

# *Managing Agricultural Phosphorus to Protect Water Quality*

*Reagan Waskom, Water Resources Specialist,  
Dept. of Soil and Crop Sciences, CSU*

Concern about agricultural nutrients and water quality is nothing new in Colorado, but in the past most of our attention was focused mainly on impacts from nitrogen. Phosphorus (P) is now receiving attention nationwide as an important surface water pollutant. Surface water that receives P due to soil erosion or nutrient runoff from feedlots, fields or lawns suffers from accelerated eutrophication. Eutrophication is the natural aging of lakes or streams brought on by nutrient enrichment. Eutrophication has been identified by the EPA as the main cause of impaired surface water quality across the country. This decline in water quality restricts use for fishing, recreation, industry, and drinking due to the increased growth of undesirable algae and aquatic weeds and the resulting oxygen shortages caused by their death and decomposition. Recent outbreaks of the dinoflagellate *Pfiesteria piscicida* in the eastern United States, and Chesapeake Bay tributaries in particular, have dramatically increased public awareness of eutrophication and the need for solutions. In Colorado, reservoirs such as Cherry Creek, Dillon, Chatfield, and Barr are known to be impaired from excess P in inflows.

Agriculture is not the only source of P in the aquatic environment. For example, the USGS estimates that of 40,000 tons of P that enter the S. Platte River Basin each year, almost 1,000 tons annually are from municipal waste discharges directly into the river. Manure and fertilizers applied to cropland and lawns make up the bulk of the P load in most river basins and have been identified by the EPA as needing attention.

One of the difficulties in achieving better management of P fertilizer and manure is the disparity between critical lake and soil P concentrations. Lake water concentrations of P above 0.02 ppm generally accelerate eutrophication and these values are an order of magnitude lower than P concentrations in soil solution critical for plant growth (0.2 to 0.3 ppm). Continual long-term application of fertilizer or manure at levels exceeding crop needs will increase soil P levels. Most livestock producers apply manures at rates that meet crop N requirements and avoid ground water quality problems created by leaching of excess N. Nitrogen based management has been advocated by Extension and other crop advisers for many years. The result is a buildup of soil P to excessive levels over time. In many cases we now will need to recommend P based management, significantly increasing the number of acres needed to accommodate all of the manure produced.

The example calculation below shows that manure rate can change from 20 tons per acre to 7 tons per acre when going from an N to a P based recommendation. Dairy operations in specific are going to need to evaluate their annual manure production and the land base available for safely accommodating the nutrients in the waste. In some cases, altering feed rations may be the best way to improve manure management.

## **Example of how P based nutrient management could change the recommended manure application rate at a hypothetical dairy\*.**

Manure Nutrient	Nitrogen	Phosphorus
Available in 1st Year(lbs/ton)	10	12
Corn fertilizer requirement(lbs/acre)	200	80
Recommended manure rate (tons/acre)	20 (N-based)	7 (P-based)
Supplemental N fertilizer needed (lbs/acre)	0	130

\*Based upon table values for manure on a wet weight basis and

a 200-bu corn yield goal.

The Colorado USDA-NRCS has just adopted a new nutrient management standard that includes an evaluation of P runoff risk on operations that utilize manures or other organic wastes. This risk assessment is designed to identify potential water quality problems associated with adding P fertilizer or manure to agricultural fields. The P Index ranks fields from "low risk" to "very high risk" and is intended to help producers protect water quality. At the present time, P based manure management is voluntary for dairy operations. However, be aware that the EPA and the Colorado Department of Health and Environment are considering the need for P based manure management in future permitting requirements.

*For more information on the Colorado P Index, contact:*

Reagan Waskom	or,	Jim Sharkoff	
Water Resources Specialist		State Conservation Agronomist	Dept. of Soil and Crop
Sciences	USDA, Natural Resources		
Colorado State University		Conservation Service	
Fort Collins, Colorado 80523-1170		655 Parfet Street	
970-491-6201		Lakewood, Colorado 80215-5517	
		303-236-2886 ext. 208	