Introduction

Agricultural nutrients, primarily nitrogen (N) and phosphorus (P), in drainage water from farms in the Everglades Agricultural Area (EAA) are alleged to be contributing to the eutrophication of Lake Okeechobee and undesirable changes in the Water Conservation Areas (WCAs) and the Everglades National Park (ENP) ecosystems (Florida Department of Administration, 1976; LOTAC I, 1986; LOTAC II, 1990; SFWMD, 1990). The question of whose responsibility it is to alleviate the flux of nutrients to those protected environments is presently (1991) being debated. There are many indications that much of the physical and financial burden will be placed on the agricultural community (SFWMD, 1990).

Nitrogen and P concentrations in EAA farm drainage water are higher than background levels in each of the three ecosystems (Lake Okeechobee, WCAs, ENP), and are therefore considered to be environmental threats. Phosphorus has been identified as the limiting nutrient (SFWMD, 1990). In other words, increasing P concentrations will accelerate eutrophication of area waters and further stimulate the proliferation of undesirable plant growth, while decreasing P concentrations will have the opposite effects.

The high nutrient levels in EAA drainage can be partially attributed to the high water table organic soils of the EAA which are shallow, drained, and subject to biological oxidation and mineralization of both N and P. Fertilizer P applications vary widely, from zero to several hundred lbs/ac/yr, depending on the crop and P available in the soils. Therefore, fertilization practices have a variable impact on P concentrations throughout the EAA. Nitrogen fertilizer is rarely used. Rainfall events in south Florida are characteristically of high volume and intensity, necessitating drainage to off-farm canals. High nutrient concentrations and large drainage volumes translate to high nutrient loading rates to drainage water receiving areas.

Attempts to reduce area nutrient loadings should logically begin at the farm level. The Surface Water Improvement and Management (SWIM) Plan (SFWMD, 1990) suggests implementing on-farm Best Management Practices (BMPs) to reduce on-farm P concentrations and loadings. After lowering P concentrations and loadings at the farm level, regional Stormwater Treatment Areas (STAs) would be used to further polish the agricultural drainage water. To assure the proper management and optimum effectiveness of BMPs, water quality monitoring will be a necessary activity for the growers in the EAA.

Large variations in P concentrations occur between farms, seasonally, and within individual drainage events on a farm (Izuno et al., 1990a; Izuno et al. 1991b; and Izuno and Bottcher; 1991). Therefore, simply collecting and analyzing a water sample occasionally will provide little useful information. A meaningful farm water quality monitoring program requires that a comprehensive monitoring program will need to be developed and implemented at each farm location. Because the physical characteristics, water management, and cultural practices differ among farms, each site could potentially require a unique program. The purpose of this publication is to provide general information to consider when developing a water quality monitoring program for an individual farm.

Nutrient parameters to monitor

A water sample can be analyzed for numerous chemical properties. This publication will be limited to a discussion of N and P, with the emphasis being on P. Total-N (TN) and Total-P (TP) measurements account for all N and P, respectively, in organic and inorganic forms, measurable using standard chemical analysis procedures. Total-N cannot be measured directly, and is therefore determined as the sum of Total Kjeldahl Nitrogen (TKN) (Izuno et al., 1991a) and Nitrate (NO_3). Total Dissolved Kjeldahl Nitrogen (TDKN) is simply the fraction of TKN that passes through a 0.45ym filter, separating out the particulate-N. Ammonium (NH_4) is another parameter commonly measured and provides a breakdown of the TKN into inorganic and organic N.

Total-P represents all organic and inorganic forms of P, measurable using a standard chemical analysis procedure (Izuno et al., 1991a). Other P parameters commonly analyzed for are Ortho-Phosphate (PO_4), Soluble Reactive Phosphorus (SRP), and Total Dissolved Phosphorus (TDP). Particulate P is calculated as the difference between TP and TDP.

The current SWIM Plan (SFWMD, 1990) focuses on TP. Hence, the minimal analysis of a water sample for south Florida should include TP. However, TP includes particulate forms of P, the amount of which could be greatly influenced by sampling procedures. Hence, it is advisable to also