

# Runoff & Erosion in Long-Term No-Till

by Matt Hagny

TECHNIQUE

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Some intense rain events in recent years have highlighted our failure to eliminate runoff and erosion in long-term no-till on many soils in



Photo by Matt Hagny.

Devastating erosion in central Kansas following a 4.5-inch rain in a couple hours. Several more big rains continued to damage the field that season, from which the field will never recover. The field had been low-disturbance no-till for 14 years; all residues were retained, and grass cover crops were grown nearly to maturity on several occasions. At the time of the photo, soybeans had been seeded after stacked corn, which had followed stacked wheat and double-crop proso millet. Residue levels had gotten too low during and after the 2d-year corn—a grass cover crop was badly needed. Note that the field had an abundance of terraces, which did almost nothing to mitigate the erosion.

Nebraska, Kansas, and Oklahoma. I had always assumed that improvements in soil aggregation and porosity would eventually take care of the problem after 10 – 15 years of continuous no-till with adequate cropping intensity and all residues retained. I was wrong—we're not even close to having the problem under control.

While essentially all studies that have ever been conducted show that infiltration is improved with no-till, and that erosion by runoff is reduced by 95 – 99% with no-till (with adequate cropping intensity and residues retained), the problem is that a 'little bit' of erosion in continuous no-till creates major problems. The rills that form in continuous no-till never get smoothed or filled as they did routinely in the days of tillage (occasionally they were filled with dozers). Maybe with an aggressive coultter cart, or with hoe or knife openers, enough soil gets moved around to fill some small rills, but it's sorta like robbing Peter to pay Paul—soil is being dragged down the hill by the disturbance (Lobb's tillage erosion),

and you might find the disturbance costly in other ways (too much residue loss; planting and 'banking' weed seeds). So the field gets rougher as the rills get a bit deeper with each intense rain. Eventually you find a scraper to carry in some soil to fill the deeper rills, and you just bounce across the others, cursing the whole time. Rolf Derpsch is right: Erosion must be zero.<sup>1</sup>

The scary aspect of erosion is that the ability to control it is utterly

**Occasional tracts of native sod have been converted to cropland in recent decades, and the productivity advantage of these areas compared to older cropland is enormous.**

dependent on being able to grow enough vegetation, and this ability to grow robust vegetation declines significantly each time some of the most fertile soil slides down the hill. Eventually, you slip 'over the edge,' and no amount of management can halt the erosion—you've created a wasteland. Some will protest that erosion has been preached at them for decades, and they're still growing crops, maybe even better crops

<sup>1</sup> Or extremely close to zero. Some erosion occurred on the prairies and other natural ecosystems, although typically it was extremely slow over long geologic timeframes, and quite often soil formation outpaced erosion. Even the most skilled no-till practitioners using annual crops generally do not attain erosion rates as slow as nature's, but this must be the goal. (During some phases of the crop rotation, such as during or soon after a good wheat crop, long-term no-till with 90 – 100% residue cover and a dry subsoil usually has infiltration rates similar to the average perennial pasture, although erosion is slightly higher with annual cropping due to the absence of a fibrous perennial root system enmeshing the soil particles, as well as the presence of soil disturbance with mechanical openers during seeding or fertilizing. Also, note that the average perennial pasture is considerably degraded from its natural state.) Any cropping system involving tillage on mild slopes (or where the wind blows) isn't even close to being sustainable.