

# Minnesota Irrigator

PUBLICATION OF THE IRRIGATORS ASSOCIATION OF MINNESOTA WINTER 2021



## Comments by the IAM President

Jake Wildman

Greetings IAM members,

First and foremost, I hope everybody had a Merry Christmas and a Happy New Year.

I would like to start out by giving everybody an update on a few items that have taken place down in St. Paul. As I'm sure you are all aware, COVID-19 has remained a large priority at the Capital. With that said, IAM has remained active throughout by continuing to have communications with key legislators and representatives from the DNR. Being an election year and COVID-19 restrictions, ways of communication have been a little different, but our lobbyists have continued to work hard preparing for the 2021 legislative session.

Unfortunately Representative Jean Poppe, the lead author of our bill in the House, did not win reelection. So since Election Day, a priority has been to come up with a couple different options for who IAM can look to carry our bill through the House and Senate. Before coming up with a final game plan, we needed to see the makeup of the different committees within each chamber. On Decem-

PRESIDENT continued on page 2

## Alan Peterson Agricultural Scholarship Fund

Dear Irrigators,

I would very much like to thank those of you who have contributed to the Alan Peterson Agricultural Scholarship Fund in memory of my husband, Alan. Alan's passion was being an advocate for agriculture, especially regarding the irrigated sandy soils of Minnesota. I would also like to thank the Irrigators Association of Minnesota for establishing this scholarship. I am pleased to say we have formed a scholarship committee and are hoping to award one or two scholarships this spring. Special gratitude goes to Anna Bregier, Keith Olander, Rick Gilbertson, and Mark Koch who have generously stepped up to be on the scholarship committee.

The mission of this scholarship is to advocate agriculture at local, regional, and national levels, protect irrigated production agriculture, promote research, embrace innovation, and respect natural resources. The committee will be selecting candidates who have leadership qualities and plans to become educated in agriculture; embodying this mission.



Alan Peterson

We have already met our first financial goal of raising \$10,000 from people who had a connection to Alan. I am proud to match that total with my own gift of \$10,000. During our 35 years of married life, Alan couldn't stress how important it was to be involved and to continually gather information, resources, and knowledgeable people to cause positive change.

Now I would like to invite you to donate to the Alan Peterson Agricultural Scholarship Fund. Together, we can support the future of agriculture in Minnesota by investing in young people who can help our industry grow and thrive. Thank you so much for your part in bringing Alan's passion to the next generation.

Most sincerely,  
Laurie Peterson

## IAM 2021 COVENTION & EXPO CANCELLED

We are sorry to inform you that the IAM Board in mid-December voted to cancel the 2021 irrigators convention after much discussion and input from past vendors over COVID-19 impacts.

We are planning to arrange a Zoom virtual IAM Business meeting on February 18th and we are hoping to have a couple lead Legislators and our Lobbyists give updates. WE are also planning to host a "Day on the Hill" via a virtual gathering in late February or early March.

If you are interested in attending either the Zoom annual business meeting or Virtual Day on the Hill, please share your interest via email with IAM Membership secretary Jerry Wright, jerrywright1970@gmail.net.

Checks can be made payable to the "IAM-Alan Peterson Scholarship Fund" and mailed to: Irrigators Association of Minnesota

c/o Fletcher Syltie, Treasurer  
24 S. Edquist St.  
Appleton, MN 56208

## INSIDE

BOARD OF DIRECTORS ..... 2

INTEGRATING IRRIGATION ..... 3

PRECIPITATION ..... 5

AUNT MARY ..... 6

MEMORIES WHILE CONFINED ... 7

IAM SUPPORTERS..... 9

IRRIGATION TODAY PT. 2..... 12

MEMBERSHIP FORM ..... 16

## Welcome to the MN Irrigator's Winter Newsletter



Jerry Wright, 2021 IAM Membership Secretary

### Welcome to the Minnesota Irrigator's WINTER Newsletter

This newsletter comes to you thanks to the support of advertisers, current IAM members, Industry Sponsors and Extra Mile Member Supporters listed on page 9.

Your Directors on the IAM Board welcome and strongly encourage you to become a member if you have not already joined. Last year we ended up with only 420 members and the Board and officer would like to see those numbers grow in the coming year.

We all benefit from each other's ideas, experiences, and partnership in IAM activities this year including keeping a watchful eye on **MN Irrigators Water Rights**; telling personal stories about benefits of irrigation with **Legislators** as well as representing the interests of irrigation practices across the state.

To become a member, simply return the signup form included on the last page of this newsletter. As a member, you can also be placed on the **IAM email alert list** if you submit your email address.

**PRESIDENT** *continued from pg 1*  
ber 30th, the Senate assignments were announced and on January 2nd, the House made their announcement. As I write this, I can say Senator Howe has once again agreed to be the lead author in the Senate. On the House side, our lobbyists have been and will be meeting with multiple members and by the time you receive this newsletter we should have an author in the House that will carry our bill. If you are interested on who the lead author is, please don't hesitate to call myself or another board member or you can look on the House of Representatives website as well.

Next thing I want to touch on. I'm guessing some of you received an email from DNR earlier this summer regarding a new water conservation report that irrigators could take part

in. At that time, the understanding was that this was a voluntary report and if we wanted to take part in it we could. Then in the fall DNR sent out another email and the language seemed to switch. This report was no longer voluntary, but will be required. This raised some concern among the board and we felt we needed to dig a little deeper into this. Our lobbyists were able to get in touch with a few individuals at DNR and it was determined that there was somewhat of a misunderstanding and the report is not required but something we as irrigators can do if we choose so.

I bring this up as an example of just how important it is for IAM to have a set of eyes and ears watching over our interests as irrigators and that sometimes playing defense can be just as important as playing offense. Again in 2021, IAM will be promoting a \$.25/

acre donation that will be used strictly for legislative funds. I would like to thank everybody who donated in 2020 and I encourage everybody to give this thought again in 2021. A mailing will be sent out here in January to all members with information in regard to the donation, so please keep an eye out for that.

In the last newsletter, I mentioned that IAM was looking to start a scholarship in memory of Alan Peterson. The board met in December via zoom and we were able to work out some of the details for the scholarship. We feel this will be a great way to honor Alan's legacy for many years to come. I want to thank Alan's wife, Laurie and sons, Ryan and Nick for wanting to work with IAM to promote the scholarship. I also want to thank everybody who has donated to the scholarship fund already and if you are interested in

making a donation more details can be found in the newsletter.

Last thing I want to mention before I wrap things up. At our last meeting, the board made the decision that IAM's 2021 annual meeting will not be held in person this year. We do plan on organizing an event that you can participate in via Zoom. As of right now at minimum, we plan on having an annual business meeting along with an update from our lobbyist's. You can find more details in the newsletter and I encourage you to attend if your schedule allows.

With that, I just want to say thank you for your support of IAM. As always, if any questions come up, please don't hesitate to reach out.

Jake Wildman, IAM-President

If you are not interested in receiving future newsletters from Irrigators Association of Minnesota (IAM), please send a note to [wrightsj@charter.net](mailto:wrightsj@charter.net) or IAM, 24 S. Edquist St., Appleton, MN 56208

If you have a topic that you would like to see discussed in a future issue, drop a note to IAM president, Jake Wildman at [jakewildman@outlook.com](mailto:jakewildman@outlook.com). Articles for the newsletter are solicited and gathered by the IAM officers and Membership Secretary, Jerry Wright whom can be contacted at [jerrywright1970@gmail.com](mailto:jerrywright1970@gmail.com).

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### IRRIGATORS ASSOCIATION OF MINNESOTA, OFFICERS & DIRECTORS

#### **PRESIDENT**

Jake Wildman  
21648 Cty Rd 28  
Glenwood, MN 56334  
320-424-0713  
[jakewildman@outlook.com](mailto:jakewildman@outlook.com)

#### **VICE PRESIDENT**

Jim Anderson  
4391 Hwy 9  
Sunberg, MN 56289  
320-905-9001  
[jranderson52@gmail.com](mailto:jranderson52@gmail.com)

#### **TREASURER**

Fletcher J Syltie  
24 S. Edquist,  
Appleton, MN 56208  
Cell 320-241-1767  
320-289-2062  
[fsyltie@hotmail.com](mailto:fsyltie@hotmail.com)

#### **SECRETARY**

Ron Halvorson  
22213 N. Games Lake  
New London, MN 56273  
320-354-0090  
[rhalvor1@hotmail.com](mailto:rhalvor1@hotmail.com)

#### **LEGAL ADVISOR**

Lee W. Hanson, Lathrop GPM LL  
Hanson Law  
130 Division St. Suite 118  
Waite Park, MN  
320-252-4414  
[lee@hanlawoffice.com](mailto:lee@hanlawoffice.com)

#### **MEMBERSHIP**

##### **SECRETARY**

Jerry Wright  
490 2nd St. NE,  
Glenwood, MN 56334  
Cell 320-760-6388  
320-634-4306  
[jerrywright1970@gmail.com](mailto:jerrywright1970@gmail.com)

##### **AFREC REPRESENTATIVE**

Grant Anderson  
44868 225th St.  
Belgrade, MN 56312  
320-905-9006  
[andersongrant.ga@gmail.com](mailto:andersongrant.ga@gmail.com)

##### **BONANZA VALLEY**

Jim Anderson  
4391 Hwy 9  
Sunberg, MN 56289

##### **CENTRAL**

Ron Halvorson  
22213 N Games Lake  
New London, MN 56273  
[rhalvor1@hotmail.com](mailto:rhalvor1@hotmail.com)  
  
Ben Deuel  
12095 Co Hwy 71  
Parkers Praire, MN 56361  
320-491-1907  
[tatorman270@yahoo.com](mailto:tatorman270@yahoo.com)

Cordell Huebsch  
38132 470th Ave.  
New York Mills, MN 56567  
218-841-2364  
[precisionfence@arvig.net](mailto:precisionfence@arvig.net)

##### **DAIRYLAND**

Dave Kolb, AFREC alternate  
24941 Co. Rd 10  
Paynesville, MN 56362  
320-267-6175  
[davekolbfarms@yahoo.com](mailto:davekolbfarms@yahoo.com)

##### **EAST CENTRAL**

Jeff Edling  
13562 Sunset Dr.  
Becker, MN 55308  
320-249-9511  
[jedling@izoom.net](mailto:jedling@izoom.net)

##### **ROSS IMHOLTE**

Ross Imholte  
7934 62nd Ave. SE  
Clear Lake, MN 55319  
Cell 320-760-6388  
320-333-8700  
[Rimholte25@gmail.com](mailto:Rimholte25@gmail.com)

##### **POMME DE TERRE SANDS**

Johnny Carruth  
932 70th St. SW  
Danvers, MN 56231  
320-808-3707  
[jccarruth20.jc@gmail.com](mailto:jccarruth20.jc@gmail.com)

#### **SOUTHEAST**

Terry Stoudt  
27247 Cannon Falls Blvd.  
Cannon Falls, MN 55009  
612-756-1453  
[Terry.Stoudt@hastingsnomos.org](mailto:Terry.Stoudt@hastingsnomos.org)

#### **JOHN CONZEMIOUS**

John Conzemius  
25024 Cannon Falls Blvd  
Cannon Falls, MN 55009  
651-210-5842  
[jwc25024@gmail.com](mailto:jwc25024@gmail.com)

#### **SOUTHERN**

Kevin Rohwer  
60650 State Hwy 56  
Dodge Center, MN 55927  
507-456-1525  
[twincreekfarms007@gmail.com](mailto:twincreekfarms007@gmail.com)

#### **UPPER MISSISSIPPI**

Marlene Schlichting  
3001 145th St NW  
Rice, MN 56367  
320-293-6291  
[marlene@schlichtingfarms.com](mailto:marlene@schlichtingfarms.com)

#### **DEAN ZIMMERMAN**

Dean Zimmerman  
21331 Kettle Rd  
Royalton, MN 56373  
320-630-5318  
[DeanFZim@gmail.com](mailto:DeanFZim@gmail.com)

#### **INDUSTRY**

##### **REPRESENTATIVES**

Jeff McManigle,  
West Central Irrigation  
810 Industrial Park  
Starbuck, MN 56381  
218-639-3185  
[jeffmcmanigle@hotmail.com](mailto:jeffmcmanigle@hotmail.com)

##### **DARYL KARASCH**

Traut Companies  
141 28th Ave S  
Waite Park, MN  
320-492-6376  
[darlyk@trautcompanies.com](mailto:darlyk@trautcompanies.com)

##### **DAN BAUER**

Kimmes – Bauer Irrigation  
22100 Lilllehei Ave  
Hastings, MN 55033  
[dbkb75@gmail.com](mailto:dbkb75@gmail.com)

##### **MARK KOCH**

Compeer Financial - Waite Park  
248 Kings Ct.  
Sartell, MN 56377  
320-241-9470  
[mark.koch@compeer.com](mailto:mark.koch@compeer.com)

##### **DANIEL WHITNEY**

Northwest AqwaTek Solutions  
219 Bryant Ave SE  
Wadena, MN 56482  
218-248-0502  
[dwhitney@nwats.com](mailto:dwhitney@nwats.com)

#### **AT LARGE DIRECTORS**

Jake Wildman  
21648 Cty Rd 28  
Glenwood, MN 56334  
[jakewildman@outlook.com](mailto:jakewildman@outlook.com)

##### **FLETCHER J SYLTIE**

24 S Edquist St  
Appleton, MN 56208  
320-289-2062  
[fsyltie@hotmail.com](mailto:fsyltie@hotmail.com)

##### **NORM KRAUSE**

21608 Briarwood Ln.  
Nisswa, MN 56468  
218-296-0920  
[krause0328@gmail.com](mailto:krause0328@gmail.com)

##### **BYRON FISCHER**

516 Nelson  
Belgrade, MN 56312  
320-815-0233  
[bfischer@cvbean.com](mailto:bfischer@cvbean.com)

##### **ANNA BREGIER**

3000 145th St NW  
Rice, MN 56367  
[annabregier.pfc@gmail.com](mailto:annabregier.pfc@gmail.com)



#### RESEARCH PROJECT HIGHLIGHT

## Nitrogen management for irrigated corn with a winter rye cover crop and kura clover living mulch

Fabián G. Fernández, Researcher and Extension Specialist in Nutrient Management and Jessica Wayment, Graduate Student Research Assistant

#### Overview

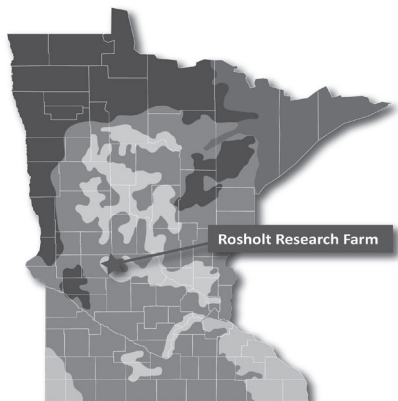
This study began in 2011 at Rosholt Farm in Pope County, Minnesota where two cropping systems were established, continuous corn and corn-soybean.

#### Objectives

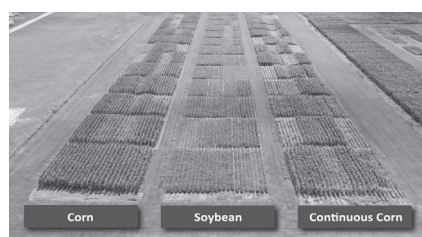
- ▶ Quantify the effect of a winter rye cover crop and kura clover living mulch on nitrate leaching.
- ▶ Measure the impact of the cover crop and living mulch on the response of the corn crop to nitrogen and on soybean yield.

#### Study design

- ▶ 5 nitrogen rates with no cover crop.
- ▶ 5 nitrogen rates with a winter rye cover crop planted in the fall and terminated before planting in the spring.
- ▶ 2 nitrogen rates with a kura clover living mulch.
- ▶ The entire study was strip-tilled to allow the kura clover to continue to grow between rows when the cash crops are planted.
- ▶ Permanently installed lysimeters in several of the treatments allowed collection of nitrate samples from water that drained below the root zone.



The above map shows Minnesota's sandy soils in yellow



Plots established in 2011 with continuous corn (right) and a corn (left)-soybean (center) rotation. Photo from 2020

*RESEARCH PROJECT continued on pg 8*

## Integrating Irrigation Technology in Otter Tail and Wadena Counties

By: *Nathan Wiese, EOT SWCD Irrigation/Nutrient Management Specialist*

East Otter Tail and Wadena Soil & Water Conservation Districts would like to announce that they were selected to receive funding to implement new irrigation technology. Funding is provided by the Clean Water Fund through the Minnesota Board and Water Soil Resources.

The goal of this grant is to prevent potential nitrate leaching into the groundwater, by using the best available technology to manage irrigation water. The SWCD's will be working with producers in the two counties to install soil moisture sensors, which will allow producers to view moisture levels in the field from remote locations.

The grant application was focused on irrigation technology by using the Groundwater and Agriculture report, which gave information on the common barriers for technology adoption that local producers provided. Producers showed interest and excitement for precision irrigation management tools to provide exactly the right amount of water at the right time.

The application period for this project will be announced in the spring/summer of 2021.

For more information contact the East Otter Tail SWCD @ 218-346-9105.

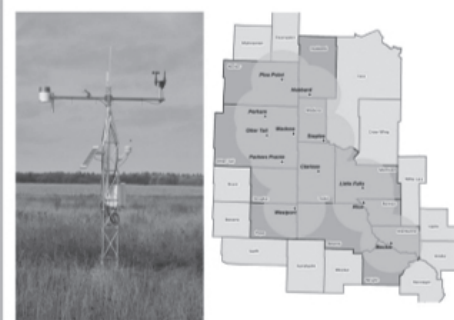
#### Local Weather Data

The Irrigation Scheduling Program uses data from our local Weather Station Network.

The Weather Station Network is a group of 12 weather stations across central Minnesota that collect important agricultural weather data, including:

- Temperature
- Humidity
- Wind Speed
- Evapotranspiration (Crop Water Use)
- Rainfall

We use this data for irrigation decisions and so do many of our growers. All of the current weather data can now be found on the NDAWN website.



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## New Water Conservation and Efficiency Reporting for Irrigators

By: Carmelita Nelson, Water Conservation Coordinator, Minnesota DNR

If you have a Minnesota Department of Natural Resources (DNR) permit to use water, including permits for crop irrigation, it's time to report monthly water use. The deadline for reporting the water you used during calendar year 2020 is February 15, 2021. Go to the Minnesota DNR Permitting and Reporting System (MPARS) at [www.mndnr.gov/mpars/signin](http://www.mndnr.gov/mpars/signin) and add your monthly total water use for each of your permits. If you have any questions, please contact DNR staff at 651-259-5678 or email us at [mpars.dnr@state.mn.us](mailto:mpars.dnr@state.mn.us).

2020 is also the first year that the new Water Conservation Reporting System (Water Conservation Report) is available to irrigators. Municipal, commercial, industrial and institutional water users throughout the state have been reporting water conservation and efficiency actions for the last one to three years. This year golf course, lawn and landscape, and agricultural crop irrigators can report their water conservation accomplishments as well.

### Frequently asked questions about the new DNR Water Conservation Reporting System

*What is the new report for?*

The Minnesota DNR is required by state law to have a Water Conservation Program. We worked with ESPWater to develop this

new, user-friendly Water Conservation Reporting tool. While completing the report is not mandatory, your participation is important and beneficial to all. The information you provide will help us all understand where we've been, what progress we are making and what else can be achieved. While there is no penalty for not reporting water conservation and efficiency efforts, please join all of the DNR water use permittees contributing to this important effort.

*What do I need to do?*

1. Fill out your DNR annual water use report and pay the water use fees in MPARS. This information is then available to be used as part of the Water Conservation Reporting System.
2. Look for the email invitation with the subject heading "Minnesota DNR invites you to join the Water Conservation Reporting System".
3. Once you find it, click on the link and set up a new account. It will take you to the new reporting system.
4. Simply check the boxes of water saving actions that you have completed with your irrigation system(s).
5. Can't find the email invitation? Contact [espwater.support@energy-platforms.com](mailto:espwater.support@energy-platforms.com).

CONSERVATION continued on pg 11

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## Irrigation Water Management

*Irrigation Water Management (IWM) tools often help improve water quality and quantity. Tools such as sensor-based water management, variable rate technology, and nutrient and pest management allow producers to monitor and evaluate management impacts to the environment and increase yields.*

### Environmental Quality Incentives Program (EQIP) 2021

- Financial assistance is available to all operators for Irrigation Water Management (IWM) related practices.
- Acres must have been irrigated for at least 2 of the past 5 years.
- Eligible IWM Plans include:
  - \* Basic Irrigation Water Management (Greater than 30 acres) - \$12.52—\$17.73 acre
  - \* Advanced Irrigation Water Management (Greater than 30 acres) - \$27.14—\$38.45 acre
- Fertigation/Chemigation Retrofit - \$2,119.09—\$3,002.05
- Operators can apply for up to 3 consecutive years of payments for Basic or Advanced IWM. Payments will be received each year after the IWM Plan is certified.
- Contact the Stearns County SWCD office for an application. Applications are accepted on a continual basis. Applicants must determine:
  - \* The resource concern(s) to be addressed.
  - \* The type of crop to be planted and their rotation.
  - \* Amount of acres to be enrolled.



Stearns County SWCD employee talks with a producer on irrigation water management.

### Stearns County Highly Vulnerable DWSMAs: N Management Practices for Safe Drinking Water

- Financial assistance is available to implement Irrigation Water Management related practices in DWSMAs.

### Potential Benefits of Irrigation Water Management

- Savings on water, energy, and costs.
- Improve irrigation water use efficiency.
- Provide sufficient soil moisture conditions for the desired crop response.
- Increase crop production/yields.
- Minimize irrigation induced soil erosion.
- Enhance nitrogen use through fertigation.
- Reduce nutrient runoff to surface water and reduce the potential to leach nutrients to groundwater.



View of fertigation system with check valves and portable tank.

## Additional IWM Practices



### Variable Rate Irrigation by Zone

Integrating variable application technology onto a center pivot system for precision zone placement of water along the length of the system for water savings.



### Fertigation Retrofit

Integrating fertigation application technology onto a center pivot system for efficient placement of chemicals along the length of the system.



### Uniformity Test/Catch Can Test

Stearns County SWCD offers free uniformity tests on irrigation center, lateral, and traveling gun units. Tests measure the distribution of water to determine if water is being applied evenly.

*To be eligible for any of these practices, an IWM Plan must be included in the contract or plan. Let us help you decide what may personally work best for your operation!*



### Soil Moisture Sensors, Data Recorder, & Telemetry Options

All 3 of these technologies provide different levels of measuring soil moisture conditions allowing for more accurate irrigation adjustments.



### High to Low Pressure Conversion

Changing nozzles on a center pivot to a low pressure system to improve efficiency of water usage and to reduce energy use.



### Micro-Irrigation

There are several options available for micro-irrigation systems including: Subsurface Drip Irrigation (SDI), Surface Drip Irrigation (within a hoop house), and Surface Tape.

### Stearns County Soil & Water Conservation District Natural Resources Conservation Service



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(320) 251-7800 ext. 3



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# How Much Precipitation Recharges the Water Table?N

By:James Vanderwaal, Licensed Professional Geologist, Groundwater Specialist, Minnesota DNR

With nearly 12,000 lakes on the landscape, Minnesotans are very aware that there is a lot of water out there. One might then wonder why there are concerns about the use of groundwater underlying those lakes and dryland. Unfortunately, movement of water from the surface to the groundwater is not that simple. It happens through a process called ground-water recharge.

Recharge is the downward flow of water reaching the water table, therefore adding to groundwater storage. This definition does not include water that flows into the aquifer from an adjoining groundwater system, which is termed interaquifer flow or simply interflow. Thus, we distinguish between vertical recharge (downward from the surface) versus horizontal recharge (flow downhill within the aquifer and nearly parallel to the ground surface).

The amount of vertical recharge

(hereafter simply ‘recharge’) depends on several factors:

- Soil type (e.g., infiltration capacity, ground cover)
- Precipitation rate (e.g., rainfall rate, snowmelt rate)
- Topography (e.g., convergence zones, divergence zones)
- Meteorological (e.g., monsoon rains, snowmelt)

Two major influences on vertical recharge are precipitation and the specific yield of a soil or rock.

### Precipitation

Annual precipitation varies across the state (Figure 1). It ranges from less than 22 inches in the northwest corner of the state to 36 inches in the southeastern corner. The type of precipitation affects the amount of vertical recharge. For example, snowfall will see delayed recharge, while snowmelt will show large recharge episodes.

### Specific Yield

Specific yield is the ratio (percentage) of water within a given soil volume that will yield to gravity when that soil volume is saturated. The table below shows the average value of specific yield for various soil texture types. For example, clay (0.02 or 2%) holds most of its water against gravity due to the small pore spaces and strong adsorption forces; thus, clay soils yield little water to gravitational forces.

By contrast, coarse gravel yields a high amount of water at saturation (0.22) due to the large pore spaces and weak adsorption forces. However, the large spaces between gravel particles means that it cannot hold as much water

at saturation as gravel with fine-grained material filling the pore spaces. Thus, specific yield is slightly higher for medium sand (0.26) or gravelly sand (0.25). Figure 2 shows a map of the specific yield around the state, based upon soil types.

### Estimating Recharge

Several different methods have been used to estimate recharge across Minnesota. The most recent effort estimated the potential for recharge across the state for each year between 1996 and 2010. Figure 3 presents a published map that shows the average fraction of annual precipitation that recharged the water-table system over the 1996-2010 period.

PRECIPITATION continued on pg 15

Average specific yield based upon soil texture.

Texture type	Specific yield	Texture type	Specific yield
Clay	0.02	Coarse sand	0.27
Silt	0.08	Gravelly sand	0.25
Sandy clay	0.07	Fine gravel	0.25
Fine sand	0.21	Medium gravel	0.23
Medium sand	0.26	Coarse gravel	0.22

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## AUNT MARY

By: Jim Anderson, Farmer from Belgrade, MN

She was an old woman with a big polio arthritic leg and a bigger heart. She grew up the daughter of Norwegian immigrants with English as her second language. She lived in a little house in a small railroad town down the road called Sedan with no running water and only an outhouse for a bathroom. Her husband had worked for the Soo Line railroad and had died young. In the fall Aunt Mary would move into our home to spend the winters with us. Occasionally we would take the passenger train from Belgrade to Sedan to visit her for a few days. In her later years she lived full time with our family.

Aunt Mary had raised our mother when our grandmother had contracted tuberculosis. In those days the government quarantined those people in a group home in Fergus Falls. My mother kept a heart wrenching letter from our grandmother in her group home lamenting the knowledge that she would never see her family again.

As children we loved having Aunt Mary living with us. She would teach us card games like Crazy 8, Buck Euckre and board games like Chinese Checkers. Aunt Mary would tell us bedtime stories, give us wonderful backrubs, say our prayers, and tuck us in at night. She would help Mom bake all the Norwegian goodies like lefse, rosettes, and flatbread. She also taught us how to like pickled herring, limburger cheese and maybe lutefisk.

Aunt Mary was always a wonderful part of our family and we felt lucky to have her live with us until a couple days before she died at the

age of 93. The love that woman gave our family was more than any gift that money could buy.

As I grow older and especially during the last 9 months of government mandated loneliness; I have come to realize that the joy us children gave her was priceless.

Take some time today and reach out to an elderly relative or lonely neighbor with a visit or a phone call and brighten their day with conversation. We must never accept a “new normal” of social distancing and isolation.



Jim Anderson



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## Memories While Confined

By: Fred Bergsrud, Professor Emeritus and Retired Extension Agricultural Engineer  
University of Minnesota, Department of Bioproducts and Biosystems Engineering  
(former IAM Secretary 1975-1980)

When the recent copy of the Minnesota Irrigator arrived I was seated in my recliner watching the latest updates on the Covid-19 pandemic. I decided I didn't need anymore of that to fill my time so shut it off and reflected on my experiences with Irrigators which were some of the most enjoyable times of my working life.

In the past two years the farm I knew as CMDRIF, Central Minnesota Research Demonstration Irrigation Farm, celebrated its' 50th birthday. This past spring IAM celebrated its' 45th birthday and both of those events brought many memories of the strong leadership provided by many individual irrigators in putting together and supporting those different but related enterprises.

"The Farm" which it is now known as and the Association have had a lot of support over time from Irrigation dealers and related suppliers, from SWCDs, from State and Federal Agencies and from NDSU, SDSU and the University of Minnesota.

Just before the 2020 spring issue of the Minnesota Irrigator which carried the obituary of Alan Peterson, I had my last public event out before the pandemic shut down, I attended the funeral of Jim Sutherland who led the specialty crop effort in the mid-seventies. These events reminded me of the many others that have left this world over the years after making significant

contributions to the irrigation community. There are many family names like Anderson, Edling, Roth, Felton, and Carruth that bring and in some cases are still bringing happy memories.

So I simply want to say "Thank You" for your contributions, for the enjoyable times we have spent together and for your continued efforts to keep irrigated agriculture strong in Minnesota. And a special "Thank You" to Jerry

Wright who has provided leadership to the Extension effort in Irrigation for the past 40 plus years and has been a good friend to me as he has been to you.



Fred Bergsrud & Jerry Wright

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Results

Environmental water quality results

- Winter rye made no difference in reducing nitrate-N load for any of the cropping systems. Even the soybean crop that received no nitrogen had similar loads as the corn plots that received nitrogen.
- Kura clover produced a substantial reduction in nitrate-N load regardless of cropping system. When compared to the average of rye and no-rye treatments, kura clover reduced load by 66% in CC, 79% in CSb and 77% in SbC. The reduction was even greater than the check plots, where no nitrogen was applied.

Agronomic crop results

- Winter rye had no impact on grain yield.
- Winter rye increased the amount of nitrogen to reach the economic optimum nitrogen rate.
- Winter rye was a challenge to obtain consistent establishment.
- Kura clover substantially reduced yield of both corn and soybean -- by 36% in CC, 38% in CSb, and 19% in SbC when compared to the average of rye and no-rye treatments.

A full discussion on this research project “Nitrogen study looks at two cover crops’ potential to reduce nitrate leaching” can be found at website of University of Minnesota Extension - Minnesota Crop News - October 15, 2020 by Fabián G. Fernández, Nutrient Management Specialist  
<https://blog-crop-news.extension.umn.edu/2020/10/nitrogen-study-looks-at-two-cover-crops.html>

Table 1 Season-long mean nitrate-N load average across nitrogen rates and years (2016-2019)

COVER CROP	CONTINUOUS CORN	CORN/ SOYBEAN	SOYBEAN
	LB/ACRE		
RYE	64	74	88
NO RYE	60	73	70
KURA CLOVER	21	15	18

Table 2 Grain yield averaged across nitrogen rates and years (2016-2019)

COVER CROP	CONTINUOUS CORN	CORN/ SOYBEAN	SOYBEAN
	BU/ACRE		
RYE	102	127	56
NO RYE	102	129	58
KURA CLOVER	56	79	47

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Don Stueve - Dumont  
Trutt Bros - Perham  
Steve Werner - Hampton  
Brian Wildman - Glenwood  
Daryl Zeise - Deer Creek

## IAM 2021 COVENTION & EXPO CANCELLED

We are sorry to inform you that the IAM Board in mid-December voted to cancel the 2021 irrigators convention after much discussion and input from past vendors over COVID-19 impacts.

We are planning to arrange a **Zoom virtual IAM Business meeting on February 18th** and we are hoping to have a couple lead Legislators and our Lobbyists give updates. WE are also planning to host a **“Day on the Hill”** via a virtual gathering in late February or early March.

If you are interested in attending either the Zoom annual business meeting or Virtual Day on the Hill, please share your interest via email with IAM Membership secretary Jerry Wright, [jerrywright1970@gmail.net](mailto:jerrywright1970@gmail.net).



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If I have 10 permits, do I need to fill out 10 water conservation reports?

No, you can complete one report including all of your conservation and efficiency accomplishments for multiple permits. However, if you have permits under different business or family names, you will have a water conservation report for each separate business.

Can I complete the Water Conservation Report when I complete my MPARS report?

You should complete the MPARS annual report first, then complete the Water Conservation Report. The total gallons used you entered in the MPARS report will auto-populate into the Water Conservation Report.

How do I submit the Water Conservation Report?

Just save each section as you go. There is no submit button. For your records, you can download a summary report or a certificate of completion.

What if I have a renter who irrigates their crop on my land?

If your renter is registered in MPARS as a contact person, they will receive an invitation from ESPWater and can complete the Water Conservation Report. Otherwise, contact [espwater.support@energyplatforms.com](mailto:espwater.support@energyplatforms.com) to add the renter to the account to complete the Water Conservation Report.

What happens to the information I provide?

The site is not open to the public and people logging in cannot see individual reports. The data will be aggregated and used in statewide and regional reports. Information submitted is considered state-owned public data under the Data Practices Act. ESPWater cannot use or distribute the data or contact information. The state is required to make public data available for inspection after receiving an appropriate data practices request.

I am extremely busy, overwhelmed and stressed. May I opt out this year?

Yes. It would be great to see 100% participation, but we understand the stress everyone is under this year. Since you have an active permit, you will continue to get reminders. You may skip the Water Conservation Report, since it is voluntary. However, the MPARS report and annual fee are mandatory.

The primary goal of the Water Conservation Report is to provide protection and sustainable use of Minnesota’s water resources for future generations. If we don’t measure it, we can’t improve

Here is a handy table you might want to keep with your records for future reference.

Minnesota DNR Two Water Reports	
Water Use Report/MPARS	Water Conservation Report/ESPWater
Due Feb 15, 2021	Due March 30, 2021
Platform: MPARS (MNDNR Permitting & Reporting System)	Platform: <u>ESPWater</u> System
Mandatory: report water use gallons and annual fee payment  MPARS calculates annual water use fees and accepts electronic payments.	Voluntary, but encouraged: all permits have water conservation conditions.  Conservation report provides a summary of accomplishments.
Complete MPARS report first.	Complete second: gallons will be auto-populated from MPARS.
Passwords and accounts remain the same.	First time users must set up an account. Irrigators received an email to join in Oct./Nov. Simply accept the invitation from <u>ESPWater</u> to set up an account.
For more information: <u>MNDNR Water Permitting and Reporting System</u>  Sign-In: <a href="http://www.mndnr.gov/mpars/signin">www.mndnr.gov/mpars/signin</a>	For more information: <u>MNDNR Water Conservation Reporting</u>  Sign-In: once account is set up <a href="http://espwater.org">http://espwater.org</a> .
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Shorter crops like wheat or alfalfa can benefit from drops and a lower sprinkler mounting height. At low sprinkler mounting heights it is especially important to account for field terrain to prevent the sprinklers from getting too low into the crop or even dragging on the ground.



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### Breaking down decision-making

The acronym CROPS is a helpful way for dealers and growers to work through the water application thought process. Each decision made relating to the way the center pivot operates will affect the performance or uniformity of the water application package itself.

**C** – **canopy**. Will the sprinklers be mounted above the canopy of the crop or within it? You may be growing corn in the Midwest or alfalfa in Eastern Oregon, but either way, having a plan based on whether the sprinklers are in canopy or not is going to have an effect on everything else. If the sprinklers are on top of the pipe or just above the canopy, locating them at a height to reduce any stream obstruction that would limit the sprinkler's radius must be considered, and

obstructions must be avoided if possible. Any water that may have been lost to evaporation will not matter much if you have overwhelmed the soil by having too little radius and/or too large a droplet and are then seeing water and soil run out of the field. The "sweet spot" for sprinkler height has to do with where it can be mounted to minimize stream or droplet obstruction.

**R** – **radius**. Your decision on where to place the sprinklers in relation to the crop canopy will impact the effective radius of the sprinklers. For maximum radius, place the sprinklers at about the height of the crop at maturity but avoid as much structural steel as possible. If wind is an issue or the sprinklers are down deep in the canopy, you will not be able to use wide spacing. For in-canopy sprinkler placements, a reduced effective radius will result.





IT IS KEY TO REMEMBER THAT THE MOST IMPORTANT PART OF THE WATER DELIVERY SYSTEM FROM THE WATER SUPPLY TO THE ROOT SYSTEMS IS THE SOIL ITSELF.

**O** – **outlet spacing.** Given the effective radius of the sprinkler, what does the outlet spacing need to be for adequate coverage of water to the soil? You will want to place sprinklers so that they can cover each other as much as possible given the available span pipe coupler spacing. As a rule-of-thumb for over-canopy sprinklers, 150% coverage should be considered a minimum.

**P** – **pressure.** At this outlet spacing and canopy placement of the sprinklers, which pressure is optimal? If the sprinklers are above the canopy, they can benefit from pressure to achieve maximum radius. Higher pressures can also lead to wider radius, higher uniformity and gentle droplets. If sprinklers are down in the crop canopy and closer together, a lower pressure 10 psi regulator is commonly a great choice.

**S** – **soil intake rate.** You will need to know your soil intake rate and water-holding capacity within the crop's root depth. If, when all of the above-mentioned decisions have been made and the soil intake rate and surface storage in the field are exceeded, there will be potential for runoff. We must be able to meet our crop evapotranspiration demands and avoid runoff of water and nutrients from the field or within the field. If excessive water runoff is an issue, go back through the CROPS acronym again to find ways to reduce the average application rate while still meeting the maximum crop ET. You may need to place the sprinklers higher or even switch to a different type of sprinkler or drop for increased radius. Another consideration could be to increase the amount of crop residue in the field, increasing soil surface penetration and storage. Runoff must be eliminated and maximum uniformity achieved. Part-circle sprinkler technology also helps prevent wheel track issues, which can be affected by the soil intake rate.

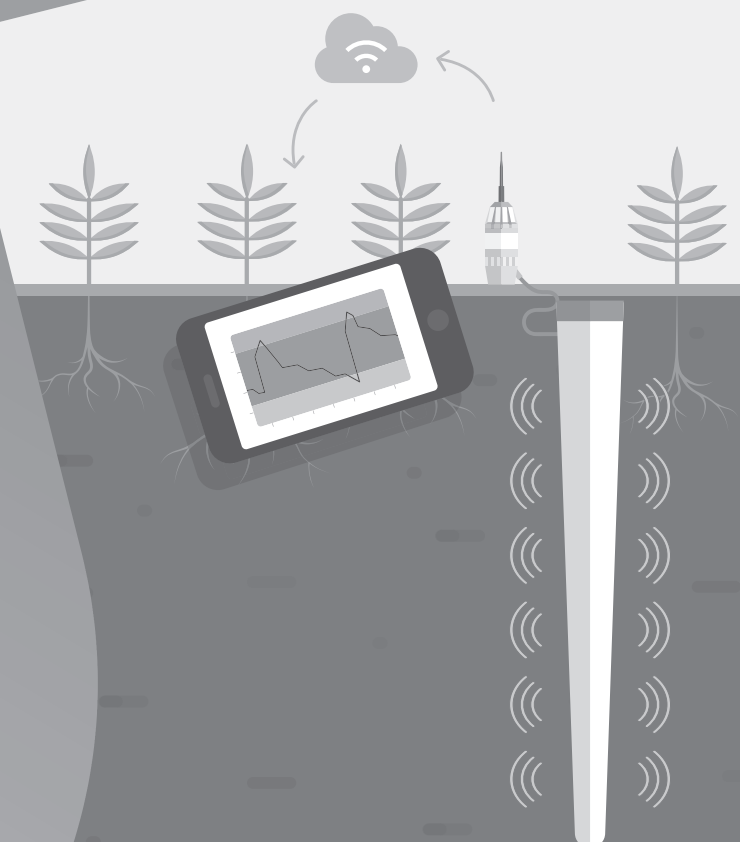
Whether you are buying a new center pivot or updating an existing water application package, use these ideas to get the most out of your investment. Using the suggestions provided in the CROPS acronym can help you optimize your sprinkler package given the canopy height, soil, topography and climate while meeting your crop potential. 💧

**Steve McCoon, CID**, is a territory manager at Nelson Irrigation Corporation.

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## PRECIPITATION continued from pg 5

For example, in the extreme south-west corner of the state, the dark color on the map indicated that, on average, less than 10% of the annual precipitation recharged the water table between 1996 and 2010. Therefore, if 22 inches of precipitation occurred in a given year, there was likely only 2 inches or less of recharge.

### Connection Between Precipitation and Recharge

Five locations were chosen for plotting the annual precipitation (P) against the recharge fraction (R/P), which is presented in Figure 4. For each site on the figure, the average annual precipitation (inches) for the period 1996-2010 is shown in parentheses next to the site name. Also shown is the strength of this connection between precipitation and

recharge fraction. The strength of the connection is called the correlation coefficient, and it is expressed as a percentage.

In general, the recharge fraction goes up when the annual precipitation increases. For example, in the Crookston area, around 4-5% of precipitation will recharge the water table at annual precipitation values of 18-20 inches, but this recharge fraction rises to 10% and higher when annual precipitation is 26 inches or greater. The correlation coefficient at Crookston is 13%, which means that only 13% of the variation in recharge can be explained by the variation in annual precipitation. That means there are other factors influencing the recharge.

Comparing different regions of the state shows that the northwest corner (e.g., Crookston) generally has very low values for the recharge fraction (Figure

3). Although annual precipitation in Crookston and Marshall both averaged 27.8 inches over 1996-2010, the Marshall area saw a greater recharge fraction. This can be explained partly by the difference in specific yield, where values in the Marshall area range between 0.11 and 0.15. By contrast, the Crookston area has finer-grained materials that yield less to gravity (0.06-0.10).

The highest recharge fractions on Figure 4 were for the Anoka sand plain, as represented by Zimmerman. Although the annual precipitation is higher in the southeast corner of the state (e.g., Caledonia), the Zimmerman area shows higher recharge fractions. Again, values for specific yield can explain part of this difference, with the Zimmerman area ranging from 0.16 to 0.25, whereas Caledonia has material in the range of 0.11-0.15.

Overall, between 1996 and 2010, nearly 90% of the state averaged between 2 and 8 inches of recharge to the water table. Recharge increases generally in a west to east direction. Values from Table 3 can be used with annual precipitation values to get estimates for recharge at specific locations.

### References

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Healy, R.W., 2010. *Estimating Groundwater Recharge*, Cambridge University Press, Cambridge, UK, 245p.

Smith, E.A., and S.M. Westenbroek, 2015. *Potential Groundwater Recharge for the State of Minnesota Using the Soil-Water-Balance Model, 1996-2010*. U.S. Geological Survey Scientific Investigations Report 2015-5038, 98 p.

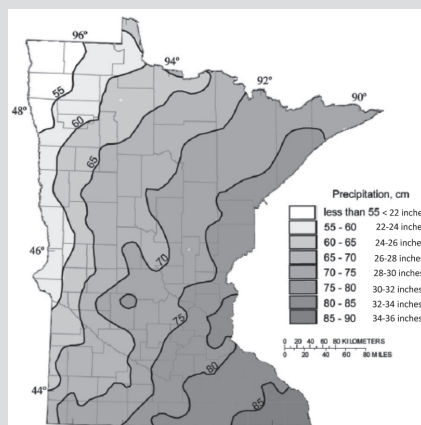


Figure 1. Average annual precipitation across the state of Minnesota. Modified from Delin and others (2007).

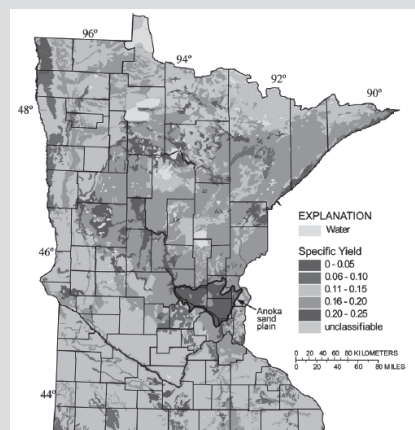


Figure 2. Specific yield of surficial material in Minnesota. From Delin and others (2007).

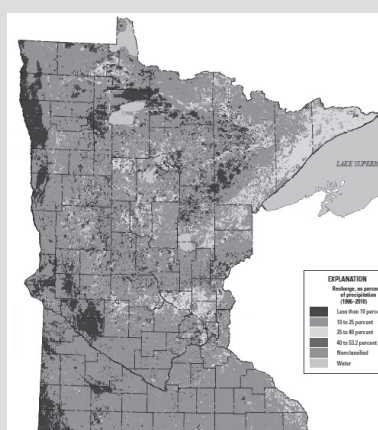


Figure 3. Estimates of average annual recharge as a percentage of annual precipitation. From Smith and Westenbroek (2015).

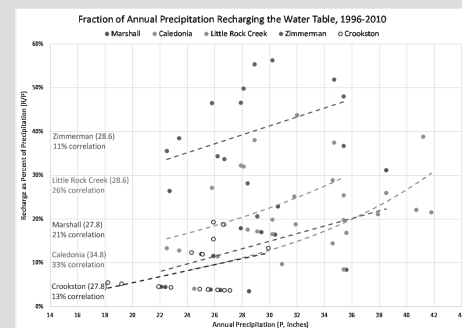


Figure 4. Recharge as a percentage of annual precipitation for five sites in Minnesota, 1996-2010.



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