Blanchard River Flooding

In late August 2007, the Blanchard River watershed received between 7 - 9 inches of rainfall overnight and another 1.5 to 3 inches of rain the next day. Tremendous flooding in Findlay and Ottawa occurred; resulting in damaged homes, businesses, and lost property. This rainfall was considered a 100 year flood which is simply the probability of a heavy rainfall event occurring once every 100 years. However, these rare floods events seem to be occurring more often. Dr. Norm Fausey, USDA-ARS soil drainage scientist and I looked at two agricultural best management practices that might be used to reduce this flooding problem.

Since agriculture accounts for 85% to 90% of the land area in the Blanchard River watershed, agriculture needs to be a part of the solution. Perhaps we should consider trying to deal with rainfall on a per acre basis basis versus waiting for the water to gain momentum and flow down the river? *Overall, the goal should be to increase the water infiltration, increase water retention and storage, and decrease the velocity of the water flowing off the land.*

How does tillage and land management affect water infiltration, soil absorption of water, and peak water discharge to our rivers and streams? Let's compare a bare soil, a no-till field, and a permanent grass field using the USDA-NRCS Engineering Handbook, Hydrology calculator on a 3% slope. On a bare soil with a 2.8 inch rain, runoff is 1.49 inches (53% lost), 1.31 inches absorbed and peak flood flow is 122 cubic feet per second (CFS). For a no-till field on a straight row field (corn or soybeans) with residue, runoff is 0.83 inches (30%), 1.97 inches absorbed and peak flood flow is 55 CFS. For a permanent grass field, runoff is 0.29 inches (10%), 2.51 inches absorbed and peak flood flow is 10 CFS. The permanent grass field has a 92% reduction in peak flows.

What would happen on a more substantial rainfall event? On a bare soil with a 4.5 inch rain (same parameters), runoff is 3 inches (67%), 1.5 inches absorbed and peak flow is 248 CFS. For a no-till field, runoff is 2.05 inches (46%), 2.45 inches absorbed and peak flood flow is 145 CFS. For a grass field, runoff is 1.08 inches (24%), 3.42 inches absorbed and peak flood flow is 58 CFS. The permanent grass field has a 77% reduction in peak flows on a 4.5 inch rain. On a 9 inch rain (same parameters), a permanent grass cover could potentially absorb 53% of the rainfall. Source: USDA-NRCS Engineering Handbook, Hydrology calculator.

How effective are our Northwest Ohio soils at storing water in the soil profile? Next time it rains, watch how water flows off the land to our creeks and rivers. In an ideal soil, 45% of the soil volume is composed of minerals (sand, silt or clay particles), 5% is soil organic matter and 25% is air space and 25% is water at 50% moisture. In this ideal soil, 50% is pore space so it is possible to store 6 inches of water per foot of topsoil when saturated. In tilled soils, the mineral portion does not change but the soil organic matter content is only 2-3% and about one-third to

half of the soil pore space has been lost due to soil compaction. The result is slower water infiltration and less water stored in the soil profile.

Due to surface crusting and poor infiltration, a significant portion of the rain runoffs over the soil surface, picking up sediment and nutrients, increasing in speed as it moves. *A doubling of water velocity increases the holding capacity of the water 64 times to move more soil, sediment, and nutrients in our rivers and streams (Walker et al 2006).* A hard driving rain may have a terminal velocity of 35 miles per hour when it hits the ground! No-till farming with crop residues on the surface and living crops act like shock absorbers to slow down the velocity of raindrops before soil is displaced and nutrients are lost in surface water.

Growing cover crops and no-tilling row crops could improve water infiltration and potentially reduce flooding. Although permanent grass cover provides the highest water infiltration; most farmers raise row crops like corn, soybeans, and wheat rather than permanent grass or hay crops. Agriculture has the ability to mimic that natural system by using no-till with cover crops to increase water infiltration, increase water retention and storage, and decrease flooding potential. Storing additional soil water can be beneficial in a dry year. The end result is healthier crops, potentially less runoff and flooding, and cleaner water with higher farm profits since fewer inputs are lost in runoff.