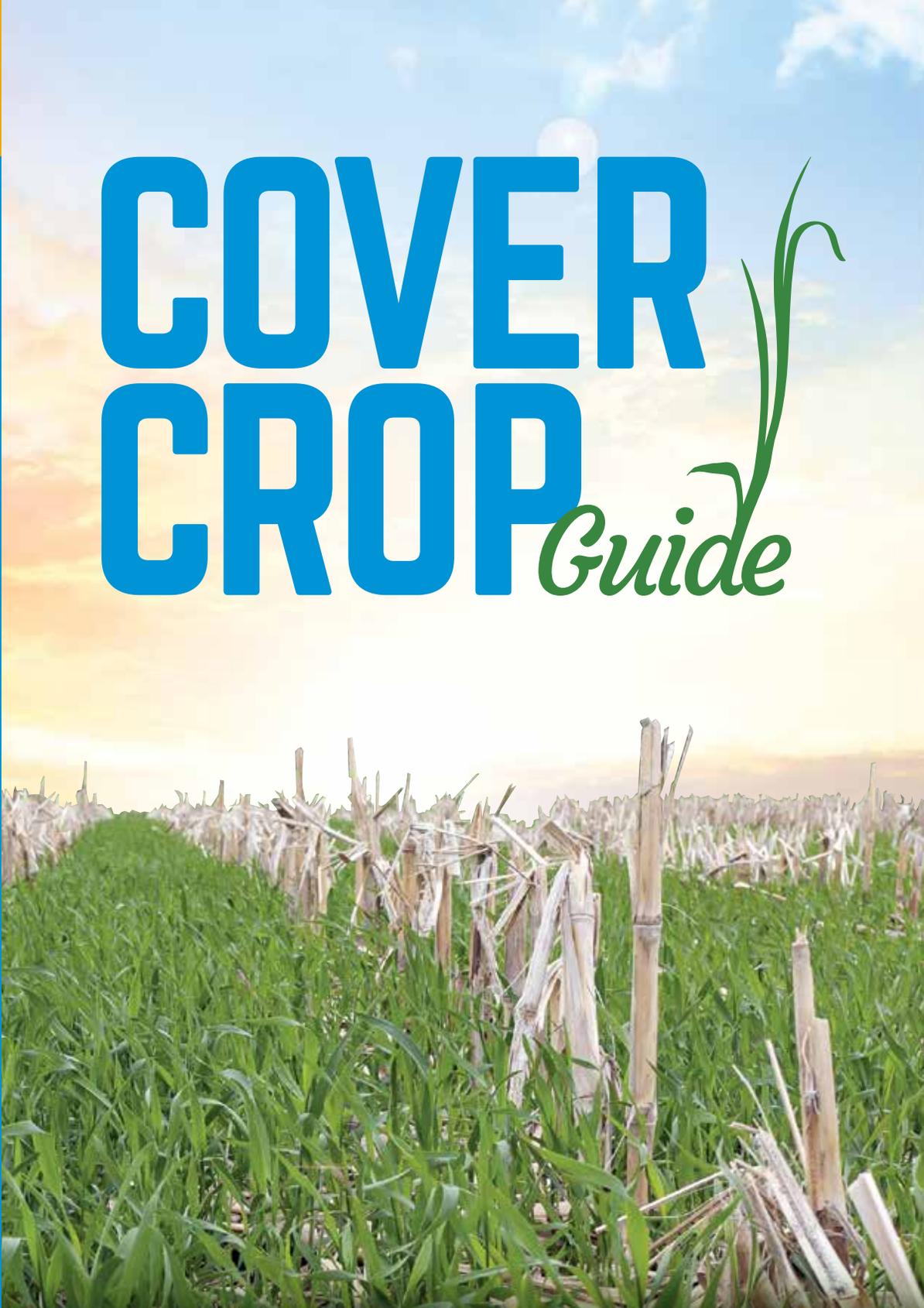




# COVER CROP *Guide*

A decorative green plant stem with several long, thin leaves, positioned to the right of the word "CROP" and extending upwards.

## Cover Crops for New Adopters

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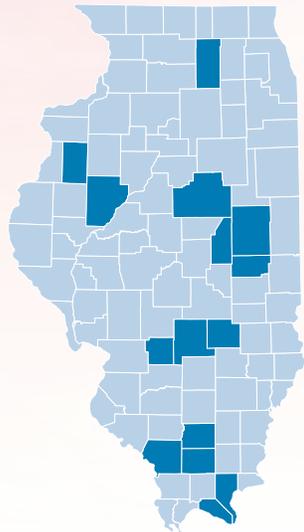
A compilation of observations and recommendations from researchers funded by the Illinois Nutrient Research and Education Council

2021 Edition



# COVER CROP Guide

2021 Edition



Counties Where NREC-funded Cover Crop Research is Being Conducted

- Bond
- Champaign
- DeKalb
- Douglas
- Effingham
- Fayette
- Franklin
- Fulton
- Jackson
- Massac
- McLean
- Piatt
- Pope
- Warren
- Williamson

## Topics Covered

Why Cover Crops .....	3
NREC Recommends Cereal Rye Following Corn .....	4
What is C:N Ratio .....	5
Important Considerations .....	7
Planting Options .....	8
At What Rate? .....	10
Termination Options .....	11
Planting Soybeans in the Spring .....	13
Do Cover Crops Really Reduce Nutrient Losses .....	15

## Notes

The observations and recommendations included here are based upon multi-year and multi-location projects funded by the Illinois Nutrient Research & Education Council (NREC) and a panel of experienced cover crop specialists. While a printed document is restricted to what is known at the time of publication – in this case December 2021 – NREC will refine this document on our web site as new research substantially changes our recommendations.

**The purpose of this publication is to encourage the use of cover crops, and NREC’s enthusiasm for these recommendations are based upon science.**



All of NREC’s recommendations and observations are based upon the findings of researchers that are funded by NREC. In this photo samples of cereal rye are being cut and sampled for nitrate levels.



Cereal rye at one week growth in Piatt County



# Why Cover Crops?

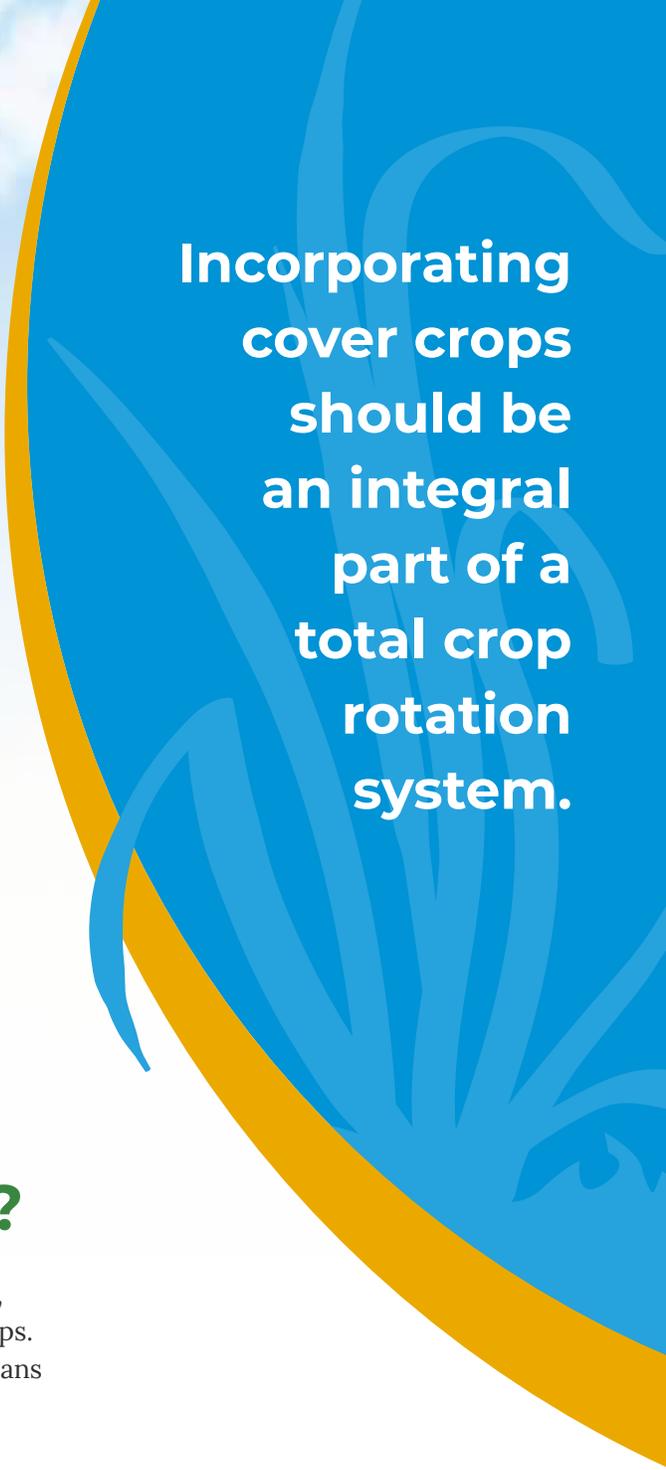
Cover crops, when properly managed, can help reduce nutrient loss, reduce soil erosion, suppress weeds, increase water infiltration rates, contribute organic matter, and provide grazing for livestock. Many of these benefits such as weed suppression occur immediately and others, like increased organic matter, deliver results over time.

Cover crops have been identified as one solution to help Illinois agriculture meet the goals of the Illinois Nutrient Loss Reduction Strategy (INLRS), which calls for a 45% reduction of both nitrogen and phosphorus losses moving from soil into Illinois' waterways.

NREC plays a part in helping agriculture meet the goals of the INLRS by funding research that investigates and identifies achievable and profitable solutions for farmers. We also believe that the work being done is part of the next generation of cover crop management; we are answering the questions before the questions are asked. Even if you are unsure of the role cover crops may play in your operation, consider that they contribute to soil and water health that will assure the vitality of our resources for coming generations.

# Why Start with Cover Crops Ahead of Soybeans?

NREC Research has shown that when a cover crop precedes soybeans, yield has been maintained compared to replications with no cover crops. Therefore, we encourage you to start with cover crops ahead of soybeans before you consider using them ahead of corn.



**Incorporating  
cover crops  
should be  
an integral  
part of a  
total crop  
rotation  
system.**



# NREC Recommends Cereal Rye

NREC recommends cereal rye (sometimes called winter rye, but not to be confused with annual ryegrass). Cereal rye has been the focus of NREC research due to its ease of establishment, winter hardiness, and nutrient-holding capability in both the fall and spring. It works well ahead of soybean and easy to terminate, plus cereal rye reduces soil erosion and suppresses weeds.

Other options. Wheat, triticale, and winter barley can also be considered if you need less vegetative growth. While the focus of this guide is the management of cereal rye, the same principles can be utilized.

The Midwest Cover Crop Selector Tool <https://mccc.msu.edu/selector-tool/> is an excellent resource that enables you to select a cover crop based on your location, planting date, soil characteristics and desired benefit. Benefits such as weed suppression, increasing soil health, erosion prevention, grazing, fixing atmospheric nitrogen or nitrogen uptake can be selected to find a mix that would achieve a specific objective. These kinds of benefits usually include combining a cover crop with a high C:N ratio with one which has a low C:N ratio.



**CEREAL RYE**



**ANNUAL RYE**

# Cover Crops and C:N ratio

Carbon to Nitrogen (C:N) is the ratio of the mass of carbon to the mass of nitrogen in a given substance. This is important when considering cover crops because it relates to the soil microorganism's ability to consume the material. A soil microorganism needs a diet with a C:N ration of 24:1 to stay alive.

Alfalfa for example is 25:1 and a soil microorganism will consume it with little to no excess carbon or nitrogen left over. Hairy vetch has a C:N ratio of 11:1 so the microorganisms will consume the N-rich vetch and leave the excess nitrogen in the soil (N mineralization). Wheat straw has a C:N ratio of 80:1 which means the microorganism will not have enough nitrogen to consume the carbon-rich wheat straw. To meet their nitrogen requirement, microorganisms then take inorganic nitrogen from the soil (N immobilization), which can create a deficit in the availability of soil nitrogen.

So to review, cover crop residue added to the soil with a C:N ratio of greater than 24:1 will result in a temporary nitrogen deficiency (immobilization) while those with a C:N ratio less than 24:1 will result in a temporary nitrogen surplus (mineralization).

## Why C:N ratio matters and what research shows

Another important consideration for a grass cover crop such as cereal rye is that *the C:N ratio widens as the cover crop grows*. Over a four-year period, cereal rye biomass accumulation at the replicated tile drainage study in Douglas County showed a strong inverse relationship of cover crop biomass and cover crop biomass N concentration at the time of termination. The C:N ratio in the cereal rye biomass ranged from a low of 17:1 in 2018 and 42:1 in 2019. Therefore, the quality of the cover crop residue can have an impact on net soil N mineralization (mineralization minus immobilization) and this has management implications, especially when a cereal rye cover crop is grown before corn.

Cereal rye biomass accumulation was a function of cover crop planting date and accumulated growing degree days prior to termination. The smallest amount of cereal rye biomass (0.39 tons/A) occurred during the cold spring of 2018 and the greatest amount (1.29 tons/A) occurred when cereal rye was allowed to grow until the soybean crop was planted on June 5, 2019. It is interesting to note that the amount of total N in the cereal rye biomass in 2018 (19.3 lbs/A) was 70% as much as what was found in 2019 (26.3 lbs/A) when cereal rye biomass was 3 times greater. Additionally, there was no soybean yield reduction as a result of no-till planting into standing cereal rye that had been sprayed with glyphosate the previous day.

# Cover Crops

## *Think a “Systems” Approach*

To maximize the potential benefits of a cover crop program, it is important to manage the cover crop as part of the total production system and not merely as an additional input to an existing cropping system. Depending on the goals associated with the decision to utilize cover crops, consideration should be given to aspects of the total production system such as, the herbicides applied to the previous crop, what cover crop species will be used, timing of seeding the cover crop, seeding method, the row crop that will be planted in the spring, spring weather (is it excessively wet/dry?), and cover crop termination strategies/options. Just planting a cover crop in the fall can accomplish basic goals of reducing erosion and nutrient loss, but attention to the other details mentioned is necessary to ensure the cover crop acres successfully transition into productive and profitable row crop acres during the next season. *When cover crops have failed, it is often due to being managed only as an additional input, rather than as part of a modified production system.*



Corn residue is evenly distributed over the field's surface.  
This aids in even cover crop emergence and benefits other field operations, such as strip till.

# Important Considerations When Growing Cereal Rye Ahead of Soybeans

**Herbicides:** Cover crops offer many benefits; however, including them in a rotation adds another layer of complexity. Look at labels for herbicides applied in the previous growing season or any pre-emergent/post-emergent application earlier in the season. Specifically look at your field's corn herbicide program history to ensure that it is compatible with the seeding of cereal rye.

Several common corn herbicides have a four-month or less restriction, but some can exceed this. Dry summer conditions may slow degradation of some residual herbicides and late-applied post herbicides. If carryover concerns exist, hand seed and water a few square feet before your anticipated planting date and evaluate the growth.

Be mindful that you cannot make a fall residual herbicide application to control winter annuals if you want to establish a cover crop. Fortunately, a well-established stand of cereal rye can provide significant weed control.



This photo shows that cereal rye residue is not allowing weeds to emerge.

A number of midwestern universities have web pages that explain what you need to know about herbicide carryover.

Here is an excellent resource from Purdue:

<https://extension.entm.purdue.edu/newsletters/pestandcrop/article/soil-residual-herbicides-and-establishment-of-cover-crops-in-the-fall/>

**Residue distribution at harvest:** It's often said, "a crop season starts with the residue coming out of the back of the combine." Properly sized residue that is evenly spread across the width of the area being harvested creates uniform field conditions. A mat of residue next to a strip of bare ground will make all aspects of management more difficult, whether it is establishing a cover crop or managing the cash crop that follows.

**Planting date:** You can plant cereal rye from early September through the first week of November in any part of the state. Do not plant via unincorporated surface applications after late October. Aerial seeding of cereal rye might be practical starting mid-late August depending on crop stage and soil moisture.

# Cover Crop Planting Options

Planting and incorporating seeding methods generally produce more uniform and predictable stands compared to aerial or surface applications.

## Pre-Harvest Seeding

### Aerial seeding

Skilled pilots can uniformly broadcast cereal rye into standing corn. However, where needed, we advise you to establish up to a 100-foot buffer on the end rows or field boundaries to avoid off-target seed applications. This will keep seed from falling into fields or areas where you (or your neighbor) don't want it. Seed germination from aerial applications is more consistent when these conditions are present:

- Wait until corn dry-down has started and sunlight penetration on the soil surface reaches 50%.
- Fly on seed when the soil is damp and a substantial rain is likely in the coming days.

### High clearance applicator

You can apply cover crops into standing corn with a high clearance applicator equipped with a cover crop seeder. This method has proven very effective at several NREC research sites. Again, an open canopy from the crop drying down along with moist soil will create a better environment for stand establishment. Minimal corn will be damaged during the operation and usually only when the applicator turns.

## Harvest Seeding

### Air seeder

A newer cover crop establishment method that shows promise is to mount an air seeder on your corn head or combine. Seed is dispersed while corn is being harvested, saving time and money.

**Here's how it works:** Cereal rye is blown from the seed hopper through individual hoses mounted under each row snout and scattered before crop residue is sized and deposited by the corn head. In-cab controls automatically adjust seeding rates based on ground speed and start/stop the flow of seed when the corn head is lowered/raised. We recommend a minimum seeding rate of 40 lbs/acre. Commercially available hoppers have capacities to hold up to 80 acres worth of seed. A seed tender is used for filling.



Aerial seeding of oats and radish into standing soybean prior to maturity.



This high clearance sprayer was modified to include an air seeder. Drop tubes place the seed under the upper canopy. This works for both 30" corn and soybean rows with very little crop damage.



Southern Illinois University is doing research on planting with an IntersSeeder.



Individual hoses are mounted under each row snout.



A stalk devastator is added.

## Post-Harvest Seeding

### Surface application with fertilizer

If you uniformly fertilize the field (no variable rate), cereal rye can be blended with the dry fertilizer. An air-flow machine is preferable to a spinner-spreader, but not required. You may need to consider making a light tillage pass, as surface residue can interfere with seed-to-soil contact, but success has also been achieved without this step. **Be Mindful** – complete cleanout of cover crop seed from both the fertilizer applicator and tender truck is necessary to prevent subsequent fertilizer applications elsewhere from unintentionally spreading cover crop seed.

### Drill/planter

A no-till drill will generally produce a uniform, quick emerging stand. Research has also shown that 15” planters with row cleaners and the correct seed disc/plate perform very well. A corn head that sized stalks will help with material flow during these operations. A vertical tillage pass and then drill/planter pass can also be effective. Labor and machine costs need to be considered when using these methods.

**Additional Strategy:** Many producers are initially concerned about cereal rye growing aggressively in the spring and “getting away” from them before it can be terminated. A concept unique to drills or planters is they allow for precision cover crop planting. This method helps manage cover crop residue by creating defined paths for spring planting of your cash crop. The pictures on the right from Southern Illinois show cover crops seeded by adapting a drill to coordinate with 30” row spacings (top), and an operator who utilized a 15” row width planter that seeded the cereal rye, followed by a strip-till bar (bottom). These techniques require tractors with RTK guidance.

- ⋮ **REMEMBER** that cereal rye can double in size in ten
- ⋮ **days with adequate moisture and warm conditions.**

### Vertical tillage tool with attached seeder

...is a similar concept to the combine/air seeder combination. A seed hopper with distribution tubing is mounted onto a vertical tillage tool. As you travel across the field, seeds are distributed and incorporated into the residue and soil.

### Aerial application

This method of seeding can still be considered. To increase the level of success, a light vertical tillage pass should also be considered because the surface corn residue can interfere with seed-to-soil contact. Again, any aerial application should cease by the last several days of October and should include a buffer around field edges or other boundaries to avoid seeding off-target areas. Aerially seeding will need moisture to germinate and to become established.



Cereal rye is planted at approximately 100 pounds per acre, which is nearly double the recommended rate. In this case in Piatt County the land owner wanted to sow a higher for spring weed control.

# At What Rate to Plant?

## Seeding Rate

We encourage starting with the lower end of recommended seeding rates, especially for drilled/planted and harvest seeding methods. Also, earlier planting dates require less seed, as plants have additional time to allow for fall growth and tillering. The phrase “one day of growth in September is equal to three days in October” comes to mind. As you become more comfortable with cover crops, you can adjust your seeding rates based on your own experiences. Use the table below as a guide to determine the appropriate cereal rye seeding rate based upon your choice of seeding method.

Seeding rates can be adjusted depending on the desired goals of the cover crop program. For example, use higher seeding rates if grazing cover crop fields or if a high biomass late termination plan for improved suppression of summer weeds.

## Cereal Rye Seeding Rates Ahead of Soybeans\*

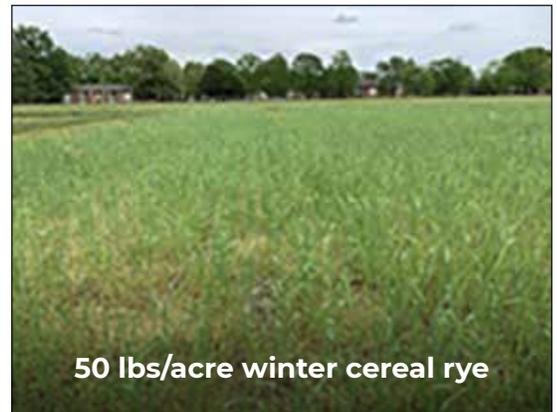
Drilled seeding rate .....	40-60 lb/acre
Broadcast seeding rate with shallow incorporation .....	40-70 lb/acre
Aerial seeding rate .....	50 lb/acre
Seed count .....	18,000 seeds/lb

**Higher rates should be used if you are planning to graze the cover crop.**

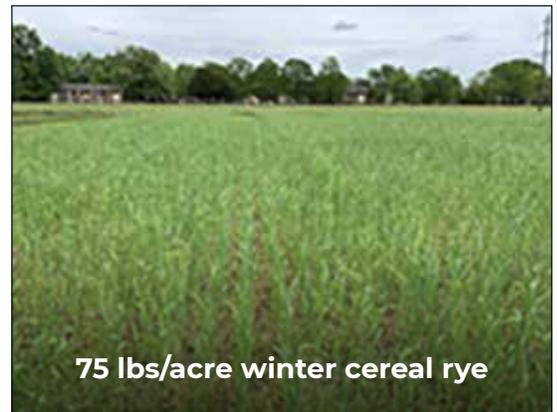
*\*These rates are based on high-quality seed with germination rates of 85–98%. Based on fall growth and tillering, earlier planted rye (September) can use lower seeding rates than rye planted later in the fall (November). Seed cost and quality can vary significantly. Obtain quotes in the summer from 2-4 reputable suppliers. Seed is available in 50 lb bags and mini-bulks.*



30 lbs/acre winter cereal rye



50 lbs/acre winter cereal rye



75 lbs/acre winter cereal rye



100 lbs/acre winter cereal rye

# Termination Options

## Timing

Some growers will want to terminate cereal rye before planting soybean. Be aware that with adequate moisture and warm conditions, cereal rye can double in size in 10 days. Cover crop termination at or after planting requires enhanced management. If cover crop goals include benefits such as improved weed suppression or enhancing aspects of soil health, then later termination closer to, or at, planting should be considered.

## Terminating with Herbicide

A full label rate of glyphosate applied to actively growing cereal rye provides excellent control. An application made in March should not contain any additional herbicide active ingredients. If you intend to plant soybean within 2-3 weeks of termination, you can include a residual soybean herbicide with the glyphosate. Always consult your crop advisor to develop a complete, season-long herbicide program.

## Terminating with Crimper

The use of a crimper is an alternative, non-chemical option to terminate cereal rye. To be effective, the cereal rye needs to be in the reproductive stage; this is because a roller “crimps” each elongated stem in several places. The flattened rye then creates a mulch on top of the soil. When crimping just ahead of planting soybean, the drill or planter pass should travel in the same direction as the crimper, with a compatible machine width. Available crimper sizes range from 10’ to 40’. Crimping can also occur anytime immediately after planting through the V1 growth stage. A bulletin by Iowa State University is a helpful resource for management of this practice:

<https://crops.extension.iastate.edu/cropnews/2016/10/cereal-rye-suitability-roller-crimping-and-notill-applications>

## Terminating At/After Planting Soybeans

A planned termination near or after planting can be a legitimate and effective management strategy. This concept helps achieve objectives like maximum nutrient sequestration and weed control.



Terminating cereal rye with Gator sprayer.



Terminating cereal rye with boom sprayer.



Crimping cereal rye. Attachments are also available for the planter to perform this operation at planting time.

From multiple tile drainage studies in central Illinois, research has shown that tile nitrate concentrations are significantly reduced when a threshold of at least 0.5 tons of above ground cereal rye biomass per acre is produced. This amount of cereal rye biomass occurs when the stem is 6-8 inches long (before stem elongation and “boot” stage). The establishment of your soybean crop always takes priority over attempting to reach a specific cereal rye growth stage

before terminating the cover crop. With the biomass threshold in mind, NREC research has concluded that the ideal cereal rye biomass range ahead of no-till soybean is 0.5 to 2.5 tons/A. No soybean yield hit has been observed in any of these studies in this range of cereal rye biomass. In addition, weed suppression improves with increasing cover which may partially offset the cost of cover cropping by eliminating one herbicide application.

## Management of Armyworms, Slugs, or Other Pests

Occasionally, insects or other pests feeding on a cover crop can move over to the cash crop following cover crop termination. Removing this “green bridge” may help to deter these pests. Typically, if termination occurs a minimum of two weeks prior to soybean planting, the source of food and habitat for pests will diminish.

Voles can appear in cover crop and no-till environments. They eat all vegetation around their colony (generally areas 10-20 feet in diameter). A resource from the University of Tennessee on controlling voles in no-till soybean is available here:

<https://extension.tennessee.edu/publications/Documents/PB1667.pdf>

## Cover Crop Roots Impeding Field Tiles

This is extremely rare; however, if you experience any issues please contact Dr. Shalamar Armstrong, an author of this publication, to discuss the situation.

## Manure Application

Manure applied to cover crops can decrease potential negative effects to water quality, nutrient leaching, and surface runoff. Late summer or early fall manure applications combined with cover crops will allow for manure nutrient uptake by the cover crop. Although manure can be applied before, after or with cover crop planting, there is a risk of newly emerged plants becoming smothered by applications that are too high or unevenly applied. Poor application can also lead to ammonia toxicity which can increase soil pH and kill seedlings. Seeding and then waiting to apply manure to a well-established cover crop is recommended. Manure along with cover crops can improve overall soil health if managed appropriately.

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## Suggestions and observations regarding planting into a standing cover crop:

1. Apply a herbicide to kill the cereal rye a day or two before or after planting. This allows the cereal rye to remain upright and firmly attached to the soil to facilitate planting. If the cereal rye is killed several days before planting occurs, lodging can be an issue and may lead to a troublesome thatch that you must deal with.
2. Use a planter or drill with sharp disc openers to slice or slide through the plant material.
3. If you use a lower cereal rye planting rate, this will mean less vegetation to work through. With a planned late termination strategy, a modest to higher seeding rate would normally be preferred to a lighter seeding rate to maximize benefits associated with that strategy.
4. Scouting for pests, mainly armyworms and slugs, is absolutely necessary.



There is science behind all of NREC's recommendations and observations. Here insects are captured under vessels in terminated cereal rye, then counted.

## Cover Crops Ahead of Corn

NREC research has revealed that nitrate losses in the fall and early spring from harvested soybean fields can be as problematic as nutrient losses from fertilized corn fields. While this guide focuses on achieving success with cover crops ahead of soybean, NREC is also investigating how to successfully manage cover crops ahead of corn.

### RECOMMENDATION:

*Corn planted following cover crop termination requires starter N (30-60#) and sidedress N as soon as possible for optimal production.*

The “*Illinois Cover Crop Recipe*” document is a beginner’s guide for managing cover crops ahead of corn, starting with oats and radish. This document also contains tillage and fertility recommendations when considering cover crops ahead of corn and is available here:

<http://mccc.msu.edu/wp-content/uploads/2019/05/MCCC-106-IL-post-soybean.pdf>

# Planting Soybeans Following Cereal Rye

## ***Plan your fall tillage in advance.***

To reach the full benefit of cover crops, you need to consider the cover crops as part of your total crop production system – including the use of strip-till and no-till strategies. How you manage your corn stalks in the fall, how you plant cereal rye and how you address soil preparation plays a *vital* role in determining the best soybean planting method.

There are several scenarios that work well. If you are trying one of these practices for the first time, pay attention to planter settings to achieve appropriate performance for the respective field conditions. Increased residue can influence planting depth and the closing of the seed slot.

### **Untouched Corn Stalks**

In this scenario, plan to no-till soybean in the spring. Use well maintained drills and planters with sharp disc openers. Avoid no-till coulters if they pin residue in the seed slot or throw soil out of the furrow. Row cleaners improve the seed zone, and those that float are preferred over fixed models. The goal is to push aside debris, not soil. This simple setup results in corn residue and cereal rye being pushed aside or penetrated. Use closing wheels to firm soil around the seed. If they can also somewhat crumble the seed trench sidewall, that is a bonus. Normal seeding rates apply if equipment is performing well and soil conditions are fit.

### **Vertical Tilled Corn Stalks**

Again, most planters equipped with row cleaners, or no-till/minimum till drills can handle this planting environment. One vertical tillage pass is generally adequate, usually being made in the fall. If you determine that a fall and spring pass is beneficial, that is at your discretion.

### **Fall Strip-tilled Corn Stalks**

Simply plant soybean into the strips in the spring. Strip-till should be performed only on level, non-highly erodible fields. If your operation fits this description and you plant soybeans in 20” or greater row width, we highly recommend you evaluate strip-till. Our researchers’ experience has been that this method of crop establishment provides benefits not just for a system that includes cover crops, but for overall residue and soil management.



Soybeans no-till planted into corn stalks.



Fall vertical tillage on corn stalks help to incorporate cover crop seeding via fertilizer spreading and removes winter annual seedings.



This photo shows fall strips made into corn stalks.



Strip freshener used in advance of spring corn planting. This tillage needs precision guidance such as RTK.

## Strip Freshening

This tool features row units that incorporate a row cleaner, three low disturbance coulters, and a finishing basket to create shallow tilled strips approximately 10" wide. A freshener bar can be utilized in the fall, spring or both as a stand-alone tool. This bar can also be used in the spring on level fields that were strip-tilled the prior fall. Row widths of 20" or 30" are available.

## Reduced Tillage Options

After soybean harvest, continue your rotation to corn, but consider reduced tillage options. Reduced tillage options discussed in this guide are also very compatible with corn production. Fall tillage and incorporation of fragile soybean residue leaves a landscape vulnerable to soil erosion. Since phosphorus moves with soil, erosion is a conduit for nutrient loss. If we are going to maintain topsoil and reduce phosphorus losses to help meet the goals of the Illinois Nutrient Loss Reduction Strategy, we need to reduce tillage.

***If your field has level to slightly undulating topography, and ideally soybean residue was spread evenly behind the combine, strip-till is again a great option. Where topography is more rolling, evaluate the use of no-till.***

Several strip-till bar manufacturers offer machines with a multitude of options, sizes and configurations to accommodate your needs. There is base equipment that just builds strips, to complete set-ups that also perform deep placement of N, P and K. You may also consider hiring a custom operator if one is available in your area.

## Ammonia Toolbars for Strip-tillage

One option is making strips in the fall with an ammonia toolbar, whether you apply nitrogen or not. No additional fall tillage following soybean is needed. Note: Any dry fertilizer or lime applications should occur before the strips are made. Tractors pulling the ammonia toolbar and performing the spring planting pass should be RTK autosteer equipped. Repeatable accuracy will allow the planter to stay on the strip, which is extremely important. If winter annuals concern you, a cover crop or fall herbicide application may be warranted, but be sure to consult with a trusted crop advisor.

In the spring, you can plant directly into the strips, as they have mellowed over the winter. They can also be "scratched" lightly if you have access to a strip freshener, to create a more finished seedbed. A row cleaner on your planter that is set to remove any residue or clods, without throwing soil to the side, is helpful.

## Other Considerations

Cover crops can play a role in carbon sequestration.

Many studies are being conducted on behalf of farmers to assure that they can be fairly compensated for their role in keeping carbon in the soil.

For instance, the timing of cover crops may influence the amount of carbon sequestration. The Illinois Nutrient Research & Education Council is reviewing options and will have information available as soon as it is reasonable. We recommend you follow NREC on social media and on our web site.



Fall anhydrous ammonia application using guidance to provide strips for planting in the spring. In the spring use of a strip freshener with RTK guidance is recommended.

# Do Cover Crops Really Reduce Nutrient Losses?

NREC researchers at different universities have consistently shown over time and at different locations and with controlled scenarios that cover crops really do reduce nutrient losses.

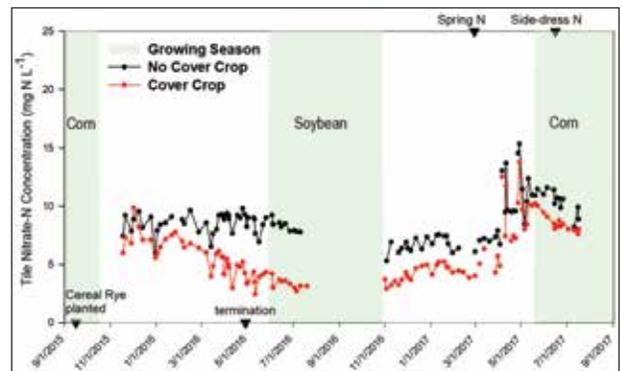
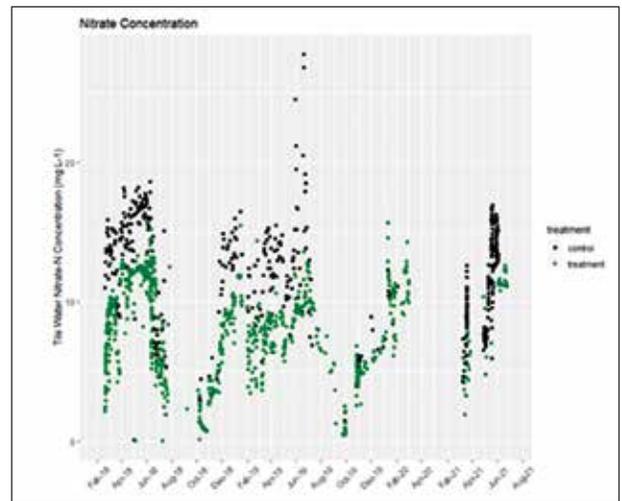
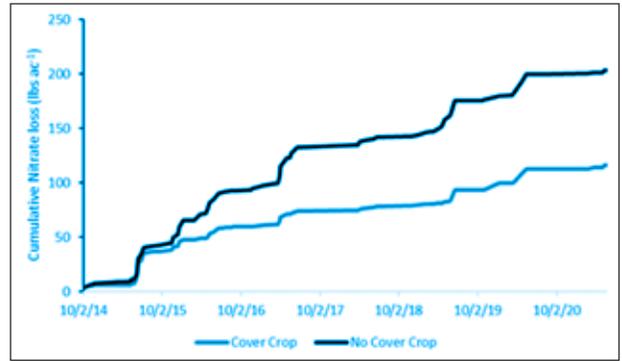
For instance, in McLean County, data demonstrates the effect of a cereal rye cover crop in reducing tile nitrate concentrations by at least 30-40%. The studies are on two different scales – one from a paired watershed and the other on a single field.

In a single field with different treatments over a six-year period, the adoption of cereal rye resulted in a 37% reduction in tile water nitrate concentration and a 43% reduction in the pounds of nitrate loss via tile drainage.

A paired Lake Bloomington watershed study (one watershed treated with cover crops and one watershed used as a control) showed significantly less nitrate concentrations and a 36% reduction in pounds of N loss with only half of the acres in cover crop. This research is confirming that the cover crop impact of nitrate loss via tile drainage is scalable and effective on a watershed scale.

In a replicated tile drainage study in Douglas County, each dot on the graph represents the average of three 4-acre plots. All plots received the same amount of fertilizer N during the corn phase of a corn/soybean rotation (80 lbs of N/acre as a pre-plant application of anhydrous ammonia and 80 lbs of N/acre as a side-dress application of UAN). Cereal rye was aerielly seeded into standing corn for these plots. Above ground cereal rye biomass was 1.1 tons/acre containing 28 lbs of N/acre. The cereal rye cover crop reduced tile nitrate loads by 9 lbs/acre, a load reduction of more than 40% (22 lbs/acre from no-cover tiles vs. 13 lbs/acre from cover crop tiles). While 9 lbs/acre is a seemingly minor amount compared to total applied nitrogen, notice the much-reduced tile nitrate concentrations in parts per million. Note that the federal drinking water standard for nitrate is 10 ppm on the left axis.

This dataset also shows the beneficial carryover effect of the cover crop on tile nitrate concentrations through the next tile drainage season. A full year after the cereal rye was terminated, and a soybean crop was raised, tile N loads remained below those plots that had no cover crop.





# COVER CROP Guide

## 2021 Edition

### Summary

One of the greatest challenges facing Midwest corn and soybean growers is the public (and governmental) expectation that we will measurably reduce nutrient losses to the environment. The benchmarks for reducing nutrient losses are established, and by 2025, the Illinois Nutrient Loss Reduction Strategy (INLRS) calls for a 15% reduction in nitrogen and a 25% reduction in phosphorus losses. Ultimately, USEPA and the INLRS call for a 45% reduction of both to meet the goals of the Gulf Hypoxia Action Plan. This is a huge challenge.

NREC was established to discover and encourage the adoption of practical, economically feasible and ultimately profitable methods to meet the environmental challenges facing Illinois agriculture. Nutrient management will get us part of the way, but ultimately an overall change in our cropping system will need to occur.

Using a cereal rye cover crop has proven to meet NREC objectives on several tile-drained farms in central Illinois that have previously been managed in a conventional corn/soybean rotation system. Cover crops work best in a production system that utilizes strip-till or no-till; reduced tillage also helps to reduce nutrient losses by reducing soil erosion during heavy rain events, and also enables the placement of nutrients into the strip — another method to reduce nutrient loss. This system is working, and we hope that you realize the benefits and will give it a try.

**Cover Crop Selector Tool**  
<http://mccc.msu.edu/selector-tool/>  
Available from the Midwest Cover Crops Council

**Cover Crop Decision Support Tool.**  
<https://covercrop.ncsa.illinois.edu>

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**The Illinois Nutrient Research & Education Council (NREC)** was created by state statute and is funded by a 75 cent per ton assessment on bulk fertilizer sold in Illinois. NREC supports nutrient research and education programs to ensure the discovery and adoption of practices that address environmental concerns, optimize nutrient use efficiency and ensure soil fertility. For more information on NREC go to [www.illinoisnrec.org](http://www.illinoisnrec.org)

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<http://illinoisnrec.org/>  
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