

Keep Soil Out of Sight

by Jon Stika

I don't like to see the soil. This may seem like an odd statement for a soil scientist to make, but it's true. If improving soil health is your goal, you should not see the soil very often. Soil should always be covered by growing plants and/or their residues, and therefore, rarely be visible from above. This is true regardless of land use (cropland, hayland, pasture or range).

Managing for soil health (improved soil function) is mostly a matter of maintaining suitable habitat for the myriad of creatures that comprise the soil food web. This can be accomplished by disturbing the soil as little as possible, growing as many different species of plants as practical, keeping living plants in the soil as often as possible and keeping the soil covered all the time. Even in a no-till system, soil cover cannot be taken for granted. Because of harvest methods, amounts of residue produced and carbon:nitrogen ratios of various crop residues, there are times when soil cover may be lacking.

Why is soil cover so important for improving soil health? Soil cover conserves moisture, intercepts raindrop impacts, suppresses weed growth and provides habitat for members of the soil food web who spend at least some of their time above, and not in, the soil.

In western North Dakota, more than 65% of the soil must remain covered to limit evaporation of water from the soil. Bare soil heats up quickly in direct sunlight and the hotter the soil gets, the faster water will evaporate from it. This not only wastes water, but leaves salts behind at the soil surface. Residue cover also limits the drying effect of the wind and traps snow during the winter.

Soil cover also protects soil aggregates from taking a beating by raindrops that impact the soil. A healthy soil with water-stable aggregates held together by biologic glues may be able to withstand wetting by the rain, but may not be able to withstand a pounding by impacts from raindrops for very long. If water-stable soil

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aggregates are going to allow water to infiltrate into the soil; they have to be protected with growing crops, or crop residues, from disintegration by the hammering energy of raindrops.

A mulch of crop residues on the soil surface also suppresses weeds early in the growing season to allow the intended crop to gain an advantage. This is particularly the case with a rolled cover crop that can cover the entire soil surface at once.



NRCS photo

Crop residues on the soil surface also provide habitat for many species of arthropods that begin residue decomposition by shredding residues into smaller pieces. If these "shredders" have good residue habitat they can increase residue decomposition (and therefore nutrient cycling) up to 25%. Not all members of the soil food web are microscopic.

Keeping the soil covered, while allowing crop residues to decompose so their nutrients can be cycled back into the soil, can be a bit of a balancing act. Producers must give careful consideration to their crop rotation (including any cover crops) and residue management if they are to keep the soil covered and fed at the same time.

A New Perspective on Soil Conservation

by Jon Stika

As I traveled around western North Dakota this summer, I observed some fields with slopes that had visible rills and gullies, even though there were reasonably good crops growing on them. I also observed many other fields with similar slopes and soils that did not show any visible signs of rill or gully erosion. Twenty years ago, most fields with such slopes would have had rills and gullies after summer thunderstorms.

After some checking, I found that the fields with rills and gullies were those farmed using a considerable amount of tillage. By contrast, the fields without symptoms of rills and gullies had not been tilled to produce annual crops for the past several years. It dawned on me that in the past we used to think that soil erosion on slopes was inevitable during significant rain events because of the water that ran off from the soil



Farmers observe how aggregate stability affects water infiltration at a soil health clinic near Makoti, ND Photo by Diana Irizarry

Now that the majority of the land in western North Dakota is no longer tilled and has at least a fair degree of crop rotation diversity, the soils are functioning better, with more water infiltrating into the soil instead of running off. In the past, we were dealing with collapsed, non-functioning soils and trying to figure out how to deal with all the water that was running off the fields. As a colleague recently pointed out to me, soils do not have a runoff problem, they have an infiltration problem. The water runs off because it does not infiltrate due to a lack of aggregate stability at the soil surface. Now that we realize that erosion is a symptom of a soil that is not functioning, we can deliver the message to producers that we can help them build their soil and get it to function again; erosion is no longer a symptom.

There have been many folks that have attempted to understand the reasons why farmers may be reluctant to apply conservation practices to their land. I believe it is because our message of “you have erosion and need to control it” was not a positive one. We admitted that we could only help them slow the decline of their soil from the effects of erosion and catch the water and sediment as it tried to leave the field. This was not a very hopeful message and therefore did not usually elicit positive responses from producers.



A group of farmers and conservationists from several states tour the Burleigh County SCD soil health demonstration near Menoken, ND Photo by Jon Stika

In contrast, our message from a soil health perspective now is, “We can help you rebuild your soil and get it to function again to reduce your input costs and be truly sustainable.” This is a message of hope. Producers respond positively to it and are applying conservation practices such as no-till, crop rotation, residue management, cover crops, and nutrient management as tools to pursue a goal of building soil health.

The only shortcoming to getting conservation on the ground in the past was everyone’s lack of understanding about how soil functions. Currently, we are providing a positive message to producers by explaining in sensible terms how the soil functions and how to get it to function better.

Armed with an understanding of how the soil functions, we can now provide the education and technical assistance that will solve resource problems that were the result of dysfunctional soil in the past. With soil health as the goal, we will be able to do an even better job of helping people help the land.

“From the Ground Up” has been sharing news and information on natural resource management in western North Dakota since 1996.

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