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Soil Health Practices Revive Salinity Areas Regenerating Dead Zones

By Lura Roti for SDSHC

White desert is how Frederick farmer, Don Nickelson, used to describe the saline patches on his land. "Nothing would grow there," says the crop and cattle producer.

Hitchcock farmer, Scott Hamilton understands. Saline patches began showing up on his land in the 1990s. "If nothing will grow, not even (the weed) kochia, you know the land is in pretty tough shape." Although their approaches vary, both farmers discovered by implementing soil health practices, they were able to restore life to these former dead zones.



Don Nickelson (pictured at left) began bale grazing on saline patches, four years ago.



Scott Hamilton has used native prairie landscapes as a guide, planting perennial grass species in saline areas.

Geological roots

Although landscape, soil type and climate may differ, the root of salinity issues on the land today stem from a common source that dates back to geology 65 to 145 million years ago, explains Cheryl Reese, South Dakota State University Senior Lecturer in the Department of Agronomy, Horticulture and Plant Science. "Most of the interior of the United States, from Texas to North Dakota - including South Dakota - was covered by a shallow, in-land, sea." She explains, shale a type of sedimentary rock, was deposited at the bottom of this sea for millions of years. "The shale contains salts because it was deposited in a marine environment," Reese says.

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Register For 2020 Soil Health School To Be Held In Mitchell

By Lura Roti for SDSHC

The 2020 South Dakota Soil Health Coalition (SDSHC) Soil Health School will be held in Mitchell, S.D., on the Stehly Farm and at the Highland Conference Center (2000 Highland Way). Registration is now open for the School which is scheduled for August 31-September 2.

"If you are seriously interested in soil health and all that goes into it, this is a very good place to be," explains Dennis Hoyle, founding SDSHC board member and Edmunds County farmer. Held in a new location every two years, Hoyle explains the Soil Health School is designed to provide applicable, research-based, expert and landowner-tested resources and information to producers through on-farm demonstrations and classroom sessions.



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What remains today of this prehistoric sea are those salty shale deposits. The salts in this deposit are highly soluble in water. As the groundwater, water tables rise, due to increased precipitation, salts from this old marine deposit can seep to the soil surface and form white patches on the surface of fields and pastures, often referred to as saline seeps.

The location of a saline seep depends on a number of factors. These factors include how close the shale deposit is to the soil's surface and how the water moves under the surface of the land. For example, if water percolating through the soil meets an impermeable soil horizon (layer) than water will be forced to flow along this border and potentially form a saline seep on the side of a hill.

Let Mother Nature be your guide

Sometimes the solution is right in front of you. This was the case for Scott Hamilton. For years, he'd been trying to get crops to grow on some saline patches. But instead of progress, the patches increased in size. Then, one day he looked across the road. Just a few yards away, on pastureland, he noticed quite a few forages growing.

"I thought, why am I fighting this? If plants are growing on that side of the road, why aren't they growing on this side of the road." He realized, that instead of working to get specific crops to grow, he would experiment with a variety of forages to see what would grow in saline soils. "In native prairie, there are up to 300 different species of plants in one spot," he says. "So, if one plant can't grow, another one does. That is what I wanted – to put together a blend that is diverse enough to work all the time."

Working with Millborn Seeds he began trying different blends and ratios until they came up with a diverse blend that worked: tall wheatgrass, AC Saltlander green wheatgrass, Garrison creeping foxtail, intermediate wheat grass, and salinity max alfalfa. In fact, the blend works so well, the company named it "The Hamilton." "Neighbors would stop and ask me what I was doing. I explained it to them and told them to call Millborn and tell them you want The Hamilton," he says.

Today, instead of trying to get corn or soybeans to grow, Hamilton raises about 3 to 3.5 tons of forage per acre for his cattle. "By not fighting nature, I am not spending money on those areas," Hamilton says. "Sure, if I try and convert it back to crop production, it would probably work for a little while, but it would go back to saline after a while. Since I can't farm the saline or salt spots most of the time anyway. Why fight it?" Contact your local seed dealer or technical representative to create a mix customized for your area, management needs and goals.



Formerly unproductive cropland now producing forage.

Backed by science

Growing a diverse mix of salt tolerant perennial grasses on saline areas is a proven solution, explains Reese. "It goes back to plant roots and transpiration (water movement through the plant)," she says. "The roots of perennial grasses go down very deep and can potentially lower the ground water table which is the source of the salts coming to the surface when the ground is not covered with vegetation." She adds, the longer there is a living root on soils susceptible to saline issues, the better. "That is why planting cover crops after winter wheat or spring wheat is a good idea. It provides a source of organic acids and carbon for the soil microbial population and may potentially keep the water table lower."

Let the cows do the work

After wracking his brain to try and fix the "white deserts" on his land, crop and cattle producer Don Nickelson decided to put his cattle to work for him. Four years ago, he began bale grazing the saline patches on his land. An idea that came to him after attending SDSHC Soil Health School. "I had limited time and limited resources. But I learned, keeping things covered is one of the principles of soil health. This ground was uncovered. It was too wet in the spring to do anything with it. And come summer, it was cracked and looked like a white desert."

He stacked bales of hay close together - only 10 to 12-feet apart. "Having livestock, I knew a lot of things grow in barn lots once you pull the cows. I knew the cows would be standing around trampling the hay and manure into the ground. I knew something would grow without me having to do too much work." Nickelson was right. Within a season, seeds brought in with the bales began to grow. "Some people think of it as weeds growing. I only call it a weed if it is competing with something else," he says. "I think of it like a scab. It looks kind of ugly, but that's how healing starts."

Along the edges of the saline patches, he began no-till drilling some salt tolerant grasses, like Garrison creeping foxtail. "I am amazed how much it has changed in the last few years. They are not 100 percent. And it never will be my highest producing areas of the field. I will always treat it as forage grass and utilize it for my livestock."

He likens the process of converting white deserts to lush pasture to rescuing a calf during calving season. "It's like when you save a calf that otherwise would have died – that ground was essentially dead – and I was able to save it by getting some plants growing on it."



Saline area which has been bale grazed on, for multiple years.

To learn more about how soil health practices can improve your land and connect with soil health technicians or producers in your area willing to mentor, visit www.sdsoilhealthcoalition.org.

Soil Health Resources



South Dakota
Soil Health Coalition



These virtual meetings, held through Zoom, facilitated great discussion between SDSHC directors, staff, and participants on everything Cover Crops! Those who joined were able to share their experiences, ask questions and connect with others. Recordings of these sessions may become available and membership will be notified!

Download A Soil Health Assessment Card Today!

The image shows a detailed assessment scorecard with columns for indicators, observations, and scores. Indicators include Soil Cover, Biological Activity, Soil Disturbance, Soil Disturbance (Duration), Living Roots, Crop Diversity, Soil Erodibility Management, Soil Erosion (Wind), Soil Erosion (Water), Observations after rainfall event, Soil Structure (0-17), and Soil Structure (18-27). Each indicator has a corresponding observation and a score field.



Grazing Rape Provides High Quality Forage

By: Alvaro Garcia, Dairy Knowledge Center

Livestock production under grazing conditions requires practical knowledge of animal behavior as well as plant growth cycles. Depending on the region of the world, the forage base may not be available year-round, and requires management techniques that allow to save it for times of shortages. This has oftentimes consisted of either feeding conserved forages or stockpiling perennial forage that can later be grazed.

Orchardgrass and tall fescue are typical perennial cool season forage species popular in pasture-based operations. They are however not plentiful year-round and need to be supplemented with other plant species. One such companion has been perennial ryegrass which however has some issues of its own, such as a fast decline in nutritive value with maturity. Annual ryegrass however is sensitive to grazing pressure particularly when not grazed at an adequate point in its development, and in regions where climate is relatively adverse.

One alternative that has been explored in the US is the use of forage brassicas. Brassicas are cool-season annuals that can help fill the gap with quality forage throughout the grazing season. Once established they grow rapidly, tolerate better the spring-summer warmer temperatures, and maintain a relatively greater proportion of highly nutritious leaves that helps later in the year. Their more widespread adoption has not been widespread because of limited research to understand their management under grazing conditions.

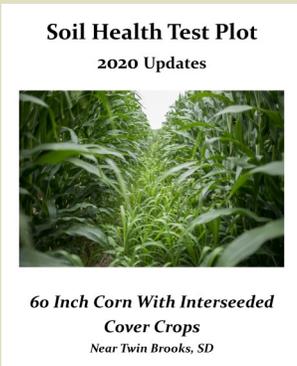
A recent study (Dillard et al., 2020) conducted in Pennsylvania, compared the yield and forage quality of three forage brassica species relative to annual ryegrass. The experimental design consisted of three treatments with different types of Brassicas and one control of ryegrass:

- Barsica RAP (Forage rape; *Brassica napus* L.)
- Inspiration CAN (*Brassica napus* L.)
- Appin TUR (*Brassica rapa* L.)
- KB Supreme (CON; annual ryegrass)

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Updates From The Field

Summary Of Test Plots Across The State



As a no till farmer who has been utilizing cover crops for many years, David Kruger is interested in taking his soil health to the next level. He has been experimenting with 60 inch interseeded corn which would increase the biodiversity throughout his system. David has been experimenting with 60-inch corn for the last two growing seasons. Last years plot location is now planted to soybeans, which will be followed throughout the growing season. We will monitor differences in weed pressure where the interseeded cover crops were planted vs. where they were not, emergence, yield, test weight, and moisture at harvest.

This year the 60-inch corn plot was planted into wheat stubble, that had been combined using a stripper head leaving behind great residue to protect the soil surface. Both the 60 inch and 30-inch spaced corn were planted at a 30K population on April 25th. There are 4 replications of 30-inch rows without cover crops and 4 replications of 60-inch corn with interseeded covers which were seeded on June 4th using a 10' Vermeer hay buster. The cover crop blend is a 13-way mix consisting of Medium Red Clover, Barley, Buckwheat, Cowpeas, Hairy Vetch, Mung Bean, Phacelia, Rape Seed, Sunn Hemp, Flax, Oats, and annual Ryegrass. Throughout the season we will monitor the differences in soil moisture, soil biology, plant health, plant stage, and cover crop growth. At harvest time we will monitor yield, test weight, moisture, cover crop biomass and value.

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As a transitioning soil health farmer, Ryan Larson is implementing the five soil health principles of maintaining soil cover, minimizing soil disturbance, maintaining living roots, encouraging diversity, and integrating livestock on the land he manages. Over the last few years, he has implemented rotational grazing with his beef cattle herd on pasture lands as well as crop lands to better utilize crop residues and cover crops.

Last year Ryan interseeded diverse cover crops between his 30" corn rows and was impressed with the cover crop growth early in the season. Prior to corn tassel, he observed the cover crop beginning to dwindle due to reduced sunlight in the narrow rows. This year Ryan is experimenting with 60" corn rows with cover crops interseeded between the wide rows. After corn grain harvest, the field will be utilized by his cows to graze the forage late in the fall.

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This year Ryan's 60-inch corn plot was no-till planted into soybean stubble, that was also spread with cattle manure. On May 1st, the corn was seeded to a desired population of 32K. When seeding the 60" rows, the mechanical planter transmission's highest setting was set to 59K (29.5K seeds per acre for the wide rows) and half of the seed meters were disabled. June 5th the cover crop was seeded between the wide corn rows using a three-point hitch mounted grain drill seeding five cover crop rows between the 60" corn rows. The cover crop mix consists of 10 different species with a seeding rate of approximately 27 pounds per acre. Information gathered from this field comparison will help quantify costs and opportunities associated with diversifying corn production with cover crops.

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Soil Health Events

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"This is not soil health 101. We pack a lot into the school," says Hoyle, a third-generation farmer who has been implementing soil health practices on his farm since 1982. "We figure if you are going to invest the time, then we will provide as much information as possible."

40 years of soil health practices on display

Four decades ago, economics motivated brothers Craig and Gene Stehly to begin implementing soil health-focused farming practices on their Mitchell farm. "Our first motivation is always profit," Gene says. "We are running a business. If you look at the result of the journey, we started 40 years ago, we have soil that is much healthier in every way. We can raise more bushels with less inputs."

Wide-row corn & nutrient management test plots

Since their first organic matter test came back at 2 percent in the 1980s, the brothers' soil health efforts have resulted in rebuilding organic matter in most fields to between 4 and 5 percent. "It comes down to profitability. If you improve organic matter, you'll get higher yields and more water holding capacity," explains Craig. "Also, it's about the land as a legacy. If you want your land to remain productive, you need to build organic matter."

During the 2020 Soil Health School, attendees will have an opportunity to learn firsthand what practices have worked on the Stehly Farm as well as Edinger's. Several test plots provide Soil Health School participants with firsthand, field-based opportunities to learn from soil health experts about nutrient management, grazing cover crops, manure application and cover crop practices. The test plots were established by SDSHC and South Dakota State University (SDSU) on the Stehly Farm and, Chet and Charlie Edinger's farm.

Wide-row corn: An 8-acre field has been planted to 44-inch corn rows and interseeded with a diverse cover crop mix when the corn was V4 stage. The cover crop mix is designed to help cycle the corn stalk residue after 2020 corn harvest. In 2021, corn will be planted into the cover crop residue.

Grazing cover crops: Several cover crop plots were planted into a 3-acre parcel of land on the Edinger Farm. Developed for the purpose of livestock grazing, the majority of the plot was planted to a diverse cover crop mix of cool and warm season grasses and broadleaves. A real-time demonstration, this plot is designed to give participants the opportunity to apply classroom knowledge and monitor their results.

Biomass benefits: Participants will see firsthand the amount of biomass produced by different cover crop mixes and scenarios as they tour four different cover crop plots. These plots provide insight into what mixes may work best depending on a producer's land and management goals - biomass for livestock grazing or soil cover to minimize weed pressure.

Herbicide impact: Several individual cover crop plots, featuring diverse plant species, were established by SDSU to provide producers with insight into how various herbicides impact specific cover crop species.

Experts discuss nutrient management and much more

Livestock manure is one of the quickest ways to build soil organic matter, explains John Lentz, Ag Nutrient Management Team Leader for Natural Resources Conservation Service (NRCS). "Different from commercial fertilizer, livestock manure builds organic matter because it also contains carbon," Lentz says.

During the 2020 Soil Health School, Lentz will share how producers can make the most of their livestock manure. He is one of several experts invited to lead interactive seminars during the classroom portion of the school. In addition to nutrient management, other topics to be covered include microbiology, machinery adaptations, soils, carbon, beneficial insects, cover crops and more.

**Class Size Is Limited,
Register Today!**

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Upcoming Soil Health Events

**-July 27-29, Virtual
75th Soil & Water
Conservation Society
Annual Meeting**

**-July 30-31, Virtual
Soil Health Institute
Annual Meeting**

**-Aug. 31-Sept. 2
Mitchell, SD
Soil Health School**



**Access Our E vents
Calendar [HERE](#).**

“The experience helps build confidence in what you are doing and confidence in making the investment to change to farming practices that are outside the norm. For anyone interested in soil health, this is one of the best events to attend.”



Trevor Zantow
Producer Near Leola, SD




Soil Health School changed my whole perspective on soil management. I now look at things differently and treat the causes rather than the symptoms. I definitely recommend others to attend.

Don Nickelson
Producer Near Frederick, SD




I gained a lot of new knowledge about land management and believe it is so important that we take care of the earth and soil around us.

Sasheen Thin Elk
Realty Director For The
Yankton Sioux Tribe





South Dakota

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Q&A: 2020 World Food Prize laureate wants world to pay attention to soil health

Q&A: 2020 World Food Prize Laureate Wants World To Pay Attention To Soil Health

Why is soil health a fundamental part of the food system?

“Ninety-five percent of the food that we consume globally comes from soil. Agriculture is becoming more important. If anything happened to soil productivity and

functionality, that impacts all ecosystem services that are provisioned by soil. There are many ecosystem services: food quantity, food quality, nutrition quality, food safety, water quality, water renewability, transport of pollutants — chemicals from soil to water — air quality. Soil is the major source of greenhouse gases that cause global warming. My research has been focused on how to make soil a sink of adverse carbon dioxide and methane, rather than a source.” Visit <https://bit.ly/2Wro8zv> to read the full article/ Q&A session.