



FIELD NOTES

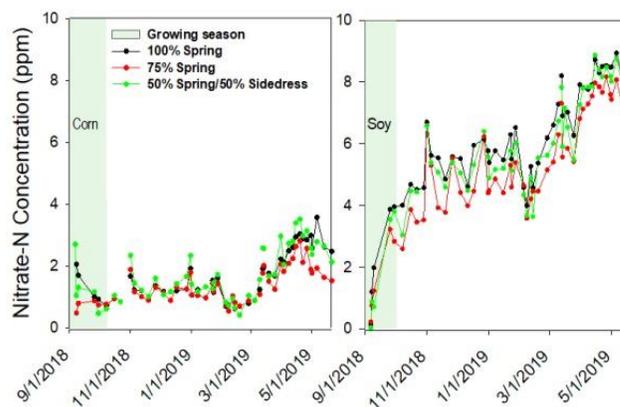
Unusual Year – Unusual Response: Douglas County Tile Drainage Study

The replicated tile drainage study in Douglas County showed that more nitrate loss occurred following soybean production than following corn this past drainage season. It's not that tile nitrate concentrations were particularly high after soybean last year, but rather, tile nitrate losses from corn were unusually low. In our 25 years of monitoring tile drainage water in central Illinois, we have never seen tile nitrate concentrations this low following corn production.

Unlike previous years, tile flow started before crops were harvested in September, two months earlier than usual. The first tile water samples had very low nitrate concentrations, regardless of previous crop, suggesting that both corn and soybean crops left little nitrate in the soil at harvest. Note: In 2018, average grain yield at this site was 205 bu/A for corn and 77 bu/A for soybean. For tiles following corn, nitrate remained at about 1 ppm all winter and modestly increased in the spring, reaching 3 ppm. *However, in tiles following soybean, nitrate quickly reached 4 ppm in October and steadily increased through the fall and accelerated in the spring reaching 8 ppm (prior to spring fertilizer N application on May 21).*

We were surprised by the sustained low tile nitrate concentrations throughout the winter following corn production last year. Although it is well established that microbial decomposition of corn residue can immobilize soil N, this past year was particularly interesting as the 2018 corn crop was found to be N deficient by the end of the growing season (as indicated by very low stalk nitrate values) and its residue had a very wide C:N ratio (>70:1). We believe that immobilization of soil N during the decomposition of this C-rich (and N-poor) corn residue limited nitrate leaching and decreased tile nitrate loss. On the other hand, we speculate that the soil system is C limited after soybean production and that nitrate liberated from the decomposition of soybean residue can and does substantially add to tile nitrate loads.

This unique site and experimental design allows for the simultaneous comparison of tile nitrate loss from corn and soybean production systems under any kind of weather scenario. Additionally, the weather extremes that we have experienced at this site in the past 4 years have been a great benefit to our understanding of how and when tile nitrate losses occur. Overall, these data suggest that soil N mineralization during the non-growing season, especially following soybean production, is a major source of tile nitrate, and therefore, river nitrate. As we have concluded before, tile nitrate loss is not simply a matter of excessive N fertilization. In fact, the similarity between the pattern of tile nitrate loss from the reduced rate treatment (red dots) and the full rate treatments (black and green dots) suggest that tile nitrate loss following soybean production had little to do with how much fertilizer N was applied the previous year.



Graph of tile nitrate concentrations from three fertilizer N treatments following either corn or soybean during this past year.

Each dot is the average of three replicates. Fertilizer N was applied to corn either as 1) full rate in the spring; 2) reduced rate in the spring; or 3) full rate split equally between spring and side-dress. The full rate of fertilizer N was 160 lbs/A and the reduced rate was 120 lbs/A. Soybean did not receive fertilizer N.