Module 6.3-2 Place phosphorus in the soil to protect water quality in Lake Erie. Phosphorus (P) is an essential nutrient for growing crops. But in excess concentration in streams, rivers and lakes it can lead to algal blooms. In the Lake Erie watershed region in and around the state of Ohio, USA, levels of dissolved P in rivers and algal blooms in lakes have been trending upward from 1995 to 2011. Fertilizers applied to the predominant corn-soybean cropping system are not the only cause, but are one of many probable causes. Wherever practical, growers are encouraged to place fertilizer P in the soil rather than on the soil surface, for two main reasons.

First, placing below the top 2 in. of the soil helps minimize its stratification within the soil profile (**Figure 1**). Stratification of soil P can develop in any soil that is not moldboard plowed. When the soil test P of the top 2 in. increases, so does the concentration of dissolved P in runoff water.

Second, P fertilizer is soluble P. Leaving it on the soil surface dramatically increases the concentration of dissolved P in any runoff that happens to occur soon after application. As shown in **Figure 2**, surface-applied fertilizer resulted in much more dissolved P in runoff than fertilizer incorporated into the soil. Incorporation also minimized levels of total P in runoff when P fertilizer was applied.

Incorporation can increase loss of total P through increased erosion. Using the minimum disturbance possible to place P into the soil is important for managing loss of both dissolved and total P. Innovative growers are coupling conservation tillage practices such as zone tillage with P placement to keep their cropping systems productive while minimizing nutrient losses.

References

Eckert, D.J. and J.W. Johnson. 1985. Agron. J. 77:789-792.

Tarkalson, D.D. and R.L. Mikkelsen. 2004. J. Environ. Qual. 33:1424–1430.

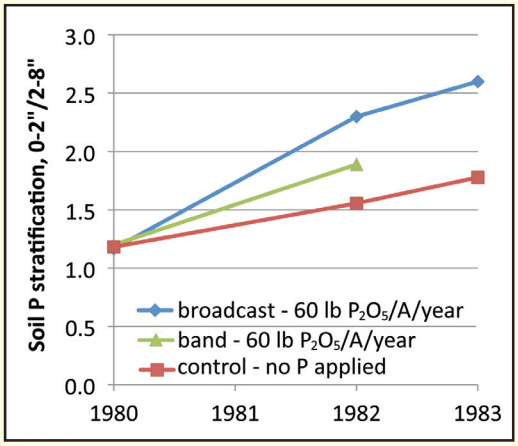

Figure 1. Soil P stratification—defined as the ratio of soil test P in the top 2 in. compared to that in the 2 to 8 in. depth—increased over time more with broadcast than with band application. Silt loam soil near Wooster, Ohio; continuous corn, no-till from spring 1980. Data from Eckert and Johnson (1985).

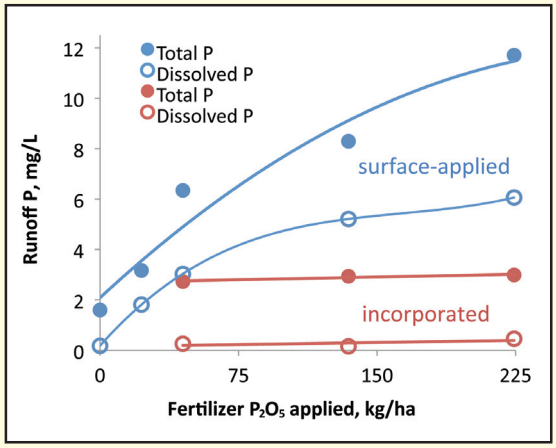

Figure 2. Concentration of dissolved and total P in runoff from a clay loam soil in North Carolina, from artificial rainfall immediately following application of superphosphate fertilizer. Incorporation was to a depth of 5 in. by rotary tillage following application. Data from Tarkalson and Mikkelson (2004).

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