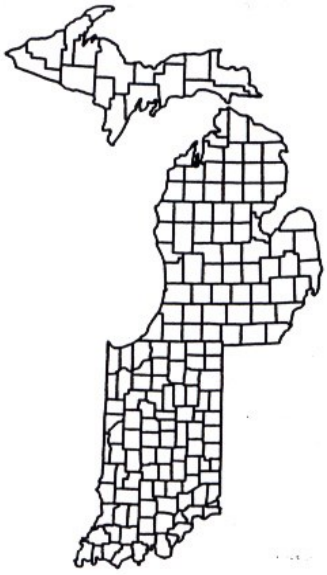
MICHIANA IRRIGATION ASSOCIATION

MICHIGAN-INDIANA IRRIGATION NEWSLETTER

APRIL 2019

52540 LAWRENCE RD
LEONIDAS, MI 49066



Greetings,

It is hard to believe that planting has begun which leads to a summer of irrigation. There are several articles in this newsletter that I think you will find very helpful this growing season.

If you have questions about what Michigan Irrigation Association does, don't hesitate to reach out to one of the current members. Following is list of current board members with their e-mail address:

- Joel Annable joel.annable@peerlessmidwest.com
- Todd Feenstra todd@tritiuminc.net
- Tom Frank tfrank70@comcast.net
- Justin Gentz gbfarms@live.com
- Brian McKenzie mckenziehighlander@msu.com
- Mike Morehouse mmore@maplenet.net
- Doug Pedler dpedler@maisco.net
- Ben Russell brussell@mwconnections.com
- Jeremy Walker walkerprecisionag@gmail.com

Sincerely,

Jeremy Walker
MIA President

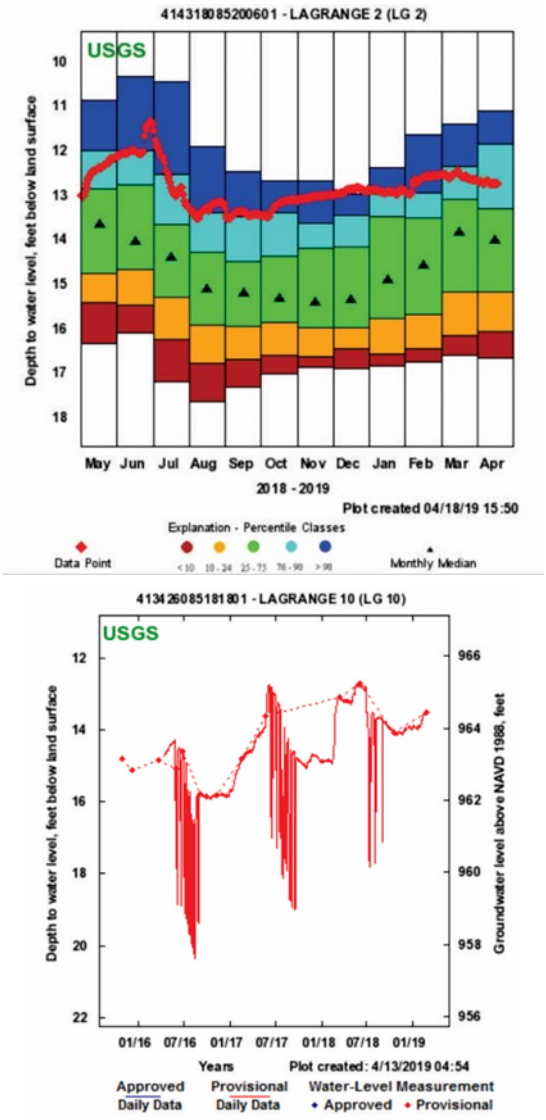
JW:tb

Early inspection of power and water supplies allow for repair before the need for irrigation.

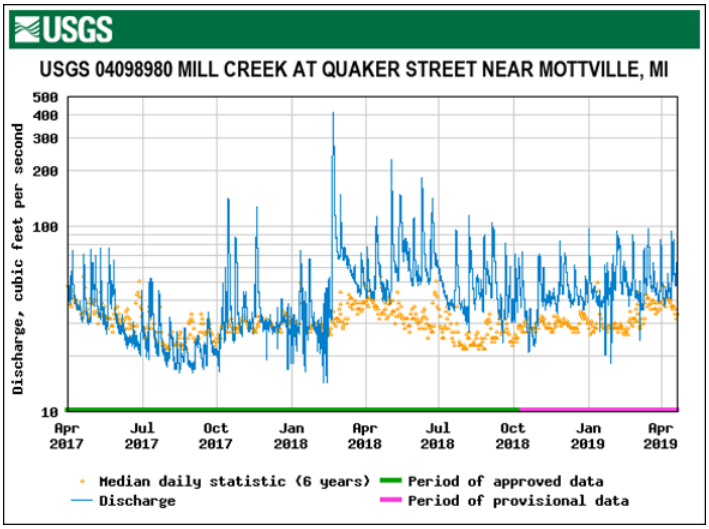
Irrigation Impact on Late Summer Stream Flow, or Lack There of

Todd Feenstra - Tritium, Inc.

The groundwater levels and stream discharges across southern Michigan, northern Indiana, and northwestern Ohio are currently well above the long-term median levels. In February of 2018 we observed a rapid rise in groundwater levels of nearly 2 feet across virtually the entire region. The USGS stream gages in southwest Michigan indicate significant increases in stream discharge during that same time period. Given normal precipitation patterns in 2019, both the groundwater levels and the stream discharges are expected to remain well above the long-term median levels.



Groundwater levels measured in a USGS monitoring well and a private grower's monitoring well included in the USGS Groundwater Watch network. Both wells are located in LaGrange County, Indiana.



Surface water discharge at Mill Creek in St. Joseph County, Michigan.

Streamflow depletion due to crop irrigation has still not been identified in our region. Identifying depletion induced specifically by pumping irrigation wells is very difficult due to the limited number of stream gages, the limited accuracy of streamflow measurements, extremely complex geology, and challenges in separating irrigation effects from the other stresses that affect streamflow.

Growers continue to invest in monitoring both the groundwater and surface water resources across the region. The private monitoring well network now exceeds 150 monitoring wells across 9 counties. Significant work is also being accomplished in the modeling/evaluating of streamflow depletion using local scale 2-dimensional analytical models as well as regional scale 3-dimensional numerical models. The Fawn River watershed model has been completed, peer-reviewed, and submitted to the State of Michigan. The LENK Group in Indiana has two peer-reviewed, numerical models that cover LaGrange/Noble and Elkhart/Kosciusko counties. And, the Cass County Pilot Project will conclude in the Fall of 2019 with another county-wide numerical model coupled with a wide-ranging evaluation of field methodologies for both groundwater and surface water measurements.

Groundwater continues to be the focus of increasing legislation and regulation in the Midwest. The State of Michigan enacted new law in 2018 implementing an alternative Site Specific Review process. The law specifies two additional analytical models for predicting streamflow depletion, clearly defines the required data to be collected, and allows for the use of approved regional studies such as the Fawn River model. The State of Indiana has begun to delineate regions of the State for regional water planning. Funding has been provided to form regional water committees and studies, beginning with the Central Indiana Region. In Ohio, several suburbs of Toledo are considering development of groundwater

resources in northwestern Ohio to meet their public water supply demands. The plan has drawn sharp criticism from local activist groups who are aggressively pushing for increased regulations and changes to the water laws in Indiana, Michigan, and Ohio.

The increased concerns about the viability of our shared water resources, our own lack of knowledge regarding those resources, and imported fears of aquifer and surface water depletions from other areas of our country have highlighted the need for long-term groundwater and surface water data to build representative and reasonable models. The data and the models are needed to answer difficult questions regarding the source and protection of our shared water resources. One of the greatest assets contained in our region of the Midwest is the tremendous abundance of resilient groundwater and surface water resources that sustains one of the most substantial agricultural industries in the world. We need to define those resources more reliably in order to manage them and protect our future.

Tar Spot and Irrigated Corn: What we saw in 2018 and will it happen again?

Bruce MacKellar, Martin Chilvers & Eric Anderson - MSU Extension

Tar spot, a new fungal pathogen first seen in Michigan in Allegan County in 2016, spread like a wildfire across west Michigan in 2018. The disease, which is prevalent in production areas in Mexico, comes from higher altitude fields in that country. The fungal pathogen apparently is well adapted to our environment here and likely overwinters on infected corn residue. Based on the rapid spread last season, we anticipate that there will be plenty of spores to go around in southwest and northern Indiana Michigan in 2019.

One of the more troubling aspects of the disease is that it really caused yield reductions during 2018 in the irrigated areas of fields, with much less effect on the dry corners. In some cases, dry corners out-yielded irrigated areas with the same hybrid by 30-40 bushels per acre. That is not to say that there was no tar spot in the corners but that the pathogen showed more severity in those areas. In thinking back on 2018, we did not tend to irrigate fields a whole lot in areas where thundershowers were more prevalent. This has us worried that just a couple of irrigation events at the wrong time may have set the stage for rapid disease development. Unfortunately, we were not able to conduct a lot of research and field observations on the situation because we had no idea that the disease would have this level of impact. We have been looking at a few fields that showed this level of reduction, tracing back irrigation events, cloudiness, rainfall, temperature, wind, relative humidity, leaf wetness values from the closest MSU Enviroweather station and planting dates for the hybrids planted. This hopefully will give us a place to start in understanding what conditions in the field triggered severe infection last season.

Marty Chilvers, MSU Field Crops Pathologist, thinks that trying to manage irrigation to reduce tar spot is going to be a tough challenge, and success will likely depend on several weather factors, especially dew point. He believes limiting leaf wetness is going to be critical. Considering this, irrigating late in the day would most likely extend the time leaves remain wet and enhance tar spot development. If we have conditions where the leaves are already going to be wet, starting the pivot at, for example, 1:00 AM, running it until the sun is up, then shutting the system off to let the canopy dry out may be the best option. How quickly leaf drying would occur depends on cloud cover, relative humidity and wind speed. We are going to be working on gathering leaf wetness data on both irrigated and dry corner corn plants this summer to help provide Dr. Chilvers' crew with a better insight on how center pivot irrigation changes the duration of leaf wetness under field conditions.

Managing irrigation to minimize the duration of leaf wetness is not how we have thought about running center pivots in the past. Depending upon water demand and the capacity of a system to cover acres, you may not be able to do it in the future and maintain yield potential. But some aspects of irrigation triggered disease response in 2018.

Managing for Tar Spot: Unfortunately, the disease is so new to the US that there has not been a lot of research compiled to determine the best ways of controlling the disease. Evaluation of university hybrid performance trials has shown there are substantial differences among hybrids in commercial corn. Initial recommendations would be to obtain as much information as possible from the companies about hybrid performance in areas with tar spot issues in 2018. Fungicide applications will likely increase on commercial corn grown in areas where the disease is prevalent. The thought is that products that provide both a protectant and curative function will likely be the most widely used in 2019. Early results showed that a DMI (triazole) fungicide application with or without a QoI (strobilurin) pre-mix fungicide resulted in the lowest disease severity. The timing and duration of tar spot sporulation makes the best timing of fungicide application a bit harder to know. Dr. Chilvers suggests that if you were planning on making a single application of a fungicide, applying around tasseling would probably provide the best window for application. If two applications are being considered, the first application most likely would be applied during the later vegetative growth stages with the second applied closer to R2. As the seed industry completes more screening for hybrid resistance to tar spot and incorporates these genes into

their breeding lines, we hopefully will be able to reduce our reliance on fungicides to control this disease.

Levels of resistance to tar spot vary greatly among hybrids. The brown areas were severely injured by tar spot compared with the green strips planted to a different hybrid. Photo courtesy of Dr. Martin Chilvers, MSU.

Reducing Irrigation Cost

Lyndon Kelley - MSU Extension & Purdue Extension

Almost all crop producers are experiencing tight margins. The added expense of irrigation investment increases the need to keep expenses in check. Here are a few areas that have the potential to reduce irrigation costs while keeping yields and returns up.

Only apply water that will increase yield or profits
Suppling the water necessary to prevent water stress yield reduction is the goal of checkbook irrigation scheduling. Tracking the daily water removal, termed Evapotranspiration (ET) and rainfall allow irrigators to apply the water necessary to replace the deficit. Irrigation scheduling will provide for the highest yield with the least irrigation needed.

Indiana producers may use data from their own ET gauge station or rET (reference evapotranspiration) data from Purdue's PAC center weather stations. Simply multiply the reference ET by the crop coefficient (Kc) which stands for the ratio of you crops water use at its stage of development to the reference crop (6" grass). If you multiply that result by 7 (days), you obtain the estimated corn water use per week. Support for irrigation scheduling in Indiana can be found at: https://www.purdue.edu/agsoftware/irrigation/

Michigan and Indiana producers in the counties adjacent to Michigan, can have daily rET data sent to them by E-mail or text by signing up for the service at MSU Enviro-Weather website. (https://enviroweather.msu.edu/rpetalert.php). Messages are sent at 5:30 AM each day providing rET data for the previous five days and estimates of projected rET for the following 7 days from any of the networks 87 stations. Estimates of rET can also be found by going to the Enviroweather web site at https://enviroweather.msu.edu/ and following the link to "More weather" and then navigate to the "Water-use tools" heading.

Use big irrigation applications
To make the best use of irrigation water, producers will want to try to provide 4 or 5 days' worth of crop water use per application, typically 1 to 1.25 inches at peak water use periods. These larger irrigation applications increase the amount of effective water available to the crop by reducing the water lost by evaporation in the crop canopy and on the residue and soil surface, about 0.1" per application regardless of the amount of irrigation water applied. A producer making two 0.5" applications provides 0.8" of effective water, compared to a producer making a single 1.0" application that provides 0.9" of effective water.

Irrigators with center pivots that apply water faster than can infiltrate into the soil are forced to use smaller applications (less than 0.5") to avoid irrigation runoff.

Irrigate to the end
Irrigate until the crop reaches maturity but no longer to increase and ensure yield and test weight. The goal of the soybean irrigator should be to maintain at least 50% of his available soil water holding capacity for soybeans till most pods yellow. Corn producers trying to maintain test weight in a dry late summer should maintain at least 50% of the available soil water holding capacity until the crop reaches black layer.

Use fertigation or spit N application to maximize return on your Nitrogen
Irrigated production has the advantage of fertigation as an option in nitrogen management. Fertigation is the process of applying fertilizer through irrigation water. Liquid 28% nitrogen is the most common product for fertigation with proper equipment.

From a management standpoint, fertigation allows producers the opportunity to evaluate crop stands, N losses due to wet conditions or heavy rains and the current market situation to adjust the nitrogen plan to meet the crops needs and maximize profitability. The closer the N fertilizer is applied to the time of peak crop needs, results in the least potential for N loss and the greatest return for your N investment.

Even if you never fertigate, irrigation still provides the opportunity to water in surface applied or knife in N applications. Incorporation by irrigation reduce N loss to valorization, increasing the amount of N the crop can benefit from.

Use the least expensive energy source available
Choosing the most cost effective energy source available has the potential to have immediate and long term cost saving. If available at reasonable installation cost, three-phase electric is the low cost source when you consider the cost of energy, equipment and maintenance. If installation cost of electricity is prohibitive, consider propane/natural gas compared to diesel fuel powered systems.

If you are lucky enough to have electric power, contact your supplier to explore potential saving from "off peak use" pricing opportunities and winter disconnect option to further lower costs.

Control system that prevent overwatering
Automation of irrigation system can be an extra expense at a time that budgets are tight, but interlocking pumps and center pivots or other distribution systems can be done for under $500 and can avoid overwatering when the pivot stops or application cycle ends.

Maintain irrigation equipment to minimize expensive repairs
Irrigation repair people seem to agree, most of the costly irrigation repairs could be avoided with preventive maintenance and precautionary start-up procedures. Here are a few of their words of wisdom:

- Remove mice, insects, vermin and their nests and waste. Close access to electrical control boxes before spring start-up.
- Clean and inspect the function of electric disconnect boxes, and well starter systems.
- Test center pivot end stop controls and stop structures before the first run.
- Test traveler end run stop control system before the first run.
- Trim or remove trees and brush that are anywhere near the pivot end boom's travel path.
- Inspect tires early in spring, add air to specification, recheck a couple weeks later, repairing any tire that lost pressure.
- Observe each center pivot drive motor and drive gearbox while running, drain accumulate water, check oil levels and refill. Growling and grinding sounds indicate the need for replacement or repair.

Dealing with these issues before planting reduces the need for expensive repairs and minimizes the start-up time needed the first time the irrigation system is used. The added benefit of being ready to irrigate to aid in germination, emergence, incorporate fertilizer or activate herbicide often leads to a better start to a profitable year.

Top Production Tips for Irrigated Corn Production:

Bruce MacKellar and Eric Anderson - MSU Extension Southwest Michigan

With low corn prices and increasing costs for inputs, irrigated corn growers need to be looking at trimming costs while keeping yield potential high. The following are a few thoughts that hopefully can promote these goals.

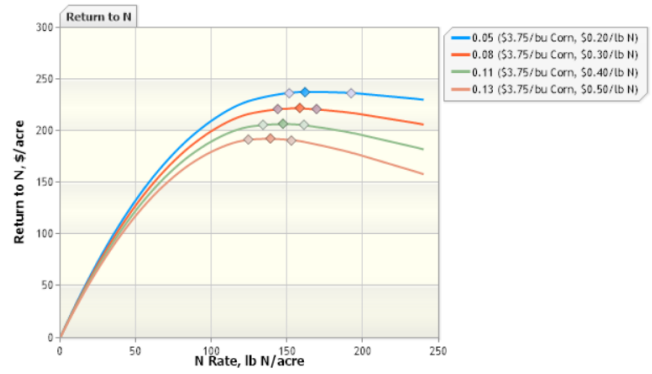
- **Variety Selection**: The basic truth remains that there are substantial differences among hybrids, even those offered by the same company. Hybrids differ in their ability to perform in high population, high competition environments. Don't overlook leaf disease ratings in irrigated corn. If you can find info on Tar Spot tolerance, that could be important this year. With hybrid turnover at such a fast pace, it takes work to keep up to date. Be a student of the game in hybrid selection.
- **Soil Fertility:** Starter nitrogen (N) and phosphorus (P) (2x2) is the most efficient way of maximizing nutrient uptake while applying a high enough rate to ensure N availability. Only add P if the soil test levels suggest it is needed as excess does not improve yields but does quickly add costs. Check potassium on sand, loamy sand soils regularly as it has potential to leach through the soil profile. Sulfur is likely to be needed on most of the irrigated sands in the region. Sulfur helps with N utilization as well as alleviating the yellow striping that can slow down corn growth in the early vegetative stages. Make sure there is adequate magnesium in your soil test (80 lbs per acre, 40 ppm).
- **Nitrogen Management:** Always plan on splitting N applications on irrigated corn. This provides the best chance to match nutrient application with crop needs while reducing the chance of leaching loss. Applying some N through irrigation also helps optimize applications by applying N only where water is being applied and yield potentials are high in the field.
- **N Rate:** This is a bit tricky. The MSU MRTN (maximum return to N) system recommends 123-191 lbs per acre depending on your fertilizer and corn prices—see the chart below. But irrigated N management really requires a careful estimate of applied N losses and the soil's ability to mineralize N (texture, organic matter level, manure applications).
- **AGB White Grubs:** Pests like Asiatic Garden Beetle white grubs are on the rise in the region. This is especially a problem on the lightest portions of fields. Effectiveness of control with soil insecticides often varies with the population densities of these pests. There are no rescue treatments though, so early

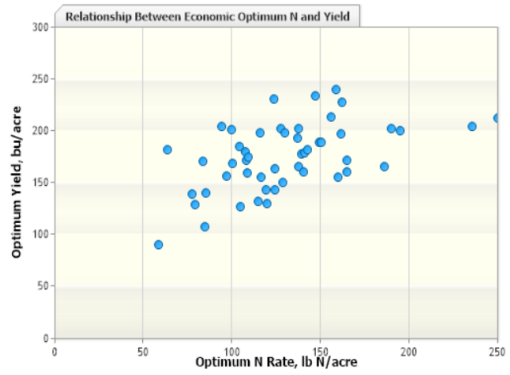
scouting for grubs being turned up by soil tillage is the key to see if soil insecticides, along with seed treatment, is warranted.

- **Scout for Trouble:** Sporadic pests and diseases like armyworm, black cutworm, western bean cutworm, gray leaf spot and now tar spot can really make a difference in corn yields if an outbreak is widespread in your fields. Keeping an eye on your fields can go a long way in terms of being able to manage for these pests. We, along with specialists Dr. Chris DiFonzo (entomologist) and Dr. Martin Chilvers (pathologist), regularly scout for these pests—look for reports in our newsletters, regional reports, and in the MSU Extension News Digest. You can also hear about late-breaking issues on the Field Crops Team's "Virtual Breakfast" series at 7:00 AM every Thursday from April 25th through September 5th, 2019. Visit the website (www.canr.msu.edu/field_crops/virtual-breakfast/) to find out more and see a schedule of topics.
- **Tar Spot:** Tar Spot should be on your radar screen this year. This disease spread very quickly in Michigan over the last two growing seasons. Recommendations are outlined in the article in this publication.

State: Michigan
Number of sites: 50
Rotation: Corn Following Soybean

N Price ($/lb N):	$0.20	$0.30	$0.40	$0.50
Corn Price ($/bu):	$3.75	$3.75	$3.75	$3.75
Price Ratio:	0.05	0.08	0.11	0.13
MRTN Rate (lb N/acre):	162	158	147	139
Profitable N Rate Range (lb N/acre):	150 - 191	143 - 168	133 - 160	123 - 152
Net Return to N at MRTN Rate ($/acre):	$237.68	$221.78	$206.58	$192.28
Percent of Maximum Yield at MRTN Rate:	99%	98%	98%	97%
UAN (28% N) at MRTN Rate (lb product/acre):	579	564	525	496
UAN (28% N) Cost at MRTN Rate ($/acre):	$32.40	$47.40	$58.80	$69.50





Using Soil Moisture Meters to Compliment Irrigation Scheduling

Steve Miller & Younsuk Dong - MSU BAE

There are several tools available for assisting irrigators in making irrigation scheduling decisions. These include paper copies on a clip board that can stay in the truck, and excel spreadsheets that assist in calculating water demand to prove graphical outputs.

All scheduling methods rely on estimated crop water usage that uses a reference value of Evapotranspiration (ET) (a well-watered grass) derived from weather station data that is then modified to reflect the crop being irrigated. We are developing methods to use satellite data to estimate ET and crop water stress then making that data available to irrigators.

These tools are helpful but cannot replace field observation of soil moisture at multiple depths and crop conditions. Soil moisture sensors can be a valuable tool to complement irrigation scheduling. All sensors use the fact that water transmits an electrical charge or electrometric pulse better than soil. To provide useful information, the sensors must be installed in representative locations in the field, be properly installed with good contact between the sensors and the soil and the results interrupted knowing soil texture.

The cost of sensor systems range in price from $440 for a Irrometer handheld meter with 5 sensors to $3,800 for a Campbell Scientific with continuous data collection, 5 sensors and remote access to the data. For a detailed breakdown of examples of cost and a description of various sensors see the PowerPoint at: https://www.egr.msu.edu/bae/water/sites/default/files/content/Sensor%20Comparison%202018.pdf
An affordable sensor system is being developed that includes 5 sensors, a data logger and remote access the continuous data that can be viewed on a smart phone, tablet or computer. We expect the components for the system to cost about $200 and less than $30 a year for the remote access.

Updated Michigan & Indiana Stats

First look at Ag Census 2017 Irrigation Numbers - Top 12 Michigan and Indiana Irrigated Counties

Rank	State/ County	2017 Irrigated acres	2017 % of States irrigated acres	Acres Increase 2017-2012	% Change in acres 2012 -2017
	Michigan	670,212	100.00%	78,012	11.6%
1	**St. Joseph**	123,099	18.37%	10,699	8.7%
2	**Cass**	71,245	10.63%	13,645	19.2%
3	**Montcalm**	59,511	8.88%	3,611	6.1%
4	**Branch**	55,701	8.31%	11,201	20.1%
5	**Kalamazoo**	43,044	6.42%	3,944	9.2%
6	**Van Buren**	35,599	5.31%	1,599	4.5%
7	**Allegan**	24,845	3.71%	-3,255	-13.1%
8	**Ottawa**	23,036	3.44%	4,936	21.4%
9	**Berrien**	20,048	2.99%	1,948	9.7%
10	**Mecosta**	17,642	2.63%	3,244	18.4%
11	**Gratiot**	15,865	2.37%	6,365	40.1%
12	**Kent**	15,273	1.99%	5,287	34.6%

Rank	State/ County	2017 Irrigated acres	2017 % of States irrigated acres	Acres Increase 2017-2012	% Change in acres 2012 -2017
	Indiana	555,443	100.00%	118043	21.3%
1	**LaPorte**	68,459	12.33%	14059	20.5%
2	**LaGrange**	38,944	7.01%	13344	34.3%
3	**Starke**	38,650	6.96%	13050	33.8%
4	**Knox**	32,107	5.78%	-2793	-8.7%
5	**Kosciusko**	30,091	5.42%	12091	40.2%
6	**Pulaski**	29,856	5.38%	11356	38.0%
7	**St. Joseph**	28,116	5.06%	516	1.8%
8	**Jasper**	25,942	4.67%	4842	18.7%
9	**Fulton**	25,065	4.51%	2165	8.6%
10	**Elkhart**	25,044	4.51%	-456	-1.8%
11	**Noble**	21,082	3.80%	7382	35.0%
12	**Marshall**	16,533	2.98%	3133	18.9%

Calendar of Upcoming Meetings

Anaerobic Digester Operator Training

MAY 7, 2019 - MAY 9, 2019 10 A.M. - 3 P.M. 4090 COLLEGE RD LANSING, MI 48910 - This training is designed for operators of anaerobic digesters.

Mid-Michigan Livestock Network - Drones in Action!!!

MAY 16, 2019 6:00PM - 8:00PM KITTY CURTIS FARM, DIRECTLY ACROSS FROM GREENWOOD TWP. HALL, 3447 TEMPLE DR., HARRISON, MI 48625 - Join the Mid-Michigan Livestock Network at our May program in the field, where guest speaker Charles Rhines from Aero Bay Shores demonstrates what his company can do with the use of aerial vehicles (drones).

Right-of-Way Review Class

JUNE 5, 2019 8:00AM - 5:00PM 8 A.M. - 5 P.M. MSU EXTENSION WASHTENAW 705 N. ZEEB RD. ANN ARBOR, MI 48107 - Right-of-Way review class for Commercial Pesticide Applicators.

Mid Michigan Livestock Network - McKimmy Ag Services

JUNE 20, 2019 6:00PM - 8:00PM MCKIMMY AG SERVICES, 1925 NICKLESS RD., GLADWIN, MI 48624 - Join Matt and Kristen McKimmy as they give us a tour of McKimmy Ag Services and cover their vision for the future of the Elevator in Gladwin.

MSU Agriculture Innovation Day

The 2019 MSU Agriculture Innovation Day will take place on July 26, 2019 at Michigan State University Farms in Lansing, Michigan. With a theme of "Focus on Precision Technology That Pays," experts will detail how implementing technology that aids in decision-making can improve yields, increase profit margins and reduce environmental impacts.

The free event, which runs from 8:30 a.m. to 5 p.m., features nine field-based sessions focused on specific issues and includes lunch.

Daily updates for ag producers from MSU Extension:

If you haven't added https://www.canr.msu.edu/agriculture/news to your favorites, you should. We have taken our seasonal pest update system and expanded it from crops, vegetables and fruit to livestock, poultry, dairy, bioenergy, farm management and home horticulture, year round. This web site is updated DAILY by MSU Extension field staff and campus faculty, with current and relevant items that can impact all areas of your ag business.