



United States Department of Agriculture



2019 South Dakota Cropping Systems Inventory



Natural Resources
Conservation Service
South Dakota

A Crop Year Like No Other

In the 37 years the South Dakota Natural Resources Conservation Service has gathered information to measure the progress South Dakota producers are making in building soils and sustainable cropping systems across the state, never have we seen a year like 2019.

As you'll see in this report, record rainfall amounts prevented about 4 million acres from being planted—that's about a third of the normal cropland acres usually planted that were idled this year. Wet weather raised havoc at harvest, too. Besides being tough on farmers, it made this year an anomaly in comparing previous years' data for our latest county-level, biennial "snapshot in time" report on crop management systems being used in South Dakota.

That said, the steady trend in the past 15 years towards more use of no-till farming systems continued this year. In fact, the percentage of no-till use on planted acres surveyed was the highest ever. This may be because one heavy rainfall after another during the spring planting season left only a very narrow window for planting, and the more stable soil structure that's developed with no-till systems with cover crops allowed no-till producers to get into fields that were not overwhelmingly saturated to plant during that narrow window. The increase in no-till systems percentage could also reflect more interest in no-till and healthy soils. In either case, more no-till systems and cover crops are a bonus to producers and all of us who live in South Dakota, because healthier soils and cleaner water are benefits we can all enjoy.



We invite you to take a look at the latest statewide information on cropping systems in South Dakota, and pledge NRCS will continue to do our best to assist producers in caring for their natural resources in these times of wildly-fluctuating weather patterns.

Jeff Zimprich
State Conservationist

2019:

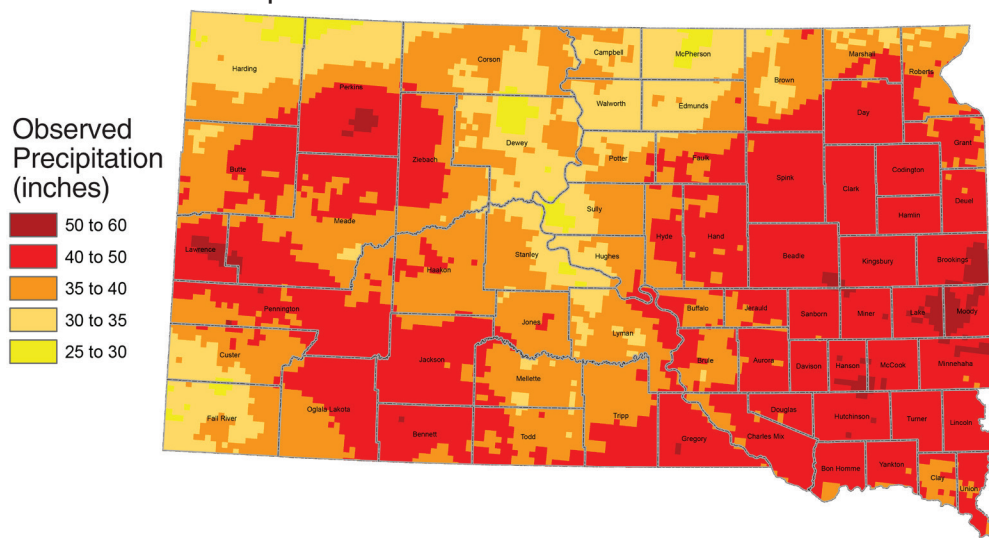
A Year of Extremes

Heavy rains pounded South Dakota in 2019, all across the state. By late October 2019, the National Weather Service showed rainfall amounts ranging from 6" above normal in Buffalo to nearly 14" above normal in Mitchell. Twelve reporting stations across the state showed the rainfall up until October 28 varied from almost 20" in Buffalo to just under 37" in Sioux Falls.

The rain and snow started in the fall of 2018; from October 2018 until October 2019, parts of

61 counties received 20 inches or more of rain than normal. Nearly every county received more than 8" of rainfall above normal, and about half the state received at least 20" of rainfall above normal. Parts of more than a dozen counties received between 50 and 60 inches of rain from October 2018 through October 2019. Locations on both the west and east sides of the state had surpassed their normal annual rainfall amounts before the end of July.

Precipitation October 2018 to October 2019



Record Rainfall October 2018 to October 2019. About half the state (red) received 40 to 50 inches of precipitation over the 12-month period and most of the rest of the state (light and dark tan) received from 30 to 40 inches.

“

I'VE NEVER SEEN A YEAR LIKE THIS. IT WAS RELENTLESS. WHAT NORMALLY WORKED, DIDN'T WORK THIS YEAR. OUR GROUND WAS SO SATURATED, IT WAS SQUISHY EVEN ON TOP OF THE HILLS.



— Scott Carlson
Seneca, SD
Faulk County

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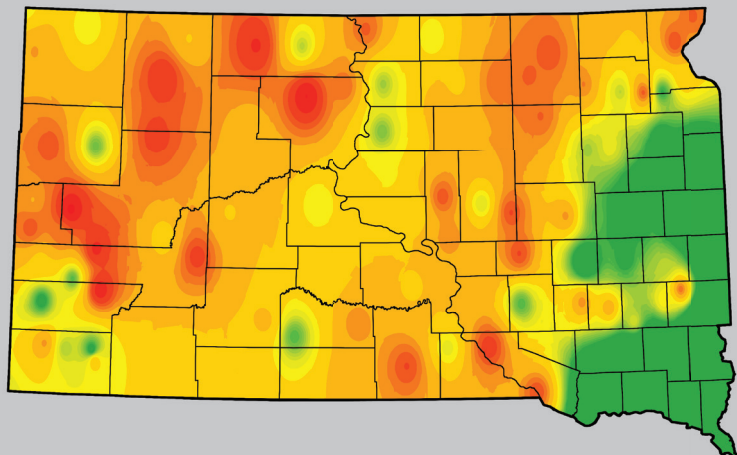
WE CAN'T CONTROL RAINFALL, BUT WE CAN DO SOMETHING ABOUT WHAT HAPPENS WHEN IT HITS THE GROUND. BY BUILDING BETTER SOIL STRUCTURE, I AM SMOOTHING OUT THE BUMPS IN ANNUAL PRECIPITATION, MAKING MY LAND READY FOR THE RAIN!

— Doug Sieck, Selby, SD
Walworth County

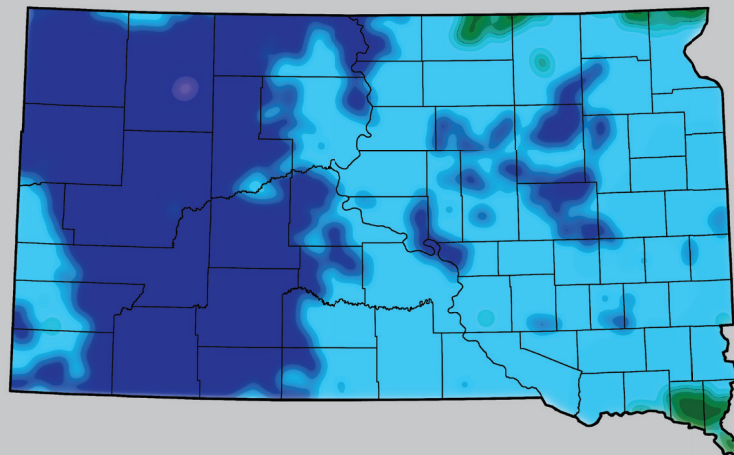
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From Drought to Gully Washers

Drought in 2017



Waterlogged in 2019



Drought in 2017, Waterlogged in 2019. Red and yellow areas on an August 1, 2017 weather map show all but eastern South Dakota suffered from drought; two years later, the west led the state in above normal precipitation, with two to three times normal rainfall (shown in dark blue), while the rest of the state received up to two times normal precipitation.

Weather Alert! Ready your soils for drought AND too much water!

South Dakota producers have faced wildly fluctuating weather in the past three years. In 2017, only the eastern part of the state escaped drought. Two years later, most areas in the eastern half of the state received 150 percent of their normal rainfall, and the western part of the state that was so dry in 2017 received double, triple, and even four times their normal rainfall amounts.

Climatologists predict it will get worse. Two key messages from state climate summaries for South Dakota from the National Oceanic and Administration predict 1) higher temperatures will increase evapotranspiration rates and increase the rate of soil moisture loss during dry spells, leading to an increase in the intensity of future droughts and 2) along with a projected increase in winter and spring precipitation, heavy precipitation events will increase.

These projections call for farming and ranching systems and soils that can adapt to both dry and wet weather extremes.

“

OUR COUNTY WAS 68% PREVENT PLANT. WE HAD 330 APPLICATIONS FOR A SPECIAL EQIP SIGNUP FOR COVER CROPS. PEOPLE SEEDED COVER CROP MIXTURES IN PREVENT PLANT ACRES THAT THEY GRAZED OR PUT UP FOR HAY. A LOT OF THEM PUT UP FEED.



”

— Brent Woods
NRCS Conservationist
and farmer, Parkston, SD
Hutchinson County

DID YOU KNOW?

In dry seasons, and particularly in western South Dakota in late summer, thunderstorm bases may be as high as two miles above the ground and consequently the rain often evaporates before reaching the ground.

MILLIONS of Acres Unplanted in 2019

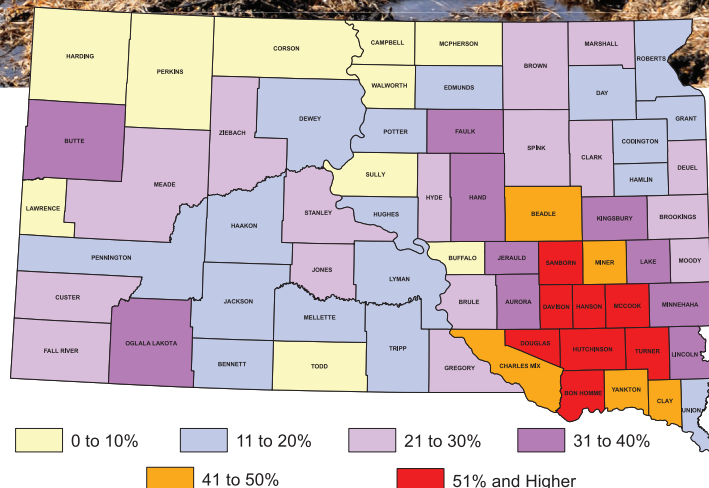
After a wet fall in 2018, as the National Weather Service put it, “May of 2019 rewrote the record books, with heavy snow and rain, and rapid snowmelt contributing to widespread flooding.” The combination caused delayed planting and ultimately resulted in nearly 4 million acres not being planted to crops in 2019.

Most of those acres were reported as “prevented planting” to USDA, and producers were eligible for crop insurance payments on those fields. But never before in South Dakota have so many fields gone unplanted—the 4 million acres is unfortunately more than twice as many acres as any other state and accounts for more than one-fifth of the total acres in the country that weren’t planted to crops because of harsh weather conditions. The nearly 4 million acres account for about 32 percent of the total cropland acres reported to USDA in 2019.

Eight counties in southeastern South Dakota reported more than half the crop acres went unplanted, and 23 counties—more than a third of the counties in the state, reported more than 30 percent of their cropland, mostly corn, soybeans and wheat, went unplanted.

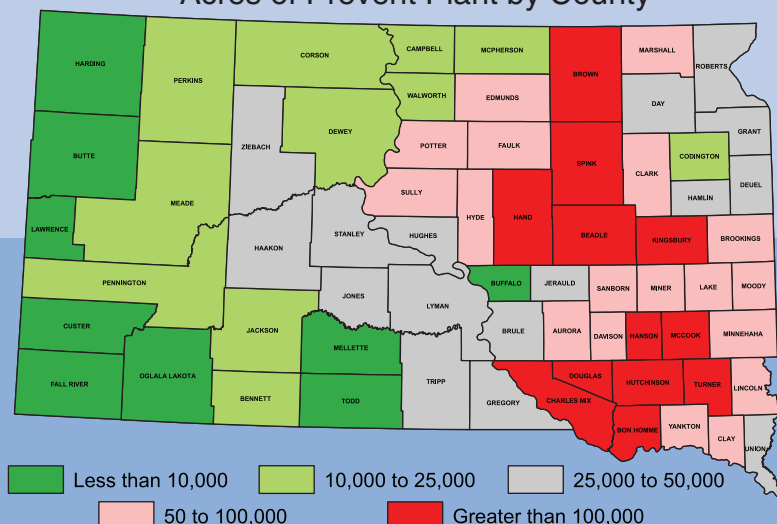
Wet conditions at harvest in 2018 and 2019 contributed to compaction and rutting—in some cases, severe rutting.

2019 Percent of Crop Acres with Prevent Plant



Eight counties (in red) reported more than 50% of their cropland acres went unplanted.

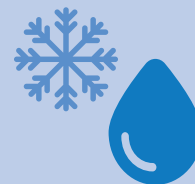
Acres of Prevent Plant by County



Most counties in the eastern half of South Dakota had at least 50,000 acres unplanted in 2019; planting crops was prevented on 10,000 acres or more in three out of four counties across the state.



**EXTREME
conditions**



4

**MILLION
acres unplanted**

COMPACTION



**RUTTING
damage**

Why We Track Tillage

The drought of 2017 and the very wet 2019 crop year, and the predictions for repeats of those kinds of weather patterns, have demonstrated the need for healthy soils and production systems that provide resilience to both drought and excessive rainfall.

Cropping systems that provide cover to protect the soil against wind and water erosion are the first step to stem soil losses. The percentage of the soil that's disturbed with tillage relates directly to how much wind and water erosion may occur.

A growing number of producers who know you can't build topsoil until you first stop it from eroding are going beyond saving soil to building or regenerating it.

We track tillage and no-till methods because they are an indicator of progress in both soil protection and regeneration. Tillage destroys the cover and structure for microbial life in the soil like a tornado

destroys the roof and walls of a house. The healthy soils those microbes help build hold more moisture in dry times, and their superior structure holds up better against heavy rains, allowing faster infiltration, less runoff, and more stable soils in wet periods.

Pairing no-till with cover crops, diverse cropping systems, and grazing builds healthy soils that are more resilient to droughts and rainstorms alike—that resiliency is something more and more producers see as a key to a sustainable, successful farm or ranch operation.

DID YOU KNOW?

On average, South Dakota cropland soils have lost about one-third of their organic matter and organic nitrogen after years of cropping. The good news is, organic matter can be regenerated by using methods that build healthy soils.



Tillage leaves soils open to serious erosion; fields that were tilled but not planted in 2019 and were left without ground cover could be particularly susceptible to water erosion early in 2020.

Despite a wet year, wind erosion is likely on bare soils. The windblown soil in this field came from a neighboring tilled field.

No-till, a method of planting without tilling the soil, offers ground cover without soil disturbance. That covers two of the five critical components for soil regeneration. It's the most popular planting method among South Dakota producers.



More Fields Planted with No-till in 2019

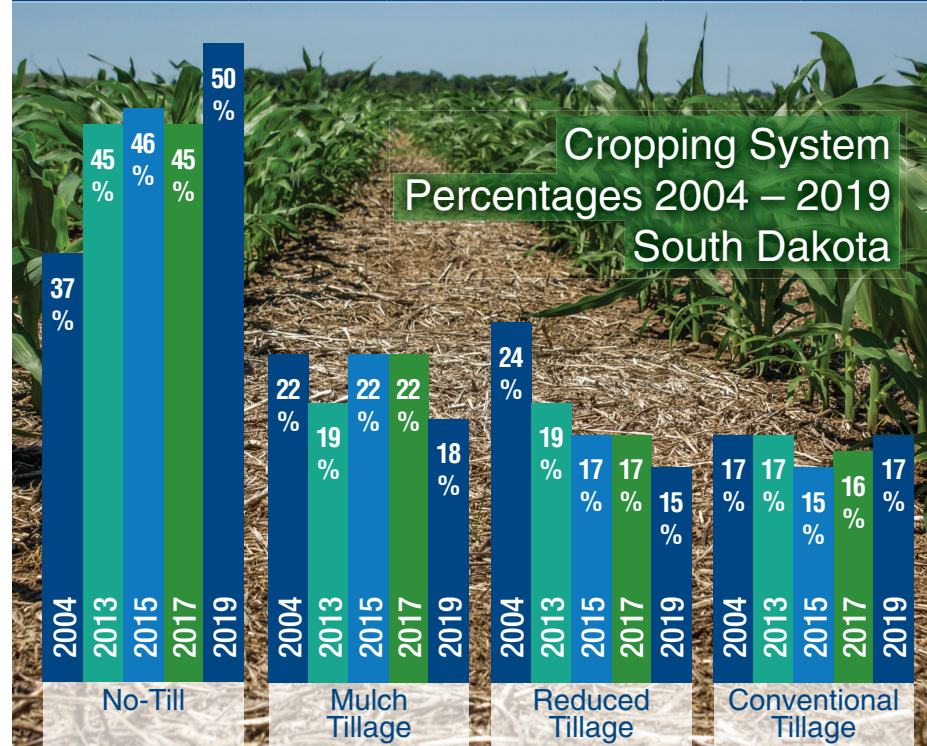
There's a perception among many farmers that wet soils need to be tilled to dry out for planting, but in 2019, a really tough year, fewer no-till acres went unplanted compared to full width tillage systems, including conventional tillage. Estimated unplanted acres in each cropping system in 2019 were no-till, 20%; mulch tillage, 39%; reduced tillage, 38%; and conventional tillage, 27%.

Of the 9,894,301 crop acres that were planted in South Dakota in 2019 (as reported by the Farm Service Agency on August 1, 2019), 50 percent were planted using no-till methods. That compares to 45 percent in 2017, 46 percent in 2015, 45 percent in 2013, and 37 percent in 2004.

The higher no-till percentage in 2019 comes mostly from a drop in the percentage of mulch tillage which fell from 22% in 2017 to 18% in 2019. Reduced tillage fell from 17% in 2017 to 15% in 2019. Conventional tillage increased 1%, to 17% in 2019.

The percentages are similar going back to 2013, but no-till use is decidedly higher in 2019 than in 2004, when no-till was used to plant 37% of the crops in the state.

CROPPING SYSTEM ACRES	2004	2013	2015	2017	2019
No-Till	4,873,352	6,229,856	6,475,903	6,190,063	4,943,535*
Mulch Tillage	2,851,399	2,603,467	3,097,171	3,006,885	1,826,469*
Reduced Tillage	3,165,728	2,665,327	2,393,269	2,408,289	1,482,247*
Conventional Tillage	2,178,121	2,357,387	2,111,708	2,254,002	1,642,050*



Weather Complicated The 2019 Inventory

In 1982, the Conservation Technology Information Center's (CTIC) National Crop Residue Management Survey began measuring and tracking the type of tillage used by crops planted at the county level through personal observations of field conditions. The national NRCS requirement to collect tillage data ended in 2004; the South Dakota NRCS, at its own expense, resumed the survey in 2013.

As planting operations were delayed, and rains prevented about 4 million acres from being planted, the gathering of data for the 2019 Cropping Systems Inventory was also affected. The 2019 Cropping Systems Inventory includes only those acres that have data points tied to them, where data was collected. Since tillage type could not be observed at data points with prevented plant, acres associated with those data points were not included in the 2019 inventory.

That means a big asterisk is being included for acreages of each type of cropping system, because 4 million acres were not counted.

Total acres of each cropping system couldn't be compared fairly to other years because that couldn't be determined on prevented plant acres. However, it was reasonable to determine statewide percentages by each cropping system type from information associated with the data points where information was gathered.

% RESIDUE LEFT ON SURFACE AFTER PLANTING:

Mulch tillage > 30%

Reduced tillage 15% to 30%

Conventional tillage < 15%

Use of Cover Crops Nears 1 Million Acres

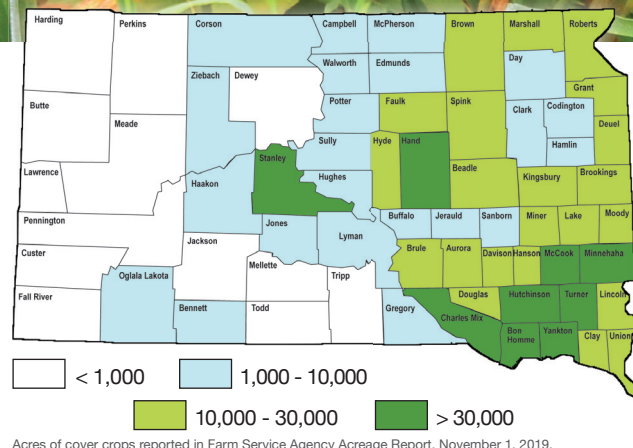
South Dakota Cover Crop Acres in 2019

The use of cover crops in South Dakota is ever-expanding, as farmers reported using the practice on 924,500 acres in the November 1, 2019 Farm Service Agency acreage report. Most of those cover crops were planted at the producer's own initiative and expense, but farmers also responded to incentives payments from NRCS conservation programs after the entire state began to experience too much rain in late spring and early summer.

After flooding became an issue in parts of South Dakota early in 2019, NRCS offered a special Environmental Quality Incentive Program (EQIP) signup to encourage producers to plant cover crops and apply other practices to treat flooded land and prevent further problems.

A total of 2,600 applications were made for EQIP funding, primarily for incentives to plant cover crops. NRCS initially set aside \$1.5 million of EQIP funding, but requested additional funds as extreme rainfall continued through the summer months. In the end, NRCS obligated \$3,283,000 to 502 producers.

Statewide, South Dakota producers planted 138,960 acres of cover crops in 2019 through EQIP and the Conservation Stewardship Program—that's more than twice as many acres of cover crops planted through those programs in 2017 or 2015. Many of the seedings on prevented plant acres were multispecies cover crops, including such diverse plants as millet, sorghum-sudan, oats, buckwheat, radishes, turnips, common vetch, clovers, and others. Generally, the diversity that comes with multispecies cover crops builds healthy soil more quickly.



“

MY FAMILY HAS NO-TILLED SINCE 1988. I USE A 3-WAY ROTATION WITH COVER CROPS. I WAS ABLE TO PLANT 91 PERCENT OF MY CROPS—THE COVER CROPS USED UP EXTRA MOISTURE, AND THEIR ROOT BASE SUPPORTED MACHINERY. OUR SOILS ARE ABSOLUTELY BETTER NOW WITH THESE SOIL HEALTH PRACTICES.



— Jesse Hall, Arlington Kingsbury County

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DID YOU KNOW?

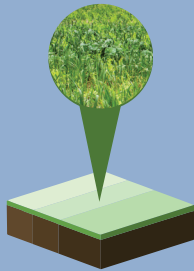
Earthworm populations, which explode with the use of no-till, consume 2 tons of dry matter per acre per year, partly digesting and mixing it to form healthy soil.



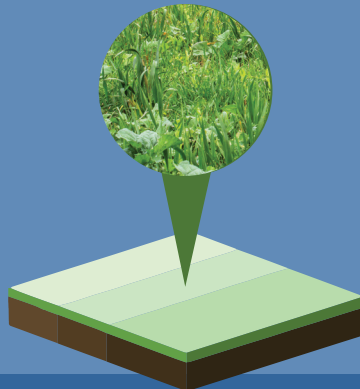
DID YOU KNOW?

Every 1% increase in soil organic matter results in as much as 25,000 gallons of available soil water per acre.

DOUBLING UP IN 2019



2017



2019

S.D.
farmers
planted

2X

as many acres to soil-building cover crops in 2019 as in 2017 as part of USDA working lands programs.

Many planted **multispecies cover crops** on acres that could not be planted to cash crops in the spring; other cover crops were planted that were not part of government programs.

SOURCE: USDA Natural Resources Conservation Service, South Dakota

“

IT'S BEEN A LONG TIME SINCE IT WAS THIS WET, MAYBE BACK IN '92. I DIDN'T WANT TO DESTROY THE WORM HOLES, SO I DIDN'T PLANT SOYBEANS. NO-TILL AND MULTISPECIES COVER CROPS WITH A CROP ROTATION IS REALLY GOOD FOR A PERSON WITH LIVESTOCK. YOU GET HIGHER CROP YIELDS AND THE VALUE OF EXTRA FEED.



”

— Wayne Moore
Howard, SD
Miner County



Why Cover Crops and Crop Rotations Matter

Scientific studies have confirmed what farmers and ranchers have always known—that is, a conventionally tilled corn-soybean rotation leads to lower organic matter in the soil compared to when small grains are included in the crop rotation.

Optimal levels of soil organic matter, usually composed of dead plants and microbial residues, help crops thrive by releasing nutrients into the soil and allowing soils to retain moisture.

Cover crops help in the same way. Both contribute to having plants and plant residues not only protect the soil surface against soil erosion, but also extend the amount of time plants are actively growing in the soil. Roots of growing plants feed soil microbes,

which in turn build organic matter and soil structure—two of the strongest indicators of healthy soil.

While cover crop use continues to grow in South Dakota, the same can't be said for use of small grains in crop rotations. The number of acres planted to oats, wheat, barley and other small grains as part of a crop rotation in 2019 are only a fraction of the 7.2 million acres planted in 1981. A wet fall in 2018 prevented winter wheat from being planted on thousands of acres, and the wet spring and low wheat prices resulted in fewer acres of spring wheat planted. The 1,433,000 acres of wheat planted in 2019 amounted to a significant drop from more than 2 million acres in 2016.

“

IN A TYPICAL YEAR, I THINK FARMERS WITH HEALTHY SOILS FEEL LESS STRESS BECAUSE THEIR SOILS ARE SET UP TO HANDLE FLUCTUATIONS IN MOISTURE. BUT THIS YEAR, WE HAD 18 INCHES OF RAIN ABOVE THE AVERAGE, AND THE SOIL PROFILE WAS JUST TOO SATURATED. IT'S AFFECTED EVERYONE ACROSS THE BOARD, AND MAKES ME CONCERNED ABOUT NEXT YEAR.

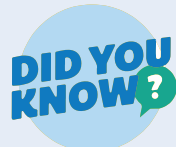


”

— Kirk Lindgren
NRCS Conservationist
Howard, SD
Miner County

Many South Dakota farmers who couldn't plant some of their crops on time in 2019 later seeded multispecies cover crops on Prevent Plant acres to protect and build the soil.

Leading soil health farmers have learned they build soil organic matter and strong soil structure much more quickly when they include small grains in the crop rotation and seed multispecies cover crops.



Healthy soil with strong structure is made of about 45% minerals, 25% water, 25% air, and 5% organic matter.



2019: A Year to Evaluate your Cropping System

How resilient was your soil in a very wet year?

If extreme weather is here to stay, and that's what expert scientists are saying, this past year was a good one to evaluate the performance of your cropping system's ability to withstand continued wet weather. While farmers who have been building healthy soils weren't immune to problems brought on by so much rainfall, they do believe their healthy soils were more resilient. They thought the same thing in 2017 when most of the state was in drought. They have learned there are five keys to regenerating healthy, resilient soils.

The stage is set for more wet soils in 2020. Strong soil structure that comes with healthy soils can support equipment better than tilled soils in wet weather.

FIVE PRINCIPLES OF SOIL HEALTH

There are five building blocks necessary to build a healthy soil foundation. Each is important in its own right, but the additive result from using all five principles together is a cropping system that will offer the most resilience to weather extremes that are forecast to continue into the future. The five principles to keep in mind and put into practice are:

DID YOU KNOW?

One teaspoon of healthy soil contains up to 1 billion individual bacteria. That's 3 times more bacteria in a teaspoon than there are people in the U.S.—healthy soil is alive!



1.

SOIL ARMOR. Reduced soil erosion, lower evaporation rates, a moderation in soil temperatures, less compaction, and weed growth suppression are all benefits that come from armoring the soil with residues or living plants to protect against harsh wind, rain, and sun. Armor comes from no-till, cover crops, crop rotations, and permanent vegetation.



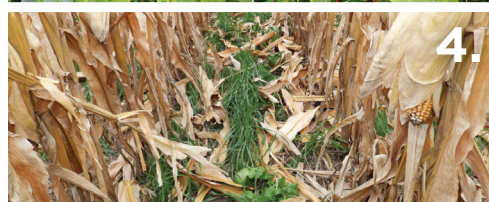
2.

MINIMAL SOIL DISTURBANCE. Tilling soil destroys its structure and hastens erosion. Life in the soil—the microbes that naturally build soil structure and organic matter content—do their best in soil that is not tilled.



3.

PLANT DIVERSITY. Nature's way of building rich prairie soils features the interdependence of a very long list of plants, growing together in harmony. Monoculture crops work against that—solutions include multispecies cover crops and crop rotations. Diverse plants feed the whole soil food web, and that improves water infiltration, nutrient cycling, and other things critical to healthy soils.



4.

CONTINUAL LIVE PLANTS AND ROOTS. You have to realize the soil is alive to appreciate this principle. Growing a crop from May through October and then tilling it the rest of the year shuts off the food supply for soil microbes that thrive when they feed off living plant roots. Cover crops keep something growing through more of the year.



5.

LIVESTOCK INTEGRATION. Again, nature's system that was a mix of both plants and animals developed deep, healthy prairie soils. The economics of extra livestock feed from cropland acres has made cover crops a no-brainer for most livestock producers, but grazing cover crops also helps convert high carbon crop residue to low carbon organic material, balancing the carbon to nitrogen ratio. It speeds up the recycling of nutrients, mineral, vitamins, and carbon.

50%

In 2019, a really tough year when so many acres couldn't be planted, the cropping system with the lowest percentage of non-planted acres was no-till.



Halfway There

For the first time, South Dakota farmers used no-till to plant half the crop acres in the state. No-till, a critical part of soil regeneration, is now used on as many acres as all other cropping systems combined.

DID YOU KNOW?

Only 20% of no-till acres statewide in South Dakota were unable to be planted in the extremely wet spring of 2019.

0%

SOURCE: USDA Natural Resources Conservation Service, South Dakota

“

WE PLANTED ON TIME WHEN OTHERS AROUND US COULDN'T PLANT. WE HAD UNDER 5% PREVENT PLANT. WE HARVESTED IN WET CONDITIONS, BUT WE WERE NEVER STUCK, WITH MINIMAL RUTTING. WE GIVE A TON OF CREDIT TO OUR SYSTEM—SMALL GRAINS IN OUR CROP ROTATION, WITH NO-TILL, COVER CROPS, AND CATTLE.

”



— Brian and Jamie Johnson
Frankfort, SD, Spink County

“

I'VE NO-TILLED ABOUT TEN YEARS, BUT WHAT REALLY MADE A DIFFERENCE WAS PUTTING A SMALL GRAIN INTO OUR ROTATION, FOLLOWED BY A COVER CROP. EARTHWORM ACTIVITY IS AMAZING NOW—AND NO EROSION, NO GULLIES WITH WAY LESS RUNOFF. MY LAND WAS FIT TO PLANT WHEN I DIDN'T SEE ANYONE ELSE PLANTING.

”



— Carl Eliason, Crooks, SD
Minnehaha County



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Natural Resources Conservation Service

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