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### TIPS FOR KEEPING PHOSPHORUS IN THE FIELD

**The phosphorus in commercial fertilizers in the U.S. is more than 60 to 80% water-soluble, which enhances phosphorus absorption by plant roots.** Phosphorus availability to plants is highest as soon as the fertilizer granule dissolves, and then it slowly declines as it reacts with the soil.

**Animal manures are lower in total phosphorus concentration...and portion that is water-soluble phosphorus (0.4 to 5% water-soluble)...compared to commercial fertilizers, yet manures may also deliver significant amounts of water-soluble phosphorus when applied at relatively high rates.**

**In most soils, when phosphorus is applied at agronomic rates, it moves very little: only a few inches from the depth of application or tillage within 5 to 10 years, or more.** Excessive transport of phosphorus from land surfaces can pose a significant water quality risk to nearby streams. Surface runoff in grasslands may be dominated by soluble inorganic phosphorus. In tilled (plowed, disced, cultivated) fields, more of the surface runoff loss of phosphorus may be associated with soil erosion.

**Natural nutrient loss of phosphorus to surface waters before human settlement was estimated by the National Research Council at about 0.4 lb/A/year.** The loss of phosphorus from farm fields, forest lands, and lawn and turf areas depends on the phosphorus content of the soil, the amount of crop residues and their decomposition rate, tillage intensity and timing, soil slope, crop and soil management factors, rainfall (frequency, intensity, and duration), and other environmental factors...including the rate of erosion.

**Maximum crop uptake of applied phosphorus and minimum loss to water resources can be encouraged in several ways.**

- Maintain soil pH in the optimum range for the specific crop of interest (often in the 5.8 to 6.8 range).
- Prevent or correct soil compaction to enhance water infiltration and crop use.
- Provide other essential nutrients in appropriate balance with phosphorus.
- Manage irrigation water effectively to maximize crop use and to minimize runoff.
- Use agronomically appropriate rates, timing, and placement of phosphorus.
- Avoid surface applications of phosphorus sources (including manure) when there is significant risk of runoff-producing rains, especially where applied phosphorus will not be soil-incorporated (such as in no-till cropping, pastures and hay meadows, turf and lawns, and in established forests and forest plantations).
- Band P applications beneath the soil surface (where practical and economically feasible). This application method can reduce the risk of runoff loss during storm events. However, care must be taken to ensure that grooves caused by placement equipment do not run up-slope and down-slope in a way that could aggravate or accelerate channelized flow of water. Channelized flow in phosphorus application grooves could potentially increase phosphorus runoff loss.
- Establish and maintain vegetative buffers and riparian areas. Keep stream banks vegetated and stabilized.

If runoff-producing rainfall events could be accurately predicted, much of the phosphorus lost from farm fields to surface waters might be avoided. **Since we cannot accurately predict runoff-producing storms, we must work to improve phosphorus retention in fields and maximize the benefits of other management practices. Start your management plan with a good soil test and rely on research-based agronomic and environmental interpretations to maximize the performance of the inputs on fields.**

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