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Minnesota Irrigator

PUBLICATION OF THE IRRIGATORS ASSOCIATION OF MINNESOTA FALL 2015

Comments by the IAM President

Alan Peterson, IAM President

Dear Irrigators,

Soon another summer will be behind us. We have been blessed with timely rains and that has saved irrigators a significant amount of money in electrical costs and diesel fuel.

IAM, along with Jim and John Anderson of Belgrade will be hosting a farm tour on August 21st. Many DNR personnel have been invited, as well as legislative members that sit on agriculture and environmental committees. We will be visiting a calcareous fen, a DNR monitoring well site, and a variable rate irrigation system.

This farm tour is a wonderful opportunity to show DNR staff many great things irrigators are practicing around the state. I'd like to thank the Anderson family for volunteering to host this tour.

I was recently invited to Royalton to help start a new local irrigator's association. The IAM board welcomes this new association and look forward to their input on irrigation issues.

Welcoming a new local association makes me think about the many local associations across the state. We need our local associations to be active. If your association hasn't met in the last year, consider becoming active again.

Have a safe harvest,

Alan Peterson, Irrigators Association of Minnesota President
alpetefarm@frontiernet.net
or 320-743-2551

INSIDE

Variable Rate Irrigation Validation

By Joshua Stamper, Irrigation Extension Specialist/University of Minnesota

Joshua Stamper uses a Neutron Probe to measure soil moisture in a field with VRI at the Anderson Farm in Belgrade, MN.

Variable Rate Irrigation (VRI) is viewed by many people in the agronomic world as the next wave in precision management tools for addressing the variability of what used to be considered marginal soils due to low water holding capacity.

Water holding capacity of soils is often the most limiting yield factor in central Minnesota. This is mainly due to our glaciated past. Fields with gravel and coarse textured outwash sands and poorly drained "pothole" wetlands are common across the state. These fields present significant management challenges from profitability and a conservation standpoint. No grower is interested in spending money on a part of the field that is not going to yield, and there are societal downstream impacts to poor fertilizer and water use efficiencies.

This is where VRI shows up as solution to being able to apply the right rate of water, at the right place, and at the right time.

VARIABLE RATE continued on page 3

Welcome to the Fall 2015 Newsletter

Jerry Wright, IAM Membership Secretary

This newsletter comes to you thanks to the support of the enclosed advertisers and the current IAM irrigator and industry membership and those Extra Mile Supporters listed in the newsletter.

The IAM Board of Directors' encourages you to become a member if you have not already joined. We all need each others ideas, experience and support to continue the IAM activities into the coming year especially in keeping a watchful eye on our irrigation water rights, at the **Legislator** as well as represent the interests of irrigation practices across the state.

To become a member return the application form on the last page of this newsletter with a check made payable to the "**IAM**". There are many benefits in belonging to IAM with the best one being simply knowing that you have joined in partnership with your neighboring irrigators in supporting your IAM officers and the board of directors' legislative and agency contact activities. As a member you can also be placed on the IAM email alert list if you submit your email address.

If you have a topic that you would like to see discussed in a future newsletter issue, drop a note to IAM president, Alan Peterson at <*alpetefarm@frontiernet.net*>
Articles for the newsletter are solicited and gathered by the IAM officers and Membership Secretary, Jerry Wright whom can be contacted at <*wrightsj@charter.net*> Crow River Press, in Hutchinson, MN manages advertiser space and edits, prints and mails the newsletter.
If you are not interested in receiving future mailings from Irrigators Association of Minnesota (IAM), please send a note to: wrightsj@charter.net or IAM, c/o Fletcher, 24 S. Edquist St., Appleton, MN 56208

MONITORING NITRATE-NITROGEN MOVING IN IRRIGATED SANDY SOILS

By George Rehm, University of Minnesota (retired) and coordinator of Discovery Farms-Minnesota

The Discovery Farm-Minnesota concept has been described in another article in this newsletter. Throughout the project, selection of participating farms has followed an application process. For at least two years, IAM has requested that an irrigated sandy field be used as a Discovery Farm. This request was discussed in detail by the steering committee and there was a decision that monitoring of an irrigated sandy field should be included in the Discovery Farm-Minnesota system. A search for a cooperating farmer started in the fall of 2014 and work on installation of necessary equipment was completed in early spring of 2015 at a farm in Benton County.

Measurement of movement of nitrate-nitrogen through irrigated sandy soils might sound like an easy task. But, it isn't. This task requires collection of soil water at some point below the soil surface followed by analysis of this water for nitrate-nitrogen. In addition, it's necessary to determine the amount of water that flows through the sandy soil profile. Then, by multiplying concentration of nitrate-nitrogen in the water by water flow the profile it's possible to calculate loss of nitrate-nitrogen in units of pounds per acre.

A ceramic suction cup is used to collect the water. If everything goes right, water flows from the soil into the cup and is removed from the cup by placing suction on the cup. For this specific monitoring project, the cups are placed about 5 feet below the soil surface well below the activity of any tillage equipment. They will not be removed until the project is completed. The five foot depth is also below the activity of the roots of most irrigated crops.

A water budget is used to calculate the amount of water that moves through the sandy soil. To do this, the amount of rainfall and irrigation water used is measured. Water use by the crop (evapotranspiration) is calculated from weather data.

MONITORING continued on page 11

MAWRC Monthly

MDA Releases 2014 Pesticide Monitoring Report

The Minnesota Department of Agriculture has published their 2014 Water Quality Monitoring Report summarizing groundwater and surface water sampling, primarily focused on agricultural pesticides. The MDA coordinates one of the top pesticide monitoring programs in the country.

The report provides analysis of 560 groundwater samples from 167 sites across the state, and concludes that "no groundwater pesticide detections exceeded any human health-based drinking water standards or reference values in 2014."

Surface water monitoring results from nearly 1000 samples shows 25 samples in which pesticide concentrations exceeded water quality standards, a slight increase from previous years. It should also be noted that several of these standards also contain a duration requirement, i.e. the concentration must exceed the standard for a certain number of days to actually exceed the standard, and the analysis of concentration duration was not included in the report.

The data show that crop protection products continue to be used effectively and safely by Minnesota farmers and commercial pesticide applicators, while also serving as a reminder to continue to follow label requirements and handle pesticides with care.

Find the full report here:
http://www.mda.state.mn.us/chemicals/pesticides/~/media/Files/chemicals/maace/wqm2014rpt.pdf

MAWRC
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We're looking forward to continued discussion on irrigation topics and innovations at the
42ND ANNUAL IAM CONVENTION ON FEBRUARY 18, 2016
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Minnesota Farmers: NATURALLY RESOURCEFUL

Minnesota farmers are leaders in the production of corn, soybeans, wheat, sugar beets, potatoes, milk, pork, beef and poultry products. They are also leaders in conservation per the opening lines on the Minnesota Agricultural Water Resource Center (MAWRC) website at http://www.mawrc.org/ .

MAWRC has two featured programs that are developed and administered by farmers to provide a research and education foundation to continuously seek areas of improvement in farming practices and tracking our improvement.

DISCOVERY FARMS MINNESOTA

Discovery Farms Minnesota is a farmer-led program combining water quality information and farming system information to help characterize the relationship between agricultural management and water quality.

Green Star Farms Initiative

The Green Star Farms Initiative is a new approach to comprehensively evaluating farming systems, intended to challenge farmers and those who advise them on farming practices to think critically about both agricultural production and resource protection.

The Minnesota Agricultural Water Resource Center is a non-profit research and education organization dedicated to assisting Minnesota farmers in addressing water quality concerns. It's members and supporters include agricultural organizations representing more than 50,000 farmers and those who advise them.

IAM is a member – partner of this research based and effective organization.

MAWRC
MINNESOTA AGRICULTURAL WATER RESOURCE CENTER

Check out their website to follow their research program, Discovery Farms Minnesota, and their environmental assessment programs to learn more about Minnesota farmers' commitment to environmental stewardship.

VARIABLE RATE continued from page 1

Make no mistake, VRI systems with "by nozzle" resolution is not cheap, plus there are added costs like installing a variable frequency drive to match pumping capacity with system demand. The real key to making a VRI system "cash flow" is finding a field with a sufficient amount of variability where you can be sure that water is your most limiting factor. This is usually going to be your upland soils, where you may have outwash sandy pockets, that usually end up yielding 25-30% less than the areas around it. Unfortunately, there is not a much that you can do about the parts of the field that have too much water. This is where being able to program VRI to not apply water can save you water and money. Writing the VRI prescription maps is relatively easy, however making sure that your prescription is correct takes some time.

As part of a ongoing research program through UMN Extension, we have team up with irrigators in Stearns and Otter Tail counties to validate VRI prescription maps. This process involves incorporating yield map data, elevation data, soil survey data, gravimetric sampling, electrical conductivity mapping using either a Veris or EM38, and physically mapping out places in the field where you do not want to apply water. Then we create management zones, and install Neutron Probe access tubes and rain gauges in parts of the field that are representative of these zones. Each week during the growing season, we collect soil moisture data and the amount of rainfall and irrigation water that each zone received. Then water balance maps are created and can be overlaid with thermal imagery maps for in-season validation (when plants get water stressed, the canopy temperature increases). At the end of the season we can then add in yield map data to show the relationship between too much or too little water and yield. This will then allow use to continue to dial in the appropriate irrigation prescription for the VRI system. The results of this study will be presented at winter irrigation meetings put on by your local SWCDs and your state and local irrigation associations. I hope to see you all there!

Joshua Stamper, University of Minnesota - Irrigation Extension Specialist, CPAg/CCA, Google Voice/Cell: 612-405-3006, Email: jstamper@umn.eduOffice: 612-626-4986

How to grow more food with less water

By Matt Weiser Washington, D.C. Journalist

Scientists and farmers collaborate on a quest for more efficient irrigation

This story was adapted from a longer version at Ensia (http://ensia.com/), a full version of article can be found at http://ensia.com/features/how-to-grow-more-food-with-less-water/

From reading the weather to choosing a crop, farming has always been a hands-on enterprise. When a farmer wonders how much water a crop needs, a simple test has always sufficed: Grab a handful of soil and feel how it clumps together.

Now something else is helping inform the farmer's touch: Data. Sensors, satellites and software are adding piles of new data to help manage water on the farm. From soil moisture to leaf transpiration, pump speed to valve status, a farm field these days can seem as wired as an airport.

Water scarcity is adding urgency to the quest for this kind of information. Droughts have seemingly become more common and persistent across the globe, presenting farmers with tough choices and slimmer economic margins. In the face of uncertainty, technology offers one way to exert more control over basic inputs like water.

In the Texas panhandle, the recent prolonged drought forced many farmers to realize they can no longer depend on rain alone to irrigate crops. Many are drilling deep wells to tap into the Ogallala Aquifer, the largest in North America, for supplementary irrigation water.

"Irrigation is important to people here — not only farmers, but the whole economy." — Susan O'Shaughnessy, a research agricultural engineer at the U.S. Department of Agriculture in Bushland, Texas, is developing new sensors for center-pivot irrigation devices to help farmers ensure that precious groundwater isn't wasted. The sensors measure leaf-canopy temperature to gauge water demand, which helps avoid over-irrigating.

"We know it'll run out someday. We can't stop that," she says. "Irrigation is important to people here — not only farmers, but the whole economy. We're looking to sustain farmers for a few years to come."

Improved irrigation efficiency can also reduce diversions from creeks and rivers, leaving more water for aquatic habitat and other human uses. And it may prevent herbicides and fertilizers from being carried back into those rivers when water runs off fields.

Sensitive Center-Pivots

Agriculture accounts for 69 percent of global freshwater withdrawals, according to estimates by the United Nations Food and Agriculture Organization. The number is generally higher in developing countries and lower in industrialized nations, where a greater share goes to manufacturing. ***In the United States, agriculture uses close to 40 percent of freshwater withdrawals.***

Only about 20 percent of global farmland is irrigated, but that irrigated land accounts for 40 percent of food production. Flood irrigation is the most commonly used method, even though crops use only about half of the water applied by this method.

Many people recognize a center-pivot sprinkler because it creates "crop circles" visible from the air. A giant sprinkler on wheels rotates around a central water supply (a well or supply pipe), watering a circular field. It is the most common irrigation technique in the Texas panhandle and many other parts of the United States. And it is becoming increasingly popular around the world because it is simpler and more durable than many other irrigation technologies. It can also be efficient, with up to 90 percent of applied water being absorbed by the crop in automated center-pivot systems. The remaining 10 percent is either lost to the wind or runs off the field.

O'Shaughnessy is helping make center-pivot systems even more efficient by developing infrared sensors. Shown being adjusted by O'Shaughnessy and colleague Nolan Clark in the photo at the top of this story, these hang from the center-pivot arm to measure temperature in the leaf canopy of the crop below and provide data farmers can use to apply water only when and where needed. Such data are a better indicator of plant health than traditional soil-moisture readings, she says, which are commonly used to determine irrigation settings.

In O'Callaghan system, an onsite computer — the brains of the US$3,000 system — processes data from the infrared sensors along with weather information. The computer compares these data against stress thresholds for that particular crop to determine how much to irrigate. Different zones within the circle may have unique thresholds based on soil type, drainage characteristics and other factors, and will get different amounts of water.

"At midnight, it takes this data … and spatially calculates the crop water stress for each management zone," O'Shaughnessy says. "So if that is exceeded, it signals to the system that an irrigation is needed in that zone."

The system produces a map of the circle for the farmer to show which areas need water. It also creates a new irrigation schedule to provide the water each zone needs. The farmer can either allow it to go ahead, or change it if — in his own judgment — other factors need considering.

Gauging Absorption

Another new technology being used in California, primarily with drip irrigation, measures actual evapotranspiration — the movement of water from soil through plants to the atmosphere — on an entire farm field. Sensors have long been available to measure evapotranspiration for a single plant or a single point in a field, providing data farmers can use to estimate water use on a whole field. But that approach is imprecise.

The new approach, called "surface renewal," measures the energy of wind eddies that contact plants. As wind moves across a field, water vapor moves from plants into the air. A sensor measures change in the wind's energy, which is then used to calculate the amount of water vapor transfer over the area the wind has traveled.

The farmer uses this information to gauge the amount of water absorbed by the crop. It can be compared against a predetermined stress level in the plant to decide how much water to apply for the best yield — or, in the case of wine grapes, the best balance of acids in the grapes to get the desired flavor.

"In the same field and in the same season, we sometimes help with water savings, yield and quality." — Tom Shapland. Developed by researchers at the University of California at Davis, the system is being deployed commercially by Tule Technologies, a company formed with university support. The company installs its sensors, which can cover as much as 10 acres (4 hectares), for US$1,500 each, and provides a growing-season-long data subscription. The system is being used with wine grapes, almonds, walnuts, citrus, pistachio, melons, strawberries, tomatoes and other crops.

Tom Shapland, CEO of Tule Technologies, said the goal is to both improve crop yield and save water.

"Tule is an efficiency technology," says Shapland, who developed the system while a Ph.D. candidate. "If a grower happens to start applying too much water, we tell them the plants are not using all the applied water. In the same field and in the same season, we sometimes help with water savings, yield and quality."

Chemigation Permit Program

By Jane Boerboom

A permit is required from the MDA for the application of fertilizers or pesticides through an irrigation system directly connected to any water source including wells or surface water. The MDA has issued 2,480 chemigation permits since the start of the program in 1994.

The MDA issues the majority of permits for center pivot irrigation systems that are used most commonly for potato and/or corn production. The MDA also issues permits for greenhouses, nursery, fruit and vegetable sites.

Sites are prohibited under state law from applying fertilizers or pesticides through an irrigation system unless: a) the required antipollution equipment is installed and is operational; and b) the permit application and required fee have been submitted to the MDA.

When violations are found the MDA will likely require the operator to cease use of the chemigation system until noted items are corrected. Violations may result in financial penalties.

If you would like more information please contact Jane Boerboom, MDA Chemigation Supervisor, 651-201-6540, jane.boerboom@state.mn.us or the MDA Chemigation Permit Line at 651-201-6057. Additional Information on chemigation permit requirements is at the MDA's webpage: http://www.mda.state.mn.us/chemicals/fertilizers/chemigation.aspx

Chemigation Permit and MDA Inspection Information:

- If the operator – the person who uses the chemigation system, changes, a new chemigation permit must be obtained.
- Visit http://bit.ly/1GhREFa to apply on-line for a chemigation permit. Fees are $50.00 for a fertilizer only; $250.00 for a pesticide only or combination pesticide/fertilizer permit.
- After you apply for a permit it typically takes 30 days for a chemigation permit to be issued.
- The MDA may inspect any site before or after permitting to determine compliance with MN laws, including installation of antipollution devices. Antipollution devices that are defective or missing, bulk fertilizer containers located less than 20 feet from the well and no chemigation permit are examples of violations that have been documented by MDA inspectors over the past few years.

Time and Money

Time is an important factor in any new irrigation technology, and one that's not often taken into consideration, says Daniel Howes, a professor of engineering and irrigation technology at California Polytechnic State University in San Luis Obispo.

Howes cites the example of data provided by soil moisture sensors buried 2 to 3 feet down at strategic intervals in a field. The sensors have become common across the U.S. for many types of crops to help farmers decide how much water a field needs and when.

But the large volume of data they spit out can be overwhelming. Howes says that time management studies have shown farmers have as little as 5 percent of each day to make irrigation decisions. The rest of the day is packed with choices about labor management, tractor work, pest control, fertilizer application and purchasing raw materials, not to mention selling the crop.

"A lot of farmers have gotten bogged down and basically abandoned that [soil moisture] system, because…they just don't have time to actually look at it every day and decipher the data," Howes says.

The next step, Howes says, is to equip a drone with a thermal-imaging camera.In partnership with colleagues at NASA and the U.S. Geological Survey, Howes is working to turn remote-sensing data from satellite imagery into measures of evapotranspiration on farms. The team is producing satellite photos with 30-meter resolution showing water use by crops in varying color codes. The photos show farmers at a glance which area of a crop needs more or less water.

Because of processing time, those images may be weeks old once they reach the farmer. The next step, Howes says, is to equip a drone with a thermal-imaging camera to produce the same kind of maps faster and in finer detail. Although drones have been getting lots of attention as commercial tools, it remains to be seen if the promises will bear fruit.

Money matters, too.

"A big part of the business is to make sure you're not overspending on technology," said John Diener, a farmer in California's San Joaquin Valley, who has helped Howes and colleagues with the satellite mapping. "We are conserving every drop of water that we can. It's not in our financial interest to do anything but that."

There have never been so many ways to help conserve water on farms. The key question is, will farmers embrace them, given the trade-offs? Just like the trajectory of future water supply and demand, that remains to be seen.

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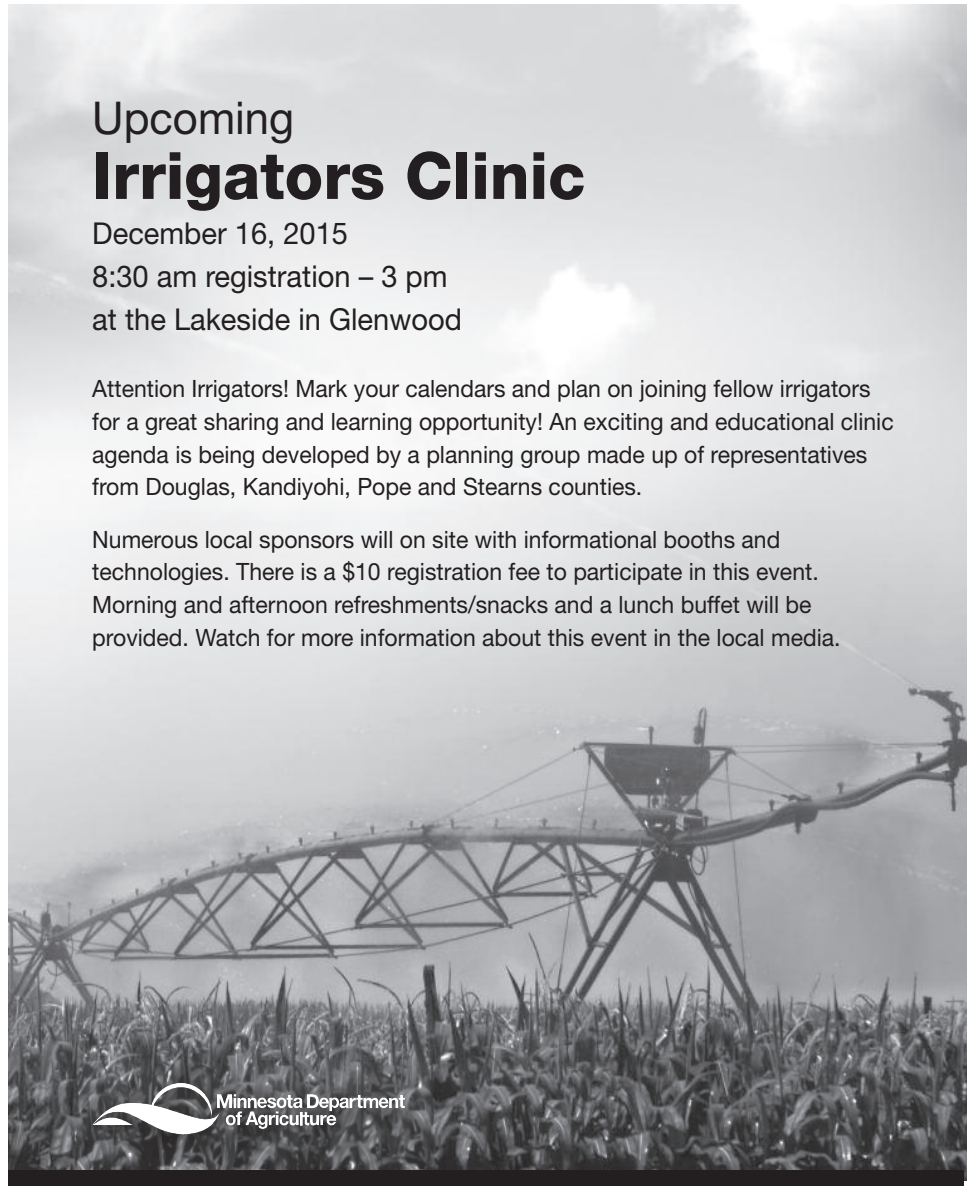


Irrigation Stewardship Tips from an Irrigator

Jim Anderson, Andersons Farms – Belgrade (5th generation farm) IAM Board Member from Bonanza Valley Irrigators Association

Editor's Note: On August 21st, Irrigators Association of Minnesota and Anderson Farms from Belgrade are hosting a tour of irrigated crops in the area for officials from the Department of Natural Resources, area legislators, county agency staff, Bonanza Valley Groundwater Management Area advisory Team and local irrigators.

With the 2012 drought and low lake and stream levels through last winter irrigation water management and increases in water user fees were high on the agenda for the 2013 Minnesota legislature. While there were no reporting fee increases there were many new provisions put into law that grants the Minnesota Department of Natural Resources power to further regulate how we use our state's water resources.

As responsible irrigators need to do everything we can to efficiently and conservatively use our water, to work with our neighbors and project a positive public image, and work with state agencies to accurately provide information on water usage and insure that there is no contamination of our groundwater.

We can efficiently use and conserve water by:

1. ***Use irrigation scheduling.*** Most county NRCS offices have programs available and are a good tool to determine the need for additional irrigation water depending on the crop, stage of plant growth, and weather conditions. Evaporative transpiration values available on the internet, rain gauges, soil moisture blocks, a good sand shovel that can dig a hole as deep as the topsoil, and a couple good weathermen that have been known to tell the truth are also valuable tools for scheduling.
2. ***Conversion of high pressure sprinklers*** to low pressure drop nozzles with pressure regulators.
3. ***Fix the leaks***. Leaking pipes, gaskets, and tower boots usually place the water where it is least needed; by tower wheel tracks and at the pivot and do little to grow a crop.
4. ***If water is needed at germination***, apply no more than necessary. Excessive moisture especially applied prior to a rain event can cause compaction and hinder later root growth.
5. ***Allow crops to become rooted*** and somewhat stressed during early crop growth. This will provide for stronger root systems later in July and August and reduce problems with root diseases.
6. ***Fix all end gun shutoff valves and*** swing tower corner machine shutoff valves to uniformly water all areas of the field and not waste water on non-cropland and roads.
7. ***In the future adopt variable rate irrigation technology.*** Even today most

computer driven irrigators can be programed to deliver more water to certain quadrants of a field.

With the high commodity prices of the last several years the public has a totally different opinion of us compared to their perceptions of 30 years ago during the farm crisis. The public is not as tolerant of some of the things that happen.

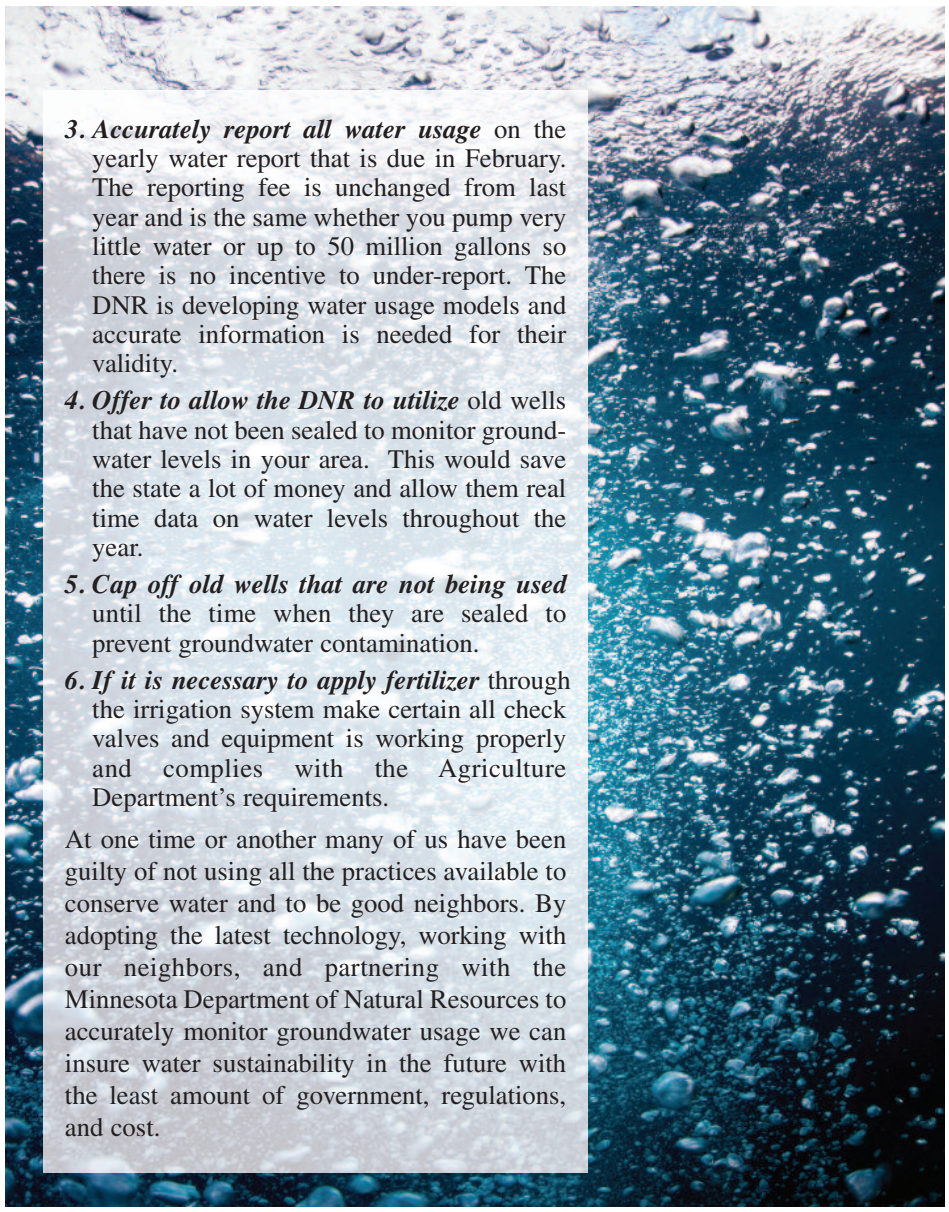
We need to try harder to communicate with our neighbors and maintain a positive public image.

1. ***Talk to your neighbors about*** their wells and water systems. Encourage them to contact you if they have problems. Offer your help and expertise if they are experiencing water shortages during a dry year. It may be something as simple as a pump not being set too shallow.
2. ***Respect roads and highways.*** Keep end guns from watering roads. Offer to pay to fix a road if it is damaged during harvest. Don't expect to reroute or close a road without due process. Allow cars and other traffic to pass when moving large farm equipment during planting and harvesting.
3. ***During irrigation season shut off*** irrigators as soon as possible after a rain event that saturates the soil.
4. ***Stay involved in local organizations,*** schools and churches. Donate to local charities and fundraisers.

We must work with the DNR to report and monitor water usage and comply with the Minnesota Ag Department's fertilization and chemigation requirements.

1. ***Obtain a permit on all irrigation wells*** you are using. Check so that the Health Department well number in the field matches the DNR Appropriations permit.
2. ***Check so that all land irrigated*** by a particular permit is listed on the DNR Appropriation permit. Sometimes one may have forgotten to amend the permit if one decided to pump water to a neighboring field from the same well.

STEWARDSHIP continued on next page



3. ***Accurately report all water usage*** on the yearly water report that is due in February. The reporting fee is unchanged from last year and is the same whether you pump very little water or up to 50 million gallons so there is no incentive to under-report. The DNR is developing water usage models and accurate information is needed for their validity.
4. ***Offer to allow the DNR to utilize*** old wells that have not been sealed to monitor groundwater levels in your area. This would save the state a lot of money and allow them real time data on water levels throughout the year.
5. ***Cap off old wells that are not being used*** until the time when they are sealed to prevent groundwater contamination.
6. ***If it is necessary to apply fertilizer*** through the irrigation system make certain all check valves and equipment is working properly and complies with the Agriculture Department's requirements.

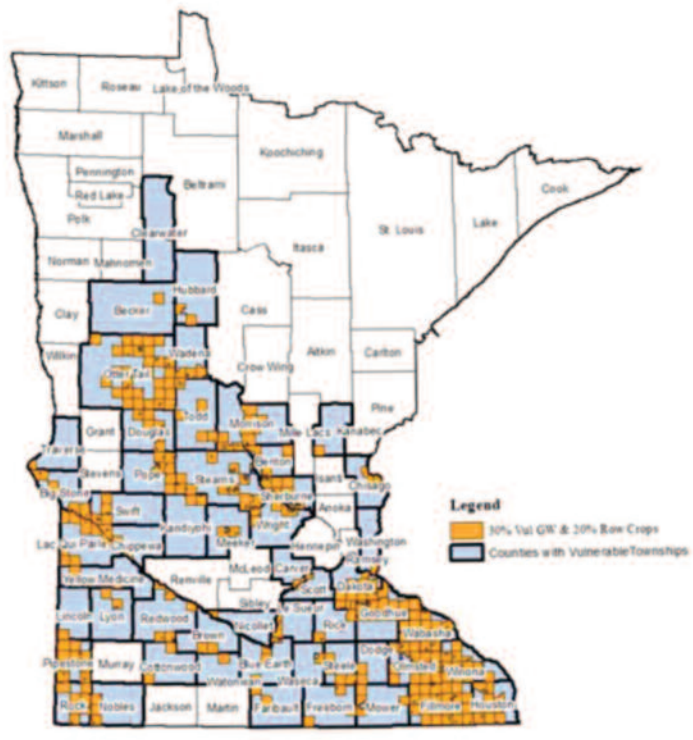
At one time or another many of us have been guilty of not using all the practices available to conserve water and to be good neighbors. By adopting the latest technology, working with our neighbors, and partnering with the Minnesota Department of Natural Resources to accurately monitor groundwater usage we can insure water sustainability in the future with the least amount of government, regulations, and cost.

Domestic Well Nitrate Testing Program

Several County SWCDs will be working with the Minnesota Department of Agriculture to test domestic wells in targeted townships in the outwash sand plains especially as shown on the state /county map. IAM Board & Officers encourages irrigating farmers in these areas to get their drinking well tested as well as their irrigation wells.

The quality of drinking water is important for every well owner. Nitrate is one of the most common ground water contaminants found in rural areas. Drinking water with high nitrate concentrations can cause serious health effects in infants and the presence of nitrates may be an indicate of other contaminants in water. Wells in these townships may be at risk to nitrate contamination due to the type of geology and depth to groundwater.

Local SWCD offices will be coordinating with homeowners in these targeted townships to offer a free nitrate testing for their wells. They will be sent a letter and testing kit in the next couple of months. The information provided by the testing will help these families and provide valuable information on the presence of nitrates in drinking water. If you have questions please contact your local SWCD office staff.

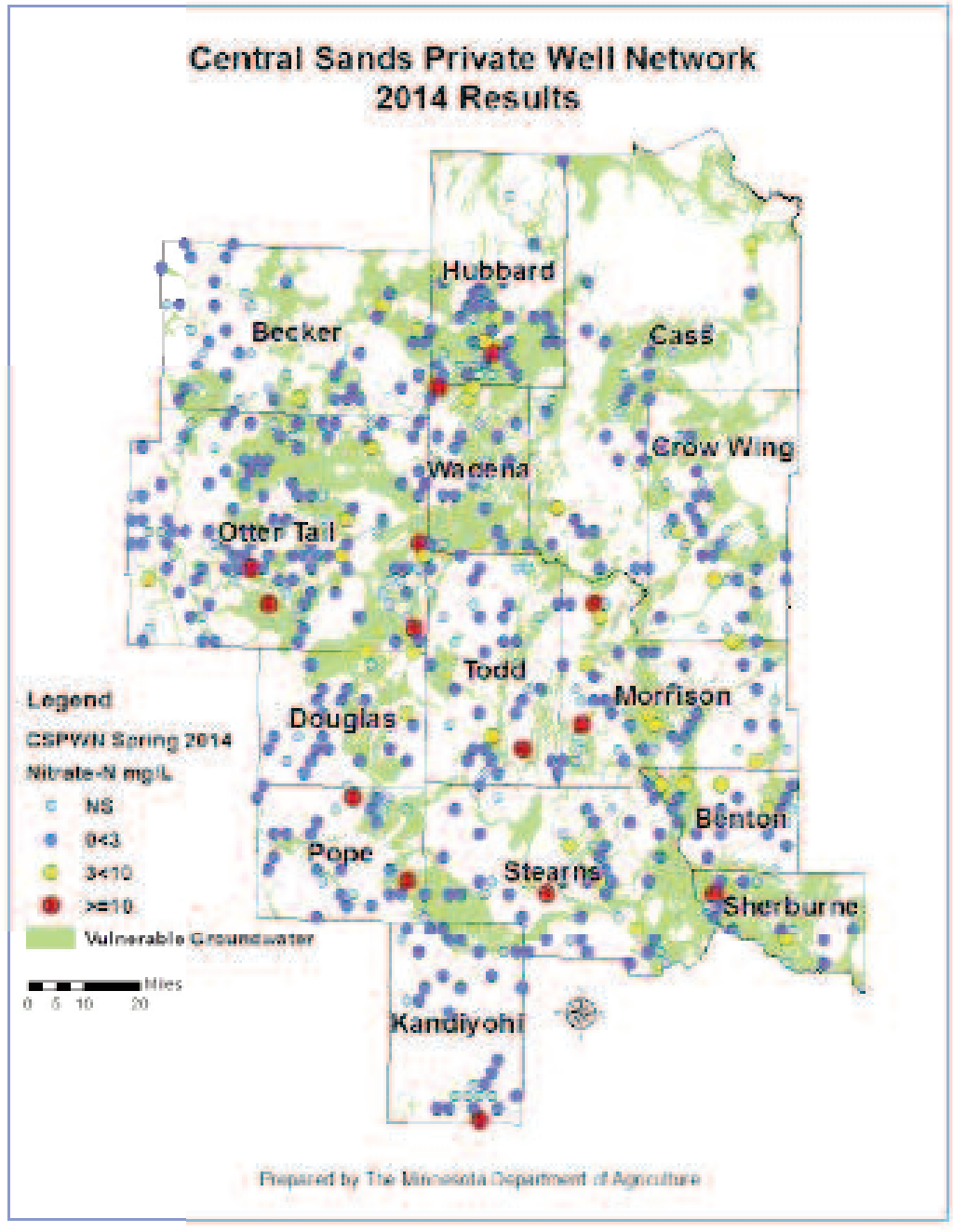


Central Sands Private Well Network for Nitrate 2014 Results

Concerns about high nitrate levels in private drinking water wells led to the development of the Central Sands Private Well Network starting in 2011. Too much nitrate in drinking water can cause serious health problems for infants. The state's Health Risk Limit for nitrate-nitrogen is 10 mg/L.

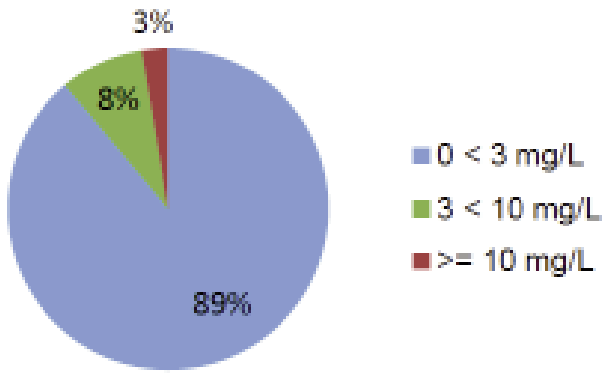
The Central Sands region has widespread sandy soils that may be vulnerable to groundwater contamination. The long-term goal of the network is to determine nitrate trends in the region. To the greatest extent possible, the same households have been tested in 2011, 2012, 2013 and 2104.

In 2014, 434 private drinking water wells were sampled for nitrate.



2014 Nitrate-N Results

- 89% of results were < 3 mg/L
- 8% of results were 3<10 mg/L
- 3% of results were ≥10 mg/L



Nitrate-N mg/L	2011	2012	2013	2014
Total Samples	534	510	487	434
0 < 3	478	454	433	388
3 < 10	35	40	41	32
≥ 10	21	16	13	14
Percent ≥ 10	4%	3%	3%	3%

On a regional scale, 96-97% of participating wells have water that is below the state's Health Risk Limit for nitrate-nitrogen.

Results from 2014 are similar to results from 2013, however fewer overall samples were returned. It is likely that well owners with results less than 3 mg/L have dropped out of the network because their results were low and they did not feel the need to continue sampling. Most well owners that have high nitrate levels in their well have stayed in the network.

MINNESOTA DEPARTMENT OF AGRICULTURE

This could not be done without the help of homeowner volunteers! Thank you for making this program possible. Your participation is helping to protect local groundwater.

Soil & Water Conservation District

CLEAN WATER LAND & LEGACY

Impact of Air

By Tom Scherer NDSU Extension Agricultural Engineer

Impact of Air in Irrigation Pipelines

A common misunderstood concept is how air gets into a pipeline and its effect on the operation of the irrigation system. All irrigators are familiar with the air release valves mounted near the discharge of a pump. When the pump is turned on, the air in the pipeline is discharged from the valve, sometimes watering down those unfortunate enough to be standing in front of it.

Many irrigators are familiar with the air release valves installed at the high point of a pipeline that goes over a hill between the pump and irrigation system. Since these are often in the middle of fields, they have to be farmed around and many have been broken off or shut off because they are perceived to be a nuisance and an obstacle to field operations. However, they should be maintained and kept working because they are important for proper operation of the irrigation system.

Air gets into a pipeline two main ways. The first is at startup, when the pipeline is being filled. Much of this air will be pushed down the pipeline where some will collect in the high points of the pipeline, and the rest will be pushed out through air release valves. If no air release valves are at the high points, the air will create a bubble that will not be pushed out by flowing water, even under pressure.

The second source of air is in the water. By volume, water contains about 2 percent air, even water from a well. This doesn't sound like much but consider that this would form a 40-foot bubble in a 2000-foot pipeline, no matter the pipeline diameter. During pumping, the air will leave the water and contribute to the bubble at the high points of the pipeline.

Can this bubble of accumulated air have an impact on the flow through the pipeline? Absolutely.

Many irrigators have a hard time understanding this principle, but the bubble of accumulated air acts like a pipeline restriction and can reduce the flow rate and increase the pressure at the pump. In addition, sometimes packets of air will be pushed out of the bubble to flow downstream and create the potential for water hammer (a high pressure surge) that can damage pipeline joints and connections. The solution is to make sure the air release valves at the pump and on the high points of the pipeline are working and maintained.

Air in the water can also affect the operation of the sprinklers on a center pivot. If you notice the sprinklers on the pivot sometime hiss from escaping air then there is air in water and it is probably accumulating near the top of the gooseneck. This can reduce the flow to the sprinkler head resulting in uneven water application.

The solution is to install a continuous air release valve near the pivot point, preferably at the start of the first span. A continuous air release valve will let air out of the system even under pressure. They are readily available from sprinkler manufacturers.

Tom Scherer NDSU Extension Agricultural Engineer Thomas.Scherer@ndsu.edu or (701) 231-7239

MONITORING continued from page 1

The Discovery Farm-Minnesota project was started in 2015 and we plan to monitor for 5 to 7 years. This plan should allow for monitoring of several crops in a rotation. Sample collection has started: but, there are no results to report at this time.

This project with the irrigated sandy soils, like all Discovery Farm-Minnesota sites, would not be possible without excellent cooperation from the farmer as well as the personnel from the Benton County Soil and Water Conservation District. Stay tuned.

George Rehm, University of Minnesota (retired) and coordinator of Discovery Farms-MinnesotaEmail: rehmx001@umn.edu

Mark your 2016 Calendar for the Irrigators Association of Minnesota's 42nd Annual Convention! February 18, 2016

(Location TBD)

We're proud to gather so many talented irrigators and irrigation industry leaders together..

Plan to join us for the latest irrigation topics, legislative news and industry trends.

EXTENSION TO HOLD:
Tillage, Technology and Residue Field Day

Farmers and other ag professionals are invited to a field day highlighting the latest in variable depth tillage equipment, including side-by-side field demonstrations, on

Thursday, September 9

The field day will run from 9:00 a.m. until 3:30 p.m. at the West Central Research and Outreach Center near Morris, MN. To pre-register, go to http://z.umn.edu/tillagefieldday. There is no cost to attend the event. Lunch and refreshments will be available for purchase on the grounds.

For more information, contact Jodi DeJong–Hughes (dejon003@umn.edu), Doug Holen (holen009@umn.edu), or Phil Glogoza (glogo001@umn.edu) or view the field day brochure.

IAM 2015 Membership Registration – We need your support!

Name _____
(Please complete)

IRRIGATOR

❒ Ag crop ❒ Horticulture ❒ Wild Rice

IRRIGATION INDUSTRY

❒ Irrigation equipment dealer, well driller, etc.

❒ Agribusiness — seed, fertilizer, financial, etc.

❒ Educational or agency _____

_____

❒ Other _____

Irrigators Association IAM of Minnesota Since 1975

Please mail this form and a check payable to "**IAM**" to:
IRRIGATORS ASSOCIATION OF MINNESOTA
Attn: Fletcher J. Syltie, IAM Treasurer, 24 S Edquist ST, Appleton, MN 56208

Address _____

City & State _____ **Zip** _____

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ANNUAL MEMBERSHIP DUES

Individual Annual Dues — $100 or **$275 for 3 Years**	**$** _____
Platinum Circle Membership — $1,000 or more	**$** _____
Presidential Membership — $500 or more	**$** _____
GOLD Membership — $300	**$** _____
Silver Membership — $200	**$** _____
Bronze Membership — $150	**$** _____
TOTAL ENCLOSED	*$* _____