Introduction

A water sample can be analyzed for numerous chemical properties. This publication will be limited to a discussion of pH, electrical conductivity, turbidity, hardness, nitrogen (N) and phosphorus (P), with the emphasis being on nitrogen and phosphorus. Total-N and Total-P measurements account for all nitrogen and phosphorus, respectively, in organic and inorganic forms, measurable using standard chemical analysis procedures.

Nitrogen is an indispensable part of the life cycle. However, even though plants, animals and most micro-organisms require some form of combined nitrogen for growth and reproduction, concentrations above certain levels can present problems. Total-N is the sum of Total Kjeldahl Nitrogen (TKN) (see Izuno, Davis, and Bottcher, 1991 for details) and nitrate (NO_3^-). Total Dissolved Kjeldahl Nitrogen (TDKN) is the fraction of TKN that passes through a 0.45 μm filter. Ammonium (NH_4^+) is another nitrogen parameter commonly measured and reported. Inorganic nitrogen is normally found in soil water as ammonia (NH_3), nitrate, and nitrite (NO_2^-).

Ammonia, a product of microbiological decay of plant and animal protein, is used in commercial fertilizers. Its excessive presence in raw surface waters usually indicates domestic or agricultural pollution. Above certain levels it is toxic to fish. Excessive amounts of nitrate or nitrite in water can cause infant death and adult illness, and produce spontaneous abortion of cows. Fairly low levels of nitrite can be harmful to humans and aquatic life.

Phosphorus parameters commonly analyzed for are Ortho-Phosphate (PO_4^{-3}), Soluble Reactive Phosphorus (SRP), Total Dissolved Phosphorus (TDP), and Total-P (TP). Particulate phosphorus is calculated as the difference between TP and TDP. Phosphorus occurs in natural waters as one of the forms of phosphates: ortho- or reactive phosphate, meta- or poly- (condensed) phosphate (requires hot acid digestion) and organic phosphate (requires severe digestion). Phosphates enter water supplies from soil runoff, cleaning operations, water treatment, boiler blowdown and sewage. Although necessary for plant growth, too much phosphate causes excessive growth of aquatic plants and eutrophication of fresh water bodies.

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 phosphorus, the amount of which can be greatly influenced by sampling procedures. Hence, it is advisable to also analyze samples for TDP. Ortho-P and SRP are of limited value if monitoring is being conducted for the purpose of complying with terms of the SWIM Plan.

Water sample collection devices vary widely in complexity and cost: samples can be manually dipped from a body of water, one at a time, using specially prepared containers; sophisticated autosamplers are available that collect a series of samples at equal time intervals or at specific times or in amounts proportional to flow. Descriptions, costs, and benefits of using the different sample collection tools will be discussed. At times, phosphorus concentrations of the soil solution are also helpful in assessing BMP efficacy. Hence, instruments for extracting this water in situ will also be discussed herein.

Sample Collection and Storage

Preparing Bottles for Water Samples

Containers for collection of water samples for nitrogen and phosphorus analyses should be made out of nalgene or some other inert material. Sample bottle sizes generally should range from 250 to 500 mL to ensure that an adequate sample will be available for re-analysis when necessary. The cost of the special bottles will vary according to size and style.

Prior to use, the sample bottles should be washed with a phosphate-free detergent, rinsed with distilled water, rinsed in a dilute hydrochloric acid (HCl) solution, rinsed with distilled water again, and dried. The bottles should be capped with foil, saran wrap, or bottle caps (washed and rinsed in the same manner as the bottles themselves) to protect against dust particles and other contaminants (i. e., free ammonia in the air, insects) from entering the containers during storage. Once prepared for receiving water samples, nothing except the water to be sampled should come in contact with the insides of the bottles or caps.

The proper labeling of the sample bottles is critical to a successful water quality monitoring