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## Cover Crops Require Careful Management

By Stan Wise

With dry conditions still covering most of South Dakota, increasing water infiltration rates and water storage capacities is an important task for the state's agricultural producers. Some of them have turned to cover crops to improve the water use efficiency of their land. Those cover crops will also reduce erosion, sequester carbon, feed soil organisms, provide livestock forage, suppress weeds, and aid nutrient cycling; however, they must be managed correctly.

In a drought year, it's important to remember that overwintering cover crops use water as they put on new growth in the spring. If soil moisture levels drop too low, it can negatively affect the cash crop following the cover crop.

One popular crop combination is a cereal rye cover crop followed by soybeans. The rye grows deep roots in the spring, which improves the soil, and creates significant biomass, which covers the soil and suppresses weeds. All that growth requires a lot of water. In a wet year, that's a benefit because it can allow producers to operate equipment in the field sooner. In a drought year, it can leave the soil too dry for the young soybean crop.

"In an ideal year, we would have that cereal rye planted in the fall, and we would let it continue to grow until it got to about early boot stage and then plant our soybeans into the rye green," Producer Matt Leischner said. "And then we just let that rye grow until it hits the anthesis stage, which is right around pollination



Healthy young soybeans grow through cover crop residue, which protects the soil and suppresses weeds. USDA NRCS South Dakota photo.

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## Learn how to fight soil compaction!

See Page 4 to learn more about soil compaction, its causes, negative effects, and how to fight it using living roots and biodiversity!

stage. Once it hits that point, then it's at the right stage where that roller-crimper will terminate the cereal rye crop."

Leischner, who grows corn, soybeans, rye, oats, and winter wheat with his brother, Max, southwest of Parkston, SD, said that his area is dry right now. "It's starting to be a concern," he said.

"You have to make that call every spring, especially in our region, that if it's too dry, you have to terminate that cereal rye and not let it grow too much," Leischner said. "If it is dry, it will hurt the bean yield."

"If it gets in that late April timeframe and it's just looking pretty dry," Leischner said, "we'll go ahead and terminate that rye either right after or right before we plant those soybeans."

Craig Stehly, who farms with his brother, Gene, near Mitchell, SD, said that in a very dry spring, he might terminate the rye a week or two before planting. "I had to do that last year because we had such a dry spring. I terminated it probably the first week of May, and I planted those fields probably a week later," he said.

Stehly said, however, that if the soil was only a little bit dry, he would still plant his soybeans into green rye before terminating the cover crop. "I still think the soil health benefits outweigh what moisture that rye uses," he said. "You got to have August rainfall for soybeans, anyway. I'd give up a little moisture for the benefits of the green cover crop."

### Monitor soil and weather

The weekly U.S. Drought Monitor offers producers a general overview of moisture levels across the state (<https://bit.ly/3vjNwte>). However, because conditions can vary locally, producers need to check their soil.

Natural Resources Conservation Service Conservation Agronomist Eric Barsness said that it's important to monitor moisture levels deeper than just the top four inches of soil. "Get out there with the soil probe or even just a simple spade — probably something just a little bit deeper or bigger than just the plier handle."

Barsness said that a soil moisture level of 70 percent or below is a good threshold to start thinking about early cover crop termination. "Once you hit 50 percent or below, it's almost too late," he said.

Producers also need to have a good feel for their weather patterns. If there is a prospect for rain on the horizon, it might be worth letting the cover crop grow longer, even if moisture levels are low.

However, predicting the weather two or three weeks into the future is a difficult task, Barsness said. "You're going to have to have a little bit of luck on your side and have a feeling for what the weather patterns have been doing," Barsness said. "If you're in those 30-40 percent chances of rain and they are hitting a half-inch to an inch at a time, then I'd say you're more in a wetter pattern. If you're getting those 30-40 percent chances of rain and you're not



**Matt Leischner used a roller-crimper to terminate this cereal rye cover crop near Parkston, SD, in early June 2021. Soybeans are already growing in the rye, but they won't be damaged by the crimper.** Photo courtesy of Matt Leischner.

getting anything, then we tend to be in a drier pattern. So, you kind of have to go with a gut feeling call and hope it works out."

Producers who normally use a roller-crimper to terminate their rye will likely need to use another method if they are forced to terminate early because for a crimper to be effective, the rye needs to be mature. Barsness said that haying could be one method of termination. However, most producers will likely use herbicides.

South Dakota State University Extension Agronomy Field Specialist Sara Bauder said that producers using herbicides to terminate their cover crop should consider their crop rotation first. "There's really a pretty good gamut of chemicals that can kill a cover crop," she said. "It's the rotation restriction that's the issue. That's why you should plan ahead and start looking at a rotation restriction table and herbicide labels, depending on what your next crop is."

As many cover crops are not yet listed on herbicide labels, Bauder suggested looking for updated labels and research data. If no label information is available, she said a bioassay may be needed.

Bauder recommended the Herbicide Rotation Table on the SDSU Extension website (<https://bit.ly/3heWOP7>).

Bauder also cautioned producers who might be tempted to use tillage as a termination method. "Especially because it's dry, if producers really want to retain their moisture, tillage is just not the way to go because they're going to have poorer infiltration, more runoff of the little bit of moisture that they do get. And of course, tillage does dry out that top layer."

While it's unfortunate to have to terminate a cover crop early, Leischner said there's still cause for optimism. "Initially it seems like you've wasted all that money — there's quite a bit of money put into establishing that rye crop as a cover crop — but just because we weren't allowed to let that plant grow into maturity, there's still a lot of productivity in the soil that is still benefitting us."

To learn more about cover crops and cost-share programs, contact the South Dakota Soil Health Coalition at [sdsoil-health@gmail.com](mailto:sdsoil-health@gmail.com) or 605-280-4190 or visit [www.sdsoilhealthcoalition.org](http://www.sdsoilhealthcoalition.org).



## Membership Minute: Robert and Angela Arbeiter

Robert Arbeiter runs an operation near Huron, SD, with his wife, Angela, his son, Matt, his parents, Howard and Hilda, and his brother, Tim. Their diversified operation includes crops, hay, pasture grass, cattle, and sheep.

They began using no-till practices in 2012, but after experiencing excessive moisture in 2019, they began to look for other solutions. They attended the South Dakota Soil Health School to increase their knowledge. As a result, they started using cover crops on their prevented planting acres in 2020, and they seeded cereal rye into their corn silage stubble last fall. They are planning to add wheat into their crop rotation this season.

"Our long-term goals are to increase organic matter by using no-till, cover crops, and high-residue crop rotations to help with water holding capacity and mineralization to lower our fertilizer bill," Robert said.

Every day on his operation is a gift, Robert said, but his best days include seeing green rows of corn emerging from crop residue and watching his young livestock kick up their heels with his family by his side.

"Keep an open mind, and never stop learning," Robert said. "You're not as smart as you think you are."



Last fall, the Arbeiters planted a cereal rye cover crop into their corn silage stubble. Courtesy photo.

## Cover Crop Planning Workshop - April 5 in Madison

Do you want to learn how to make cover crops work better in your operation? Sign up for the Cover Crop Planning Workshop, 10 a.m. to 1 p.m. on April 5 at the Madison Public Library, 209 Center Street East, Madison, SD!

SDSU Extension Agronomy Field Specialist Sara Bauder, SDSU Extension Sustainable Cropping Systems Specialist Peter Sexton, SDSHC Soil Health Technician Austin Carlson, and SD Agricultural Experiment Station at SDSU Operations Manager Brad Rops will cover the following topics:

- Cover crop goals and objectives, species selection, seeding rates and dates.
- Hybrid rye, weed control, termination options.
- Seeding options, drill calibration.
- Livestock grazing cover crop considerations.

Lunch will be included! Please register for lunch counts at [tinyurl.com/MadisonCoverCrops2022](https://tinyurl.com/MadisonCoverCrops2022). The workshop will be free for current SDSHC members and \$25 for non-members. (Entry fee includes SDSHC membership.)

Don't miss this excellent training event! Questions about the workshop should be directed to Austin Carlson at 605-323-8061 or [austin.soilhealth@sdconservation.net](mailto:austin.soilhealth@sdconservation.net).



USDA-NRCS South Dakota photo.

## Upcoming Soil Health Events

### March 30

Producer Program Workshop  
Milbank, SD

### April 5

Cover Crop Planning Workshop  
Madison, SD

### April 14

SDSHC Board Meeting  
Pierre, SD

### April 22

Earth Day

### April 22

University of South Dakota Sustainability Day  
Vermillion, SD

### April 24-May 1

National Association of Conservation Districts Stewardship Week

### April 26-27

Landowner Fire Workshop  
Mitchell, SD

### May 12

SDSHC Board Meeting  
Pierre, SD

### May 12

Dakota Lakes Tour  
Pierre, SD

### June 2-3

Landowner Fire Workshop  
Astoria, SD

### June 21-23

West River Grazing School  
Wall, SD

### July 12-15

Young Producers Ranching for Profit School  
Huron, SD

### July 26-28

East River Grazing School  
Marvin, SD

### Aug. 31-Sept. 2

South Dakota Soil Health School  
Garretson, SD

### Sept. 13-15

South Dakota Grazing School  
Chamberlain, SD

Access Our Events

Calendar [HERE](#).



# Fighting soil compaction with biology and diversity

**A**s farm equipment has modernized, it has become much larger. That extra horsepower comes at a cost – and not just the one on the sticker.

“Back in the day, they weren’t recommending any more than 5 tons per axle,” South Dakota State University Soils Field Specialist Anthony Bly said. “And we’ve well exceeded that in most all of our tractors and combines today.”

The weight of farm equipment is supported by the soil, and if the weight is too high or if the ground is too wet when it is worked, it can severely compact the soil, making it more difficult to successfully grow crops.

“Porosity decreases, so we have less ability to store water and nutrients – especially those mobile inorganic soil nutrients that are mostly in the soil moisture, the water,” Bly said. “We have less area for our roots to explore – healthy plants require healthy root systems. And we have less pore space for air exchange.”

According to the SDSU Extension Best Management Practices for Corn, “Soil compaction reduces soil drainage, aeration, yields, root growth, and the ability of plants to recover from disturbance, while simultaneously increasing surface runoff and soil erosion. Compaction can be severe in wet, clay soil, and it is increased by the use of heavy machinery during planting and harvesting, especially in wet soil conditions.”

Bly said that while producers can try to limit surface-level compaction by spreading equipment weight over a larger surface area, using tracks and bigger tires, “the weight of that tractor or that combine is transferred somewhere, and more than likely it’s the deep compaction that we’re really ignoring.”

Tillage is another cause of compaction. “We see tillage uplifting the soil, and we think we’re loosening the soil, but on a micro scale, that tillage implement – whether it’s a shank or a disk blade or a plow – it’s resting on something, and it’s causing compaction on what it’s resting on,” Bly said. “And as it shears through the soil, it’s pushing the aggregates – the sand, silt and clay – together at the point the shearing is taking place.”

Bly noted that diskling is a common practice used by road engineers to compact roadbeds so that water doesn’t enter the soil and cause damage with the freeze and thaw cycle. That’s not a goal producers should have for their fields and pastures.

In 2021, Bly co-authored a study (<https://bit.ly/3hSXGcm>) that used x-ray scanning to compare the makeup of soil managed with different practices. The study found that soil from no-till fields managed with diversified crop rotation, cover crops, and livestock integration had 57% porosity – space for air and water infiltration – and an internal water movement rate of 4.7 inches per hour. Soil from conventionally tilled fields managed with a corn/soybean rotation, no cover crops, and no livestock integration had 49% porosity and an internal water movement rate of only 0.8 inches per hour. This disparity demonstrates how tillage and a limited crop rotation results in greater soil compaction.

Livestock can also be a cause of compaction if they are allowed to graze a crop field when it is too wet. “We wouldn’t be out there doing field activities with a tractor, so why would we be out there with a herd, a mob, intensively compacting the soil?” Bly asked. He said that if cattle are grazing on cropland, it’s important to have some place to put them, like back on a perennial, when soil conditions are too wet.

## Living roots

Producers can limit their tillage and keep livestock off wet cropland, but they are unlikely to transition to smaller equipment. The best way for them to fight compaction caused by heavy equipment, Bly said, is with living roots – cover crops and diverse crop rotations.

“Let the roots and natural biology, a plant’s biology, do that work,” he said. “Every root has some compaction fighting capability. That’s why crop rotation is im-

portant. That’s why a diverse cover crop mix is important, to have fibers and taproots and all those gradients in between.”

Kurt Stiefvater, who has a cow-calf operation and grows corn, soybeans, oats, and winter wheat near Salem, SD, said that to avoid compaction on his operation he uses no-till practices to help limit traffic in his fields and waits to work in his fields until “the soil is dry enough that you don’t make extra compaction layers in there that go deeper in the soil profile.”

He also uses other soil health management practices to fight compaction. “I’ve improved my soil structure quite a bit with the no-till, multiple crops, using cover crops as part of my feed source for my cow-calf operation,” Stiefvater said, “and building the aggregate stability in the soil really helps keep that compaction down.”

He also varies the direction of his rows between crops. “If I go diagonally one year, I’ll try to go the opposite way the next year and plant my soybeans and small grains in different directions,” he said. Stiefvater also said that using rotational grazing helps limit compaction from cattle trails in his pastures, and when he’s grazing his cropland, he tries “to spread the water source around a little bit and give them different options.” He noted that he does most of his cover crop grazing in the winter when the ground is frozen, so compaction from livestock is less of a concern then.

“A little hoof action doesn’t hurt anything with incorporating the residue just a little bit and breaking the residue down during the winter months, too, and during the early spring,” he said.

For producers who would like to try cover crops, Bly said that since all roots have some compaction fighting ability, it’s better to pick a diverse cover crop mix that will meet producers’ operational goals. “A living root, just period, is in my mind the important thing to focus on,” he said.

“If you can, get some deep-rooted plants in your rotation at some point to help break up any hard pan that has developed,” Stiefvater said.

To download instructions on how to conduct a soil bulk density test, visit <https://bit.ly/3hQWKfJ>. To learn more about soil bulk density and cover crops, visit South Dakota Soil Health Coalition website [www.sdsoilhealthcoalition.org](http://www.sdsoilhealthcoalition.org).



**This radish was affected by soil compaction. The root was forced to grow horizontally until it found space in tightly packed soil to continue growing deeper.** SDSU Extension photo.

# "Snirt" ... and How to Minimize It

By Sara Bauder, SDSU Extension Agronomy Field Specialist

Blowing soils, dust storms, and "snirt" (snow with 'dirt' on it that appears black) have been quite evident this winter. High winds combined with dry conditions are certainly a driving force of this issue, the other: lack of soil cover and soil resiliency.

Black snow in the ditch or 'snirt' is a clear example of where valuable topsoil is lost to the ditch or neighbor. Topsoil is not only ideal in a healthy soil system, but it contains valuable nutrients, including non-mobile nutrients (P and K).

Avoiding all soil erosion is nearly impossible, so having resilient soils that are prepared to take on Mother Nature at their top game should be the ultimate goal. Two of the five principles of soil health will help keep your soil from eroding and in the field for yourself and the next generation.

**1. Soil Cover.** Keeping the previous crop's residue and/or other living plants on the soil surface helps wind and water become absorbed by the cover, rather than erode the top soil. Many view the top layer of residue on a field as "trash," but do not be fooled. In fact, for every 1 inch of residue left on a field, there is potential for 4 inches of horizontal erosion prevention (height x 4= distance of protection). Crop residues not only protect your soils during dormant periods, but helps cycle any nutrients that were left in that residue back to the soil, thereby keeping nutrients on your field rather than in corn stalk bales or straw taken elsewhere. Soil cover in the form of crop residue or cover crops can also help to reduce weed pressure, moderate soil temperatures, retain moisture, reduce compaction and crusting, and provide a home for vital soil biology.

In a rangeland setting, it is all about grazing management. In order to catch as much winter snowfall as possible and protect soils, producers should strive for at least 50-60% of organic material cover on the soil surface with at least 4-6 inches of residual stubble height for native grasses (if possible) when moving into

winter (Kelly, 2021).

**2. Limit Soil Disturbance.** The most obvious example of soil disturbance is tillage. Many farmers were taught to till in order to open up the ground, allow air in, and help soils to absorb moisture as well as dry out the surface when needed. As years have passed, research and experience have shown us that tillage actually reduces water infiltration by destroying natural pores and root channels that transport water. Tillage also destroys the natural soil ecosystem, and burns up soil carbon (organic matter) more quickly. In a dry year, keeping as much soil moisture as possible is very important. In fact, soil organic matter can hold up to 20 times its weight in water (Reicosky, 2005). Tillage reduces soil organic matter by exposing it to air, which allows it to be consumed by opportunistic bacteria and lost as carbon dioxide (CO<sub>2</sub>) to the atmosphere. Soils naturally receive all the oxygen and nutrients needed to be healthy by growing a variety of plants, allowing them to build up organic matter and healthy soil microbiology consisting of a balance of fungi and bacteria.

In summary, avoid as much erosion as possible while maintaining healthy, resilient soils by excluding tillage and providing soil covering (armor) by leaving crop residues in place on the soil surface. This may look different on every operation whether you grow row crops, small grains, forages, livestock, etc. In order to work towards a whole systems approach, it is advised to adopt all five of the soil health principles. For information on the remaining three principles (diversity, living roots, and integrating livestock) visit [www.sdsoilhealthcoalition.org](http://www.sdsoilhealthcoalition.org). Making changes to a farm or ranch operation is not easy, but taking steps towards protecting one of our most important natural resources, soil, is a great way to help your farm or ranch become more resilient and provide a future for the next generations.

Read a complete version of this article at [extension.sdstate.edu/snirt-and-how-minimize-it](http://extension.sdstate.edu/snirt-and-how-minimize-it).

## SDSHC Brings Soil Health to Kids During Ag Day at Washington Pavilion!

On March 25th, students across the Sioux Falls area visited agriculture-related educational exhibits at the Washington Pavilion. The students were excited learn more about soil health and water management from the SD Soil Health Coalition staff. On March 26th, the exhibits were open to families as part of Ag Day at Washington Pavilion, and hundreds parents and children stopped by the SDSHC booth to learn more about how soil health can improve our farms, ranches, and communities!





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## Cost Share Funds Available for Cover Crops!

The Soil Health Planning and Improvement Project offers financial and technical assistance to producers willing to adopt certain soil health management practices for land within specific watershed areas in South Dakota. The goal of the project is to improve water quality by increasing the adoption of soil health practices. If you have land in one of the project's watershed areas, this is your chance to get help with implementing new practices to improve your operation and your community!

Learn more about the project and download an application at [www.sdsoilhealthcoalition.org/319-program](http://www.sdsoilhealthcoalition.org/319-program). Direct any questions about the project to [sdsoilhealth@gmail.com](mailto:sdsoilhealth@gmail.com).



## Registration is officially open for the 2022 Soil Health School!

The 2022 Soil Health School is already shaping up, and space is limited, so don't wait to sign up for this excellent combination of field exercises, classroom instruction, and discussions led by soil health experts and producers! The School will be hosted **Aug. 31-Sept. 2** on the farms of Anthony Bly and Bruce Carlson near **Garretson, SD**. A block of rooms has been reserved at the Quality Inn in Brandon, SD, at a rate of \$98.10 per night for attendees. Learn more about this event at [www.sdsoilhealthcoalition.org/event-calendar/soil-health-school/](http://www.sdsoilhealthcoalition.org/event-calendar/soil-health-school/).

## Integrate Livestock In Your Operation! Find More Forage!

Will you have crop residue, cover crops, or grassland available for custom grazing this year? Are you looking for sources of forage to lease for your livestock? The **South Dakota Grazing Exchange** is a great place to list your resources and make private grazing agreements with others to meet your needs! **It's easy to use and free!** Learn more at [www.sdgrazingexchange.com](http://www.sdgrazingexchange.com).