Oklahoma agriculture plays a significant role in the quality of the water found in our streams, rivers, and reservoirs simply because agricultural land represents a large portion of Oklahoma. Cropland agriculture can contribute to poor water quality because of sediment, nutrients, and pesticides lost from these lands to the surface water. No-till management is the most effective way to reduce these negative impacts of crop production on water quality.

The most obvious and immediate benefit comes from the dramatic reduction in erosion. Even under conservation tillage, it is easy to erode two to five tons of soil annually from a cropland field. A portion of this sediment reaches surface water. To put this in perspective, if five tons per acre per year of soil were eroded from a 160-acre field into a 1-acre pond, the depth of the pond would decrease by approximately 5 inches per year. Removing tillage and maintaining continuous residue cover can easily reduce this rate of erosion to a fraction of a ton per year.

With this reduction in erosion, a reduction in other common pollutants from agriculture is also achieved. The most well studied of which is the reduction in phosphorus transport to surface waters. Phosphorus is insoluble relative to other nutrients such as nitrogen. Most phosphorus that is lost from cropland soil to surface waters is attached to eroded clay particles. Therefore, no-till can dramatically reduce phosphorus losses to surface water. However, when phosphorus is applied in excess of crop requirement, it will accumulate near the soil surface. Excess accumulation can cause water quality problems even under no-till. This will generally only occur when manures or other organic nutrient sources are used for long periods of time. Care should be taken that excess phosphorus is not applied regardless of its source.

Nitrogen is a mobile nutrient, and therefore does not have to be transported with sediment to surface waters. This makes its management with respect to environmental quality more challenging than phosphorus. With no-till management, much of the nitrogen is surface applied. When this is done prior to a rainfall event to prevent NH₃ volatilization, we are increasing the potential for off-site loss to the environment. Therefore, care should always be taken to select the appropriate N rate without applying excess nitrogen. Another option to reduce the potential for N loss to surface waters is to inject liquid or gas N with low disturbance applicators. This places the N below the soil surface, where it is protected from losses to runoff and NH₃ volatilization.
In its natural state, soil serves as a water filter, which removes many contaminants. However, under conventional tillage its capacity to filter water is reduced due to surface crusting, which limits water infiltration. Removing tillage allows natural processes to occur that improve soil structure, which in turn improves water infiltration rates. This allows the soil to regain its function as a filter, and thereby reduces contaminants as they move into groundwater instead of being washed to the nearest surface water body. This being said, it is always important to remember that everything humans do can impact the environment. There is no doubt that the benefits of no-till far outweigh the potential harmful consequences such as an increase in the potential for pesticide contamination. However, always keep in mind that when agricultural inputs are applied in excess of that required for profitable production, they can result in unwarranted harm to water, and in some cases, air quality. Sound soil fertility management can further improve the effectiveness of no-till in protecting the quality of Oklahoma’s water supply.