

Rocks and Soil Physics

14 September 2026

I have been provoked by my darling wife to write the following. She is absolutely in order to make such a request. I am hopeful that many of you who have to farm with a prominent stoney phase on your farm will share her enthusiasm for what follows. The adage “an ounce of prevention is worth a pound of cure” might be appropriate, especially when it comes to picking pounds of rocks (or maybe tons).

I began to experience the rock situation at a very tender age when I got old enough to pick rocks. It got more difficult that when I got taller, so we picked them using a dung fork. (that's a pretty small rock) We always would marvel how in two or three years of growing a hay crop we would be able to destroy sickle knives on the mowing machine with rocks that were not apparent after we had painstakingly hand-picked the whole field.

I shall never forget my father, complaining over the dinner table, “I thought you boys picked the rocks on that piece!”

The similarity between what I and my dear Dad experienced here in my youth and no-till farming never entered my conscious mind for decades which have followed. Who had ever heard of no-till in 1949?

By now you may have guessed where this conversation is going but to be sure I will finish the picture. It all ties into the phenomenon of microerosion and freeze/thaw cycles of soil. I learned a couple of new terms recently which I am going to use here so that if you have occasion to repeat this which follows, you can sound better informed than I have for many moons.

Microerosion results from two discrete physical events which occur in soil under the influence of water percolation, infiltration and hydration. Of course, percolation doesn't happen unless the soil experiences infiltration, which can be a problem. That's why I have included it here in my short list. Percolation refers to the vertical downward movement of water known as gravitational water or freewater. Lastly, hydration refers to the replenishing of hygroscopic water on the colloidal surfaces of the soil and organic matter.

When all of these function together in harmony the soil will approach the ideal proportions of air, water and soil particles, (25/25/50). As most of you know, perhaps this harmonious arrangement is flawed by the addition of water to the surface of the soil and the attraction which gravity has for the water molecule. Hence, we experience eluviation or downward movement of soil particles and other things in the soil profile which can be carried by gravitational water. As this water moves downward it is replenishing hygroscopic water and therefore begins to slow and eventually ceases to be gravitational water. At this point illuviation takes place. In other words, the particles of soil which have been moving with the gravitational water are no longer being carried downward and come to rest in a new location in a concentration. This concentration at one or more locations impedes the flow of gravitational water in the future. The

impediment to percolation is a direct result of the reduction in soil pore space size from these downward transported particles.

The reduction in percolation rate, which is what we are really talking about here, is actually a result of the inability of soil air to escape upward out of the soil. The passageways for this air escape are a result of the pore spaces being occluded or plugged with mostly silt-sized soil particles. You can find the data collected using soil textural analysis which clearly illustrates this in several articles on www.soilcursebuster.com.

Ok, I had to go through all of this to get to the point of being able to understand why the CurseBuster can represent a serious aggravation with rocks. Unfortunately, there is not much that adjusting the machine can do to avoid creating the problem of rocks to pick or deal with other ways...and there are other things besides picking [them, at](#) least in the near term. What the CurseBuster has done is reveal the results of microerosion when combined with freeze/thaw cycles which characterize northern climes in the spring. and perhaps even in mid-winter thaws.

Bear with me as we walk through the sequence. Keep in mind that it is gravitational water which produces the eluviation and illuviation. I say this because there are many low rainfall climates which still experience microerosion but not because they had lots of precipitation. A few large amounts of precipitation events that don't add up to very much total rainfall can move a lot of silt. In fact, direct seeding or no-till practices can improve infiltration significantly and actually accelerate the rate of eluviation or particle transport downward.

Now we are going to add cold enough to freeze water now to a soil profile which has a poor percolation rate. Most of you recognize this as soil that "honeycombs". That's when we do that frost seeding of red clover or other small seeded crops that can withstand cold soil temperatures after germinating.

Question...What is happening as the gravitational water, which accumulated from the warm day yesterday that is sitting above the density concentration of silt as it encounters temperatures that drop to below freezing? Of course. water crystals that form will swell and everything trapped in that ice moves with the water crystals upward, just like water does in an ice cube tray.

As the sun and air warm during this freeze/thaw cycle, the soil thaws the ice and the soil begins to float in the water. The net effect is that the rocks that were trapped in the ice are rising in the soil profile. I want you to imagine this happening several times in the course of a year and then over several years.

Now let's assume that you have discovered frustrated taproot formation under beans and brassicas; Pancake root system architecture on corn plants and other grasses, and you are going to do something to arrest this "compaction issue". We are typically going to do this with a soil engaging device of some kind that is essentially trying to break rocks out of concrete. You got it. The rocks which have been getting closer to the surface and more of them every year through the freeze/thaw cycles combined with water perched in the top of the plow layer are going to emerge onto the surface of the field.

At this point I need to stress that the number of rocks emerging with a CurseBuster is highly affected by the action of the Phillips Rotary harrow attachment. So, one option to minimize the rock problem is to raise the harrows so that the combing action of the harrow is eliminated. This is not going to eliminate the rock problem. The other thing to do is to not run the roller/tine system at an offset angle. Run it straight perhaps two or three times over the early adoption period. The fracturing will let rocks begin to move laterally instead of vertically.

The other fix is to roll or pack the field in an effort to push rocks back into the plow layer. This is actually very effective in making rocks disappear in lieu of picking them. Since the soil was not predisposed to traffic or roller compaction there is little to no impact on root system development. Additionally, the rock trying to re-enter the plow layer will not encounter resistance from a horizontal tillage pass as would be the case with a disc or field cultivator pass.

Like so many other things in farming, there are tradeoffs in doing something.; solve one problem and make a different one. The interesting long term benefit which I have heard repeatedly is "I have had to pick fewer rocks than ever before". Think about it. If your soil stops jacking up the rocks in the plow layer through the freeze/thaw cycles they begin to disappear for good. Is the soil going to get suddenly immune to freezing temperatures? NO, OF COURSE NOT! However, if the microerosion phenomenon which has resulted in Gravitational water in the top of the plow layer freezing, then the soil doesn't swell and move the rocks upward. The lack of disturbance of the horizontal density layer which has developed over time and precipitation events is exactly what no-tillage ultimately presents.

Please bear in mind that to be effective try to get the machine over your fields in the fall following the last harvest of perennials and anytime before spring on open ground, but the sooner behind the combine the better.

No extra cost for this ... tap rooted plants, like alfalfa and fall-seeded canola, even winter wheat won't be heaving in the spring either.

Sorry that this has turned into a chapter in the book. God Bless.