Nutrient Pollution Analysis

O·I·Analytical
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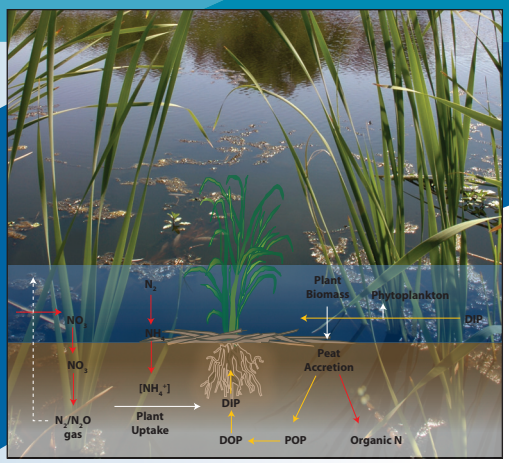
Nutrient Pollution and Water



In June of 1998 the U.S. Environmental Protection Agency issued a National Strategy for Development of Regional Nutrient Criteria to help states in developing nutrient water quality standards for lakes, reservoirs, rivers, streams, wetlands, estuaries, and coastal waters.[1] The European Commission took similar action in Directive 91/676/EEC which requires member states to identify nitrate vulnerable zones (NVZs) and take steps to monitor, control, and reduce water pollution from excessive use of fertilizers.

In characterizing the problem of nutrient pollution the USEPA stated; "Cultural eutrophication (human-caused inputs of excess nutrients in waterbodies) is one of the primary factors resulting in impairment of surface waters in the US."[2] Nutrient pollution reduction is a priority for USEPA regions because states have listed over 10,000 nutrient-related Clean Water Act Section 303 (d) impairments. [3]

Reduction of nutrient pollution levels requires monitoring and control of the major sources of excess nutrients. Point sources of nutrient discharge include municipal and industrial wastewater facilities, stormwater runoff, and some large animal feed operations. Nutrients discharges from point sources are controlled through National Pollutant Discharge Elimination System (NPDES) permits. Nutrient discharges from nonpoint sources such as crop and livestock production, and storms are irregular and seasonal in nature.

Several factors make monitoring of nutrient pollutants a challenging analytical task. The physicochemical properties of samples from water treatment facilities are considerably different than samples from lakes, rivers, wetlands and marine environments. The concentration of nutrients in samples from impaired and unimpaired water bodies can vary significantly. Nutrient levels can also fluctuate seasonally, and after storms. In some cases, (e.g.; pore water from marine sediments), the amount of sample available for testing may be limited. Sample pretreatment and/or analytical procedures may require adjustments to address these factors.

[1] *Federal Register, Vol. 63, No. 122, June 25,1998.*

[2] *Draft Nutrient Criteria Technical Guidance Manual, USEPA, EPA-823-B-05-003, December, 2006.*

[3] *Nutrient Pollution and Numeric Water Quality Standards, USEPA Memorandum, May 25, 2007.*

USEPA Nutrient Water Quality Criteria website; www.epa.gov/waterscience/criteria/nutrient

European Commission Environment website; http://ec.europa.eu/environment/water/water-nitrates/directiv.html

Quality

Nutrient Analysis for Regulatory Compliance and Research

OI Analytical has developed a comprehensive set of nutrient analysis methods for regulatory compliance testing, and collection of research data necessary to establish numeric nutrient criteria for natural water ecosystems.

Drinking Water / Wastewater

Analyte	Technique	Range*	Detection Limit	Reference Methods
Ammonia	FIA/SFA	0.01 - 25 mg/L	0.002 mg/L	EPA 350.1 / ISO 11732
Carbon – TOC	Wet Oxidation	50 ppb - 2,000 ppm	25 ppb	SM-5310-C / ISO 8245
Nitrate/Nitrite	FIA/SFA	0.005 - 10 mg/L	0.002 mg/L	EPA 353.2 / ISO 13395
Nitrite	FIA/SFA	0.01 - 10 mg/L	0.002 mg/L	EPA 353.2 / ISO 13395
Nitrogen –TKN	FIA/SFA	0.05 - 20 mg/L	0.01 mg/L	EPA 351.2
ortho-Phosphate	FIA/SFA	0.01 - 5.0 mg/L	0.001 mg/L	EPA 365.1 / ISO 15681-1
Total Phosphorus	FIA/SFA	0.01 - 20 mg/L	0.003 mg/L	EPA 365.4 / ISO 15681-1

Seawater

Analyte	Technique	Range*	Detection Limit	Reference Methods
Ammonia	SFA	0.10 - 5.0 µmoles/L	0.077 µmoles/L	EPA 349.0
Carbon – DOC	Wet Oxidation	0.5 - 10 ppm	0.1 ppm	SM-5310-C / ISO 8245
Carbon – TOC	Wet Oxidation	0.5 - 10 ppm	0.1 ppm	SM-5310-C / ISO 8245
Nitrate / Nitrite	SFA Cd-reduction	0.02 - 40 µmoles/L	0.007 µmoles/L	EPA 353.4
ortho-Phosphate	SFA ascorbic acid	0.02 - 10 µmoles/L	0.009 µmoles/L	EPA 365.5
Silica	SFA	0.35 - 35 µmoles/L	0.071 µmoles/L	SM 4500 - SiO_2E

Soil / Plant Extracts

Analyte	Technique	Range*	Detection Limit	Reference Methods
Ammonia	FIA/SFA	0.1 - 25 mg/L	0.02 mg/L	EPA 350.2
Nitrate / Nitrite	FIA/SFA	0.1 - 10 mg/L	0.02 mg/L	EPA 300.0
Nitrite	FIA/SFA	0.1 - 10 mg/L	0.02 mg/L	EPA 353.2
ortho-Phosphate	FIA/SFA	0.1 - 5 mg/L	0.01 mg/L	EPA 365.1
Total Nitrogen-TKN	FIA/SFA	0.1 - 20 mg/L	0.03 mg/L	EPA 351.2
Total Phosphorus	FIA/SFA	0.1 - 20 mg/L	0.03 mg/L	EPA 365.4

** Measurement ranges may be extended to analyze higher concentrations by sample dilution*

OI Analytical is committed to improving and developing new methods for nutrient analysis. Abstracts of these Nutrient Analysis Methods can be downloaded at www.oico.com.

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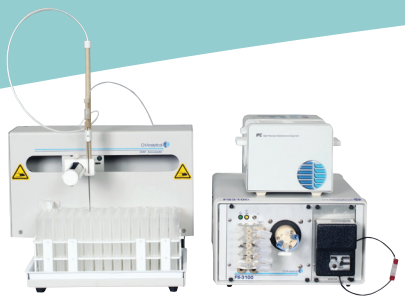
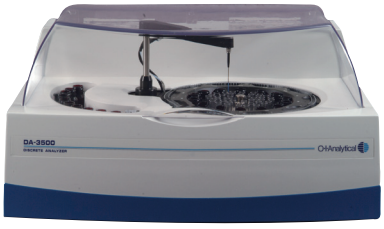
Let's Solve Water

Nutrient Analysis Solutions



FS 3100 Automated Chemistry Analyzer

The FS 3100 performs high-throughput continuous flow analysis of one or two key nutrients at a time in water samples, and soil or plant extracts.



DA 3500 Discrete Analyzer

The DA 3500 performs automated colorimetric analysis for multiple nutrients on water samples, and soil or plant extracts. Reaction chemistries and detection are performed in a disposable cuvette using microliter amounts of sample and reagents. Microliter scale chemistry allows analysis of multiple nutrients when sample volumes are limited, (e.g.; pore water in marine sediments).

FS IV® Automated Chemistry Analyzer

The FS IV® performs high-throughput continuous flow analysis of multiple nutrients simultaneously. In-line sample preparation modules allow automation of complex multi-step nutrient analysis methods requiring heated reactions, UV digestion, gas-diffusion membrane separation, and sample cleanup by dialysis or ion exchange.

Aurora 1030 TOC Analyzers

Perform total organic carbon analysis using heated persulfate wet oxidation, or high temperature catalytic combustion techniques. An optional TN_b analysis module is available to measure total bound nitrogen in water samples, (EN 12260:2003).

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