

## Chapter 15

# Assessing the Water Quality Impacts of Phosphorus in Runoff from Agricultural Lands

G. Fred Lee and Anne Jones-Lee

G. Fred Lee & Associates, 27298 East El Macero Drive,  
El Macero, CA 95618

The excessive fertilization (eutrophication) of waterbodies is recognized as one of the major causes of the impairment of the beneficial uses of waters through the growth of excessive amounts of aquatic plants such as algae and water weeds. Agricultural land use has been found to be an important source of N and P compounds leading to excessive fertilization of some waterbodies. Increasing attention is being given to controlling the water quality impacts of nitrogen and phosphorus compounds in stormwater runoff and irrigation tailwater discharges from agricultural lands. The US EPA is developing numeric chemically based nutrient criteria which will lead to increased efforts to restrict the discharge/release of N and P compounds from agricultural lands. This paper presents a review of issues that should be considered in assessing/managing the impacts of phosphorus derived from agricultural land runoff on eutrophication-related water quality.

Reference as:

Lee, G. F., and Jones-Lee, A., "Assessing the Water Quality Impacts of Phosphorus in Runoff from Agricultural Lands," IN: Hall, W., and Robarge, W. (eds), **Environmental Impact of Fertilizer on Soil and Water**, ACS Symposium Series 872, American Chemical Society, Washington, DC, pp. 207-219 (2004).

## Introduction

Increasing attention is being given to controlling the water quality impacts associated with excessive fertilization (eutrophication) of waterbodies. This effort is leading to increased attention to the role of agricultural stormwater runoff and irrigation return water (tailwater) as a source of aquatic plant nutrients (nitrogen and phosphorus compounds) that cause excessive fertilization of waterbodies. The discussion presented herein is an overview of some of the issues that need to be considered by agricultural interests and those regulating agriculture in evaluating the water quality significance of nitrogen and phosphorus derived from agricultural land runoff/discharges. For a more detailed discussion of many of these issues, consult Jones-Lee and Lee (1), Lee and Jones-Lee (2) and references cited therein.

### Water Quality Impacts of Waterbody Excessive Fertilization

The excessive fertilization of waterbodies is a long-standing, well-recognized water quality problem throughout the US and other countries. It is manifested in excessive growths of planktonic (suspended) algae and attached algae, as well as macrophytes (water weeds), which can either be floating, such as water hyacinth or duckweed, or attached-emergent. The impacts of excessive fertilization-eutrophication on a waterbody's water quality were discussed by Lee (3) and Lee and Jones-Lee (2). The impacts include:

- Domestic Water Supplies  
Tastes and odors, shortened filter runs, THM precursors, and increased costs
- Violations of Water Quality Standards  
pH and dissolved oxygen - photosynthesis
- Toxic Algae  
Toxicity to fish and animals
- Impaired Recreation  
Impaired swimming, wading, boating, odors and scum
- Impact on Fisheries  
Improved fish production, less desirable fish at high levels of fertilization
- Shallow Water Habitat  
Loss of attached vegetation and aquatic life habitat

Overall, excessive fertilization is one of the most important causes of water quality impairment of waterbodies. The US EPA (4), in its last National Water

