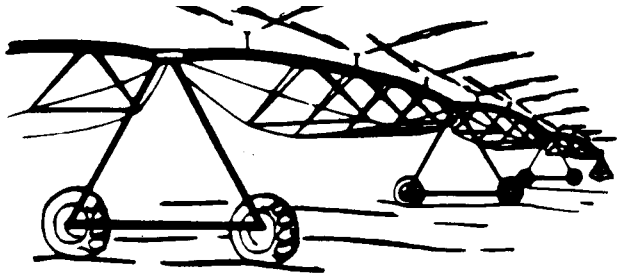
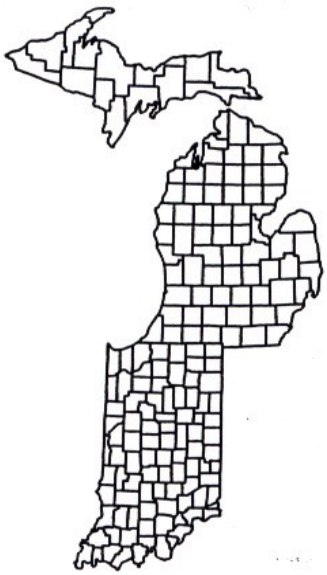
MICHIANA IRRIGATION ASSOCIATION



MICHIGAN-INDIANA IRRIGATION NEWSLETTER

July 2025

52540 Lawrence Rd
Leonidas, MI 49066



A Word from Our New President

Todd Feenstra

The 2025 irrigation season is well underway, and most farms will be getting quite busy this month. Groundwater and surface water continue to exhibit stable water levels and flow. The rainfall this year has been a little above normal and even better has come at the right time and in the right amount to keep crop irrigation at a minimum so far.

We are excited to announce the annual December conference will move back to Elkhart this year at a great attendee-friendly venue with an excellent hot lunch buffet bracketed by good speakers ready to share valuable information and insights.

Indiana and Michigan are both working to expand their groundwater and surface water monitoring programs which is great news. It is very difficult to manage what we don't measure. Both states are making great inroads at characterizing the aquifers and surface waters in our region with multiple ongoing projects.

The USGS recently completed the first part of the Michindoh Aquifer study at the tri-state intersection with assistance from Indiana, Michigan, and Ohio in data collection and cost-sharing. That study now moves on to using 3-D numerical models to predict the impacts of high-capacity withdrawals.

Indiana passed new groundwater law this past year related to high-capacity withdrawals. Indiana DNR is now tasked with evaluating the impacts between high-capacity wells, not just between a high-capacity well and a residential well. Indiana is also working with Michigan and the USGS to conduct Aerial Electromagnetic Surveys using helicopter flights to map the geologic layers across nearly 16 counties in Southwest Michigan and Northern Indiana.

Michigan has multiple large-scale projects being implemented simultaneously as the State's monitoring well network program gets a big boost, several new stream gages have been installed, the Mi-WWAT online interface is getting a major make-over, the Wellogic database continues to be improved, and the new Equis database is well underway.

We live and work in a remarkable area with incredible water resources. Focus on managing these prolific water resources continues to increase and expand in our region. We are pleased to work alongside each of you as irrigators to help keep you informed, help improve efficient irrigation, and advocate on your behalf. We wish you a safe and productive irrigation and growing season.

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Applying Water at the Right Time and in the Right Amount

Angie Gradiz Menjivar, MSU Extension

Timing and application rate are critical when it comes to irrigation. Applying water too early, too late, too little, or in excess can lead to wasted water, reduced crop performance, and increased plant stress. As weather patterns become more unpredictable and water becomes an increasingly valuable resource, adopting strategies to apply water at the right time and in the right amount, known as **irrigation scheduling**, is essential for crop and water productivity.

There are several tools available to help with irrigation scheduling, but first, it's important to understand the basics. The primary role of irrigation scheduling is to apply water in a way that meets the crop's water demand, also known as evapotranspiration (ET). The goal is to maintain adequate soil moisture within the root zone, ensuring water is readily available to the plants when they need it most.

Soil serves as a reservoir for water, and its capacity to store water varies depending on **soil texture**. Sandy soils drain faster and hold less water, while clay soils retain more. After rainfall or irrigation, water drains through the soil, and what remains is called **field capacity**; the maximum water available to plants. If the soil dries out too much, it reaches the **permanent wilting point**, when plants can no longer access water and may begin to die. When soil pores are completely filled with water, **saturation** occurs, often resulting in runoff or deep percolation; water draining below the root zone and becoming unavailable to plants.

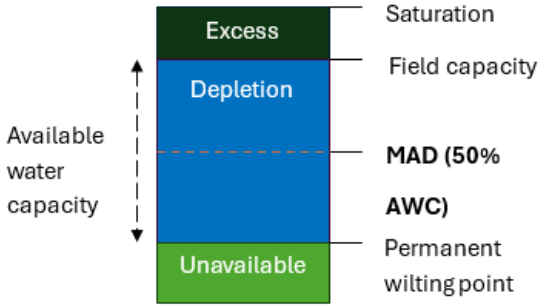


Figure 1. Soil water reservoir.

The difference between field capacity and the permanent wilting point is known as **available water (AW)**; the moisture that is accessible to plants. The **maximum allowable depletion (MAD)** represents the percentage of available water that can be depleted before plants begin to experience water stress. This threshold varies depending on the crop type and growth stage. A common guideline is to irrigate before 40% - 50% of available water is depleted, as going beyond this point can negatively impact crop yield due to stress.

A common and practical way to schedule irrigation is by using the checkbook method. Think of it like managing a bank account: rainfall and irrigation are deposits, and crop water use is a withdrawal. By tracking these inputs and outputs, you create a running balance of how much water is available in the soil's root zone. When the soil water depletion reaches or exceeds the maximum allowable depletion, it's time to irrigate. The goal is to refill the soil back to field capacity, while still leaving room for potential rainfall to avoid overwatering.

Michigan State University Extension offers helpful tools to support the checkbook method, including a soil water balance sheet and an Excel-based irrigation scheduler. More recently, MSU developed a mobile irrigation scheduling app that is user-friendly and accessible for growers on the go. It's important to create a separate scheduling sheet or profile for each field, as crop type, soil texture, irrigation system capacity, and rainfall can vary significantly from one location to another.

All of these tools rely on daily potential evapotranspiration (ET_r) data and forecasted crop water demand for the upcoming week, available from 94 Enviroweather stations across Michigan. By selecting the weather station closest to your field, you can access accurate estimates to help schedule your irrigation.

Another simple approach using Enviroweather is to calculate crop water use by multiplying the reference evapotranspiration by a crop coefficient (K_c). The crop coefficient adjusts for differences in crop type and growth stage, allowing you to estimate how much water your specific crop needs.

To use,

1. Visit the Enviroweather website (https://enviroweather.msu.edu/).
2. Select “Crops” from the main menu.
3. Click on your crop of interest (e.g., Corn).
4. Choose “Corn Potential Evapotranspiration”.
5. Select your nearest weather station and enter your crop’s emergence date.
6. Click “Submit” to generate crop water use estimates.
7. To view additional data such as temperature, rainfall, or ET_r, click “Show more data”

Additionally, MSU Extension provides weekly crop water use estimates for three key regions in Michigan. To access these updates, visit Crop Water Use.

There are other methods available to schedule irrigation, for example, soil moisture sensors can provide real-time insights into field conditions. You can refer to the “Utilizing Soil Moisture Sensors for Efficient Irrigation Management” factsheet to learn more about how these sensors work and how to use them effectively.

For additional information and resources on irrigation management, please visit the MSU Irrigation website at.

Rain Gauges Are One of the Best Low-Cost Tools for Saving Water

Brenden Kelley, MSU Extension

One of the best tools for managing irrigation and saving water is a simple rain gauge. Even with the aid of modern weather forecasts, it is hard to beat data collected from your field. While manual collection of rainfall data does require some effort, it can be easily incorporated into your scouting regime. Good irrigation records, a weather forecast, and frequent evaluation of the crop’s stage, stressors, and received rainfall will provide you with all the ingredients to manage your irrigation.

There are several issues with depending on your preferred meteorological source alone for irrigation management. Firstly, even with today’s state-of-the-art meteorological equipment, it is rare that the forecast is always right. Even if your meteorologist can tell you when and where it will rain, projections of received volume are typically associated with a high degree of uncertainty. To further complicate the issue, most forecasts are generated for population dense areas. If you’re lucky, your weather source may interpolate between the geographical locations they calculated the weather for. While this may be better than assuming your weather will be the same as the closest data collection site, precipitation is often a spatially sensitive variable. Have you ever seen a nice storm front rain on the neighbor’s field while you’re still kicking up dust? These events may be uncommon, however, it’s not uncommon to see a quarter-inch difference in received rainfall within a half mile. Checking a manual rain gauge shortly after a precipitation event avoids all the guesswork!

Not all rain gauges are created equally. There are dozens of different rain gauge designs available, ranging from something that resembles a small test tube to large, complex apparatuses. While small devices might be enticing due to low costs and convenience, it's often worth spending a few extra dollars for a higher quality rain gauge. A 32-oz fast food cup can even be made to work as a fairly accurate rain gauge when paired with a graduated cylinder. Learn more about this in the Irrigation Fact Sheet #16 on the MSU Irrigation website. Based on preliminary results of a rain gauge comparison done by the Michigan State University Irrigation Team, rain gauges with small collection openings had larger degrees of error due to reduced sampling size. Some of the cheaper models also have printed units of measurement as opposed to etched or molded markings. The paint or ink used to measure can be harder to read, especially after they have faded. Additionally, some systems measure in quarters and eighths as opposed to tenths of an inch. This works, however, tenths are easier to work with and more precise, mathematically speaking. If you're making an effort to collect manual data and managing irrigation that will apply many gallons of water, it's wise to invest in a rain gauge you have confidence in!

Electronic rain gauges can also be purchased and set up to automatically send you data. This saves some effort, but this equipment is not flawless. Debris can easily plug the funnel that most electronic rain gauges are composed of. Without maintenance, it's easy to be misinformed by these units. If used properly, they can be convenient, provide real-time data, and save you a lot of driving. Both manual and electronic rain gauges should be tested to ensure proper calibration. This can be done by pouring a known volume of water into the gauge and dividing that volume by the surface area of the gauge's opening. The reading indicated on the rain gauge should match the result of your calculation. An example is shown below. Alternatively, you can compare readings to a rain gauge that is known to work well.

Fertigation: A Midseason Option for Fertilizer Application to Irrigated Fields

Lyndon Kelley, MSU/Purdue Extension

Your fields may have lost part of their nitrogen to water through denitrification, had nitrates move below the root zone following heavy rainfall, or simply had the crop just grow so fast that you missed the sidedress window. Either way, some fields may need additional nitrogen to reach yield goals. You can contact your local Michigan State University Extension county office for information on estimating nitrogen loss from your fields, but if your field is irrigated, you have options to replenish nitrogen.

Chemigation is a term for adding fertilizers or pesticides to irrigation water. Fertigation is a subset of chemigation specific to adding fertilizer to irrigation water. Irrigated production has the advantage of fertigation as an option in nitrogen management. Liquid 28 percent nitrogen is the most common product for fertigation, but combinations of UAN, Ammonium thiosulfate, and micro-nutrient solutions are also available to meet crop nutrient needs through irrigation.

Fertigation is often the last step in a three-split nitrogen management plan following starter and sidedress applications. Starter allows quick access to nutrients for the newly germinated plants. Sidedress applications usually account for the greatest portion of the nitrogen budget, feeding the plant just prior to the rapid growth phase. Depending upon the equipment used, sidedressing can also aerate soil and improve water infiltration. Fertigation makes up the remainder of the budget, supplying nitrogen to the crop just prior to tassel emergence. For efficient use, nitrogen applications need to be made prior to tasseling or soon after to ensure the nitrogen applied is in an available form for the plant to uptake and use during early grain formation.

From a management standpoint, fertigation allows producers the opportunity to evaluate crop stands, nitrogen losses due to wet conditions or heavy rain, and the current market situation to make adjustments to the nitrogen plan to meet the crop's needs and maximize profitability.

Knowing the actual amount of fertilizer the equipment will inject is essential. It is also important to know that the system applies water uniformly across the field. Center pivot systems of good design will have a uniformity coefficient of greater than 85 percent. It is important to remember that the application uniformity of the nutrients will be no better than the water uniformity of the system. When the application is 50% over or under the average application amount, the system is malfunctioning. The desired 40 pounds N application may instead be 60 pounds in some areas and only 20 pounds in other areas. Learn more about improving irrigation center pivot uniformity on the MSU Extension Irrigation webpage.

Suggested Minimum Performance for Chemigation/Fertigation

- Pivot point and last sprinkler pressure within 10% of sprinkler package specifications
- Required backflow protection in place and functional
- No major leaks or repairs needed
- No major runoff issues
- Capable of application of .25" or less for fungicides
- No 2X or greater overapplication

The inherent risk of injecting fertilizer into a water system dictates the need for backflow protection. Indiana and Michigan have resource protection rules that require using chemigation valves for the protection of surface and groundwater sources. Chemigation valves create an air gap in the pipeline downstream from the pump when the pump is shut down. The air gap breaks the suction created by water and retreats to groundwater or surface water. Chemigation valves for most irrigation are available from local irrigation dealers for around $700. Installation cost is much less at the time of pump installation and should be included in almost all new irrigation pumping installations.

To avoid the loss of N, make sure there's enough available water holding capacity in the soil profile to hold the application volume. One of the simplest ways to accomplish this is to estimate the days of water removal required to make available space for the fertigation application. If crop water use is 0.15"/day, waiting four days (0.6" removal) from the last rainfall should assure you have the capacity to hold a 0.5" fertigation application.

In some situations, producers may choose to dribble or broadcast nitrogen on the field by air or by using a high-clearance sprayer and use the irrigation to incorporate the nitrogen if dry weather follows. This technique is quick, requiring no irrigation equipment modification, but is dependent on the availability of aerial applicators or in-row high-clearance application equipment.

Detailed information on injection pumps, backflow protection, safety interlocks, and procedures for calibrating an injection system is available in "Using Chemigation Safely and Effectively," MSU Extension bulletin E2099. For more information, you can also download this Chemigation/Fertigation PowerPoint presentation from MSU Extension and Purdue Extension.

Special thanks to Bruce MacKellar, MSU Extension Field Crops Educator, and Steve Miller, MSU Biosystems and Agricultural Engineering Irrigation Specialist, for their input into this article.

Recent Amendments to Indiana's Groundwater Rights Law (IC 14-25-4) by Senate Enrolled Act 28

Mark Basch, Indiana DNR

Indiana's statewide enactment of the Emergency Regulation of Ground Water Rights Statute in 1985 under IC 14-25-4 provides owners of small capacity water wells with protection against the impacts of high-capacity groundwater pumping if the water withdrawals substantially lower water levels, resulting in the failure of a small capacity well. A high capacity well (significant groundwater withdrawal facility) is defined in the statute as "the ground water withdrawal facility of a person that, in the aggregate from all sources and by all methods, has the capability of withdrawing at least one hundred thousand (100,000) gallons of ground water in one (1) day". A small capacity well (nonsignificant groundwater withdrawal facility) is defined as having less than 100,000 gallon-per-day pumping capability. Additional information regarding the provisions of IC 14-25-4 can be found on the Division of Water webpage.

Recent amendments to IC 14-25-4 by Senate Enrolled Act (SEA) 28 now provide for the owner or operator of a significant groundwater withdrawal facility to file a complaint with the DNR if it is believed that the facility has failed to furnish its normal supply of water due to water level impacts caused by another high-capacity facility. SEA 28 requires the DNR to launch an investigation into a complaint of a well failure from a significant groundwater withdrawal facility within three business days, and also requires that the owner of a significant ground water withdrawal facility believed to be responsible for the failure or substantial impairment of another high capacity or small capacity water well to provide "timely and reasonable compensation" to the well owner. "Timely and reasonable compensation" under IC 14-25-4 consists of, and is limited to the following:

1. The immediate temporary provision at the prior point of use of an adequate supply of potable water.
2. Reimbursement of expenses reasonably incurred by the complainant to do the following:
    a. Obtain an immediate temporary provision at the prior point of use of an adequate supply of potable water;
    b. The restoration of the affected well to its former relative capability;
    c. The permanent provision at the point of use of an alternate potable supply of equal quantity; or
    d. The permanent restriction or scheduling of the high-capacity pumping so that the affected water well continues to provide its normal supply of water, or its normal supply of potable water if the well normally furnishes potable water.

Indiana Code 14-25-4 protects all properly functioning small capacity wells installed before January 1, 1986. Small capacity wells installed after this date must be constructed in accordance with the standards set forth in Information Bulletin #26 or Rule 312 IAC 12 to have protection under the law. Copies of Bulletin #26 and 312 IAC 12 can be found on the Division of Water webpage. These standards establish minimum requirements for pump setting depths and the amount of the source aquifer that must be penetrated by the well. With the enactment of SEA 28 on July 1, 2025, owners of newly installed significant groundwater withdrawal facilities wanting to receive protection under IC 14-25-4 must construct their wells in conformance with rules adopted under the law. The promulgation of rules for the construction of high-capacity water wells will be initiated by the DNR during the summer of 2025. High capacity wells installed prior to enactment of the new rule will receive protection under IC 14-25-4 if the well is determined to be properly functioning.

Amendments to IC 14-25-4 by SEA 28 only provide protection for high-capacity groundwater withdrawal facilities against the pumping impacts caused by other high- capacity facilities. SEA 28 does not establish a priority for groundwater withdrawals in Indiana based upon well capacity, type of water use, or prior appropriation. A copy of SEA 28 is available on the Indiana General Assembly website.

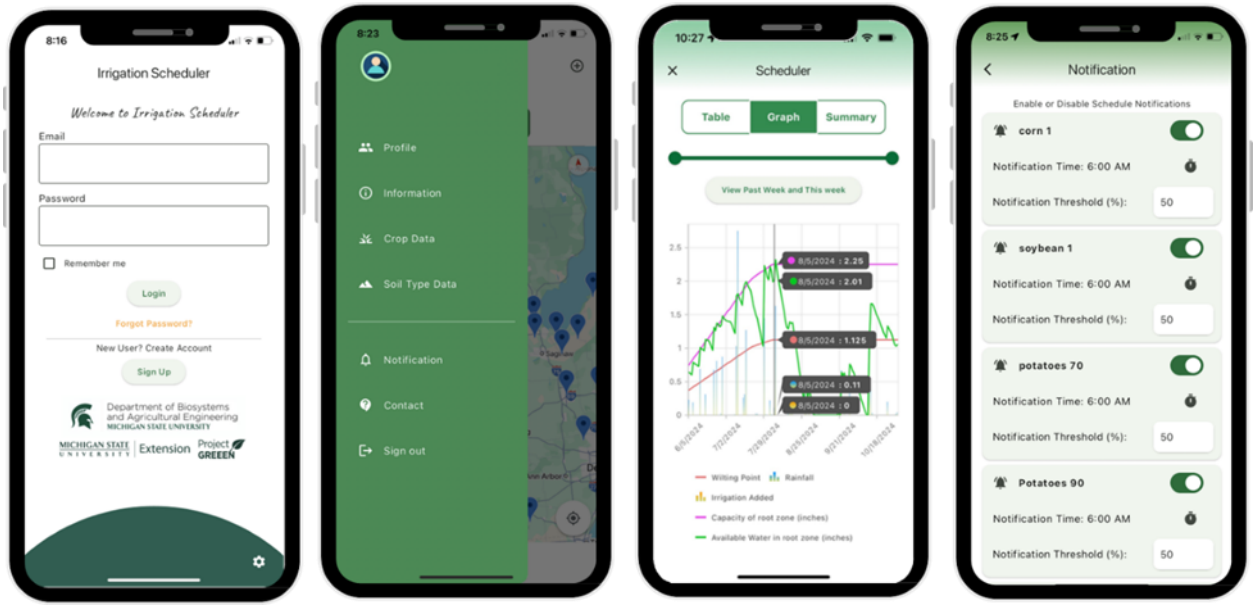
Enhancing Irrigation Water Use Efficiency with the MSU Irrigation Scheduling Mobile App

Dr. Younsuk Dong, MSU Extension

The Michigan State University (MSU) Irrigation Scheduling App is a smartphone-based tool designed to help irrigators make informed, data-driven irrigation decisions. Built upon the foundation of the original Excel-based MSU Irrigation Scheduler, the app provides a modern, easy-to-use interface that simplifies the process of estimating crop water needs based on evapotranspiration (ET) and Michigan State University Enviroweather.

The beta version of the app was released in 2024 with support from Project GREEEN. The app allows users to monitor soil moisture trends, track rainfall and irrigation events, and determine optimal irrigation timing to improve water use efficiency. The app helps farmers apply water more efficiently by delivering the right amount at the right time, promoting sustainable water use, improving crop yields, and strengthening resilience to climate variability.

The app is now publicly available in both English and Spanish on the Apple and Google stores.



Corn rolling is in indicator of crop stress. Using crop stress as a form of irrigation scheduling only indicates when you are running behind. Checkbook irrigation scheduling and soil moisture monitoring are both scientific based systems that lead to better crop management while improving yields.

SEND US YOUR QUESTIONS

The Michiana Irrigation Association wants to make sure we're educating on the topics members want. Email the association present, Todd Feenstra, at todd@tritiuminc.net, or Lyndon Kelley, MSU Extension at kelleyl@msu.edu with any questions.

STAY TUNED: The Annual Meeting of the Michiana Irrigation Association is planned for **December 2025** Location and date to be determined.