

NEWSLETTER

Driftless Ag Update

Ag news for La Crosse, Vernon, and Crawford Counties from UW-Madison Extension

Agriculture Institute



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Please contact your local extension office for the print version of any article included in this newsletter.



Here's your October Driftless Ag Update!

Hello and congratulations on receiving our October Driftless Ag Update!

This newsletter is co-written by your local UW-Madison Extension Ag Educator Sam Bibby (crops).



Notes from your Regional Crops Educator- Sam Bibby

Notes from your Regional Crops Educator- Sam Bibby

-Corn is coming off but beans are a little slower to dry down with the continued rain. This probably has at least a few folks wondering why we don't desiccate beans like they do down south. This short article by Dr. Conely and Dr. Werle gets at the answer to that question.

- This year seems to have been especially bad for weedy field edges. Keep track of heavy weed pressure on field edges this year because it will affect the field next year. Waterhemp resistance to herbicides like Callisto and Liberty is coming and anything you can do to prevent weeds from going to seed on field edges will help delay that issue. As someone who delt with some of the first Roundup resistant waterhemp in our county 15 years ago, trust me, you don't want to be the first one to deal with the next resistance case.

-Johnson grass: in short, its moving and expanding. See the picture below and give me a call if you find some!

Pictures from the Field



We spread 40 acres of camelina into standing beans with a drone on our farm on September 28th. Stay tuned for updates!



Johnson Grass continues to spread around the driftless region. I have found multiple sites across my region and all sites I found last year have expanded. The chances of this turning into a real problem are not small. If you suspect this weed in your field give me a call.

Upcoming Events



Secure Your Farm's Legacy: "Cultivating Your Farm's Future" Workshop Series

Fall 2026 Series: Runs Thursdays from November 12 to December 10, 2026 (skipping Thanksgiving), with two optional sessions in January 2027. The registration deadline is October 23, 2026.

Register:
https://farms.extension.wisc.edu/extension-to-offer-cultivating-your-farms-future-workshop-series/

Great River Graziers Pasture Walks

Christopher Baird

12241 Hwy 27
Ferryville, WI

Tillage considerations when establishing pasture in heavily outwintered areas. Reviewing nutrient management plan and soil samples. Increasing fertility over time with minimal commercial fertilizer

Online Course:

Integrating Health Care and Health Insurance into Your Wisconsin Farm

Topics Include:

- How health and insurance impact your farm and family.
- Ways to include health insurance in your farm risk management plan.
- Health insurance options for you, your family, and/or your employees.
- Budgeting insurance costs for your household or farm business.
- Resources to connect health care and insurance with your farm goals.

Register: https://farms.extension.wisc.edu/new-online-course-integrating-health-care-and-health-insurance-into-your-wisconsin-farm/



Biosecurity and Premises Mapping Workshops for Sheep and Livestock Producers in Gays Mills on October 13

Sheep producers and livestock owners are invited to attend two complimentary workshops focused on protecting animal health, enhancing disease preparedness, and strengthening farm resilience on Monday, October 13, 2026, at the Gays Mills Community Commerce Center, Gays Mills, Wisconsin. The workshop is open to all who are interested.

Upcoming Events

DRIFTLESS DIALOGUE PRESENTS

The Forest and Flood Resilience

Land management to reduce downstream flooding in the Driftless Area: a rich history pointing to new opportunities



The relationship between land management and flooding has been a topic of intense interest for residents and researchers in the Driftless Area for well over 100 years. The soil and water conservation revolution in the 1930s led to noticeable reductions in flooding. But today, the regional community is looking for more opportunities to reduce runoff, especially in the face of an increase in the frequency of heavy rainfall events. This talk will focus on the history of land management changes, how they impacted flooding, and the emerging opportunities to enhance infiltration on the region's steep forested hillslopes.

Dr. Eric Booth
Research Scientist (Hydrology)
University of Wisconsin – Madison

Presenter: Dr. Eric Booth is broadly interested in the intersection between water, land, climate, and humans. He considers his research approach to be transdisciplinary and highly dependent on collaborating with colleagues and partners from a wide variety of disciplines. His disciplinary background has water as a centerpiece and includes topics such as hydroecology, impacts of climate and land-use change, urban stormwater management, wetland/stream restoration, water quality, groundwater hydrology, fluvial geomorphology, environmental history, agroecology, remote sensing, and computer modeling.

driftless dialogue

Monday, October 12, 2026
Socializing at 5:30pm, Talk at 6pm
KICKAPOO VALLEY RESERVE
S3661 State Road 131, La Farge, WI

College of Agricultural & Life Sciences
UNIVERSITY OF WISCONSIN-MADISON

FRIENDS OF KICKAPOO VALLEY RESERVE

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Top 9 Recommendations for Winter Wheat Establishment in 2026

Authored by: Shawn Conley, State Soybean and Small Grains Specialist; Adam Roth, Research Agronomist; and Damon Smith, State Field Crops Pathology Specialist.

Top 9 Recommendations

1. Variety selection: please see the 2026 WI Winter Wheat Performance Test at https://badgercropnetwork.com/wp-content/uploads/2026/08/Winter-wheat-booklet-26.pdf.
2. Plant new seed (DO NOT plant saved seed).
3. A fungicide seed treatment is recommended for winter wheat in WI, especially for seed damaged by Fusarium head blight (FHB).
4. Cephalosporium stripe is increasing in occurrence in Wisconsin. Use the 2025 WI Winter Wheat Performance Test data to choose a wheat variety with good partial resistance to this disease.
5. Wheat should be planted 1 to 1.5 inches deep regardless of planting date.
6. Plant between September 20 and October 10.
7. The target seeding rate for wheat planted from September 20th to October 1st is 1,750,000 seeds per acre.
8. The optimal seeding rate for wheat planted after October 1st should be incrementally increased as planting date is delayed compensating for reduced fall tillering.
9. Crop rotation matters.

Variety Selection

As with any crop, variety selection is the most important factor to consider in maximizing winter wheat yield and profitability. When choosing a winter wheat variety, several factors must be considered. These include winter survival, insect and disease resistance, lodging, test weight, and most importantly, yield. Since no variety is ideal for every location, it is important to understand the crop environment and pest complex that affects your specific region to maximize yield.

Yield is based on the genetic potential and environmental conditions in which the crop is grown. Therefore, by diversifying the genetic pool that is planted, a grower can hedge against crop failure. Select those varieties that perform well not only in your area, but across experimental sites and years. This will increase the likelihood that, given next year's environment (which you cannot control), the variety you selected will perform well.

Test weight is also an important factor to consider when selecting a variety. The minimum test weight to be considered a U.S. #2 soft red winter wheat is 58 lb/bu. Wheat at lower test weights will be discounted. Environment, pests and diseases may greatly affect test weight; therefore, selecting a variety that has a high-test weight potential in your region is critical to maximizing economic gain. Test weight discounts at the elevator can range from 8 to 12 cents per ½ lb/bu below 58 lbs/bu.

Select a variety that has the specific insect and disease resistance characteristics that fits your needs. By selecting varieties with the appropriate level of resistance, crop yield loss may be either reduced or avoided without the

Select a variety that has the specific insect and disease resistance characteristics that fits your needs. By selecting varieties with the appropriate level of resistance, crop yield loss may be either reduced or avoided without the need of pesticides. Careful management of resistant cultivars through crop and variety rotation, is required to ensure that these characteristics are not lost.

When making your wheat variety decision for the 2026-202 season, take time to review several previous years of Wheat Performance Test results. While not all wheat varieties perform the same across a location, they do tend to yield better when they have less disease. Sorting the tables first by lowest FHB incidence and FHB severity scores (typically a more perennial disease in Wisconsin), then by lowest Cephalosporium stripe incidence (see 2025 trials), while then looking for yields comparable to the best yielding variety (stared yield score) can facilitate finding a variety with excellent yield and a good disease performance package for Wisconsin.

Plant height and lodging potential are also important varietal characteristics that may be affected by your cropping system. If the wheat crop is intended for grain only, it may be important to select a variety that is short in stature and has a low potential for lodging. This may decrease yield loss due to crop spoilage and harvest loss as well as increase harvesting rate. However, if the wheat crop is to be used as silage or is to be harvested as both grain and straw, then selecting a taller variety may be warranted.

For detailed information regarding winter wheat variety performance please visit www.badgercropnetwork.com for results of the 2026 WI Winter Wheat Performance Test.

Plant New Seed in 2026

- To maximize wheat yields in 2027, it is imperative that growers plant certified or private (professionally prepared) seed that is true to variety, clean, and has a high germination percentage (>85%).
- Do NOT save seed from fields that received a glyphosate harvest aid application as germination rate can be adversely affected.
- Some WI wheat fields experienced Fusarium Head Blight (FHB), also known as scab in 2026. Kernels from heads infected with scab may be shriveled or shrunken and lightweight. Some kernels may have a pink to red color (Image 1). Others may be bleached or white in color.



If growers absolutely need to plant saved seed due to availability or other economic considerations, the following steps should be taken to increase the likelihood of establishing a legal and good wheat crop:

Step One: Determine if you can legally plant the wheat seed you saved. Today, many private wheat varieties now come with statements which buyers sign at the time of purchase, stating that they understand they are not authorized to use the harvested grain for seed. Most current public winter wheat varieties are Plant Variety Protected (PVP) and though you may replant them on your own land, you do not have the right to trade/sell seed of those varieties to others for planting.

Step Two: Once you have determined if you can legally plant the seed you saved, the next step is to clean the wheat seed. It is important that wheat seed be cleaned to remove small and damaged seeds and to eliminate weed seeds. Removing small and damaged seeds will not only aid in crop establishment but will also provide a more uniform wheat seedling stand. Removing small and damaged seeds will also increase the thousand-kernel weight (TKW), which serves as a measure of seed quality. Wheat seed with TKW values greater

quality. Wheat seed with TKW values greater than 30 grams tend to have increased fall tiller number and seedling vigor.

Step Three: Perform a germination test. Germination tests can either be completed at home or by sending a sample to the Wisconsin Crop Improvement Association. A home test can be performed by counting out 4 sets of 100 seeds and placing each of them in a damp paper towel. Place the paper towel into a plastic bag to conserve moisture and store in a warm location out of direct sunlight. After five days, count the number of germinated seeds that have both an intact root and shoot. This will give the grower an estimate of % germination. It is important to choose random seeds throughout the entire seed lot and conduct at least 4 – 100 seed counts. If germination is below 85%, consider increasing the seeding rate to compensate; however, we would caution growers from seeding any wheat with a germination test below 80%.

Step Four: Assess the need for seed treatment. A number of fungicides and insecticides are labeled for use as seed treatments on winter wheat and are listed in What's on Your Seed Tool. Seed treatment fungicides protect germinating seed and young seedlings from seedborne and soilborne pathogens. Seed treatment fungicides will not improve germination of seed that has been injured by environmental factors and will not resurrect dead seed. If seed with scab must be used for planting, a seed treatment fungicide is a must to improve germination and protect stand. Note that planting scabby seed won't increase the risk of FHB next spring. Also remember that seed treatment fungicides applied this fall will not protect against potential FHB infection next summer. You may still need to apply a foliar fungicide during anthesis to control FHB.

Seeding Depth

Wheat should be planted at least 1.0 inch deep depending upon soil moisture conditions. Wheat planted less than 0.5 inches deep may result in uneven germination due to seed exposure or dry soil conditions. Shallow planted wheat is also more susceptible to winterkill. Wheat planted more than 1.5 inches deep may result in death due to pre-mature leaf opening or poor tiller development and winter survival. Uniform seed placement and seeding depth are important in promoting crop health in the fall.

Seeding Rate

The targeted fall stand for wheat planted from September 15th to October 1st is 40 plants per square foot. This is about 25 plants per foot of row in 7.5" rows. To achieve this goal, the seeding rate for soft red winter wheat is 1,750,000 viable seeds per acre (Table 1).

Our data from the 2024/5 growing seasons indicate a significant yield increase when increasing your seeding rate from 0.75 and 2.25 million seeds per acre; however, that marginal yield increase was likely offset by the increased seed cost over 1.5 million seeds (Figure 1). The optimal seeding rate for wheat planted after October 1st should be incrementally increased as planting date is delayed compensating for reduced fall tillering (Table 1).

Table 1. Recommended winter wheat seeding rate by planting date.

Seeds/acre (million)	Seeds/ft.^{2}	Row width (in.)		
		6	7	7.5
		Seeds foot^{-1} of row		
1.50	34.4	17.2	20.1	21.5
1.55	35.6	17.8	20.8	22.2
1.60	36.7	18.4	21.4	23.0
1.65	37.9	18.9	22.1	23.7
1.70	39.0	19.5	22.8	24.4
1.75	**40.2**	**20.1**	**23.4**	**25.1**
Recommended seeding rate prior to Oct. 1				
1.80	41.3	20.7	24.1	25.8
1.85	42.5	21.2	24.8	26.5
1.90	43.6	21.8	25.4	27.3
1.95	44.8	22.4	26.1	28.0
2.00	**45.9**	**23.0**	**26.8**	**28.7**

Recommended seeding rate Oct.1 to Oct.10				
2.05	47.1	23.5	27.5	29.4
2.10	48.2	24.1	28.1	30.1
2.15	49.4	24.7	28.8	30.8
2.20	50.5	25.3	29.5	31.6
2.25	**51.7**	**25.8**	**30.1**	**32.3**
Recommended seeding rate after Oct.10				
2.30	52.8	26.4	30.8	33.0
2.35	53.9	27.0	31.5	33.7
2.40	55.1	27.5	32.1	34.4
2.45	56.2	28.1	32.8	35.2

Depending upon varietal seed size, this equates to 100 to 175 pounds of seed per acre (Table 2).

Seeds/lb	Seeds per acre (x 1 million)				
	1.50	1.75	2.00	2.25	2.50
	Pounds of seed/acre				
10000	150	175	200	225	250
11000	136	159	182	205	227
12000	125	146	167	188	208
13000	115	135	154	173	192
14000	107	125	143	161	179
15000	100	117	133	150	167
16000	94	109	125	141	156
17000	88	103	118	132	147

**This table is based on 100% germination. Adjust your seeding rate by the % germination printed on your seed bag tag.*

Table 2. Seed size and seeding rate conversion table.

Our data from the 2024/5 growing seasons indicate a significant yield increase whenincreasing your seeding rate from 0.75 and 2.25 million seeds per acre; however, that marginal yield increase was likely offset by the increased seed cost over 1.5 million seeds (Figure 1). The optimal seeding rate for wheat planted after October 1st should be incrementally increased as planting date is delayed compensating for reduced fall tillering (Table 1).

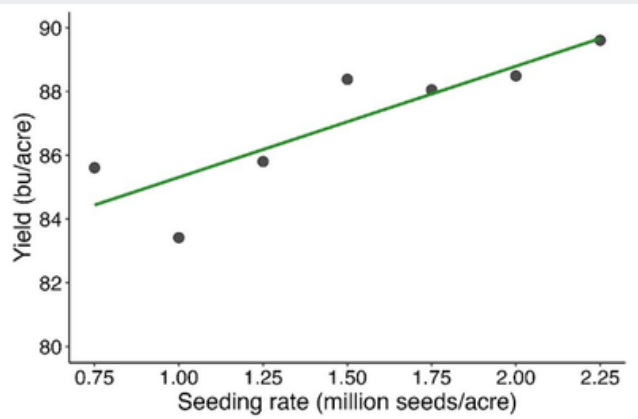


Figure 1. Winter wheat grain yield response to increasing seeding rates across four locations in Wisconsin (2025).

Planting Date

Winter wheat in WI should be seeded between September 20th and October 10th. Figure 2 shows yield and test weight response to planting date at Arlington, WI. Yield losses of 0.94 bu/a/day are possible with delayed planting after Sept. 25. Test weight response was significant but minimal.

Planting wheat too early can lead to increased incidence of barley yellow dwarf virus (BYDV) due to feeding and virus transmission by aphids. Many species of aphids (as many as 20) can transmit BYDV to wheat in the fall. Considering that there were higher levels of BYDV observed in recent years (2025 included), it is imperative to wait until after September 20th to be sure aphid activity is minimal. Aphid ability to feed on wheat and transmit BYDV is limited when temperatures are cooler. Waiting to plant wheat until later September shortens the potential aphid feeding time. Planting too early can also lead to excessive fall growth and potential smothering (increased winter respiration and winterkill) of the crop. There are also increased risks of planting too late. If air and soil temperatures get too cold, wheat will not germinate and emerge timely.

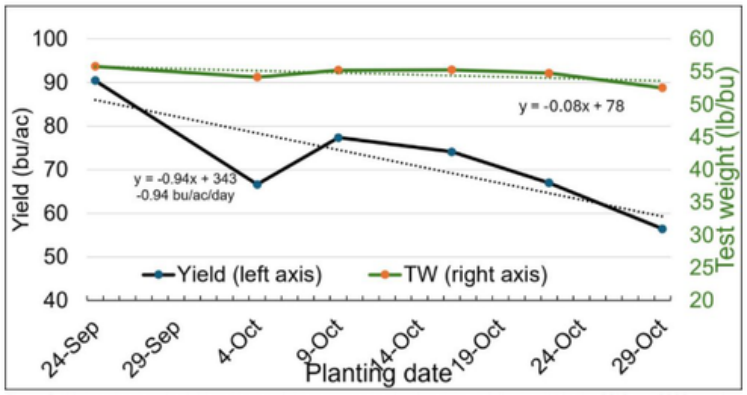


Figure 2. Winter wheat grain yield and test weight response to planting date at Arlington WI in the 2019 and 2020 growing seasons.

Planting Date

Winter wheat and crop insurance (Information courtesy of Michelle Austin, Director of Insurance Operations; and Mindy Tracy, Insurance Officer; Compeer Financial) The Wisconsin winter wheat final planting date varies by county, ranging from October 10th to

October 15th. If the wheat is seeded after the county's final plant date (late planting period) the crop insurance guarantee is reduced by 1% per day until the end of the late plant period that varies by county. If wheat is seeded after the late planting period, the crop insurance guarantee is reduced to 60% of the original guarantee or made uninsurable.

Special notes regarding the 2027 crop: The most notable changes are that ECO and SCO coverage levels for 2027 have been modified. SCO insurance now covers from MPCI coverage level up to 90%. ECO insurance now only offers one coverage level of 90-95%. Prior to 2027, ECO had two coverage level options and SCO coverage stopped at 86%. SCO continues to no longer require PLC as an FSA program requirement. A producer can now have either PLC or ARC and participate in SCO. Talk to your crop insurance agent for more details.

Additionally:

- Winter wheat coverage is not available in all Wisconsin counties.
- Air seeded (flown on by airplane) wheat is not insurable and no premium is charged.
- The final day to turn in a 2026 winter wheat claim is October 31st.
- The 2027 wheat price discovery on CBOT (using September '26 contract) will be determined as follows (this price will be used for both yield protection and revenue protection plans of insurance).
- The Projected Price tracks from August 15, 2026 – September 14, 2026
- The Harvest Price tracks from August 1, 2027 – August 31, 2027
- There is a 200% maximum difference between the Base and Harvest Prices with no downside limit.
- Coverage levels range from 50%-85%.

Crop Rotation

Yield data from our long-term rotation experiment located at Arlington, WI indicated that wheat grain yield was greatest when following soybean (Table 5) (Marburger, D., S.P. Conley, P.D. Esker, J.G. Lauer, and J.M. Ané. 2015. Yield Response to Crop/Genotype Rotations and Fungicide Use to Manage Fusarium-Related Diseases. Crop Sci. 55:1-10. doi: 10.2135/cropsci2014.03.0201). Our data suggests that growers should plant wheat after soybean first, then corn silage, corn for grain, and lastly wheat.

Table 5. Winter wheat grain yield following winter wheat, soybean, corn for grain, and corn silage.

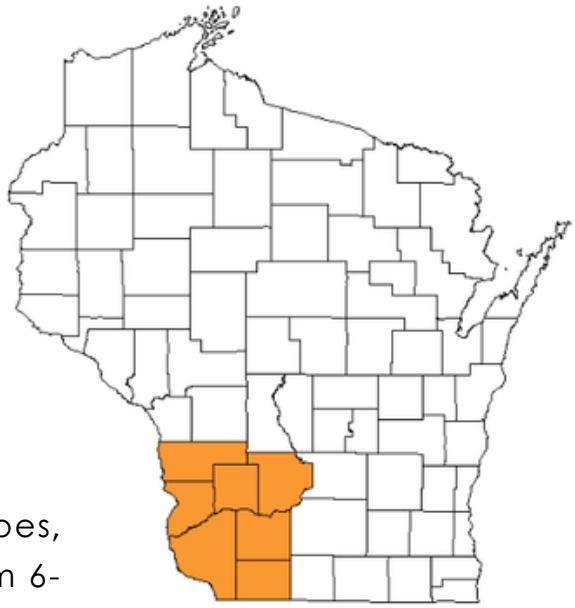
Rotation	2010	2011	2012	Average
Continuous Wheat	–[1]	–[1]	38.5	38.5
Corn-Soybean-Wheat	66.9	89.9	94.4	83.7
Soybean-Corn(grain)-Wheat	57.8	59.0	81.6	66.1
Soybean-Corn(silage)-Wheat	72.9	80.5	81.5	78.3

[1]Not able to collect data due to extremely low yields

If growers choose to plant second year wheat, several management factors should be considered to reduce risk. First plant a different wheat variety in the second year that possesses excellent resistance to residue-borne diseases. Under no circumstances should growers consider planting bin-run seed in second year wheat. By planting a different variety with strong disease resistance characteristics, you can reduce the likelihood of early disease pressure and significant yield loss. Growers should use a seed treatment in wheat following wheat. Be aware that seed treatments are not a cure for all common diseases in continuous wheat systems (e.g., take-all, Cephalosporium stripe). Growers should also consider increasing their seeding rate to 1.8 to 2.0 million seeds per acre in wheat following wheat systems. This will aid in stand establishment and increase the likelihood of a uniform stand going into the winter. Lastly, if using a no-till system, planting into a seedbed that is free of living volunteer wheat is important in reducing the incidence of BYDV. Growers should consider an herbicide application to destroy any living volunteer wheat at least 2 weeks prior to planting to prevent a "green bridge" for the aphids that transmit BYDV.

Regional Summary of P Science Assessment: Southwest Wisconsin

by Sheri Schwert



Region counties: Vernon, Crawford, Richland, Sauk, Grant, Iowa, and Lafayette.

Soil types evaluated: Newglarus silt loam 12-20% slopes, Fayette silt loam 6-12% slope, and Palsgrove silt loam 6-12% slope.

Figure numbers in this summary correspond with those in the full report.

High Potential for P Losses

Southwest Wisconsin is home to the winding valleys and ridgetops of the Driftless region, and agriculture fields with more slope than other parts of the state. This presents a challenge for agriculture water quality. When soils are disturbed and residue cover is low, the area is prone to extreme erosion and the phosphorus loss that comes with it. For example, for a continuous corn silage system managed with chisel-disk tillage, mean estimated P loss was 25 lb/acre/year from a common soil in this region, Fayette silt loam with 6-12% slope. Other rotations (corn-soybean, corn silage-alfalfa, grazed pasture, etc.) had lower losses, assuming similar tillage and nutrient management. Without any conservation practices, losses in the southwest and west central regions are much higher than other regions, but this is also an opportunity for improvement. Absolute decreases in estimated P loss following the application of any of the conservation practices below are much greater in the Driftless than other regions. Changes made here, in the Southwest, could have a profound impact on its world-class trout streams and recreational rivers providing economic benefit to the surrounding communities.

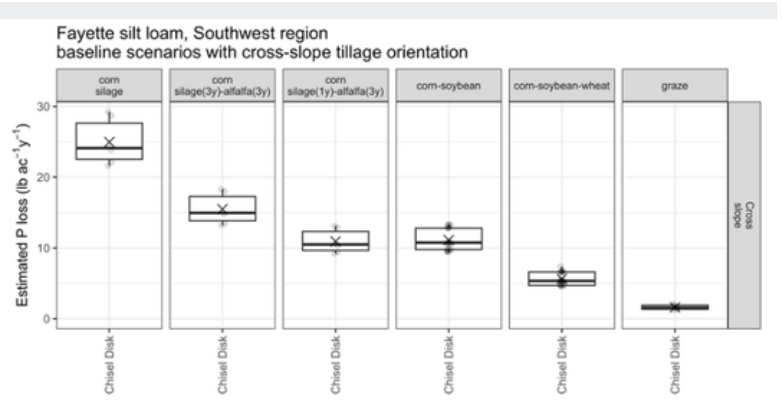


Figure 3.92: Box plot of estimated P losses for the "baseline" cropping systems with chisel disk tillage and cross-slope orientation on a Fayette silt loam with 6-12% slopes in Southwest Wisconsin. The y axis is modeled phosphorus losses in pounds per acre per year and the x axis is categories of crop rotations modeled. Corn silage has the highest P losses, while a pasture for grazing has the lowest losses.

All scenarios below were assessed alone, with no other conservation practices in place. Aside from reduced tillage assessment, the other practices were evaluated with chisel-disk tillage management. All were assessed with the three most common soil types in the region: Newglarus silt loam 12-20% slope,and Palsgrove silt loam 6-12% slope.

Reducing Tillage: A Win for Erosion Control and P Loss

Reducing tillage was the single largest P loss reduction possible across scenarios of different management, soils, and slopes in

southwest Wisconsin. In a corn grain-soybean rotation, going from a chisel-disk tillage program to a no-till program reduced P loss by an average of 11.4 lb/ac/y (Figure 3.19 and Table 3.3). That represents a percentage reduction of 89%. The total value of P reduction is even higher in continuous corn silage, with a reduction of 17.9 lb/ac/y, but represents a smaller percentage reduction at 63% (Figure 3.42). This is because baseline losses for corn silage are much higher than the corn-soybean rotation (Figure 3.92). No-till offers the greatest reduction, but even strip till reduces total P losses by 35% to 80% as compared to chisel-disk. This is no surprise, conservation tillage reduces erosion, and the phosphorus bound up in soil remains on the field.

Filter Strip: Catch P Before it Leaves the Field

A 30-ft-wide perennial grass filter strip was highly effective in decreasing P losses, regardless of soil type. In a corn grain-soybean rotation, adding a filter strip reduced P loss by an average of 10.4 lb/ac/y (Figure 3.21 and Table 3.3). That value increased in a continuous corn silage rotation to 23.1 lb/ac/yr (Figure 3.44 and Table 3.6). Both rotationssaw a decrease in estimated P osses of 80%. In the southwest, even with no other practices, adding a filter strip reduced losses to under 3.6 lb/ac/yr, except for in continuous corn silage or a corn silage (3 yr)-alfalfa (3 yr) rotation, where losses were as high as 7.5 and 7.1 lb/ac/yr, respectively. But in those two rotations, adding only a filter strip was more effective at reducing P loss than switching to no-till.

While filter strips work differently than in-field practices like reduced tillage or changing rotations, they keep phosphorus from exiting agricultural acres by trapping it. In steep topographies like the southwest, heavy precipitation can overwhelm in-field conservation practices and produce runoff. A filter strip provides an extra barrier which slows that runoff and traps the soil and phosphorus within it before it enters nearby waterways.

Rotation Changes: Cover the Soil and Slow Loss

Adding wheat into a corn grain-soybean rotation reduced P losses by an average of 6.3 lb/ac/y, representing a 49% reduction (Figure 3.22 and Table 3.3). Changing from continuous corn silage to a silage-alfalfa rotation, with 3 years in each, reduced P losses by an average of 10.5 lb/ac/y, representing a 37% reduction (Figure 3.46). Adding wheat or alfalfa to a rotation reduced the average and variation in estimated P losses, though not as much as reducing tillage or adding a filter strip. Estimated P losses could still exceed 30 lb/ac/yr in a silage-alfalfa (3 yr each) rotation for some soils in Southwest WI. Reducing the corn silage from 3 years to 1 year was able to further reduce estimated P losses, but the average exceeded 10 lb/ac/yr. This indicates an opportunity for additional practices to further reduce losses. In the scenarios with wheat added, wheat straw remained in the field, with the residue acting as a soil cover. If wheat straw is removed and baled, the benefits in estimated P loss reduction would disappear unless a cover crop were planted after wheat harvest.

Cover Crops: Effectiveness Depends on Planting

Cover crop P loss reductions varied according to planting time/method. In the Southwest, in a corn-soybean rotation, the October drilled rye cover crop did not reliably decrease P losses, which even increased in some cases. Increases occurred for scenarios with fall-applied nutrients, which were not incorporated by tillage due to the presence of the cover crop, and were therefore more vulnerable to loss. The September drilled cover crop decreased estimated P losses by 2.2 lb/ac/yr, while the August aerial seeded cover crop decreased losses by 6.5 lb/ac/yr; a 59% reduction compared with no cover crop. Other rotations that included corn also had greatest P loss reduction from the August aerial seeded cover crop This treatment was most effective in decreasing P losses because it maximized time for biomass production prior to winter and early spring, when most P losses tend to occur in our region.

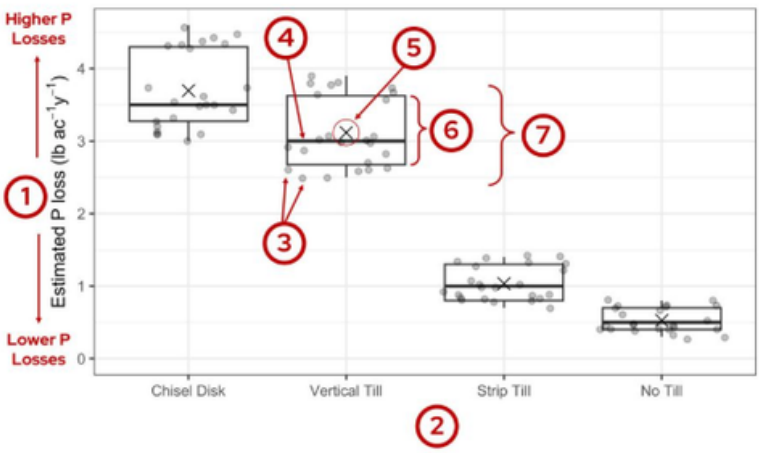
Caveats and Upshot

All of the practices included here are effective at reducing total P loss, however, they do so by reducing erosion and soil loss, which addresses only one form of phosphorus. There is another form, dissolved phosphorus, which can only be addressed by reducing soil phosphorus levels. Drawing down soil test phosphorus (STP) is a long term process and it can take 8-15 years to reduce STP by 50% with no additional phosphorus inputs. With commitment though, phosphorus drawdown is an effective and critical conservation practice in fields with extremely high STP.

The Southwest is a region particularly vulnerable to soil and P loss, but this evidence shows that it could also be a leader in reducing those losses by implementing practices like no-till and filter strips. Not every region has the ability to add a practice and reduce estimated P losses by such high margins. Using the information above to prioritize practices with the highest estimated improvements could have a profound impact on the surface water quality of this region.

Understanding Model Results

Here is an example of how to interpret the model results.



1. Model Output: The model results for rotation-average (e.g., averaged across both corn grain and soybean phases), annual P losses at the field edge are plotted along the vertical axis. The goal is to identify practices that can lower these losses.
2. Management Practices: P losses are compared across four levels of tillage intensity ranging from a 3-pass chisel disk system to no-till.
3. Individual Points: Each point represents the results of one model scenario. There are multiple points within each tillage group because other management and site variables were tested. In this example, 24 different scenarios were tested per tillage group to allow for different approaches to P application timing (fall and spring); P source (manure and synthetic fertilizer); P application rate (maintenance and 20% lower than maintenance); and soil test P levels (25, 50, and 100 ppm).
4. Median: The boxplots for each group summarize the spread of the data points. The thick line in the middle is the median or 50th percentile. This value is a good estimate of typical P losses for each group.
5. Average: The X-mark on the boxplot shows the average for the group. In most cases, it is very close to the median value.
6. Interquartile Range: The distance from the bottom to the top of the box shows the range from the 25th to 75th percentiles, respectively. This can be thought of as a typical range of P loss values for each group.
7. Range: The entire length of the boxplot shows the full range of values observed from all modeled scenarios in each group.

Interpretation: Reducing tillage intensity reduced edge of field P losses, with the largest reductions seen when shifting from a chisel-disk system to no-till. Shifting from chisel-disk to strip-till also had large reductions. The variation in estimated P losses within a given tillage category, indicated by the height of the boxes, decreased with tillage intensity. Reducing tillage intensity is an effective approach to reducing P losses, even in soils with very high soil test P.

Applied Soybean Physiology: How Potassium Impacts Soybean Function and Yeild

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Introduction

Potassium (K) is often called the "quality element" in crop production because it is essential for photosynthesis, nutrient translocation, and biological nitrogen (N) fixation in soybeans. Deficiencies in K impair these physiological processes, leading to significant yield losses. Understanding potassium's physiological function is crucial for making informed fertilizer decisions, especially when application costs are high. For example, University of Wisconsin Madison Extension guidelines note that when Bray-1 extractable soil test K is in the optimum range (121–150 ppm), the probability of a yield response to K fertilization at the crop removal rate is only 50/50 (Havlin et al., 2013; Laboski & Peters, 2012). This article examines these core processes and explores the specific roles potassium plays in soybean growth and productivity.

No, I can find southern rust in corn fields just about every year. The difference is, that on average, it shows up in September after yield is determined and at levels that most people don't even notice.

In a Bean Pod

K deficiency induced stomata and mesophyll resistance limits CO_2 diffusion in the plant, resulting in a photosynthetic decline in K deficient crops

- Reduced energy production: Low potassium levels prevent carbon dioxidefrom moving easily through leaf pores (stomata), limiting the plant's ability to produce energy through photosynthesis.

K is essential for the maintenance of turgor pressure in meristematic tissues, leading decreased cell expansion and meristematic growth under K deficiency

- Stunted growth: Potassium helps maintain the water pressure needed for new cells to expand, so a shortage directly slows down new plant growth.

Reduced photosynthetic assimilate production and transport in K deficient crops decreases the assimilate supply available to sink tissues, ultimately diminishing the yield and quality of the crop

- Lower yield and crop quality: Because potassium deficiency limits the production and transport of energy in the plant, growing parts (flowers, pods, and seeds) don't get enough vital resources, reducing final yield and quality.

K deficiency restricts the plant factors controlling nodulation and N fixation in soybean, leading to a reduction in biological N fixation

- Reduced biological nitrogen fixing: In crops like soybeans, potassium deficiency hinders the formation and productivity of root nodules, cutting down the plant's ability to convert atmospheric nitrogen into plant available N.

The Role of Potassium in Photosynthesis

Photosynthesis, arguably one of the most important plant functions, relies on K to operate. Potassium plays crucial roles in the processes of both the plant stomata and mesophyll, which directly affect photosynthetic capacity and

activity (Huber, 1985). In the stomata, K fluxes in guard cells are responsible for stomatal opening and closure, regulating gas exchange and water loss in the plant (Sardans & Peñuelas, 2021). Insufficient K levels induce a resistance to these stomatal movements, decreasing the levels of photosynthesis per leaf unit area due to limitations on the gas exchange necessary for the photosynthetic process (Pettigrew, 2008). However, stomatal resistance does not solely explain the photosynthetic decline in K deficient crops, especially under extreme deficiency conditions. Plant chloroplasts in mesophyll tissue require adequate K concentrations to establish and maintain alkaline conditions in the stroma lamella, which is necessary for photosynthesis to proceed at maximum rates (Huber, 1985). When insufficient levels of K are present, the pH of the stroma is altered (mesophyll resistance), limiting the Rubisco biosynthesis and activity (Sardans & Peñuelas, 2021). The combination of both stomata and mesophyll resistance limits carbon dioxide diffusion in K deficient soybean crops (Imtiaz et al., 2023), reducing the production of photosynthetic assimilates.

Potassium Transport Across Membranes

Similar to how K assists in the process of stomatal opening and closing, the nutrient is essential for the maintenance of turgor pressure in meristematic tissues (Pettigrew, 2008). Adenosine 5′ -triphosphate phosphohydrolase (ATPase) activity in the membrane of meristematic cells results in a difference between the electrical potential of the cell and outer medium, which induces the passive uptake of K^+ and an accompanying accumulation of malate in the cell (Mengel, 1985). The accumulation of solutes inside the cell lowers the water potential, leading to water entry and increased turgor pressure in meristematic cells (Nieves-Cordones et al., 2016). This increased turgor pressure is necessary for cell expansion, the driver of cell growth. In the case that cells are undersupplied with K^+, cell turgor levels decrease, resulting in decreased cell expansion and meristematic growth (Mengel, 1985).

As the most abundant cation in the phloem, K^+ greatly affects the phloem-loading process, which is the initial step in the long-distance transport of photosynthetic assimilates from source (primarily leaves) to sink (flowers, pods, and seeds) tissues. Solute movement in the phloem follows a hydrostatic pressure gradient created from concentration differences in solutes such as K^+ (Tränkner et al., 2018). During phloem loading, ATPase and K^+ membrane channels create a K^+ gradient across the plasma membrane, generating the energy necessary to actively transport sucrose from the apoplast of source tissues into the sieve tube cells of the phloem (Duke & Collins, 1985; Sardans & Peñuelas, 2021; Tränkner et al., 2018). This transmembrane K^+ gradient is known as a "K battery" that acts as a mobile energy source, providing energy for other transport processes (Sardans & Peñuelas, 2021; Tränkner et al., 2018). Under K deficient conditions, the transport of photosynthetic assimilates to sink tissue via the phloem is decreased, leading to increased carbohydrate concentrations in the leaf tissue and reduced concentrations in the roots (Cakmak et al., 1994). Restricted photosynthetic assimilate transport, coupled with reduced production, decreases the assimilate supply available to sink tissues and ultimately diminishes the yield and quality of K deficient soybean crops (Pettigrew, 2008).

Potassium's importance in solute transport extends to the xylem as well. Osmotic water flow in the xylem is controlled by the secretion of ions creating a lower water potential in the xylem vessels, with K^+ being the key ion responsible for this process (Mengel, 1985). Potassium also supports the transport of nitrate through the xylem. The K^+ ion is the major

accompanying counter cation for nitrate uptake and transport to the shoot system, cycling up the xylem with nitrate and back down the phloem with malate (Blevins, 1985). Once malate reaches the roots, it undergoes a chemical reaction that produces bicarbonate, which can then be exchanged for nitrate. As nitrate uptake and translocation within the plant are dependent upon adequate K concentrations, K^+ is one of the dominant ions in soybean xylem sap (Israel & Jackson, 1982). However, when plant K concentrations fall below sufficiency levels, soybean's ability to transport both water and solutes via the xylem is negatively impacted.

The Role of Potassium in Biological N Fixation

Soybeans, like all other legumes, have the unique ability to acquire a majority of their required N through a symbiotic relationship with rhizobia. This process, known as biological N fixation, is indirectly affected by K, as the nutrient influences plant factors that control soybean nodulation and N fixation (Duke & Collins, 1985). As K fertilization increases soybean yield, the plant's demand for N increases, which is primarily supplied through N fixation. To meet the crops' increased need for N, K increases soybean nodulation, nodule productivity (i.e., moles of N fixed per unit time per unit mass of nodule), or both (Divito & Sadras, 2014). This increase in nodulation and/or nodule productivity is largely due to the increased translocation of photosynthate (Duke & Collins, 1985), as K controls the transmembrane potentials that contribute to solute transport (Sardans & Peñuelas, 2021). In the case of K deficiency, the plant factors controlling nodulation and N fixation become restricted, leading to a reduction in biological N fixation. As such, proper K fertilization is essential to ensure that N fixation can adequately support soybean growth.

Ultimately, potassium serves several critical functions within the soybean plant, directly impacting photosynthesis, cellular expansion, nutrient transport, and biological nitrogen fixation. Balancing potassium fertility with the farm's bottom line safeguards these vital biological processes, helping growers protect crop health while maximizing soybean seed yield and quality.



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