

## Phosphorus Fertilization and Environmental Protection

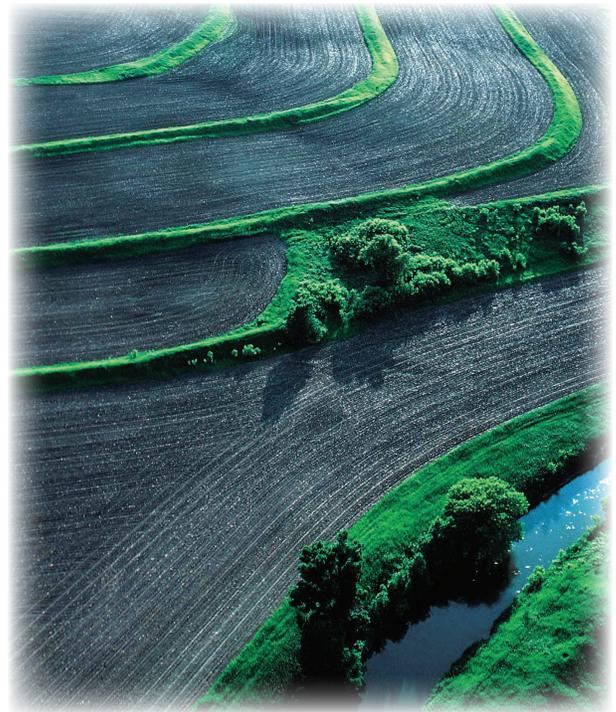
**T**here is no question that phosphorus (P) is essential to crop production. Agronomically, it is one of the three primary plant nutrients, along with nitrogen (N) and potassium. It is also essential for healthy fish and other aquatic life in our lakes and streams. Yet, excess P (and N) can lead to algal blooms and other problems in surface waters. Public water supplies are vulnerable to these effects, and treatments to reduce offensive odors and tastes can be expensive.

**It should be emphasized that most agricultural soils must be supplemented with P before crops can reach their yield potential.** In North America, half the sampled soils test medium or lower in P, and soil P levels have been declining in some key production states. Sound nutrient management programs must include consideration for P. In recent years, more attention has been given to the potential negative impacts of too much P getting into surface waters, particularly where there has been an over-application of animal manure. While manure is a good source of P and other nutrients, when it is applied year after year at rates in excess of crop use, there is a heightened risk of P loss to surface waters. It is not unusual to see soil P levels above the agronomic optimum and in the excessive range in those areas where confined animal feeding operations exist.

**Scientists have long considered P to be an immobile nutrient in soils.** However, leaching can occur when the ability of the soil to hold P is exceeded; particularly in sandy soils. Further, the transport of P bound to soil sediments can pose a significant threat to water quality when it is carried to nearby streams and other surface water bodies by erosion and runoff. To reduce surface runoff risks, fertilizer P can be injected or banded beneath the soil surface with specialized application equipment.

**There are management techniques available to correct problems arising from excessively high soil P levels.** One is to discontinue the use of fertilizer P, including mineral fertilizers and manure, until soil test P is reduced to appropriate levels. Vegetative filter strips can also be quite effective in reducing P runoff losses. Conservation tillage, alone or in combination with other practices such as vegetative filter strips, helps to keep P in place by reducing erosion and runoff. Other best management practices can also be implemented.

**Finally, there is no reason why P fertilization and environmental protection can't go hand in hand.** The key



*Vegetative filter strips can be effective in reducing runoff and nutrient movement from fields to surface water areas, such as streams.*

is 4R Nutrient Stewardship—right source, rate, time and place decisions with special care when manure is being applied to the land. Keep soil tests in the optimum range to allow the crop to develop to its fullest agronomic and economic yield potential. Monitor progress with soil testing and plant analysis and follow other best management practices that complement the use of P. **The result will be profitable crop production and a protected environment.**

### FOR FURTHER READING:

- Daverede et al. 2004. *Journal of Environmental Quality* 33: 1535-1544.
- Fixen et al. 2010. *Better Crops* 94(4): 6-8.
- Sharpley et al. 2003. *Agricultural Phosphorus and Eutrophication*. 2nd edition. United States Department of Agriculture, Agricultural Research Service. ARS-149.
- Roberts, W.M., M.I. Stutter, and P.M. Haygarth. 2012. *Journal of Environmental Quality* 41: 389-399.