabiodiesel.org and 2millionmilehaul.com.

ROW BY ROW

LOOKING BACK AT THE 2008 GROWING SEASON

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Looking back at the 2008 growing season, who would have thought it would turn out the way it did? I think we all were challenged in many unexpected ways. Personally, I experienced something I have never seen before in my life. When it rains hard in Denmark, we get 1 to 2 inches in a day. Erosion and standing water in the fields are not very common, except in the river valleys. In Ames, we received more than 34 inches from April 1 to Oct. 1, which is the normal yearly precipitation.

The season started slowly since the winter never really wanted to give up. We got close to 60 inches here in Ames, and the snow stayed on the ground until mid-March. As soon as we got into April, it started to rain pretty much nonstop. Due to the rain, approximately 25 percent of the soybeans were first planted after June 15.

Most of the soybeans, and corn, were not planted into good seedbed conditions, and sidewall compaction was very common throughout the state. Root development was, therefore, not very good. But, lucky for us, it continued to rain until late July so we didn't really need the root system, and then it stayed cool. To my knowledge, we only had four days above 90 degrees Fahrenheit in Ames this year, and, with the stressed plants from all the flooding and lack of root system, that really saved us.

Yields have been surprisingly good, considering what we went through during the growing season, but, on average, the yields for many growers were down 10 to 15 percent compared to last year, which was a huge relief to many. It seems the yield in Iowa will average close to 45 bushels per acre, which is the lowest yield we have had since 2003. However, areas like northwest Iowa had some of the best soybeans yields they have ever seen.

The growing season was cold, and a good indicator of how cold it was can be found on the late-planted soybeans. In a normal year, with normal temperatures, soybeans planted after June 15 will start to flower as soon as they have one to two trifoliolate leaves, and yields will be close to 50 percent of early planted.

This year, we were able to get 3 to 4 trifoliolate leaves before they started to flower since both photoperiod and temperature influence flowering. Adding a few more nodes helped recover some of the yield loss associated with late planting. However, the lack of canopy and shorter plants from the cool temperatures were obvious in many fields since weeds continued to come through the canopy throughout the growing season in many fields.

Sudden death syndrome (SDS) showed up very early this year, and I feared it would take away most of our yields. Again, we were lucky. I found SDS on June 24 in Greene County, but it never really took off as expected. I assume the reason for this was the rain stopped in late July and first kicked in again during the Farm Progress Show. Research has documented that rain during the podset and seedfill period can have an impact on the epidemiology of this pathogen.

PHOTO COURTESY OF PALLE PEDERSEN.

2008 will be remembered for the floods all over Iowa. Despite the floods, yields were better than expected because of cool temperatures throughout the growing season.

Then there was soybean aphid. We all thought that 2008 was going to be an "off" year, but we were wrong. But, I don't think we can talk about an "off" year anymore. Insects are much more complicated than most people think. The population dynamics of soybean aphids is a complicated system. The checkoff and the Iowa Soybean Association have been working very closely with Iowa State University and the other states in the North Central region on understanding soybean aphids and generating thresholds for us.

Overall, 2008 is a year we would like to forget, and I was happy when I closed the machine shed after this season. There is a lot we can learn from this, and let's take these lessons into next year. Merry Christmas!