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Ambient Water Quality Criteria Recommendations

Information Supporting the Development of State and Tribal Nutrient Criteria

Rivers and Streams in Nutrient Ecoregion VIII

EPA-822-B-01-015

AMBIENT WATER QUALITY CRITERIA RECOMMENDATIONS

INFORMATION SUPPORTING THE DEVELOPMENT OF STATE AND TRIBAL NUTRIENT CRITERIA

FOR

RIVERS AND STREAMS IN NUTRIENT ECOREGION VIII

Nutrient-Poor, Largely Glaciated Upper Midwest and Northeast

including all or parts of the States of:

Maine, New Hampshire, Vermont, Massachusetts, New York, New Jersey, Pennsylvania, Michigan, Wisconsin, and Minnesota,

and the authorized Tribes within the Ecoregion

U.S. ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF WATER
OFFICE OF SCIENCE AND TECHNOLOGY
HEALTH AND ECOLOGICAL CRITERIA DIVISION
WASHINGTON, DC

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FOREWORD

This document presents EPA's nutrient criteria for **Rivers and Streams in Nutrient Ecoregion VIII**. These criteria provide EPA's recommendations to States and authorized Tribes for use in establishing their water quality standards consistent with section 303(c) of the Clean Water Act (CWA). Under section 303(c) of the CWA, States and authorized Tribes have the primary responsibility for adopting water quality standards as part of State or Tribal law or regulation. Federal regulations require State and Tribal standards to contain scientifically defensible water quality criteria that are protective of designated uses. EPA's recommended section 304(a) criteria are not laws or regulations; they are guidance that States and Tribes may use as a starting point in creating their own water quality standards.

The term "water quality criteria" is used in two sections of the CWA, section 304(a)(1) and section 303(c)(2). The term has a different impact in each section. On the one hand, in section 304, the term represents a scientific assessment of ecological and human health effects that EPA recommends to States and authorized Tribes for establishing water quality standards that ultimately provide a basis for controlling discharges or releases of pollutants or related parameters. On the other hand, in section 303, ambient water quality criteria are developed by States and Tribes as part of their water quality standards, to define the level of a pollutant (or in the case of nutrients, a condition) necessary to protect designated uses in ambient waters.

Quantified water quality criteria contained within State or Tribal water quality standards are essential to a water quality-based approach to pollution control. Whether expressed numerically or as quantified translations of narrative criteria within State or Tribal water quality standards, quantified criteria are critical for assessing attainment of designated uses and measuring progress toward meeting CWA goals.

EPA is developing section 304(a) water quality criteria for nutrients because States and Tribes consistently identify excessive levels of nutrients as a major reason that as many as half of the Nation's surface waters surveyed do not meet water quality objectives, such as full support of aquatic life. EPA expects to develop nutrient criteria that cover four major types of waterbodies—lakes and reservoirs, rivers and streams, estuarine and coastal areas, and wetlands—across 14 major ecoregions of the United States. EPA's section 304(a) criteria are intended to provide for the protection and propagation of aquatic life and recreation. To support the development of nutrient criteria, EPA has published and will continue to publish technical guidance manuals that describe a process for assessing nutrient conditions in the four waterbody types listed above.

EPA's section 304(a) water quality criteria for nutrients provide numeric water quality criteria and procedures to help establish quantified criteria within State or Tribal water quality standards. In the case of nutrients, EPA section 304(a) criteria establish values for causal variables (e.g., total nitrogen and total phosphorus) and response variables (e.g., turbidity and chlorophyll *a*). EPA believes that State and Tribal water quality standards need to include quantified endpoints for causal and response variables to provide sufficient protection of uses and to maintain downstream uses. These endpoints will most often be expressed as numeric water quality criteria or as procedures to translate a State or Tribal narrative criterion into a quantified endpoint.

States and authorized Tribes have several options in adopting these criteria. EPA recommends the following approaches, in order of preference:

1. Wherever possible, develop nutrient criteria that fully reflect local conditions and protect specific designated uses through the process described in EPA's technical guidance manuals for nutrient criteria development. Such criteria may be expressed either as numeric criteria or as procedures to translate a State or Tribal narrative criterion into a quantified endpoint in State or Tribal water quality standards.

2. Adopt EPA's section 304(a) water quality criteria for nutrients, either as numeric criteria or as procedures to translate a State or Tribal narrative nutrient criterion into a quantified endpoint.

3. Develop nutrient criteria protective of designated uses using other scientifically defensible methods and appropriate water quality data.

EPA developed the nutrient criteria recommendations in this document with the intent that they serve as a starting point for States and Tribes to develop more refined criteria, as appropriate, to reflect local conditions. The values presented in this document generally represent nutrient levels that protect against the adverse effects of nutrient overenrichment. They are based on the information that was available to the Agency at the time of this publication. EPA expects States and Tribes may have additional information and data that may be utilized in the refinement of these criteria. EPA offers to work with States and authorized Tribes to establish the necessary quantitative endpoints to reduce the excess nutrient inputs into our nation's waters and to prevent any further impairments.

Geoffrey H. Grubbs, Director
Office of Science and Technology

DISCLAIMER

This document provides technical guidance and recommendations to States, authorized Tribes, and other authorized jurisdictions to develop water quality criteria and water quality standards under the Clean Water Act (CWA) to protect against the adverse effects of nutrient overenrichment. Under the CWA, States and authorized Tribes are to establish water quality criteria to protect designated uses. State and Tribal decisionmakers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance when appropriate and scientifically defensible. Even though this document contains EPA's scientific recommendations regarding ambient concentrations of nutrients that will protect aquatic resource quality, it does not substitute for the CWA or EPA regulations, nor is it a regulation itself. Thus it cannot impose legally binding requirements on EPA, States, authorized Tribes, or the regulated community, and it might not apply to a particular situation or circumstance. EPA may change this guidance in the future.

EXECUTIVE SUMMARY

Nutrient Program Goals

EPA developed the National Strategy for the Development of Regional Nutrient Criteria (National Strategy) in June 1998. The strategy presents EPA's intentions to develop technical guidance manuals for four types of waters (lakes and reservoirs, rivers and streams, estuaries and coastal waters, and wetlands) and produce section 304(a) criteria for specific nutrient ecoregions by the end of 2000. In addition, the Agency formed Regional Technical Assistance Groups (RTAGs), which include State and Tribal representatives working to develop more refined and localized nutrient criteria based on approaches described in the waterbody guidance manuals. This document presents EPA's current recommended criteria for total phosphorus (TP), total nitrogen (TN), chlorophyll *a*, and turbidity for rivers and streams in Nutrient Ecoregion VIII (Nutrient Poor Largely Glaciated Upper Midwest and Northeast), which were derived using the procedures described in the *Rivers and Streams Nutrient Criteria Technical Guidance Manual* (U.S. EPA, 2000b).

EPA's ecoregional nutrient criteria address cultural eutrophication—the adverse effects of excess human-caused nutrient inputs. The criteria are empirically derived to represent surface waters that are minimally impacted by human activities and protective of aquatic life and recreational uses. The information contained in this document represents starting points for States and Tribes to develop (with assistance from EPA) more refined nutrient criteria.

In developing these criteria recommendations, EPA followed a process that included, to the extent they were readily available, the following critical elements:

- **Historical and recent nutrient data in Nutrient Ecoregion VIII.** Data sets from Legacy STORET, NASQAN, NAWQA, EPA Region 2 - NYCDEP (1990-1998), EPA Region 1, EPA Region 3, and EPA Region 5 were used to assess nutrient conditions from 1990 to 2000.

- **Reference sites/reference conditions in Nutrient Ecoregion VIII.** Reference conditions presented are based on 25th percentiles of all nutrient data, including a comparison of reference conditions for the aggregate ecoregion versus the subecoregions. States and Tribes are urged to determine their own reference sites for rivers and streams at different geographic scales and to compare them to EPA's reference conditions.

- **Models employed for prediction or validation.** EPA did not identify any specific models to develop nutrient criteria. States and Tribes are encouraged to identify and apply appropriate models to support nutrient criteria development.

- **RTAG expert review and consensus.** EPA recommends that when States and Tribes prepare their nutrient criteria, they obtain the expert review and consent of the RTAG.

- **Downstream effects of criteria.** EPA encourages the RTAG to assess the potential effects of the proposed criteria on downstream water quality and uses.

In addition, EPA followed specific **QA/QC procedures** during data collection and analysis: All data were reviewed for duplications. All data are from ambient waters that were not located directly outside a permitted discharger. The following States indicated that their data were sampled and analyzed using either standard methods or EPA-approved methods: Maine, New Hampshire, Vermont, Massachusetts, and Minnesota. New York, New Jersey, and Michigan used standard or EPA-approved methods for some specific nutrient parameters.

The following tables contain a summary of aggregate and level III ecoregion values for TN, TP, water column chl *a*, and turbidity:

BASED ON 25th PERCENTILE ONLY

Nutrient Parameters	Aggregate Nutrient Ecoregion VIII Reference Conditions
Total phosphorus (µg/L)	10
Total nitrogen (mg/L) (reported)	0.38
Chlorophyll *a* (µg/L) (fluorometric method)	0.63
Turbidity (FTU)	1.3

For subecoregions 49, 50, 58, 62, and 82, the ranges of nutrient parameter reference conditions are:

BASED ON 25th PERCENTILE ONLY

Nutrient Parameters	Range of Level III Subecoregions Reference Conditions
Total phosphorus (µg/L)	6 - 40*
Total nitrogen (mg/L) (reported)	0.32 - 0.63
Chlorophyll *a* (µg/L) (fluorometric method)	N/A
Turbidity (FTU)	0.25 - 5.25

* This value appears inordinately high and may either be a statistical anomaly or reflect a unique condition. In any case, further regional investigation is indicated to determine the sources, i.e., measurement error, notational error, statistical anomaly, naturally enriched conditions, or cultural impacts.

NOTICE OF DOCUMENT AVAILABILITY

This document is available electronically to the public through the Internet at http://www.epa.gov/OST/standards/nutrient.html. Requests for hard copies of the document should be made to EPA's National Service Center for Environmental Publications (NSCEP), 11029 Kenwood Road, Cincinnati, OH 45242; telephone (513) 489-8190 or toll free (800) 490-9198. Please refer to EPA document number EPA-822-B-01-015.

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1.0 INTRODUCTION

Background

Nutrients are essential to the health and diversity of surface waters. However, in excessive amounts nutrients cause eutrophication or hypereutrophication, which results in overgrowth of plant life and decline of the biological community. Excessive nutrients can also result in human health risks, such as the growth of harmful algal blooms, most recently manifested in the *Pfiesteria* outbreaks on the Gulf and East Coasts. Chronic nutrient overenrichment of a waterbody can lead to the following consequences: algal blooms, low dissolved oxygen, fish kills, overabundance of macrophytes, likely increased sedimentation, and species shifts of both flora and fauna.

Historically, National Water Quality Inventories have repeatedly shown that nutrients are a major cause of ambient water quality use impairments. EPA's 1996 National Water Quality Inventory report identifies excessive nutrients as the leading cause of impairment in lakes and the second leading cause of impairment in rivers (behind siltation). In addition, nutrients were the second leading cause of impairments after siltation reported by the States in their 1998 lists of impaired waters. Where use impairment is documented, nutrients contribute roughly 25%-50% of the impairment nationally. The Clean Water Act (CWA) establishes that, wherever possible, water quality must provide for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water and/or protecting the physical, chemical, and biological integrity of those waters. In adopting water quality standards, States and Tribes designate uses for their waters in consideration of these CWA goals, and establish water quality criteria that contain sufficient parameters to protect that integrity and those uses. To date, EPA has not published information and recommendations under section 304(a) for nutrients to assist States and Tribes in establishing numeric nutrient criteria to protect uses when adopting water quality standards.

In 1995, EPA gathered a set of national experts and asked them how best to deal with the national nutrient problem. The experts recommended that the Agency not develop single criteria values for phosphorus (P) or nitrogen (N) applicable to all waterbodies and regions of the country. Rather, they recommended that EPA put a premium on regionalization, develop guidance (assessment tools and control measures) for specific waterbodies and ecological regions across the country, and use reference conditions (conditions that reflect pristine or minimally impacted waters) as a basis for developing nutrient criteria.

With these suggestions as starting points, EPA developed the National Strategy for the Development of Regional Nutrient Criteria (National Strategy), published in June 1998. This strategy presented EPA's intentions to develop technical guidance manuals for four types of waters (lakes and reservoirs, rivers and streams, estuaries and coastal waters, and wetlands), and thereafter to publish section 304(a) criteria recommendations for specific nutrient Ecoregions. Technical guidance manuals for lakes/reservoirs and rivers/streams were published in April 2000 and July 2000, respectively. The technical guidance manual for estuaries/coastal waters was published in fall 2001, and the draft wetlands technical guidance manual will be published by

December 2001. Each manual presents EPA's recommended approach for developing nutrient criteria values for a specific waterbody type. In addition, EPA is committed to working with States and Tribes to develop more refined and localized nutrient criteria based on approaches described in the waterbody guidance manuals and this document.

Overview of the Nutrient Criteria Development Process

For each nutrient Ecoregion, EPA developed a set of recommendations for two causal variables (total nitrogen and total phosphorus) and two early indicator response variables (chlorophyll *a* [chl *a*] and some measure of turbidity). Other indicators such as dissolved oxygen, macrophyte or benthic algal growth or speciation, and other fauna and flora changes are also useful. However, the first four variables are considered to be the best suited for protecting designated uses.

The technical guidance manuals describe a process for developing nutrient criteria that involves consideration of five factors. The first of these is the Regional Technical Assistance Group (RTAG), which is a body of qualified regional specialists able to objectively evaluate all of the available evidence and select the value(s) appropriate to nutrient control in the water bodies of concern. These specialists may come from such disciplines as limnology, biology, or natural resources management—especially water resource management, chemistry, and ecology. The RTAG evaluates and recommends appropriate classification techniques, usually physical, for criteria determination within an ecoregional construct.

The second factor is the historical information available to establish a perspective of the resource base. This is usually data and anecdotal information available within the past 10-25 years. This information gives evidence about the background and enrichment trend of the resource.

The third factor is the existing reference condition, a selection of reference sites chosen to represent the least culturally impacted waters of the class at the present time. The data from these sites are combined and a value is selected to represent the reference condition, the best attainable, most natural condition of the resource base at this time.

The RTAG comprehensively evaluates these three elements to propose a candidate criterion (initially one each for TP, TN, chl *a*, and some measure of turbidity).

A fourth factor often employed is mechanistic or empirical models of the historical and reference condition data to better understand the condition of the resource.

The final element of the process is assessment by the RTAG of the likely downstream effects of the criterion. Will there be a negative, positive, or neutral effect on the downstream waterbody? If the RTAG judges that a negative effect is likely, then the proposed State/Tribal water quality criteria should be revised to ameliorate the potential for any adverse downstream effects.

Although States and authorized Tribes do not necessarily need to incorporate all five elements into their water quality criteria setting process (e.g., modeling may be significant in only some instances), the best assurance of a representative and effective criterion is a balanced incorporation of all five elements.

Because some parts of the country have naturally different soil and parent material nutrient content and different precipitation regimes, the application of the criterion development process should reflect this regional variation. Therefore, an ecoregional approach was chosen. Initially, the continental United States was divided into 14 separate Ecoregions of similar geographical characteristics and similar nutrient condition (Figure 1a). Ecoregions are defined as regions of relative homogeneity in ecological systems; they depict areas within which the mosaic of ecosystem components (biotic and abiotic as well as terrestrial and aquatic) is different from adjacent areas in a holistic sense. Geographic characteristics such as soils, vegetation, climate, geology, and land cover are relatively similar within each Ecoregion (Omernik, 2000).

The nutrient Ecoregions are aggregates of EPA's hierarchical level III Ecoregions (see Figure 1b for map of level III Ecoregions). As such, they are more generalized and less defined than level III Ecoregions. EPA determined that setting ecoregional criteria for the large-scale aggregates is not without its drawbacks: variability is high because of the lumping of many waterbody classes, seasons, and years worth of multipurpose data over a large geographic area. For these reasons, the Agency recommends that States and Tribes develop nutrient criteria at the level III ecoregional scale and at the waterbody-class scale, where those data are readily available. Data analyses and recommendations on both the large aggregate Ecoregion scale and the more refined scales (level III Ecoregions and waterbody classes), where data were available to make such assessments, are presented for comparison and completeness of analysis.

Comparison of Nutrient Criteria to Biological Criteria

Biological criteria are quantitative expressions of the desired condition of the aquatic community. Such criteria can be based on data from sites that represent the least impacted attainable condition for a particular waterbody type in an Ecoregion, subecoregion, or watershed. EPA's nutrient criteria recommendations and biological criteria recommendations have many similarities in their basic approaches to development and data requirements. Both are empirically derived from statistical analysis of field-collected data and expert evaluation of current reference conditions and historical information. Both use direct measurements from the environment to integrate the effects of complex processes that vary according to type and location of waterbody. The resulting criteria recommendations, in both cases, are efficient uses of existing resources and are holistic indicators of the water quality necessary to protect uses.

States and authorized Tribes can develop and apply nutrient and biological criteria in tandem, with each providing important and useful information to interpret both the nutrient enrichment levels and the biological condition of sampled waterbodies. For example, using the same reference sites for both types of criteria can lead to efficiencies in both sample design and data analysis. In one effort, environmental managers can obtain information to support assessment of biological and nutrient condition, either through evaluating existing data sets or

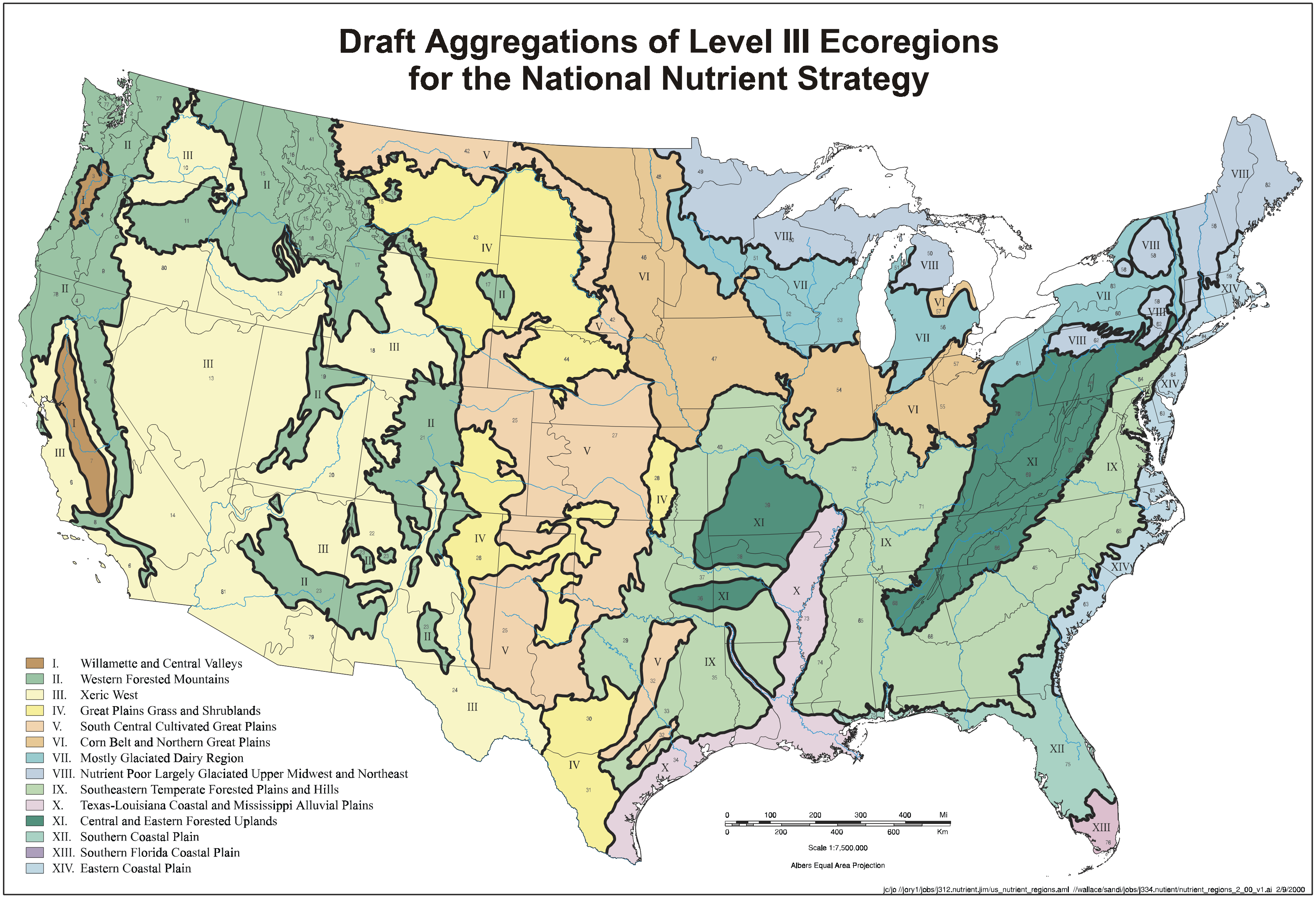


Figure 1a. Fourteen nutrient Ecoregions as delineated by Omernik (2000). Ecoregions were based on geology, land use, ecosystem type, and nutrient conditions.

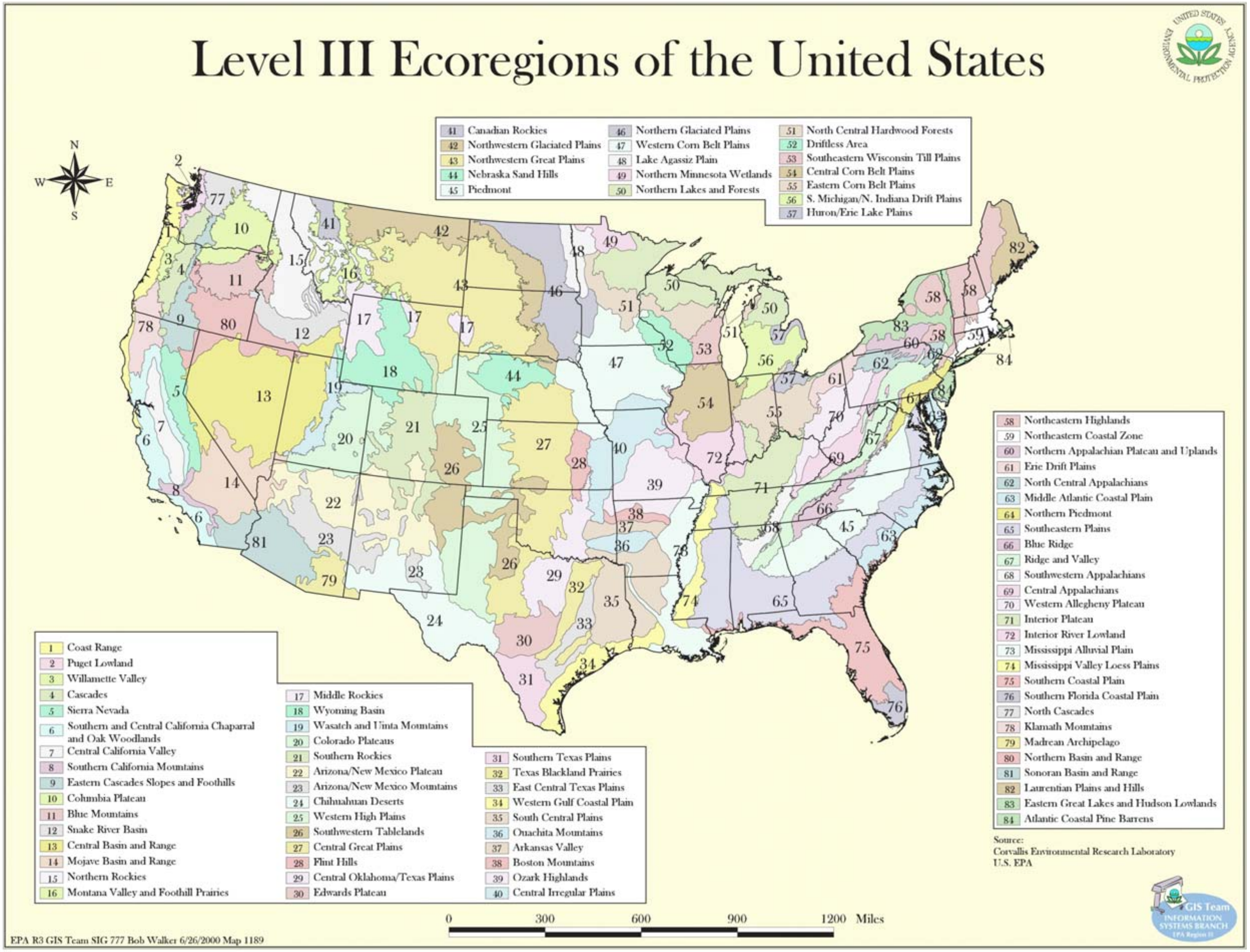


Figure 1b. Level III Ecoregions of the United States.

through designing and conducting a common sampling program. The traditional biological criteria variables of benthic invertebrate and fish sampling can be readily incorporated in a nutrient assessment. To investigate the effectiveness of this tandem approach, EPA has initiated pilot projects in both freshwater and marine environments to pursue the relationship between nutrient overenrichment and apparent declines in diversity of benthic invertebrates and fish.

2.0 BEST USE OF THIS INFORMATION

EPA recommendations published under section 304(a) of the CWA serve several purposes, including providing guidance to States and Tribes in adopting water quality standards for nutrients and ultimately controlling discharges or releases of pollutants. The recommendations also provide guidance to EPA when it determines that it is necessary to promulgate Federal water quality standards under section 303(c). Other uses include identification of overenrichment problems, management planning, project evaluation, and determination of status and trends of water resources.

State water quality inventories and listings of impaired waters consistently rank nutrient overenrichment as a top contributor to use impairments. EPA's water quality standards regulations at 40 CFR §131.11(a) require States and Tribes to adopt criteria that contain sufficient parameters and constituents to protect the designated uses of their waters. In addition, States and Tribes need quantifiable targets for nutrients to assess attainment of uses, develop water quality-based permit limits and source control plans, and establish targets for total maximum daily loads (TMDLs).

EPA expects States and Tribes to address nutrient overenrichment in their water quality standards and to build on existing State and Tribal efforts where possible. States and Tribes can address nutrient overenrichment through establishment of numerical criteria or use of narrative criteria statements (e.g., "free from excess nutrients that cause or contribute to undesirable or nuisance aquatic life or produce adverse physiological response in humans, animals, or plants"). In the case of narrative criteria, EPA expects that States and Tribes will establish procedures to quantitatively translate these statements for both assessment and source control purposes.

Ecoregional nutrient criteria are developed to represent surface waters that are minimally impacted by human activities and thus protect against the adverse effects of nutrient overenrichment from cultural eutrophication. EPA's recommended process for developing such criteria includes physical classification of waterbodies, determination of current reference conditions, evaluation of historical data and other information (such as published literature), use of models to simulate physical and ecological processes or determine empirical relationships among causal and response variables (if necessary), expert judgment, and evaluation of downstream effects. EPA has used elements of this process to produce the information contained in this document. The causal (total nitrogen, total phosphorus) and biological and physical response (chlorophyll *a*, turbidity) variables represent a set of starting points for States and Tribes to use in establishing their own criteria.

EPA recommends that States and Tribes establish numerical criteria based on section 304(a) guidance, section 304(a) guidance modified to reflect site-specific conditions, or other scientifically defensible methods. For many pollutants, such as toxic chemicals, EPA expects that section 304(a) guidance will provide an appropriate level of protection without further modification. EPA has also published methods for modifying 304(a) criteria, such as the water effect ratio, on a site-specific basis where conditions warrant modification to achieve the intended level of protection. For nutrients, however, EPA expects that it will usually be necessary for States and authorized Tribes to be more precise in identifying the nutrient levels that protect aquatic life and recreational uses. This can be achieved through criteria modified to reflect a smaller geographic scale than an Ecoregion, such as a subecoregion, the State or Tribe level, or a specific class of waterbodies. Criteria can be refined by grouping data or performing analyses at these smaller geographic scales. Refinement can also occur through further consideration of other elements such as published literature or models.

EPA expects that the values presented in this document generally represent nutrient levels that protect against the adverse effects of cultural overenrichment and are based on information available to the Agency at the time of this publication. However, States and Tribes should critically evaluate this information in light of the specific uses that need to be protected. For example, more sensitive uses may require more stringent criteria to ensure adequate protection. On the other hand, overly stringent levels of protection against cultural eutrophication may actually fall below the natural load of nutrients for certain waterbodies. In cases such as these, the level of nutrients specified may not be sufficient to support a productive fishery. In the criteria derivation process, it is important to distinguish between the natural load associated with a specific waterbody using historical data and expert judgment and current reference conditions. These elements of the criteria derivation process are best addressed by States and Tribes with access to information and local expertise. Therefore, EPA strongly encourages States and Tribes to use the information contained in this document to develop more refined criteria according to the methods described in EPA's technical guidance manuals for specific waterbody types.

To assist in further refinement of nutrient criteria, EPA has established 10 RTAGs (experts from EPA Regional Offices and States/Tribes). In refining criteria, States and authorized Tribes need to provide documentation of data and analyses, along with a defensible rationale, for any new or revised nutrient criteria they submit to EPA for review and approval. As part of EPA's review of State and Tribal standards, EPA intends to seek assurance from the RTAG that proposed criteria are sufficient to protect uses.

In using the information and recommendations in this document and elsewhere to develop numerical criteria or procedures to translate narrative criteria, EPA encourages States and Tribes to:

- Address both chemical causal variables and early indicator response variables. Causal variables are necessary to protect uses before impairment occurs and to maintain downstream uses. Early response variables are necessary to warn of possible impairment and to integrate the effects of variable and potentially unmeasured nutrient loads.

- Include variables that can be measured to determine if standards are met, and variables that can be related to the ultimate sources of excess nutrients.

- Identify appropriate periods of duration (how long) and frequency (how often) of occurrence in addition to magnitude (how much). EPA does not recommend identifying nutrient concentrations that must be met at all times; rather a seasonal or annual averaging period (e.g., based on weekly or biweekly measurements) is considered appropriate. However, these central tendency measures should apply each season or each year, except under the most extraordinary conditions (e.g., a 100-year flood).

3.0 AREA COVERED BY THIS DOCUMENT

This chapter provides a general description of the aggregate Ecoregion and its geographical boundaries. Descriptions of the level III subecoregions contained within the aggregate Ecoregion are also provided.

3.1 Description of Aggregate Ecoregion VIII—Nutrient Poor, Largely Glaciated Upper Midwest and Northeast

The Nutrient Poor Largely Glaciated Upper Midwest and Northeast is cool and moist. It is characterized by extensive forests, nutrient-poor soils, a short growing season, limited cropland, and many marshes, swamps, lakes, and streams. Less cropland and fewer people occur here than in neighboring nutrient ecoregions; related nutrient problems in surface waters are also occur less frequently. Water quality issues center around the effects of acid precipitation, logging, lake recreation, and near-lake septic systems.

Perennial streams are common and are often fed by water stored in the glacial deposits that overlie noncalcareous bedrock. Streams typically have low concentrations of alkalinity, sulfate, chloride, and dissolved solids owing, partly, to the insolubility of the bedrock. Levels of fecal coliform, total nitrogen, total phosphorus, and suspended sediment are also usually low; stream concentrations of these constituents are typically much less than in nearby, more developed nutrient regions.

Many oligotrophic and mesotrophic lakes occur in Region VIII. Total phosphorus concentrations are usually much lower, and Secchi transparencies are much higher than in the lakes of the Corn Belt and Northern Great Plains (VI). Acid precipitation caused by airborne emissions from upwind industrialized regions is a major water quality problem in the eastern portion of Region VIII and can threaten fish survival in weakly buffered glacial lakes.

3.2 Geographic Boundaries of Aggregate Ecoregion VIII

Ecoregion VIII is a fragmented region in the northeast portion of the United States (Figure 2). The region includes almost the entire States of Maine, New Hampshire, and Vermont. In addition small portions of Massachusetts, New York, and Pennsylvania are included in the

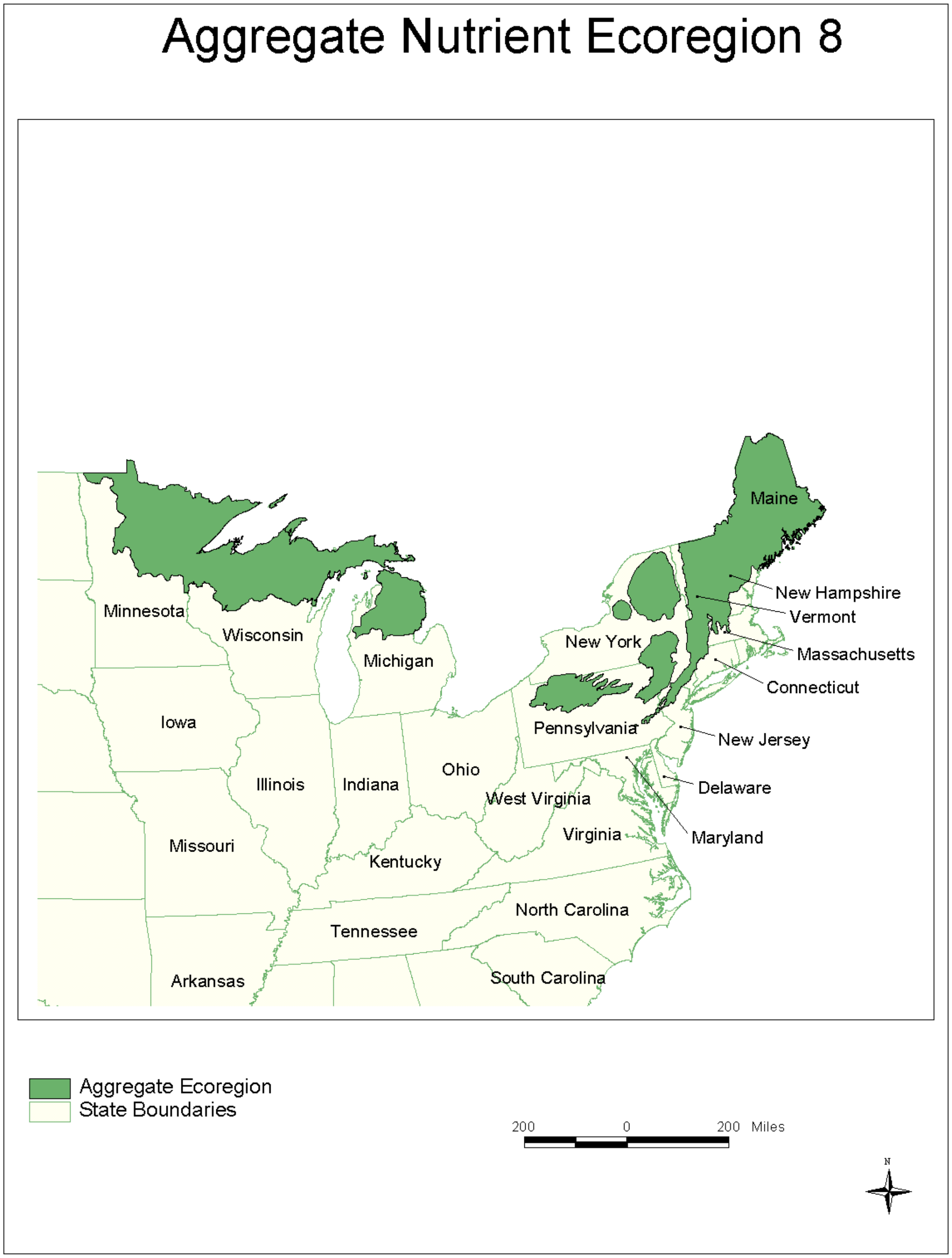


Figure 2. Aggregate Ecoregion VIII.

region. To the west of Pennsylvania, the northernmost portions of Michigan, Wisconsin, and Minnesota are encompassed in Ecoregion VIII.

3.3 Level III Ecoregions Within Aggregate Ecoregion VIII

There are five level III subecoregions contained within Aggregate Ecoregion VIII (Figure 3). The following are brief descriptions provided by Omernik (1999) of the climate, vegetative cover, topography, and other ecological information pertaining to these subecoregions.

49. Northern Minnesota Wetlands

Much of the Northern Minnesota Wetlands is a vast and nearly level marsh that is sparsely inhabited by humans and covered by swamp and boreal forest vegetation. Formerly occupied by broad glacial lakes, most of the flat terrain in this Ecoregion is still covered by standing water.

50. Northern Lakes and Forests

The Northern Lakes and Forests is a region of nutrient-poor glacial soils, coniferous and northern hardwood forests, undulating till plains, morainal hills, broad lacustrine basins, and extensive sandy outwash plains. Soils in this Ecoregion are thicker than in those to the north and generally lack the arability of soils in adjacent Ecoregions to the south. The numerous lakes that dot the landscape are clearer and less productive than those in Ecoregions to the south.

58. Northeastern Highlands

The Northeastern Highlands comprise a relatively sparsely populated region characterized by nutrient-poor soils blanketed by northern hardwood and spruce fir forests. Land-surface form in the region grades from low mountains in the southwest and central portions to open high hills in the northeast. Many of the numerous glacial lakes in this region have been acidified by sulfur depositions originating in industrialized areas upwind from the Ecoregion to the west.

62. North Central Appalachians

More forest-covered than most adjacent Ecoregions, the North Central Appalachians Ecoregion is part of a vast, elevated plateau composed of horizontally bedded sandstone, shale, siltstone, conglomerate, and coal. It is made up of plateau surfaces, high hills, and low mountains, which unlike the Ecoregions to the north and west, was largely unaffected by continental glaciation. Only a portion of the Poconos section in the east has been glaciated. Land use activities are generally tied to forestry and recreation, but some coal and gas extraction occurs in the west.

82. Laurentian Plain and Hills

This mostly forested region of dense concentrations of continental glacial lakes is less rugged than the Northeastern Highlands to the west and considerably less populated than the

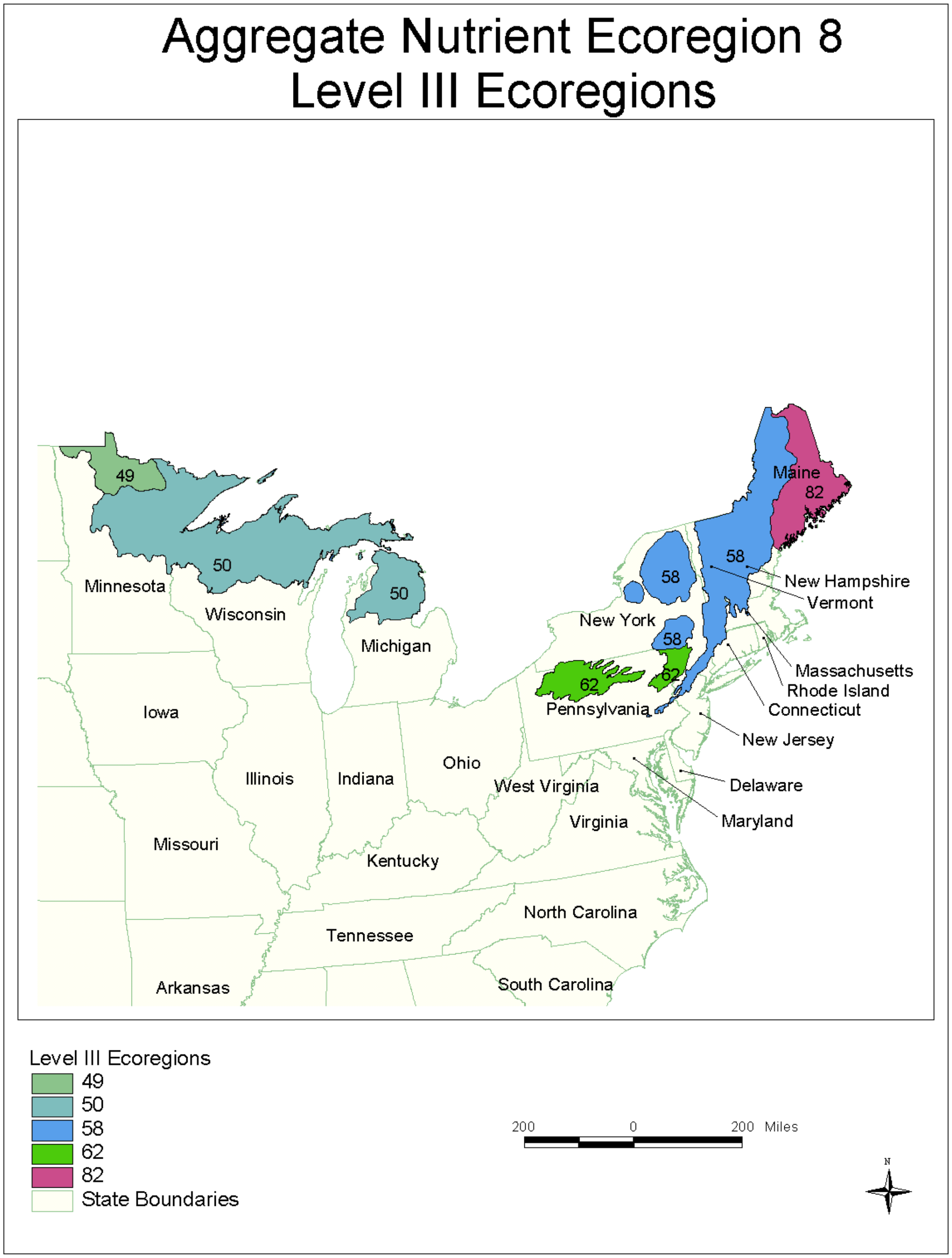


Figure 3. Aggregate Ecoregion VIII with level III Ecoregions shown.

Ecoregion to the south. Vegetation here is mostly spruce-fir with some patches of maple, beech, and birch, and the soils are predominantly Spodisols. By contrast, the forests in the Northeastern Coastal Zone to the south are mostly white, red, and jack pine and oak-hickory, and the soils are generally Inceptisols and Oxisols.

3.4 Suggested Ecoregional Subdivisions or Adjustments

EPA recommends that the RTAG evaluate the adequacy of EPA nutrient ecoregional and subecoregional boundaries and refine them as needed to reflect local conditions. See the paper by Dale Robertson (USGS, 2001b) for an alternative approach to ecoregions entitled "An Alternative Regarding the Scheme for Defining Nutrient Criteria for Rivers and Streams."

4.0 DATA REVIEW FOR RIVERS AND STREAMS IN AGGREGATE ECOREGION VIII

This section describes the nutrient data EPA has collected and analyzed for this Ecoregion, including an assessment of data quantity and quality. The data tables present the data for each causal parameter (total phosphorus and total nitrogen, both reported and calculated from TKN and nitrite/nitrate) and the primary response variables (some measure of turbidity and chlorophyll *a*). EPA considers these parameters essential to nutrient assessment, because the first two are the main causative agents of enrichment and the two response variables are the early indicators of enrichment for most surface waters (see Chapter 3 of the *Rivers and Streams Nutrient Criteria Technical Guidance Manual* [U.S. EPA, 2000b] for a complete discussion on choosing causal and response variables).

4.1 Data Sources

Data sets from Legacy STORET, NASQAN, NAWQA, and EPA Region 2 - NYCDEP (1990-1998), EPA Region 1, EPA Region 3, and EPA Region 5 were used to assess nutrient conditions from 1990 to 2000. EPA recommends that the RTAGs identify additional data sources that can be used to supplement the data sets listed above. In addition, the RTAGs may utilize published literature values to support quantitative and qualitative analyses.

4.2 Historical Data from Aggregate Ecoregion VIII (TP, TN, chl *a*, and turbidity)

Subecoregions 49, 50, 58, and 82 have remained fairly stable according to reports from stream managers in those areas. Subecoregion 62 has been subject to developmental pressure. EPA recommends that States/Tribes assess long-term trends observed over the past 50 years to assess the relative stability of the systems. This information may be obtained from scientific literature or documentation of historical trends. To gain additional perspective on more recent trends, it is recommended that States and Tribes assess nutrient trends over the last 10 years (e.g., what do seasonal variations indicate?).

4.3 QA/QC of Data Sources

An initial quality screen of data was conducted using the rules presented in Appendix C. Data remaining after screening for duplications and other QA measures (e.g., poor or unreported analytical records, sampling errors or omissions, stations associated with outfalls, stormwater sewers, hazardous waste sites) were used in the statistical analyses.

States within Ecoregion VIII were contacted regarding the quality of their data and information on the methods used to sample and analyze their waters. The following States indicated standard methods or approved EPA methods were used: Maine, New Hampshire, Vermont, Massachusetts, and Minnesota. New York, New Jersey, and Michigan indicated that standard or EPA approved methods were used for some specific nutrient parameters. Pennsylvania and Wisconsin did not provide information prior to the publication of this document.

4.4 Data for All Rivers and Streams Within Aggregate Ecoregion VIII

Figure 4 shows the location of the sampling stations within each subecoregion. Table 1 presents all data records for all parameters for Aggregate Ecoregion VIII and subecoregions within the aggregate Ecoregion.

4.5 Statistical Analysis of Data

EPA's *Technical Guidance Manual for Developing Nutrient Criteria for Rivers and Streams* describes two ways of establishing a reference condition. One method is to choose the upper 25th percentile (75th percentile) of a reference population of streams. This is the preferred method. The 75th percentile is preferred by EPA because it is likely associated with minimally impacted conditions, will be protective of designated uses, and provides management flexibility. When reference streams are not identified, the second method is to determine the lower 25th percentile of the population of all streams within a region. The 25th percentile of the entire population was chosen by EPA to represent a surrogate for an actual reference population. Data analyses to date indicate that the lower 25th percentile from an entire population roughly approximates the 75th percentile for a reference population (see case studies for Minnesota lakes in the *Lakes and Reservoirs Nutrient Criteria Technical Guidance Document* [U.S. EPA, 2000a], the case study for Tennessee streams in the *Rivers and Streams Nutrient Criteria Technical Guidance Document* [U.S. EPA, 2000b], the letter from Tennessee Department of Environment and Conservation to Geoffrey Grubbs [TNDEC, 2000], the unpublished paper entitled "Estimating the Natural Background Concentrations of Nutrients in Streams and Rivers of the Conterminous United States" [USGS, 2001], and the letter from Matthew Liebman, U.S. EPA Region 1 Nutrient Criteria Coordinator to Geoffrey Grubbs [U.S. EPA, 2000c]). New York State has also presented evidence that the 25th percentile and the 75th percentile compare well based on user perceptions of water resources (NYSDEC, 2000).

Tables 2 and 3a-e present potential reference conditions for both the aggregate Ecoregion and the subecoregions using both methods. However, the reference stream column is left blank

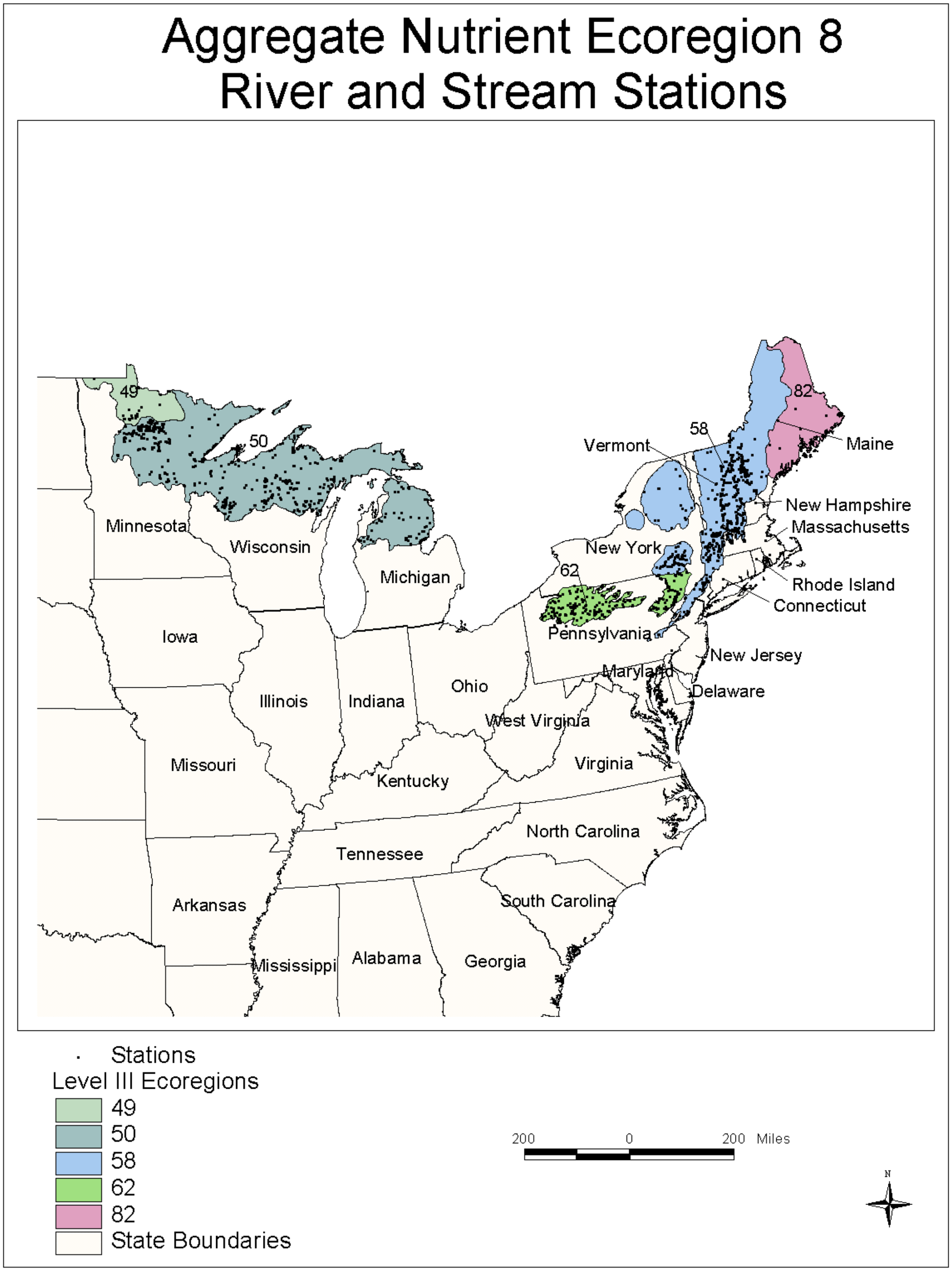


Figure 4. Map of sampling locations within each level III Ecoregion.

Table 1. River and stream records* for Aggregate Ecoregion VIII—Nutrient-Poor, Largely Glaciated Upper Midwest and Northeast

	Aggregate Ecoregion VIII	Sub ecoR 49	Sub ecoR 50	Sub ecoR 58	Sub ecoR 62	Sub ecoR 82
# of named streams	993	19	393	370	205	6
# of stream stations	1,800	28	612	803	349	8
Key nutrient parameters (listed below)						
- # of records for turbidity (all methods)	30,142	238	2,772	22,682	4,405	45
- # of records for chlorophyll *a* (all methods)	595	—	554	31	10	—
- # of records for total Kjeldhal nitrogen (TKN)	24,974	380	3,587	17,034	3,833	140
- # of records for nitrite + nitrate (NO_2+NO_3)	28,511	382	3,344	19,854	4,821	110
- # of records for total nitrogen (TN)	830	50	503	82	115	80
- # of records for total phosphorus (TP)	37,680	491	5,315	21,228	10,504	142
Total # of records for key nutrient parameters	122,732	1,541	16,075	80,911	23,688	517

*The number of rivers and streams presented in this table is based on the number of rivers and streams for which nutrient data were provided in the National Nutrient database. This does not imply that this is the total of rivers and streams within the Ecoregion. States and Tribes should determine the representativeness of the tabular data by comparing this information with any additional material they may have.

Definitions: (1) # of records refers to the total count of observations for that parameter over the entire decade (1990-1999) for that particular aggregate or subecoregion. These are counts for all seasons over that decade. (2) # of stream stations refers to the total number of river and stream stations within the aggregate or subecoregion from which nutrient data was collected. Since streams and rivers can cross ecoregional boundaries, it is important to note that only those portions of a river or stream (and data associated with those stations) that exist within the Ecoregion are included within this table.

Table 2. Reference conditions for Aggregate Ecoregion VIII streams

Parameter	No. of streams N*	Reported values		25th percentiles based on all seasons data for the decade	Reference streams‡
		Min	Max	P25 all seasons†	P75 all seasons
TKN (mg/L)	446	0.03	2.70	0.17	
NO_2+NO_3-N (mg/L)	324	0.00	3.10	0.03	
TN (mg/L) - calculated				0.20	
TN (mg/L) - reported	72	0.11	7.43	0.38	
TP (µg/L)	608	0	855	10	
Turbidity (NTU)	192	0.25	18.85	0.81	
Turbidity (FTU)	185	0.25	47	1.30	
Turbidity (JCU)	—	—	—	—	
Chlorophyll *a* (µg/L) - F	36	0.2	5.9	0.6	
Chlorophyll *a* (µg/L) - S	5	2.2	5.7	2.6	
Chlorophyll *a* (µg/L) - T	17	1.8	21.6	4.3	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

* N = largest value reported for a decade/season. TN calculated is based on the sum of TKN+NO_2+NO_3. TN reported is actual TN value reported in the database for one sample.
† Median for all seasons' 25th percentiles, e.g., this value was calculated from four seasons' 25th percentiles. If the seasonal 25th percentile (P25) TP values are: spring 10 µg/L, summer 15 µg/L, fall 12 µg/L, and winter 5 µg/L, the median value of all seasons' P25 will be 11µg/L.
‡ As determined by the Regional Technical Assistance Groups (RTAGs).

Abbreviations: P25, 25th percentile of all data; P75, 75th percentile of all data; F, Chlorophyll *a* measured by Fluorometric method with acid correction; S, Chlorophyll *a* measured by Spectrophotometric method with acid correction; T, Chlorophyll *a b c* measured by Trichromatic method; —, not applicable.

Definitions: (1) Number of Streams refers to the largest number of streams and rivers for which data existed for a given season within an aggregate nutrient Ecoregion. (2) Medians. All values (min, max, and 25th percentiles) included in the table are based on waterbody medians. All data for a particular parameter within a stream for the decade were reduced to one median for that stream. This prevents over-representation of individual waterbodies with a great deal of data versus those with fewer data points within the statistical analysis. (3) 25th percentile for all seasons is calculated by taking the median of the 4 seasonal 25th percentiles. If a season is missing, the median was calculated with 3 seasons of data. If fewer than 3 seasons were used to derive the median, the entry is flagged (z). (4) A 25th percentile for a season is best derived with data from a minimum of 4 streams/season. However, this table provides 25th percentiles that were derived with fewer than 4 streams/season in order to retain all information for all seasons. In calculating the 25th percentile for a season with fewer than 4 stream medians, the statistical program automatically used the minimum value within the fewer-than-4 population. If fewer than 4 streams were used in developing a seasonal quartile and or all-seasons median, the entry is flagged (zz).

Note: For seasonal values, refer to Appendix A, "Descriptive Statistics Data Tables for Aggregate Ecoregion."

Table 3a. Reference conditions for Ecoregion VIII streams subecoregion 49

Parameter	No. of streams N*	Reported values		25th percentiles based on all seasons data for the decade	Reference streams‡
		Min	Max	P25 all seasons†	P75 all seasons
TKN (mg/L)	18	0.03	1.47	0.69	
NO_2+NO_3-N (mg/L)	17	0.01	0.18	0.01	
TN (mg/L) - calculated				0.70	
TN (mg/L) - reported	2	0.63	1.28	0.63 (zz)	
TP (µg/L)	19	18	98	40	
Turbidity (NTU)	5	3.33	8.30	3.84	
Turbidity (FTU)	6	1.20	5.20	2.90	
Turbidity (JCU)	—	—	—	—	
Chlorophyll *a* (µg/L) - F	—	—	—	—	
Chlorophyll *a* (µg/L) - S	—	—	—	—	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3b. Reference conditions for Ecoregion VIII streams subecoregion 50

Parameter	No. of streams N*	Reported values		25th percentiles based on all seasons data for the decade	Reference streams‡
		Min	Max	P25 all seasons†	P75 all seasons
TKN (mg/L)	242	0.04	2.70	0.33	
NO_2+NO_3-N (mg/L)	171	0.00	2	0.03	
TN (mg/L) - calculated				0.36	
TN (mg/L) - reported	30	0.16	2.35	0.44	
TP (µg/L)	308	1	780	12	
Turbidity (NTU)	65	0.25	30.78	0.63	
Turbidity (FTU)	105	0.50	47	1.45	
Turbidity (JCU)	—	—	—	—	
Chlorophyll *a* (µg/L) - F	36	0.2	5.9	0.6	
Chlorophyll *a* (µg/L) - S	2 (z)	2	2.4	2 (zz)	
Chlorophyll *a* (µg/L) - T	17	1.8	21.6	4.3	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3c. Reference conditions for Ecoregion VIII streams subecoregion 58

Parameter	No. of streams N*	Reported values		25th percentiles based on all seasons data for the decade	Reference streams‡
		Min	Max	P25 all seasons†	P75 all seasons
TKN (mg/L)	122	0.05	1.20	0.10	
NO_2+NO_3-N (mg/L)	77	0.01	2.85	0.16	
TN (mg/L) - calculated				0.26	
TN (mg/L) - reported	8	0.34	0.84	0.42	
TP (µg/L)	149	2	450	5	
Turbidity (NTU)	61	0.28	4.33	0.80	
Turbidity (FTU)	34	0.25	7	0.25	
Turbidity (JCU)	—	—	—	—	
Chlorophyll *a* (µg/L) - F	—	—	—	—	
Chlorophyll *a* (µg/L) - S	3 (z)	3.4	7	3.4 (zz)	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3d. Reference conditions for Ecoregion VIII streams subecoregion 62

Parameter	No. of streams N*	Reported values		25th percentiles based on all seasons data for the decade	Reference streams‡
		Min	Max	P25 all seasons†	P75 all seasons
TKN (mg/L)	60	0.03	1.25	0.10	
NO_2+NO_3-N (mg/L)	55	0.01	1.06	0.09	
TN (mg/L) - calculated				0.19	
TN (mg/L) - reported	37	0.13	6.88	0.32	
TP (µg/L)	130	2	106	10	
Turbidity (NTU)	61	0.30	7.23	0.80	
Turbidity (FTU)	41	0.30	16.38	5.25	
Turbidity (JCU)	—	—	—	—	
Chlorophyll *a* (µg/L) - F	—	—	—	—	
Chlorophyll *a* (µg/L) - S	3 (z)	0	0	0 (zz)	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3e. Reference conditions for Ecoregion VIII streams subecoregion 82

Parameter	No. of streams N*	Reported values		25th percentiles based on all seasons data for the decade	Reference streams‡
		Min	Max	P25 all seasons†	P75 all seasons
TKN (mg/L)	4	0.25	0.40	0.27	
NO_2+NO_3-N (mg/L)	4	0.06	0.14	0.07	
TN (mg/L) - calculated				0.34	
TN (mg/L) - reported	4	0.37	0.51	0.39	
TP (µg/L)	6	10	34	12	
Turbidity (NTU)	—	—	—	—	
Turbidity (FTU)	2	1.55	1.78	1.55 (zz)	
Turbidity (JCU)	—	—	—	—	
Chlorophyll *a* (µg/L) - F	—	—	—	—	
Chlorophyll *a* (µg/L) - S	—	—	—	—	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

* N = largest value reported for a decade/season. TN calculated is based on the sum of TKN+NO_2+NO_3. TN reported is actual TN value reported in the database for one sample.
† Median for all seasons' 25th percentiles, e.g., this value was calculated from four seasons' 25th percentiles. If the seasonal 25th percentile (P25) TP values are: spring 10 µg/L, summer 15 µg/L, fall 12 µg/L, and winter 5 µg/L, the median value of all seasons' P25 will be 11µg/L.
‡ As determined by the Regional Technical Assistance Groups (RTAGs).

Abbreviations: P25, 25th percentile of all data; P75, 75th percentile of all data; F, Chlorophyll *a* measured by Fluorometric method with acid correction; S, Chlorophyll *a* measured by Spectrophotometric method with acid correction; T, Chlorophyll *a b c* measured by Trichromatic method; —, not applicable.

Definitions: (1) Number of Streams refers to the number of streams and rivers for which data existed for the summer months since summer is generally when the greatest amount of nutrient sampling is conducted. If another season greatly predominates, notification is made (s=spring, f=fall, w=winter). (2) Medians. All values (min, max, and 25th percentiles) included in the table are based on waterbody medians. All data for a particular parameter within a stream for the decade were reduced to one median for that stream. This prevents over-representation of individual waterbodies with a great deal of data versus those with fewer data points within the statistical analysis. (3) 25th percentile for all seasons is calculated by taking the median of the 4 seasonal 25th percentiles. If a season is missing, the median was calculated with 3 seasons of data. If fewer than 3 seasons were used to derive the median, the entry is flagged (z). (4). A 25th percentile for a season is best derived with data from a minimum of 4 streams/season. However, this table provides 25th percentiles that were derived with fewer than 4 streams/season in order to retain all information for all seasons. In calculating the 25^{th} percentile for a season with fewer than 4 stream medians, the statistical program automatically used the minimum value within the fewer-than-4 population. If fewer than 4 streams were used in developing a seasonal quartile and or all-seasons median, the entry is flagged (zz).

Note: For seasonal and yearly values, refer to Appendix B, "Descriptive Statistics Data Tables for Level III Subecoregions Within Aggregate Ecoregion."

because EPA does not have reference data and anticipates that States/Tribes will provide information on reference streams. Tables 3a-e present potential reference conditions for rivers and streams in the level III subecoregions within the aggregate Ecoregion. Note that the footnotes for Table 2 apply to Tables 3a-e. Appendixes A and B provides a complete presentation of all descriptive statistics for both the aggregate Ecoregion and the level III subecoregions

Tables 4 and 5 are presented for comparison purposes. They allow the reader to determine where, in the trophic state, the recommended reference conditions fall within traditionally viewed trophic boundaries.

4.6 Classification of River/Stream Type

Assessing the data by stream type should further reduce the variability in the data analysis. There were no readily available classification data in the national datasets used to develop these criteria. States and Tribes are strongly encouraged to classify their streams before developing a final criterion.

4.7 Summary of Data Reduction Methods

All descriptive statistics were calculated using the medians for each stream within **Ecoregion VIII** for which data existed. For example, if one stream had 300 observations for phosphorus over the decade or 1 year's time, one median resulted. Each median from each stream was then used in calculating the percentiles for phosphorus for the aggregate nutrient Ecoregion/subecoregion (level III Ecoregion) by season and year (Figures 5a, 5b).

Preferred Data Choices and Recommendations When Data Are Missing

1. **Where data are missing** or are very low in total records for a given parameter, use 25th percentiles for parameters within an adjacent, similar subecoregion within the same aggregate nutrient Ecoregion, **or** when a similar subecoregion cannot be determined, use the 25th percentile for the aggregate Ecoregion or consider the **lowest** 25th percentile from a subecoregion (level III) within the aggregate nutrient Ecoregion. Without data, one may assume that the subecoregion in question is as sensitive as the most sensitive subecoregion within the aggregate.

2. **TN calculated:** When reported total nitrogen (TN) median values are lacking or very low in comparison to TKN and Nitrate/Nitrite-N values, the medians for TKN and nitrite/nitrate-N are added, resulting in a calculated TN value. The number of samples (N) for calculated TN is not filled in because it is represented by two subsamples of data: TKN and nitrite/nitrate-N. Therefore, N/A is placed in this box.

3. **TN reported:** This is the median based on reported values for TN from the database.

Table 4. Suggested boundaries for trophic classification of streams from cumulative frequency distributions. The boundary between oligotrophic and mesotrophic systems represents the lowest third of the distribution and the boundary between mesotrophic and eutrophic marks the top third of the distribution.

Variable (units)	Oligotrophic-mesotrophic boundary	Mesotrophic-eutrophic boundary	Sample size (N)
mean benthic chlorophyll (mg m^{-2})[a]	20	70	286
maximum benthic chlorophyll (mg m^{-2})[a]	60	200	176
sestonic chlorophyll (µg L^{-1})[b]	10	30	292
TN (µg L^{-1})[a,c]	700	1,500	1,070
TP (µg L^{-1})[a,b,c]	25	75	1,366

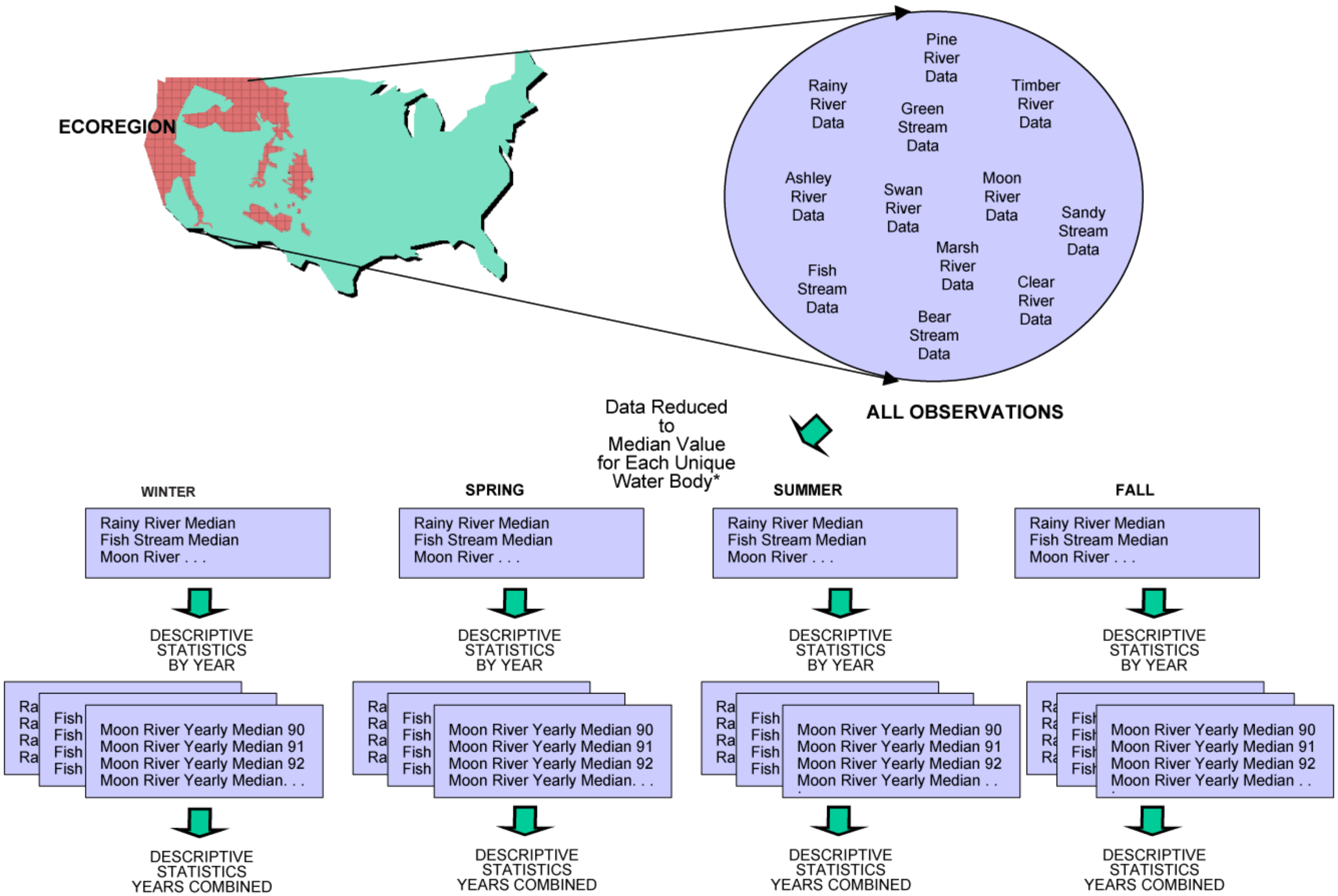
Note: This table is provided to allow the reader to make comparisons between the ecoregional criteria provided in this document and traditional nutrient and biological endpoints.

[a]Data from Dodds et al. (1998); [b]data from Van Nieuwenhuyse and Jones (1996); [c]data from Omernik (1977).

Table 5. Nutrient (µg/L) and algal biomass criteria limits recommended to prevent nuisance conditions and water quality degradation in streams based either on nutrient-chlorophyll *a* relationships or preventing risks to stream impairment as indicated.

Periphyton Maximum in mg/m²						
TN	**TP**	**DIN**	**SRP**	**Chlorophyll *a***	**Impairment Risk**	**Source**
				100-200	nuisance growth	Welch et al. 1988, 1989
275-650	38-90			100-200	nuisance growth	Dodds et al. 1997
1,500	75			200	eutrophy	Dodds et al. 1998
300	20			150	nuisance growth	Clark Fork River Tri-State Council, MT
	20				*Cladophora* nuisance growth	Chetelat et al. 1999
	10-20				*Cladophora* nuisance growth	Stevenson unpubl. data
		430	60		eutrophy	UK Environ. Agency 1988
		100[a]	10[a]	200	nuisance growth	Biggs 2000
		25	3	100	reduced invertebrate diversity	Nordin 1985
			15	100	nuisance growth	Quinn 1991
		1,000	10[b]	~100	eutrophy	Sosiak pers. comm.
Plankton Mean in µg/L						
TN	**TP**	**DIN**	**SRP**	**Chlorophyll *a***	**Impairment Risk**	**Source**
300[c]	42			8	eutrophy	Van Nieuwenhuyse and Jones 1996
	70			15	chlorophyll action level	OAR 2000
250[c]	35			8	eutrophy	OECD 1992 (for lakes)

[a]30-day biomass accrual time.
[b]Total dissolved P.
[c]Based on Redfield ratio of 7.2N:1P (Smith et al. 1997).



Unique Water Body - is a water body that is unique to a state, a subecoregion, a county, the year, and the season.

Figure 5a. Illustration of data reduction process for stream data.

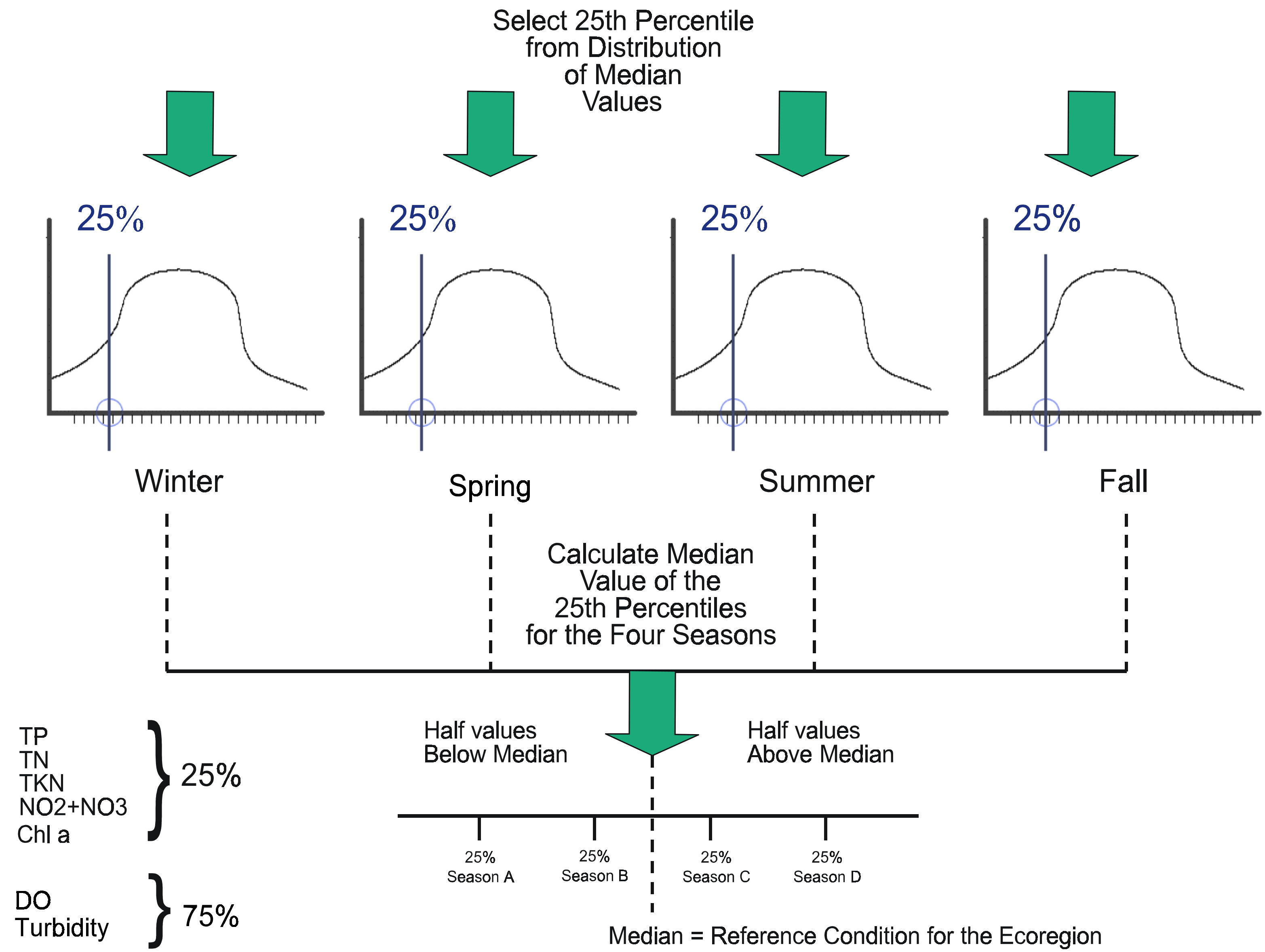


Figure 5b. Illustration of reference condition calculation.

4. **Chlorophyll *a*:** Medians based on all methods are reported; however, the acid-corrected medians are preferred to the uncorrected medians. In developing a reference condition from a particular method, it is recommended that the method with the most observations be used. Fluorometric and spectrophotometric observations are preferred over all other methods. However, when no data exist for fluorometric and spectrophotometric methods, trichromatic values may be used. Data from the various techniques are not interchangeable.

5. **Periphyton:** Where periphyton data exist, record them separately. For periphyton-dominated streams, a measure of periphyton chlorophyll is a more appropriate response variable than planktonic chlorophyll *a*. See Table 4, page 101, of the *Rivers and Streams Nutrient Technical Guidance Manual* (U.S. EPA, 2000b) for values of periphyton and planktonic chlorophyll *a* related to eutrophy in streams.

6. **Secchi depth:** The 75th percentile is reported for Secchi depth because this is the only variable for which the value of the parameter **increases** with greater clarity (for lakes and reservoirs only).

7. **Turbidity units:** Turbidity units from all methods are reported. FTUs and NTUs are preferred over JCUs. If FTUs and NTUs do not exist, use JCUs. These units are not interchangeable. Turbidity is chosen as a response variable in streams because it can be an indicator of increasing algal biomass due to nutrient enrichment. See pages 32-33 of the *Rivers and Streams Nutrient Technical Guidance Manual* for a discussion of turbidity and correlations with algal growth.

8. **Lack of data:** A dash (—) represents missing, inadequate, or inconclusive data. According to EPA statistical analyses, 5% or fewer of the reported observations are "below detection." Because of this low incidence, these data were retained and factored into the statistical analysis as reported according to the protocols described in Appendix C, "Quality Control/Quality Assurance Rules."

5.0 REFERENCE SITES AND CONDITIONS IN AGGREGATE ECOREGION VIII

Reference conditions represent the natural, least impacted conditions, or what is considered to be the most attainable conditions. This chapter compares the different reference conditions determined from the two methods and establishes which reference condition is most appropriate.

- *A priori* determination of reference sites. The preferred method for establishing reference condition is to choose the upper percentile of an a priori population of reference streams. States and Tribes are encouraged to identify reference conditions based on this method.

- Statistical determination of reference conditions (25th percentile of entire database). See Tables 2 and 3a-e in Section 4.0.

- RTAG discussion and rationale for selection of reference sites and conditions in Ecoregion VIII. The RTAG should compare the results derived from the two methods described above and present a rationale for the final selection of reference sites.

6.0 MODELS USED TO PREDICT OR VERIFY RESPONSE PARAMETERS

The RTAG is encouraged to identify and apply relevant models to support nutrient criteria development. There are three scenarios under which models may be used to derive criteria or support criteria development:

- Models for predicting correlations between causal and response variables
- Models used to verify reference conditions based on percentiles
- Regression models used to predict reference conditions in impacted areas

Appendix C of the Rivers and Streams Technical Guidance Manual (U.S. EPA, 2000b), and Chapter 9 of the Lakes and Reservoirs Technical Guidance Manual (U.S. EPA, 2000a) should be consulted for further details.

7.0 FRAMEWORK FOR REFINING RECOMMENDED NUTRIENT CRITERIA FOR RIVERS AND STREAMS IN AGGREGATE ECOREGION VIII

Information on each of the following six weight-of-evidence factors is important to refine the criteria presented in this document. All elements should be addressed in developing criteria, as is expressed in EPA's nutrient criteria technical guidance manuals. It is our expectation that EPA Regions, States, and Tribes (as RTAGs) will consider these elements as States/Tribes develop their criteria. This section should be viewed as a worksheet (sections are left blank for this purpose) to assist in the refinement of nutrient criteria. If many of these elements are ultimately unaddressed, EPA may rely on the proposed reference conditions presented in Tables 3a-e and other literature and information readily available to the EPA Headquarters nutrient team to develop nutrient water quality recommendations for this Ecoregion.

7.1 Example Worksheet for Developing Aggregate Ecoregion and Subecoregion Nutrient Criteria

*Literature sources:*____

*Historical data and trends:*____________________________________

Reference condition:

Models:

RTAG expert review and consensus:

Downstream effects:

7.2 Setting Seasonal Criteria

The recommendations presented in this document are based in part on medians of all the 25th percentile seasonal data (decadal), and as such reflect all seasons and not one particular season or year. It is recommended that States and Tribes monitor in all seasons to best assess compliance with the resulting criterion. States/Tribes may choose to develop criteria that reflect **each** particular season or **given season** or a **given year** when there is significant variability between seasons/years or designated uses that are specifically tied to one or more seasons of the year (e.g., recreation, fishing). Using the tables in Appendix A and B, one can set reference conditions based on a particular season or year and then develop a criterion based on each individual season. Obviously, this option is season-specific and would require increased monitoring within each season to assess compliance. If a case can be made that one season is more appropriate than another season, or more appropriate than the annual median, criteria should be season specific. For example, in most parts of the country, spring and summer are the most common growth periods, so criteria for chlorophyll *a* and Secchi may be set for spring and summer only. However, caution should be used when developing criteria for TN and TP because the peak loading of these nutrients may take place in seasons other than summer, such as winter and spring. For these reasons, EPA developed annual criteria and provided additional seasonal information in appendices.

7.3 When Data/Reference Conditions Are Lacking

When data are unavailable to develop a reference condition for a particular parameter(s) within a subecoregion, EPA recommends one of three options: (1) use data from a similar neighboring subecoregion (e.g., if data are few or nonexistent for the Northern Cascades, consider using the data and reference conditions developed for the Cascades); (2) use the 25th percentiles for the aggregate Ecoregion; or (3) consider using the lowest of the yearly medians for that parameter calculated for all the subecoregions within the aggregate Ecoregion.

7.4 Site-Specific Criteria Development

Criteria may be refined in a number of ways. The best way is to follow the critical elements of criteria development as well as to refer to the *Rivers and Streams Nutrient Criteria Technical Guidance Manual* (U.S. EPA, 2000b). The Technical Guidance Manual presents sections on each of the following factors to consider in setting criteria:

- Refinements to Ecoregions (Section 2.3). See paper by Dale Robertson (USGS, 2001b), an alternative approach to ecoregions entitled "An Alternative Regarding the Scheme for Defining Nutrient Criteria for Rivers and Streams."
- Classification of waterbodies (Chapter 2)
- Setting seasonal criteria to reflect major seasonal climate differences and accounting for significant or cyclical precipitation events (high-flow/low-flow conditions) (Chapter 4)

8.0 LITERATURE CITED

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9.0 APPENDICES

A. Descriptive Statistics Data Tables for Aggregate Ecoregion
B. Descriptive Statistics Data Tables for Level III Subecoregions Within Aggregate Ecoregion
C. Quality Control/Quality Assurance Rules

APPENDIX A

Descriptive Statistics Data Tables for Aggregate Ecoregion

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1994
Chloro_A_Fluor_cor_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	36	1.49	.25000	6.00	1.31	0.22	88	0.25	0.25	1.00	2.25	4.00
SPRING	23	2.30	.62500	5.00	1.37	0.29	60	1.00	1.00	2.00	3.50	5.00
SUMMER	33	2.47	.25000	18.00	3.09	0.54	125	0.25	1.00	2.00	3.00	6.00
WINTER	22	1.68	.25000	5.75	1.64	0.35	97	0.25	0.25	1.31	3.00	4.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1991 to 1997
Chloro_A_Phyto_Spe_unc_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
SUMMER	4	1.89	.00500	7.55	3.77	1.88	199	0.01	0.01	0.01	3.78	7.55

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1994 to 1996
Chloro_A_Phyto_Spec_A_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	5	3.38	2.1700	5.71	1.44	0.65	43	2.17	2.56	2.62	3.82	5.71
SPRING	2	6.50	4.7200	8.29	2.52	1.78	39	4.72	4.72	6.50	8.29	8.29
SUMMER	2	1.84	1.4900	2.18	0.49	0.34	27	1.49	1.49	1.84	2.18	2.18

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1997
Chloro_A_Trich_unco_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	17	8.13	2.0200	23.00	5.38	1.30	66	2.02	5.03	6.28	10.80	23.00
SPRING	7	8.68	1.7300	18.20	5.20	1.97	60	1.73	4.55	8.25	11.03	18.20
SUMMER	16	8.68	1.8550	22.30	5.89	1.47	68	1.86	4.06	6.48	11.83	22.30
WINTER	6	6.84	1.5875	21.00	7.36	3.00	108	1.59	2.00	4.52	7.42	21.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
DIP_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	63	8.96	.00000	43.75	7.07	0.89	79	3.00	5.00	6.25	11.25	20.00
SPRING	55	7.09	1.0000	38.75	5.81	0.78	82	2.25	5.00	5.00	7.50	17.00
SUMMER	77	9.52	1.5000	50.00	9.55	1.09	100	3.50	5.00	5.50	8.50	37.50
WINTER	55	7.29	.00000	35.00	5.80	0.78	79	1.50	5.00	5.00	7.50	20.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
Dissolved_Oxygen_percent_sat

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	9	97.52	87.500	113.90	7.93	2.64	8	87.50	92.00	96.00	100.75	113.90
SPRING	6	94.84	92.500	100.00	2.72	1.11	3	92.50	92.80	94.35	95.05	100.00
SUMMER	116	94.54	73.200	108.40	6.64	0.62	7	82.60	91.40	95.50	97.53	106.60
WINTER	1	88.00	88.000	88.00	.	.	.	88.00	88.00	88.00	88.00	88.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
Dissolved_Oxygen_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	324	9.55	2.9000	14.20	1.54	0.09	16	6.85	9.01	9.76	10.50	11.55
SPRING	289	10.68	4.3000	15.20	1.46	0.09	14	7.70	9.98	10.80	11.48	12.80
SUMMER	545	8.42	2.1000	14.10	1.57	0.07	19	5.00	7.80	8.60	9.25	10.40
WINTER	242	11.91	2.5000	14.90	2.02	0.13	17	9.25	11.20	12.33	13.20	13.88

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
Nitrite_Nitrate_NO2_NO3_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	273	0.25	.00000	5.56	0.55	0.03	223	0.00	0.01	0.07	0.18	1.30
SPRING	224	0.26	.00250	2.30	0.35	0.02	133	0.01	0.05	0.15	0.29	1.10
SUMMER	324	0.20	.00000	3.90	0.37	0.02	191	0.00	0.01	0.07	0.21	0.75
WINTER	190	0.34	.00250	1.80	0.35	0.03	106	0.03	0.12	0.23	0.39	1.20

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
Nitrogen_Tot_Kjeldhal_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	304	0.44	.02500	2.40	0.35	0.02	81	0.05	0.17	0.39	0.56	1.07
SPRING	266	0.50	.02500	4.55	0.51	0.03	102	0.05	0.18	0.39	0.69	1.29
SUMMER	446	0.49	.00000	2.60	0.38	0.02	78	0.05	0.18	0.40	0.73	1.20
WINTER	204	0.40	.02500	2.80	0.38	0.03	95	0.05	0.13	0.30	0.49	1.19

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
Phosph_Ortho_Tot_as_P_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	35	9.19	5.0000	30.00	6.08	1.03	66	5.00	5.00	5.00	12.00	21.00
SPRING	26	11.27	5.0000	45.00	9.92	1.95	88	5.00	5.00	7.50	12.50	30.00
SUMMER	50	7.67	.50000	95.00	13.93	1.97	182	1.00	1.00	5.00	7.50	20.00
WINTER	29	11.34	5.0000	35.00	7.50	1.39	66	5.00	5.00	10.00	15.00	30.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
Total_Nitrogen_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	43	0.50	.12500	1.15	0.27	0.04	54	0.13	0.30	0.48	0.60	1.09
SPRING	68	1.27	.08900	12.63	1.95	0.24	154	0.19	0.40	0.57	1.20	5.33
SUMMER	72	0.98	.10200	16.26	1.99	0.23	204	0.13	0.36	0.58	0.86	2.42
WINTER	32	0.82	.37000	2.23	0.51	0.09	63	0.41	0.50	0.57	0.93	2.06

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
Total_Phosphorus_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	389	36.31	.00000	860.00	72.49	3.68	200	2.50	10.00	20.00	40.00	100.00
SPRING	393	35.70	1.0000	850.00	58.03	2.93	163	2.50	11.00	20.00	40.00	105.00
SUMMER	608	42.86	1.0000	700.00	73.09	2.96	171	2.50	10.00	20.00	50.00	130.00
WINTER	287	39.47	.00000	1170.00	84.77	5.00	215	2.50	10.00	20.00	40.00	110.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
Turbidity_FTU

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	177	4.66	.25000	47.50	6.79	0.51	146	0.25	1.20	2.10	5.50	19.00
SPRING	157	4.75	.25000	46.50	6.14	0.49	129	0.25	1.40	2.65	7.00	12.60
SUMMER	185	4.54	.25000	110.00	9.03	0.66	199	0.25	1.30	2.35	5.50	11.00
WINTER	130	4.02	.25000	16.25	3.80	0.33	95	0.25	1.30	2.43	7.00	11.75

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
Turbidity_NTU

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	71	2.15	.25000	24.70	3.25	0.39	151	0.30	0.73	1.20	2.15	6.80
SPRING	85	2.64	.30000	13.00	2.47	0.27	94	0.60	1.30	1.90	3.00	7.40
SUMMER	192	2.05	.20000	36.85	3.10	0.22	151	0.25	0.70	1.28	2.35	6.15
WINTER	42	2.19	.25000	9.00	2.03	0.31	93	0.50	0.90	1.48	2.90	6.15

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1998
pH_S_U

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	167	6.70	2.8500	8.72	1.02	0.08	15	4.80	6.05	6.89	7.45	8.18
SPRING	193	6.70	3.0000	8.82	1.04	0.07	15	4.97	6.00	6.75	7.45	8.26
SUMMER	343	7.02	3.1000	9.10	0.85	0.05	12	5.37	6.65	7.10	7.60	8.10
WINTER	143	6.55	4.5000	8.20	0.90	0.08	14	5.01	5.89	6.65	7.23	7.99

Data were not always available for all years.

APPENDIX B

Descriptive Statistics Data Tables for Level III Subecoregions Within Aggregate Ecoregion

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1994
Chloro_A_Fluor_cor_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	FALL	36	1.49	.25000	6.00	1.31	0.22	88	0.25	0.25	1.00	2.25	4.00
50	SPRING	23	2.30	.62500	5.00	1.37	0.29	60	1.00	1.00	2.00	3.50	5.00
50	SUMMER	33	2.47	.25000	18.00	3.09	0.54	125	0.25	1.00	2.00	3.00	6.00
50	WINTER	22	1.68	.25000	5.75	1.64	0.35	97	0.25	0.25	1.31	3.00	4.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1991 to 1997
Chloro_A_Phyto_Spe_unc_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	SUMMER	1	7.55	7.5450	7.55	.	.	.	7.55	7.55	7.55	7.55	7.55
62	SUMMER	3	0.01	.00500	0.01	0.00	0.00	43	0.01	0.01	0.01	0.01	0.01

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1994 to 1996
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	FALL	2	2.59	2.5600	2.62	0.04	0.03	2	2.56	2.56	2.59	2.62	2.62
50	SUMMER	2	1.84	1.4900	2.18	0.49	0.34	27	1.49	1.49	1.84	2.18	2.18
58	FALL	3	3.90	2.1700	5.71	1.77	1.02	45	2.17	2.17	3.82	5.71	5.71
58	SPRING	2	6.50	4.7200	8.29	2.52	1.78	39	4.72	4.72	6.50	8.29	8.29

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1997
Chloro_A_Trich_unco_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	FALL	17	8.13	2.0200	23.00	5.38	1.30	66	2.02	5.03	6.28	10.8	23.0
50	SPRING	7	8.68	1.7300	18.20	5.20	1.97	60	1.73	4.55	8.25	11.0	18.2
50	SUMMER	16	8.68	1.8550	22.30	5.89	1.47	68	1.86	4.06	6.48	11.8	22.3
50	WINTER	6	6.84	1.5875	21.00	7.36	3.00	108	1.59	2.00	4.52	7.42	21.0

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1998
DIP_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	FALL	2	15.00	10.000	20.00	7.07	5.00	47	10.0	10.0	15.0	20.0	20.0
49	SPRING	2	15.00	7.5000	22.50	10.6	7.50	71	7.50	7.50	15.0	22.5	22.5
49	SUMMER	2	25.00	12.500	37.50	17.7	12.5	71	12.5	12.5	25.0	37.5	37.5
49	WINTER	2	27.50	20.000	35.00	10.6	7.50	39	20.0	20.0	27.5	35.0	35.0
50	FALL	16	6.31	1.0000	12.50	3.11	0.78	49	1.00	5.00	5.00	6.25	12.5
50	SPRING	17	8.44	1.0000	38.75	8.37	2.03	99	1.00	5.00	5.00	7.50	38.8
50	SUMMER	17	8.25	1.5000	45.00	9.94	2.41	120	1.50	5.00	5.00	6.25	45.0
50	WINTER	17	6.53	1.0000	15.00	3.04	0.74	47	1.00	5.00	5.00	7.50	15.0
58	FALL	23	10.84	2.0000	43.75	9.97	2.08	92	3.00	5.00	7.00	12.5	27.8
58	SPRING	23	6.85	1.5000	17.00	3.84	0.80	56	3.50	5.00	5.00	7.50	15.5
58	SUMMER	23	11.55	1.5000	50.00	12.4	2.59	108	5.00	5.00	5.50	13.0	41.5
58	WINTER	23	7.14	1.5000	20.00	4.80	1.00	67	3.00	5.00	5.00	8.75	18.8
62	FALL	19	7.72	.00000	16.00	4.33	0.99	56	0.00	5.00	6.00	11.0	16.0
62	SPRING	9	4.03	2.2500	5.00	1.25	0.42	31	2.25	2.50	5.00	5.00	5.00
62	SUMMER	31	7.77	2.0000	28.50	5.50	0.99	71	3.50	5.00	6.00	8.00	22.0
62	WINTER	9	3.83	.00000	5.00	1.80	0.60	47	0.00	3.00	5.00	5.00	5.00
82	FALL	3	12.50	7.5000	17.50	5.00	2.89	40	7.50	7.50	12.5	17.5	17.5
82	SPRING	4	5.63	5.0000	7.50	1.25	0.63	22	5.00	5.00	5.00	6.25	7.50
82	SUMMER	4	9.06	5.0000	12.50	3.44	1.72	38	5.00	6.25	9.38	11.9	12.5
82	WINTER	4	9.06	5.0000	16.25	4.93	2.47	54	5.00	6.25	7.50	11.9	16.3

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1998
Phosph_Ortho_Tot_as_P_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	FALL	2	20.00	10.000	30.00	14.1	10.0	71	10.0	10.0	20.0	30.0	30.0
49	SPRING	2	21.25	12.500	30.00	12.4	8.75	58	12.5	12.5	21.3	30.0	30.0
49	SUMMER	2	53.75	12.500	95.00	58.3	41.3	109	12.5	12.5	53.8	95.0	95.0
49	WINTER	2	15.00	15.000	15.00	0.00	0.00	0	15.0	15.0	15.0	15.0	15.0
50	FALL	13	7.98	5.0000	20.00	5.58	1.55	70	5.00	5.00	5.00	8.75	20.0
50	SPRING	14	11.43	5.0000	45.00	12.2	3.26	107	5.00	5.00	5.00	12.5	45.0
50	SUMMER	14	8.75	5.0000	20.00	5.55	1.48	63	5.00	5.00	5.63	12.5	20.0
50	WINTER	15	12.00	5.0000	35.00	9.32	2.41	78	5.00	5.00	12.5	15.0	35.0
58	FALL	4	6.88	5.0000	12.50	3.75	1.88	55	5.00	5.00	5.00	8.75	12.5
58	SPRING	3	8.33	5.0000	12.50	3.82	2.20	46	5.00	5.00	7.50	12.5	12.5
58	SUMMER	4	8.75	5.0000	17.50	5.95	2.98	68	5.00	5.00	6.25	12.5	17.5
58	WINTER	5	8.00	5.0000	10.00	2.74	1.22	34	5.00	5.00	10.0	10.0	10.0
62	FALL	13	9.65	5.0000	21.00	4.97	1.38	52	5.00	5.00	10.0	12.0	21.0
62	SPRING	3	6.00	5.0000	8.00	1.73	1.00	29	5.00	5.00	5.00	8.00	8.00
62	SUMMER	26	3.01	.50000	20.00	4.88	0.96	162	1.00	1.00	1.00	2.00	15.0
62	WINTER	3	15.00	5.0000	20.00	8.66	5.00	58	5.00	5.00	20.0	20.0	20.0
82	FALL	3	8.33	5.0000	15.00	5.77	3.33	69	5.00	5.00	5.00	15.0	15.0
82	SPRING	4	11.88	7.5000	15.00	3.15	1.57	26	7.50	10.0	12.5	13.8	15.0
82	SUMMER	4	10.00	5.0000	20.00	7.07	3.54	71	5.00	5.00	7.50	15.0	20.0
82	WINTER	4	8.44	5.0000	10.00	2.37	1.18	28	5.00	6.88	9.38	10.0	10.0

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1998
Total_Nitrogen_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	FALL	2	0.84	.52500	1.15	0.44	0.31	53	0.53	0.53	0.84	1.15	1.15
49	SPRING	2	0.90	.80000	1.00	0.14	0.10	16	0.80	0.80	0.90	1.00	1.00
49	SUMMER	2	1.05	.70000	1.40	0.49	0.35	47	0.70	0.70	1.05	1.40	1.40
49	WINTER	2	1.03	.55500	1.50	0.67	0.47	65	0.56	0.56	1.03	1.50	1.50
50	FALL	18	0.48	.12500	0.90	0.22	0.05	45	0.13	0.37	0.49	0.60	0.90
50	SPRING	21	0.88	.20000	2.54	0.60	0.13	69	0.48	0.53	0.58	0.91	1.99
50	SUMMER	30	0.75	.12500	2.47	0.63	0.11	83	0.13	0.35	0.58	0.90	2.42
50	WINTER	20	0.91	.43000	2.23	0.59	0.13	65	0.44	0.50	0.59	1.07	2.15
58	FALL	8	0.57	.19000	1.09	0.30	0.11	53	0.19	0.37	0.52	0.76	1.09
58	SPRING	4	0.48	.30000	0.60	0.13	0.06	27	0.30	0.40	0.51	0.56	0.60
58	SUMMER	4	0.59	.38500	0.86	0.20	0.10	34	0.39	0.44	0.55	0.73	0.86
58	WINTER	4	0.67	.50250	0.82	0.13	0.07	20	0.50	0.58	0.68	0.76	0.82
62	FALL	12	0.44	.16000	1.12	0.32	0.09	72	0.16	0.23	0.32	0.54	1.12
62	SPRING	37	1.68	.08900	12.63	2.54	0.42	151	0.15	0.30	0.49	1.93	7.16
62	SUMMER	32	1.30	.10200	16.26	2.91	0.51	224	0.15	0.35	0.60	0.90	5.87
62	WINTER	2	0.64	.57500	0.70	0.09	0.06	14	0.58	0.58	0.64	0.70	0.70
82	FALL	3	0.48	.46000	0.50	0.02	0.01	4	0.46	0.46	0.48	0.50	0.50
82	SPRING	4	0.47	.36000	0.65	0.13	0.06	27	0.36	0.40	0.43	0.54	0.65
82	SUMMER	4	0.38	.30000	0.48	0.08	0.04	21	0.30	0.32	0.38	0.45	0.48
82	WINTER	4	0.45	.37000	0.51	0.07	0.03	15	0.37	0.39	0.46	0.51	0.51

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1998
Total_Phosphorus_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	FALL	18	45.00	15.000	90.00	16.1	3.79	36	15.0	40.0	40.0	50.0	90.0
49	SPRING	19	49.87	11.250	100.00	19.0	4.36	38	11.3	40.0	50.0	60.0	100
49	SUMMER	15	64.33	25.000	120.00	26.9	6.95	42	25.0	50.0	60.0	80.0	120
49	WINTER	13	40.24	20.000	95.00	25.4	7.04	63	20.0	25.0	32.5	40.0	95.0
50	FALL	204	42.52	.00000	710.00	77.5	5.43	182	3.50	10.0	20.0	40.3	120
50	SPRING	165	47.54	2.0000	850.00	73.9	5.75	155	5.00	20.0	30.0	60.0	125
50	SUMMER	308	56.07	2.5000	700.00	87.3	4.98	156	2.50	14.5	30.0	60.0	160
50	WINTER	144	52.52	.00000	1170.00	114	9.49	217	4.50	10.0	25.0	50.0	200
58	FALL	81	34.02	2.5000	860.00	97.9	10.9	288	2.50	5.00	15.0	30.0	72.5
58	SPRING	80	28.75	2.5000	350.00	52.5	5.87	183	2.50	9.38	15.0	30.0	73.8
58	SUMMER	149	32.26	1.0000	550.00	69.7	5.71	216	2.50	6.00	10.0	30.0	105
58	WINTER	68	28.83	2.5000	280.00	44.2	5.36	153	2.50	5.00	16.6	34.0	85.0
62	FALL	83	21.75	2.5000	110.00	15.8	1.74	73	5.00	10.0	20.0	32.5	45.0
62	SPRING	125	22.97	1.0000	326.00	34.6	3.10	151	2.50	8.50	18.0	27.5	52.5
62	SUMMER	130	21.73	2.0000	103.00	15.4	1.35	71	5.00	10.0	20.0	30.0	45.0
62	WINTER	58	20.48	2.5000	53.00	11.1	1.46	54	5.00	10.0	20.0	30.0	40.0
82	FALL	3	26.67	20.000	30.00	5.77	3.33	22	20.0	20.0	30.0	30.0	30.0
82	SPRING	4	16.25	5.0000	20.00	7.50	3.75	46	5.00	12.5	20.0	20.0	20.0
82	SUMMER	6	31.42	11.000	90.00	29.6	12.1	94	11.0	12.5	22.5	30.0	90.0
82	WINTER	4	23.13	10.000	37.50	12.8	6.40	55	10.0	12.5	22.5	33.8	37.5

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1998
Turbidity_FTU

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	FALL	6	4.13	2.2000	6.50	1.63	0.66	39	2.20	2.90	3.80	5.60	6.50
49	SPRING	6	2.88	1.1000	3.90	1.13	0.46	39	1.10	2.10	3.15	3.90	3.90
49	SUMMER	6	4.03	1.0000	7.65	2.33	0.95	58	1.00	2.90	3.45	5.70	7.65
49	WINTER	6	2.86	1.3000	3.50	0.78	0.32	27	1.30	3.00	3.10	3.15	3.50
50	FALL	105	4.74	.40000	47.50	7.98	0.78	168	0.70	1.40	2.00	3.60	22.0
50	SPRING	83	5.09	.50000	46.50	7.78	0.85	153	0.80	1.50	2.30	4.60	22.0
50	SUMMER	102	4.76	.50000	110.00	11.7	1.16	246	0.75	1.40	2.03	4.00	12.0
50	WINTER	61	3.18	.60000	15.00	2.88	0.37	90	1.00	1.50	2.05	3.55	9.25
58	FALL	30	1.13	.25000	6.75	1.49	0.27	132	0.25	0.25	0.56	1.40	5.15
58	SPRING	28	1.41	.25000	7.00	1.55	0.29	110	0.25	0.25	1.03	1.85	4.18
58	SUMMER	34	1.41	.25000	7.00	1.58	0.27	112	0.25	0.25	0.95	1.95	5.30
58	WINTER	28	1.30	.25000	7.50	1.56	0.30	120	0.25	0.25	0.71	1.63	4.10
62	FALL	34	7.77	.30000	19.00	4.54	0.78	58	0.60	5.50	7.25	10.0	18.5
62	SPRING	38	6.89	.40000	12.50	2.94	0.48	43	0.65	5.00	7.00	8.50	11.3
62	SUMMER	41	6.83	.25000	16.50	3.54	0.55	52	0.60	5.00	6.80	8.50	13.0
62	WINTER	33	8.22	.30000	16.25	3.73	0.65	45	0.35	7.00	8.75	10.5	14.0
82	FALL	2	1.60	1.5000	1.70	0.14	0.10	9	1.50	1.50	1.60	1.70	1.70
82	SPRING	2	2.65	1.6000	3.70	1.48	1.05	56	1.60	1.60	2.65	3.70	3.70
82	SUMMER	2	1.23	1.0000	1.45	0.32	0.23	26	1.00	1.00	1.23	1.45	1.45
82	WINTER	2	1.78	1.7000	1.85	0.11	0.08	6	1.70	1.70	1.78	1.85	1.85

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1998
pH_S_U

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	FALL	1	7.98	7.9750	7.98	.	.	.	7.98	7.98	7.98	7.98	7.98
49	SPRING	1	7.80	7.8000	7.80	.	.	.	7.80	7.80	7.80	7.80	7.80
49	SUMMER	1	8.00	8.0000	8.00	.	.	.	8.00	8.00	8.00	8.00	8.00
49	WINTER	1	7.40	7.4000	7.40	.	.	.	7.40	7.40	7.40	7.40	7.40
50	FALL	10	7.91	7.4500	8.35	0.30	0.10	4	7.45	7.75	7.90	8.10	8.35
50	SPRING	10	7.68	6.5000	8.35	0.56	0.18	7	6.50	7.48	7.58	8.15	8.35
50	SUMMER	10	7.99	7.5000	8.40	0.32	0.10	4	7.50	7.80	7.93	8.30	8.40
50	WINTER	10	7.67	6.8000	8.20	0.39	0.12	5	6.80	7.50	7.64	8.00	8.20
58	FALL	139	6.62	4.5000	8.72	0.94	0.08	14	4.80	5.90	6.78	7.29	8.18
58	SPRING	137	6.44	4.6000	8.30	0.86	0.07	13	4.96	5.73	6.52	7.06	7.82
58	SUMMER	246	6.99	4.8850	8.50	0.67	0.04	10	5.58	6.65	7.00	7.46	7.99
58	WINTER	127	6.45	4.5000	8.13	0.89	0.08	14	5.00	5.81	6.56	7.00	7.90
62	FALL	17	6.55	2.8500	7.90	1.44	0.35	22	2.85	6.18	7.20	7.50	7.90
62	SPRING	45	7.26	3.0000	8.82	1.26	0.19	17	4.97	7.10	7.47	8.06	8.52
62	SUMMER	85	6.98	3.1000	9.10	1.20	0.13	17	4.35	6.55	7.40	7.75	8.10
62	WINTER	5	6.82	6.3500	7.23	0.31	0.14	5	6.35	6.83	6.83	6.85	7.23
82	SUMMER	1	8.56	8.5600	8.56	.	.	.	8.56	8.56	8.56	8.56	8.56

Data were not always available for all years.

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1994
Chloro_A_Fluor_cor_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	1990	FALL	14	1.36	.25000	2.50	0.85	0.23	63	0.25	0.63	1.50	2.00	2.50
50	1990	SPRING	16	2.38	1.0000	5.00	1.24	0.31	52	1.00	1.31	2.00	3.25	5.00
50	1990	SUMMER	25	1.82	.25000	6.00	1.36	0.27	75	0.25	1.00	2.00	2.00	4.00
50	1990	WINTER	14	1.49	.25000	5.00	1.64	0.44	110	0.25	0.25	0.44	3.00	5.00
50	1991	FALL	25	1.63	.25000	6.00	1.51	0.30	93	0.25	0.25	1.00	2.50	4.00
50	1991	SPRING	10	2.24	.25000	6.50	1.99	0.63	89	0.25	1.00	1.06	4.00	6.50
50	1991	SUMMER	11	4.00	1.0000	18.00	4.75	1.43	119	1.00	2.00	3.00	4.00	18.00
50	1991	WINTER	9	2.00	.25000	7.00	2.22	0.74	111	0.25	0.25	2.00	3.00	7.00
50	1992	FALL	2	2.00	1.5000	2.50	0.71	0.50	35	1.50	1.50	2.00	2.50	2.50
50	1992	WINTER	7	2.43	.25000	6.00	2.20	0.83	91	0.25	0.25	2.00	4.50	6.00
50	1993	FALL	1	2.00	2.0000	2.00	.	.	.	2.00	2.00	2.00	2.00	2.00
50	1993	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
50	1993	SUMMER	1	2.50	2.5000	2.50	.	.	.	2.50	2.50	2.50	2.50	2.50
50	1993	WINTER	1	2.13	2.1250	2.13	.	.	.	2.13	2.13	2.13	2.13	2.13
50	1994	WINTER	1	0.63	.62500	0.63	.	.	.	0.63	0.63	0.63	0.63	0.63

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1991 to 1997
Chloro_A_Phyto_Spe_unc_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1996	SUMMER	1	12.40	12.400	12.40	.	.	.	12.40	12.40	12.40	12.40	12.40
58	1997	SUMMER	1	2.69	2.6900	2.69	.	.	.	2.69	2.69	2.69	2.69	2.69
62	1991	SUMMER	2	0.01	.00500	0.01	0.00	0.00	24	0.01	0.01	0.01	0.01	0.01
62	1992	SUMMER	2	0.00	.00000	0.00	0.00	0.00	141	0.00	0.00	0.00	0.00	0.00
62	1993	SUMMER	1	0.02	.02300	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
62	1994	SUMMER	2	0.01	.00500	0.02	0.01	0.01	89	0.01	0.01	0.01	0.02	0.02
62	1995	SUMMER	2	0.00	.00100	0.01	0.00	0.00	101	0.00	0.00	0.00	0.01	0.01
62	1996	SUMMER	1	0.01	.01000	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1994 to 1996
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	1996	FALL	2	2.59	2.5600	2.62	0.04	0.03	2	2.56	2.56	2.59	2.62	2.62
50	1996	SUMMER	2	1.84	1.4900	2.18	0.49	0.34	27	1.49	1.49	1.84	2.18	2.18
58	1994	FALL	3	3.01	2.1700	3.53	0.73	0.42	24	2.17	2.17	3.33	3.53	3.53
58	1995	FALL	2	6.10	4.3150	7.89	2.53	1.79	41	4.32	4.32	6.10	7.89	7.89
58	1995	SPRING	2	6.50	4.7200	8.29	2.52	1.78	39	4.72	4.72	6.50	8.29	8.29

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1997
Chloro_A_Trich_unco_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	1990	FALL	4	11.38	4.0000	23.00	8.16	4.08	72	4.00	6.25	9.25	16.50	23.00
50	1990	SPRING	4	9.50	7.0000	13.50	2.86	1.43	30	7.00	7.50	8.75	11.50	13.50
50	1990	SUMMER	4	9.00	4.0000	13.00	3.92	1.96	44	4.00	6.00	9.50	12.00	13.00
50	1990	WINTER	2	2.00	2.0000	2.00	0.00	0.00	0	2.00	2.00	2.00	2.00	2.00
50	1991	FALL	3	5.67	3.0000	10.00	3.79	2.19	67	3.00	3.00	4.00	10.00	10.00
50	1991	SPRING	4	6.50	3.0000	14.00	5.07	2.53	78	3.00	3.50	4.50	9.50	14.00
50	1991	SUMMER	4	9.88	6.0000	13.00	3.07	1.53	31	6.00	7.50	10.25	12.25	13.00
50	1991	WINTER	1	3.00	3.0000	3.00	.	.	.	3.00	3.00	3.00	3.00	3.00
50	1992	FALL	3	5.17	2.9200	9.31	3.58	2.07	69	2.92	2.92	3.29	9.31	9.31
50	1992	SPRING	3	14.67	9.0000	20.00	5.51	3.18	38	9.00	9.00	15.00	20.00	20.00
50	1992	SUMMER	2	9.86	6.7250	13.00	4.44	3.14	45	6.73	6.73	9.86	13.00	13.00
50	1992	WINTER	1	2.42	2.4200	2.42	.	.	.	2.42	2.42	2.42	2.42	2.42
50	1993	FALL	3	5.19	2.1400	8.67	3.29	1.90	63	2.14	2.14	4.75	8.67	8.67
50	1993	SUMMER	3	10.89	2.8600	21.30	9.45	5.45	87	2.86	2.86	8.51	21.30	21.30
50	1993	WINTER	1	2.58	2.5750	2.58	.	.	.	2.58	2.58	2.58	2.58	2.58
50	1994	FALL	9	6.95	1.8400	11.55	2.95	0.98	42	1.84	5.13	7.21	7.28	11.55
50	1994	SPRING	3	7.63	2.4400	10.79	4.53	2.61	59	2.44	2.44	9.66	10.79	10.79
50	1994	SUMMER	5	7.14	3.0300	11.35	3.93	1.76	55	3.03	3.70	6.61	11.00	11.35
50	1994	WINTER	3	3.57	2.0000	6.55	2.58	1.49	72	2.00	2.00	2.16	6.55	6.55
50	1995	FALL	3	6.79	2.0200	12.40	5.24	3.03	77	2.02	2.02	5.94	12.40	12.40
50	1995	SPRING	3	6.51	1.0200	12.40	5.70	3.29	88	1.02	1.02	6.12	12.40	12.40
50	1995	SUMMER	3	10.75	.68000	24.80	12.54	7.24	117	0.68	0.68	6.78	24.80	24.80
50	1995	WINTER	2	1.04	1.0150	1.06	0.03	0.02	3	1.02	1.02	1.04	1.06	1.06
50	1996	FALL	1	9.80	9.7950	9.80	.	.	.	9.80	9.80	9.80	9.80	9.80
50	1996	SPRING	2	11.38	4.5500	18.20	9.65	6.83	85	4.55	4.55	11.38	18.20	18.20
50	1996	SUMMER	3	7.51	5.0250	11.30	3.33	1.92	44	5.03	5.03	6.21	11.30	11.30
50	1996	WINTER	2	14.21	7.4200	21.00	9.60	6.79	68	7.42	7.42	14.21	21.00	21.00
50	1997	FALL	7	8.04	2.7200	16.50	4.83	1.83	60	2.72	4.52	6.28	12.20	16.50
50	1997	SPRING	1	3.71	3.7100	3.71	.	.	.	3.71	3.71	3.71	3.71	3.71
50	1997	SUMMER	7	11.66	3.7500	22.30	7.19	2.72	62	3.75	4.38	11.60	18.70	22.30

Aggregate Nutrient Ecoregion: VIII
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from 1990 to 1998
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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	1990	FALL	2	20.00	15.000	25.00	7.07	5.00	35	15.00	15.00	20.00	25.00	25.00
49	1990	SPRING	2	18.75	12.500	25.00	8.84	6.25	47	12.50	12.50	18.75	25.00	25.00
49	1990	SUMMER	2	28.75	17.500	40.00	15.91	11.25	55	17.50	17.50	28.75	40.00	40.00
49	1990	WINTER	2	25.00	10.000	40.00	21.21	15.00	85	10.00	10.00	25.00	40.00	40.00
49	1991	FALL	2	12.50	5.0000	20.00	10.61	7.50	85	5.00	5.00	12.50	20.00	20.00
49	1991	SPRING	2	18.75	7.5000	30.00	15.91	11.25	85	7.50	7.50	18.75	30.00	30.00
49	1991	SUMMER	2	76.25	12.500	140.00	90.16	63.75	118	12.50	12.50	76.25	140.00	140.00
49	1991	WINTER	2	12.50	5.0000	20.00	10.61	7.50	85	5.00	5.00	12.50	20.00	20.00
49	1992	FALL	2	18.75	12.500	25.00	8.84	6.25	47	12.50	12.50	18.75	25.00	25.00
49	1992	SPRING	2	16.25	7.5000	25.00	12.37	8.75	76	7.50	7.50	16.25	25.00	25.00
49	1992	SUMMER	2	18.75	7.5000	30.00	15.91	11.25	85	7.50	7.50	18.75	30.00	30.00
49	1992	WINTER	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
49	1993	FALL	2	11.25	7.5000	15.00	5.30	3.75	47	7.50	7.50	11.25	15.00	15.00
49	1993	SPRING	2	16.25	12.500	20.00	5.30	3.75	33	12.50	12.50	16.25	20.00	20.00
49	1993	SUMMER	2	30.00	5.0000	55.00	35.36	25.00	118	5.00	5.00	30.00	55.00	55.00
49	1993	WINTER	2	25.00	20.000	30.00	7.07	5.00	28	20.00	20.00	25.00	30.00	30.00
49	1994	FALL	1	60.00	60.000	60.00	.	.	.	60.00	60.00	60.00	60.00	60.00
49	1994	SPRING	2	37.50	5.0000	70.00	45.96	32.50	123	5.00	5.00	37.50	70.00	70.00
49	1994	SUMMER	2	30.00	25.000	35.00	7.07	5.00	24	25.00	25.00	30.00	35.00	35.00
49	1994	WINTER	2	47.50	25.000	70.00	31.82	22.50	67	25.00	25.00	47.50	70.00	70.00
49	1995	SPRING	1	15.00	15.000	15.00	.	.	.	15.00	15.00	15.00	15.00	15.00
49	1995	SUMMER	1	30.00	30.000	30.00	.	.	.	30.00	30.00	30.00	30.00	30.00
49	1995	WINTER	1	80.00	80.000	80.00	.	.	.	80.00	80.00	80.00	80.00	80.00
50	1990	FALL	10	8.00	5.0000	17.50	4.53	1.43	57	5.00	5.00	5.00	12.50	17.50
50	1990	SPRING	13	12.88	5.0000	65.00	16.20	4.49	126	5.00	5.00	7.50	12.50	65.00
50	1990	SUMMER	14	11.61	5.0000	85.00	21.23	5.67	183	5.00	5.00	5.00	7.50	85.00
50	1990	WINTER	14	13.04	5.0000	75.00	18.58	4.97	143	5.00	5.00	5.00	15.00	75.00
50	1991	FALL	12	7.08	5.0000	15.00	3.51	1.01	50	5.00	5.00	5.00	8.75	15.00
50	1991	SPRING	14	8.57	5.0000	17.50	4.46	1.19	52	5.00	5.00	6.25	12.50	17.50
50	1991	SUMMER	13	9.42	5.0000	17.50	4.69	1.30	50	5.00	5.00	7.50	12.50	17.50
50	1991	WINTER	14	6.43	5.0000	15.00	2.72	0.73	42	5.00	5.00	5.00	7.50	15.00
50	1992	FALL	9	8.39	3.0000	15.00	4.60	1.53	55	3.00	5.00	5.00	12.50	15.00

Data were not always available for all years.

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	1992	SPRING	12	5.21	5.0000	7.50	0.72	0.21	14	5.00	5.00	5.00	5.00	7.50
50	1992	SUMMER	14	7.14	5.0000	20.00	4.58	1.23	64	5.00	5.00	5.00	7.50	20.00
50	1992	WINTER	14	7.50	5.0000	15.00	3.80	1.01	51	5.00	5.00	5.00	7.50	15.00
50	1993	FALL	9	5.83	5.0000	10.00	1.77	0.59	30	5.00	5.00	5.00	5.00	10.00
50	1993	SPRING	14	10.54	5.0000	27.50	6.66	1.78	63	5.00	5.00	7.50	12.50	27.50
50	1993	SUMMER	14	7.32	5.0000	17.50	3.98	1.06	54	5.00	5.00	5.00	7.50	17.50
50	1993	WINTER	14	6.43	5.0000	12.50	2.34	0.63	36	5.00	5.00	5.00	7.50	12.50
50	1994	FALL	6	7.67	1.0000	12.50	4.43	1.81	58	1.00	5.00	7.50	12.50	12.50
50	1994	SPRING	10	5.85	1.0000	15.00	3.57	1.13	61	1.00	5.00	5.00	5.00	15.00
50	1994	SUMMER	9	7.44	2.0000	17.50	5.78	1.93	78	2.00	5.00	5.00	5.00	17.50
50	1994	WINTER	8	8.13	5.0000	15.00	4.38	1.55	54	5.00	5.00	6.25	11.25	15.00
50	1995	FALL	2	6.75	1.0000	12.50	8.13	5.75	120	1.00	1.00	6.75	12.50	12.50
50	1995	SPRING	7	9.43	1.0000	25.00	7.81	2.95	83	1.00	5.00	7.50	12.50	25.00
50	1995	SUMMER	6	6.00	1.0000	15.00	4.69	1.91	78	1.00	5.00	5.00	5.00	15.00
50	1995	WINTER	7	4.79	1.0000	7.50	1.91	0.72	40	1.00	5.00	5.00	5.00	7.50
50	1996	SPRING	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
50	1996	WINTER	1	12.50	12.500	12.50	.	.	.	12.50	12.50	12.50	12.50	12.50
58	1990	FALL	6	5.92	3.0000	10.00	2.46	1.00	42	3.00	5.00	5.00	7.50	10.00
58	1990	SPRING	5	6.00	3.5000	10.00	2.47	1.11	41	3.50	5.00	5.00	6.50	10.00
58	1990	SUMMER	5	5.80	3.0000	11.00	3.03	1.36	52	3.00	5.00	5.00	5.00	11.00
58	1990	WINTER	6	6.33	3.0000	12.50	3.34	1.36	53	3.00	5.00	5.00	7.50	12.50
58	1991	FALL	4	7.38	4.0000	10.00	2.50	1.25	34	4.00	5.75	7.75	9.00	10.00
58	1991	SPRING	5	5.60	3.0000	7.50	1.92	0.86	34	3.00	5.00	5.00	7.50	7.50
58	1991	SUMMER	6	8.42	5.0000	16.00	4.72	1.93	56	5.00	5.00	6.00	12.50	16.00
58	1991	WINTER	6	6.25	3.0000	12.00	3.16	1.29	51	3.00	5.00	5.00	7.50	12.00
58	1992	FALL	3	15.17	8.0000	20.00	6.33	3.66	42	8.00	8.00	17.50	20.00	20.00
58	1992	SPRING	5	7.30	3.5000	12.50	3.95	1.76	54	3.50	5.00	5.00	10.50	12.50
58	1992	SUMMER	3	7.67	5.0000	13.00	4.62	2.67	60	5.00	5.00	5.00	13.00	13.00
58	1992	WINTER	7	9.29	5.0000	20.00	5.90	2.23	64	5.00	5.00	5.00	12.50	20.00
58	1993	FALL	17	11.82	.00000	49.50	13.99	3.39	118	0.00	5.00	5.00	15.00	49.50
58	1993	SPRING	17	7.26	2.5000	19.00	4.65	1.13	64	2.50	5.00	5.00	7.00	19.00
58	1993	SUMMER	20	10.43	2.0000	51.00	11.36	2.54	109	2.50	5.00	5.50	12.25	40.00

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from 1990 to 1998
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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1993	WINTER	19	6.71	.00000	21.00	5.84	1.34	87	0.00	5.00	5.00	8.00	21.00
58	1994	FALL	18	19.56	.00000	195.00	45.40	10.70	232	0.00	5.00	5.00	9.00	195.00
58	1994	SPRING	20	10.60	.00000	50.00	11.88	2.66	112	1.00	5.00	5.00	15.00	38.50
58	1994	SUMMER	21	10.86	.00000	49.00	11.98	2.61	110	0.00	5.00	5.00	15.00	32.00
58	1994	WINTER	21	7.71	.00000	26.00	6.74	1.47	87	2.00	5.00	5.00	10.00	26.00
58	1995	FALL	16	13.94	.00000	49.50	13.83	3.46	99	0.00	5.00	9.00	17.00	49.50
58	1995	SPRING	18	7.06	.00000	22.00	5.58	1.31	79	0.00	5.00	5.00	7.00	22.00
58	1995	SUMMER	17	14.59	1.0000	71.50	18.83	4.57	129	1.00	5.00	5.00	14.00	71.50
58	1995	WINTER	19	7.29	.00000	21.00	5.30	1.22	73	0.00	5.00	5.00	9.00	21.00
58	1996	FALL	10	15.95	2.0000	41.00	12.66	4.00	79	2.00	6.00	12.50	25.00	41.00
58	1996	SPRING	10	5.85	.00000	14.00	5.00	1.58	85	0.00	0.00	5.75	10.00	14.00
58	1996	SUMMER	10	15.95	2.0000	34.00	10.90	3.45	68	2.00	7.00	12.00	27.00	34.00
58	1996	WINTER	11	12.91	2.0000	27.00	8.51	2.57	66	2.00	7.00	9.00	23.00	27.00
58	1997	FALL	10	14.15	2.0000	46.50	13.22	4.18	93	2.00	6.00	10.75	14.00	46.50
58	1997	SPRING	10	8.90	.00000	17.00	5.84	1.85	66	0.00	7.00	7.50	15.00	17.00
58	1997	SUMMER	10	16.65	.00000	52.50	16.77	5.30	101	0.00	6.00	10.50	24.00	52.50
58	1997	WINTER	10	8.00	.00000	18.00	6.24	1.97	78	0.00	5.50	6.50	14.50	18.00
58	1998	FALL	10	11.45	.00000	29.00	8.13	2.57	71	0.00	7.00	9.00	17.50	29.00
58	1998	SPRING	10	8.35	.00000	14.00	4.38	1.39	53	0.00	6.00	8.25	12.00	14.00
58	1998	SUMMER	10	13.40	.00000	45.00	12.92	4.09	96	0.00	6.00	8.50	19.00	45.00
58	1998	WINTER	10	7.15	.00000	16.00	5.10	1.61	71	0.00	3.00	6.00	12.50	16.00
62	1990	FALL	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
62	1990	SPRING	2	15.00	15.000	15.00	0.00	0.00	0	15.00	15.00	15.00	15.00	15.00
62	1990	SUMMER	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
62	1990	WINTER	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
62	1991	FALL	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
62	1991	SPRING	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
62	1991	SUMMER	4	16.00	12.500	24.00	5.46	2.73	34	12.50	12.50	13.75	19.50	24.00
62	1991	WINTER	2	15.00	15.000	15.00	0.00	0.00	0	15.00	15.00	15.00	15.00	15.00
62	1992	FALL	3	10.00	5.0000	20.00	8.66	5.00	87	5.00	5.00	5.00	20.00	20.00
62	1992	SPRING	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
62	1992	SUMMER	1	17.50	17.500	17.50	.	.	.	17.50	17.50	17.50	17.50	17.50

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Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
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from 1990 to 1998
DIP_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
62	1992	WINTER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
62	1993	FALL	5	6.60	.00000	10.00	4.44	1.98	67	0.00	4.00	9.50	9.50	10.00
62	1993	SPRING	6	4.50	4.0000	5.00	0.55	0.22	12	4.00	4.00	4.50	5.00	5.00
62	1993	SUMMER	9	7.61	4.0000	26.00	6.95	2.32	91	4.00	5.00	5.00	6.00	26.00
62	1993	WINTER	7	3.71	.00000	5.00	1.89	0.71	51	0.00	3.00	5.00	5.00	5.00
62	1994	FALL	4	3.25	.00000	6.00	2.50	1.25	77	0.00	1.50	3.50	5.00	6.00
62	1994	SPRING	7	4.14	2.5000	5.00	1.14	0.43	28	2.50	2.50	4.50	5.00	5.00
62	1994	SUMMER	27	7.52	2.0000	28.50	5.67	1.09	75	3.50	5.00	5.50	7.50	22.00
62	1994	WINTER	7	3.93	.00000	6.00	2.01	0.76	51	0.00	3.00	5.00	5.00	6.00
62	1995	FALL	3	5.33	4.0000	8.00	2.31	1.33	43	4.00	4.00	4.00	8.00	8.00
62	1995	SPRING	3	3.00	2.0000	4.00	1.00	0.58	33	2.00	2.00	3.00	4.00	4.00
62	1995	SUMMER	7	7.00	5.0000	10.00	2.10	0.79	30	5.00	5.00	6.00	9.00	10.00
62	1995	WINTER	5	4.50	2.0000	7.50	2.12	0.95	47	2.00	3.00	5.00	5.00	7.50
62	1996	FALL	4	5.38	4.0000	8.00	1.80	0.90	33	4.00	4.25	4.75	6.50	8.00
62	1996	SPRING	4	3.50	2.0000	5.00	1.29	0.65	37	2.00	2.50	3.50	4.50	5.00
62	1996	SUMMER	3	5.33	3.0000	9.00	3.21	1.86	60	3.00	3.00	4.00	9.00	9.00
62	1996	WINTER	4	3.50	2.0000	5.00	1.29	0.65	37	2.00	2.50	3.50	4.50	5.00
62	1997	FALL	14	8.46	4.0000	16.00	3.74	1.00	44	4.00	5.50	7.00	11.00	16.00
62	1997	SPRING	4	3.50	2.0000	5.00	1.73	0.87	49	2.00	2.00	3.50	5.00	5.00
62	1997	SUMMER	3	5.50	4.0000	7.00	1.50	0.87	27	4.00	4.00	5.50	7.00	7.00
62	1997	WINTER	6	11.33	2.0000	50.00	18.99	7.75	168	2.00	2.00	4.50	5.00	50.00
62	1998	FALL	4	4.88	2.0000	8.50	2.72	1.36	56	2.00	3.00	4.50	6.75	8.50
62	1998	SPRING	5	2.80	.00000	5.00	1.92	0.86	69	0.00	2.00	3.00	4.00	5.00
62	1998	SUMMER	4	5.00	3.0000	8.00	2.16	1.08	43	3.00	3.50	4.50	6.50	8.00
62	1998	WINTER	5	2.80	2.0000	5.00	1.30	0.58	47	2.00	2.00	2.00	3.00	5.00
82	1990	FALL	3	15.00	7.5000	25.00	9.01	5.20	60	7.50	7.50	12.50	25.00	25.00
82	1990	SPRING	4	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
82	1990	SUMMER	4	8.13	5.0000	12.50	3.15	1.57	39	5.00	6.25	7.50	10.00	12.50
82	1990	WINTER	4	7.50	5.0000	12.50	3.54	1.77	47	5.00	5.00	6.25	10.00	12.50
82	1991	FALL	2	10.00	7.5000	12.50	3.54	2.50	35	7.50	7.50	10.00	12.50	12.50
82	1991	SPRING	4	6.25	5.0000	7.50	1.44	0.72	23	5.00	5.00	6.25	7.50	7.50
82	1991	SUMMER	3	9.17	5.0000	15.00	5.20	3.00	57	5.00	5.00	7.50	15.00	15.00

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Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
82	1991	WINTER	4	6.88	5.0000	12.50	3.75	1.88	55	5.00	5.00	5.00	8.75	12.50
82	1992	FALL	2	18.75	17.500	20.00	1.77	1.25	9	17.50	17.50	18.75	20.00	20.00
82	1992	SPRING	4	5.63	5.0000	7.50	1.25	0.63	22	5.00	5.00	5.00	6.25	7.50
82	1992	SUMMER	4	5.63	5.0000	7.50	1.25	0.63	22	5.00	5.00	5.00	6.25	7.50
82	1992	WINTER	4	9.38	5.0000	20.00	7.18	3.59	77	5.00	5.00	6.25	13.75	20.00
82	1993	FALL	2	6.25	5.0000	7.50	1.77	1.25	28	5.00	5.00	6.25	7.50	7.50
82	1993	SPRING	4	15.00	5.0000	25.00	8.42	4.21	56	5.00	8.75	15.00	21.25	25.00
82	1993	SUMMER	4	15.63	5.0000	30.00	10.48	5.24	67	5.00	8.75	13.75	22.50	30.00
82	1993	WINTER	4	30.63	5.0000	80.00	33.93	16.97	111	5.00	8.75	18.75	52.50	80.00
82	1994	SPRING	3	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
82	1994	SUMMER	3	14.17	5.0000	20.00	8.04	4.64	57	5.00	5.00	17.50	20.00	20.00
82	1994	WINTER	3	9.17	7.5000	12.50	2.89	1.67	31	7.50	7.50	7.50	12.50	12.50
82	1995	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
82	1995	SUMMER	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50

Data were not always available for all years.

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Dissolved_Oxygen_percent_sat

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1990	SPRING	4	98.70	92.500	105.40	7.01	3.50	7	92.50	92.65	98.45	104.75	105.40
58	1990	SUMMER	43	92.38	75.500	106.30	6.61	1.01	7	79.80	89.10	93.20	97.00	100.40
58	1991	SUMMER	41	94.24	73.200	109.90	7.56	1.18	8	84.65	89.25	96.05	97.20	106.60
58	1992	FALL	4	94.38	87.500	102.00	6.16	3.08	7	87.50	89.75	94.00	99.00	102.00
58	1992	SPRING	2	85.00	84.000	86.00	1.41	1.00	2	84.00	84.00	85.00	86.00	86.00
58	1992	SUMMER	47	90.34	68.000	100.00	5.82	0.85	6	81.00	87.00	91.50	94.50	97.50
58	1993	FALL	1	89.60	89.600	89.60	.	.	.	89.60	89.60	89.60	89.60	89.60
58	1993	SUMMER	30	95.71	54.000	108.40	8.94	1.63	9	86.70	95.15	96.95	99.50	103.00
58	1994	SPRING	1	100.00	100.00	100.00	.	.	.	100.00	100.00	100.00	100.00	100.00
58	1994	SUMMER	6	93.93	88.300	100.00	4.14	1.69	4	88.30	91.30	93.50	97.00	100.00
58	1995	SUMMER	2	95.20	93.100	97.30	2.97	2.10	3	93.10	93.10	95.20	97.30	97.30
58	1996	SUMMER	2	98.18	96.350	100.00	2.58	1.83	3	96.35	96.35	98.18	100.00	100.00
58	1997	FALL	3	104.85	99.900	113.90	7.85	4.53	7	99.90	99.90	100.75	113.90	113.90
58	1997	SUMMER	56	98.34	78.500	108.15	6.18	0.83	6	88.60	94.40	98.30	102.75	107.90
58	1998	SUMMER	35	95.19	46.000	115.00	12.56	2.12	13	74.00	92.45	96.00	100.00	112.35
62	1995	FALL	1	96.00	96.000	96.00	.	.	.	96.00	96.00	96.00	96.00	96.00
62	1995	SPRING	1	94.00	94.000	94.00	.	.	.	94.00	94.00	94.00	94.00	94.00
62	1995	SUMMER	1	83.00	83.000	83.00	.	.	.	83.00	83.00	83.00	83.00	83.00
62	1997	WINTER	1	88.00	88.000	88.00	.	.	.	88.00	88.00	88.00	88.00	88.00

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Dissolved_Oxygen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	1990	FALL	2	10.33	8.2500	12.40	2.93	2.08	28	8.25	8.25	10.33	12.40	12.40
49	1990	SPRING	2	11.43	11.050	11.80	0.53	0.38	5	11.05	11.05	11.43	11.80	11.80
49	1990	SUMMER	2	8.20	7.5000	8.90	0.99	0.70	12	7.50	7.50	8.20	8.90	8.90
49	1990	WINTER	2	7.50	3.3000	11.70	5.94	4.20	79	3.30	3.30	7.50	11.70	11.70
49	1991	FALL	6	10.05	8.5000	11.20	0.91	0.37	9	8.50	9.80	10.10	10.60	11.20
49	1991	SPRING	2	9.38	7.7000	11.05	2.37	1.68	25	7.70	7.70	9.38	11.05	11.05
49	1991	SUMMER	2	3.75	.80000	6.70	4.17	2.95	111	0.80	0.80	3.75	6.70	6.70
49	1991	WINTER	2	6.80	3.0000	10.60	5.37	3.80	79	3.00	3.00	6.80	10.60	10.60
49	1992	FALL	8	8.49	6.9000	12.30	1.69	0.60	20	6.90	7.45	8.15	8.75	12.30
49	1992	SPRING	8	9.53	8.2500	11.20	0.92	0.33	10	8.25	8.80	9.58	10.00	11.20
49	1992	SUMMER	8	7.88	6.6000	8.90	0.83	0.29	11	6.60	7.30	7.75	8.70	8.90
49	1992	WINTER	7	9.84	7.6000	12.30	1.76	0.66	18	7.60	8.10	10.10	11.50	12.30
49	1993	FALL	2	10.05	8.8000	11.30	1.77	1.25	18	8.80	8.80	10.05	11.30	11.30
49	1993	SPRING	3	10.32	9.9500	11.00	0.59	0.34	6	9.95	9.95	10.00	11.00	11.00
49	1993	SUMMER	2	6.55	5.6000	7.50	1.34	0.95	21	5.60	5.60	6.55	7.50	7.50
49	1993	WINTER	3	9.22	6.0500	10.90	2.74	1.58	30	6.05	6.05	10.70	10.90	10.90
49	1994	FALL	6	8.86	6.5000	10.20	1.34	0.55	15	6.50	8.50	9.03	9.90	10.20
49	1994	SPRING	2	9.73	9.6500	9.80	0.11	0.08	1	9.65	9.65	9.73	9.80	9.80
49	1994	SUMMER	2	7.35	6.9000	7.80	0.64	0.45	9	6.90	6.90	7.35	7.80	7.80
49	1994	WINTER	6	11.50	11.100	12.30	0.58	0.24	5	11.10	11.10	11.15	12.20	12.30
49	1995	FALL	5	9.38	8.1000	10.60	1.03	0.46	11	8.10	8.60	9.50	10.10	10.60
49	1995	SPRING	6	11.38	9.4000	12.20	1.01	0.41	9	9.40	11.50	11.60	12.00	12.20
49	1995	SUMMER	6	7.37	5.4000	9.70	1.52	0.62	21	5.40	6.50	7.20	8.20	9.70
49	1995	WINTER	5	9.07	6.0500	12.60	2.79	1.25	31	6.05	6.40	9.90	10.40	12.60
49	1997	FALL	5	9.58	9.3000	10.00	0.31	0.14	3	9.30	9.30	9.50	9.80	10.00
49	1997	WINTER	5	12.76	12.400	13.50	0.46	0.21	4	12.40	12.40	12.60	12.90	13.50
50	1990	FALL	55	9.47	3.1000	12.50	1.65	0.22	17	5.90	8.70	9.50	10.40	11.90
50	1990	SPRING	67	10.75	4.3000	14.20	1.80	0.22	17	6.90	10.00	10.95	11.70	13.15
50	1990	SUMMER	82	7.96	2.4000	12.50	1.82	0.20	23	4.90	7.00	8.30	9.10	10.00
50	1990	WINTER	65	11.37	1.3000	14.30	2.58	0.32	23	6.70	10.50	11.95	13.00	13.90
50	1991	FALL	62	9.83	4.3000	12.50	1.58	0.20	16	7.30	9.00	9.80	11.05	11.90
50	1991	SPRING	42	10.38	6.6000	13.50	1.55	0.24	15	7.60	9.60	10.55	11.50	12.30

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Dissolved_Oxygen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	1991	SUMMER	48	7.74	3.5000	10.40	1.36	0.20	18	4.90	6.95	7.98	8.58	9.50
50	1991	WINTER	33	11.44	3.9500	13.90	2.45	0.43	21	3.95	10.35	12.15	13.10	13.90
50	1992	FALL	48	9.95	2.9000	14.10	2.69	0.39	27	4.65	8.65	10.33	12.20	13.50
50	1992	SPRING	32	10.82	8.6500	13.80	1.23	0.22	11	9.30	9.90	10.68	11.50	13.70
50	1992	SUMMER	44	7.57	2.1000	13.40	2.17	0.33	29	3.60	6.63	7.50	9.15	10.25
50	1992	WINTER	30	11.88	8.8000	14.00	1.39	0.25	12	9.70	10.95	11.90	13.20	13.80
50	1993	FALL	45	9.41	3.1000	11.80	1.87	0.28	20	4.65	9.00	9.70	10.45	11.50
50	1993	SPRING	51	10.28	6.3000	14.20	1.58	0.22	15	7.00	9.60	10.30	11.10	12.50
50	1993	SUMMER	65	7.34	3.5000	10.00	1.53	0.19	21	3.60	6.60	7.70	8.40	9.30
50	1993	WINTER	38	10.43	.50000	14.40	4.11	0.67	39	0.60	6.90	12.35	13.50	14.10
50	1994	FALL	33	8.57	3.0000	12.00	1.78	0.31	21	4.95	7.60	8.60	9.50	12.00
50	1994	SPRING	40	9.88	6.3000	12.20	1.40	0.22	14	7.20	9.25	9.90	10.75	11.93
50	1994	SUMMER	60	7.11	2.6000	14.10	2.05	0.26	29	3.00	6.05	7.50	8.20	9.55
50	1994	WINTER	32	11.01	3.8500	13.60	2.32	0.41	21	3.85	10.48	11.90	12.40	13.50
50	1995	FALL	30	9.38	7.3000	11.70	1.23	0.23	13	7.70	8.35	9.15	10.45	11.70
50	1995	SPRING	24	10.79	7.9000	12.60	1.43	0.29	13	8.05	9.75	10.85	11.98	12.40
50	1995	SUMMER	56	7.55	3.0000	9.50	1.32	0.18	17	4.90	7.00	7.90	8.50	9.30
50	1995	WINTER	25	12.10	10.700	14.30	1.17	0.23	10	10.70	11.30	11.60	12.60	14.25
50	1996	FALL	14	9.28	6.3000	13.10	2.03	0.54	22	6.30	7.90	9.00	10.00	13.10
50	1996	SPRING	20	10.39	8.5500	11.90	1.08	0.24	10	8.75	9.38	10.53	11.40	11.85
50	1996	SUMMER	19	7.47	2.1000	10.60	1.89	0.43	25	2.10	6.60	7.20	8.60	10.60
50	1996	WINTER	14	8.38	2.8000	13.90	3.67	0.98	44	2.80	3.90	9.38	10.50	13.90
50	1997	FALL	31	10.23	6.4000	15.20	2.11	0.38	21	7.30	8.95	10.20	11.95	13.20
50	1997	SPRING	5	11.82	9.8000	14.20	2.22	0.99	19	9.80	9.90	11.00	14.20	14.20
50	1997	SUMMER	16	8.04	6.6000	11.80	1.53	0.38	19	6.60	7.05	7.85	8.15	11.80
50	1997	WINTER	17	12.59	10.850	15.50	1.06	0.26	8	10.85	11.75	12.50	13.10	15.50
50	1998	FALL	7	9.41	5.6000	11.20	1.90	0.72	20	5.60	8.30	10.10	10.40	11.20
50	1998	SPRING	8	10.29	9.2000	11.40	0.85	0.30	8	9.20	9.60	10.25	11.03	11.40
50	1998	SUMMER	6	7.77	6.2000	9.10	1.14	0.47	15	6.20	7.20	7.50	9.10	9.10
50	1998	WINTER	16	12.09	7.4000	14.00	1.61	0.40	13	7.40	11.45	12.33	13.25	14.00
58	1990	FALL	21	9.58	3.7000	11.10	1.55	0.34	16	7.70	9.20	10.00	10.40	10.84
58	1990	SPRING	21	10.68	5.5000	13.30	1.97	0.43	18	6.90	10.20	11.10	11.85	13.10

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Dissolved_Oxygen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1990	SUMMER	69	8.94	4.3500	11.50	1.27	0.15	14	5.80	8.60	9.00	9.75	10.40
58	1990	WINTER	22	12.28	3.2000	14.20	2.45	0.52	20	7.70	12.10	13.05	13.60	14.15
58	1991	FALL	29	9.91	5.9000	12.30	1.25	0.23	13	8.10	9.30	10.05	10.50	11.60
58	1991	SPRING	29	10.37	6.6000	13.00	1.38	0.26	13	7.90	9.70	10.70	11.10	12.60
58	1991	SUMMER	74	8.55	5.2000	11.00	0.95	0.11	11	6.70	8.00	8.70	9.20	9.80
58	1991	WINTER	30	12.93	10.800	14.10	0.84	0.15	7	11.10	12.65	13.00	13.65	14.00
58	1992	FALL	29	10.46	7.4000	13.65	1.48	0.27	14	8.00	9.50	10.60	11.10	12.90
58	1992	SPRING	29	10.99	7.8000	14.40	1.41	0.26	13	8.10	10.30	11.10	11.90	12.75
58	1992	SUMMER	82	8.83	4.2000	11.10	0.98	0.11	11	7.55	8.40	8.95	9.40	10.00
58	1992	WINTER	30	13.16	10.050	14.70	1.07	0.20	8	11.00	12.70	13.45	13.80	14.60
58	1993	FALL	44	10.02	7.7000	11.85	0.93	0.14	9	8.55	9.45	10.18	10.48	11.75
58	1993	SPRING	45	11.38	6.2000	14.40	1.64	0.24	14	8.40	10.70	11.10	12.45	14.20
58	1993	SUMMER	99	8.61	4.3000	11.30	1.01	0.10	12	6.70	8.20	8.65	9.20	10.00
58	1993	WINTER	47	13.07	9.7000	15.00	1.13	0.17	9	10.60	12.50	13.25	13.94	14.60
58	1994	FALL	51	9.76	3.9500	14.20	1.60	0.22	16	6.60	9.30	10.00	10.50	11.40
58	1994	SPRING	62	11.26	6.0000	15.20	1.74	0.22	15	8.00	10.60	11.20	12.40	14.00
58	1994	SUMMER	78	8.53	4.2000	11.10	1.01	0.11	12	7.10	8.00	8.53	9.20	9.90
58	1994	WINTER	51	12.65	8.5000	14.90	1.46	0.20	12	9.50	11.80	13.20	13.60	14.20
58	1995	FALL	38	9.76	5.8000	12.10	1.37	0.22	14	7.30	8.70	10.25	10.80	11.40
58	1995	SPRING	36	10.71	5.5000	12.80	1.45	0.24	14	8.50	10.10	10.68	11.57	12.70
58	1995	SUMMER	56	8.40	3.8000	10.00	1.12	0.15	13	6.65	8.10	8.65	9.00	9.60
58	1995	WINTER	38	12.85	8.9000	14.30	1.38	0.22	11	9.10	12.33	13.20	13.80	14.20
58	1996	FALL	27	9.43	6.4000	10.90	1.26	0.24	13	6.75	8.85	9.77	10.30	10.80
58	1996	SPRING	25	10.38	5.8000	12.40	1.67	0.33	16	6.25	9.80	10.65	11.70	12.05
58	1996	SUMMER	41	8.47	4.6000	10.60	1.16	0.18	14	5.90	8.05	8.73	9.04	9.70
58	1996	WINTER	28	12.58	9.4500	14.50	1.22	0.23	10	9.50	12.08	12.93	13.38	14.20
58	1997	FALL	21	9.80	7.8000	12.40	0.98	0.21	10	8.42	9.34	9.85	10.30	10.85
58	1997	SPRING	23	11.27	9.1000	12.50	0.88	0.18	8	10.11	10.60	11.36	12.10	12.50
58	1997	SUMMER	75	9.11	7.2000	11.95	0.80	0.09	9	8.00	8.55	9.00	9.60	10.40
58	1997	WINTER	26	12.82	10.200	14.05	0.97	0.19	8	10.90	12.45	12.92	13.60	13.88
58	1998	FALL	10	9.50	8.3100	10.20	0.72	0.23	8	8.31	8.76	9.82	10.07	10.20
58	1998	SPRING	10	10.76	9.6650	11.50	0.63	0.20	6	9.67	10.46	10.95	11.15	11.50

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1998	SUMMER	45	9.02	4.3000	11.35	1.16	0.17	13	7.10	8.40	9.20	9.60	10.80
58	1998	WINTER	12	12.73	11.100	13.79	0.80	0.23	6	11.10	12.22	12.95	13.29	13.79
62	1990	FALL	47	9.88	7.3000	14.40	1.42	0.21	14	8.10	9.00	9.80	10.60	12.60
62	1990	SPRING	46	10.72	8.4000	13.95	1.40	0.21	13	8.40	9.50	10.93	11.80	12.60
62	1990	SUMMER	61	9.40	6.8000	13.05	1.53	0.20	16	7.00	8.20	9.40	10.10	12.40
62	1990	WINTER	50	11.63	7.9000	13.40	1.25	0.18	11	9.20	10.80	11.80	12.60	13.20
62	1991	FALL	52	9.59	6.6500	13.00	1.58	0.22	16	7.00	8.43	9.58	10.80	12.20
62	1991	SPRING	50	10.94	8.3000	14.00	1.40	0.20	13	8.50	10.05	10.98	11.70	13.30
62	1991	SUMMER	74	9.05	6.2500	12.20	1.23	0.14	14	6.90	8.50	8.98	9.75	11.80
62	1991	WINTER	49	12.13	8.7000	14.20	1.42	0.20	12	9.20	11.50	12.30	13.20	14.10
62	1992	FALL	57	10.25	7.7000	13.80	1.43	0.19	14	8.00	9.20	9.95	11.25	13.25
62	1992	SPRING	50	11.10	8.7000	13.50	1.10	0.16	10	9.20	10.30	11.20	11.95	12.80
62	1992	SUMMER	78	9.35	6.9500	13.00	1.32	0.15	14	7.30	8.65	9.20	9.90	12.60
62	1992	WINTER	49	12.11	7.1000	14.00	1.52	0.22	13	9.40	11.20	12.40	13.20	14.00
62	1993	FALL	61	9.88	7.3500	13.40	1.51	0.19	15	7.55	8.85	9.60	10.90	12.90
62	1993	SPRING	76	10.54	8.1000	13.90	1.05	0.12	10	9.05	9.80	10.48	11.05	12.50
62	1993	SUMMER	81	9.12	6.7000	12.70	1.39	0.15	15	7.00	8.10	8.90	9.90	11.60
62	1993	WINTER	55	11.95	7.8500	14.20	1.33	0.18	11	9.80	11.20	12.20	12.90	13.85
62	1994	FALL	69	10.28	7.6500	13.30	1.26	0.15	12	8.00	9.35	10.45	11.05	12.40
62	1994	SPRING	52	10.96	7.7500	14.00	1.49	0.21	14	8.35	10.13	10.95	11.98	13.50
62	1994	SUMMER	83	8.97	5.7000	13.30	1.18	0.13	13	6.95	8.30	9.10	9.60	10.80
62	1994	WINTER	74	12.11	8.2000	14.50	1.18	0.14	10	10.10	11.35	12.20	12.95	13.80
62	1995	FALL	71	10.17	7.4000	14.60	1.36	0.16	13	8.00	9.40	10.30	10.90	12.40
62	1995	SPRING	74	10.77	8.2000	13.10	1.19	0.14	11	8.60	9.95	10.85	11.50	12.80
62	1995	SUMMER	78	8.98	.80000	14.70	1.65	0.19	18	6.70	8.15	9.13	9.80	11.20
62	1995	WINTER	75	12.46	9.4000	14.40	1.21	0.14	10	9.60	11.90	12.80	13.30	13.90
62	1996	FALL	72	9.68	7.3000	12.05	1.08	0.13	11	7.95	8.75	9.85	10.40	11.25
62	1996	SPRING	73	10.85	8.7500	13.90	1.09	0.13	10	9.25	10.00	10.65	11.55	13.05
62	1996	SUMMER	75	9.11	6.9000	13.80	1.28	0.15	14	7.40	8.40	8.90	9.45	11.90
62	1996	WINTER	55	11.76	8.7000	13.70	1.25	0.17	11	9.20	11.00	12.00	12.70	13.45
62	1997	FALL	56	9.76	7.7400	13.25	1.15	0.15	12	8.05	9.01	9.57	10.50	11.90
62	1997	SPRING	69	10.89	8.1000	14.05	1.11	0.13	10	9.05	10.15	10.80	11.60	12.60

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Dissolved_Oxygen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
62	1997	SUMMER	66	9.30	7.3500	13.20	1.15	0.14	12	7.60	8.70	9.10	9.70	11.50
62	1997	WINTER	50	11.93	8.9000	14.40	1.40	0.20	12	9.40	11.30	12.05	12.85	14.00
62	1998	FALL	6	8.99	6.6000	10.40	1.46	0.60	16	6.60	7.90	9.48	10.08	10.40
62	1998	SPRING	6	10.70	8.4000	12.40	1.30	0.53	12	8.40	10.60	10.86	11.10	12.40
62	1998	SUMMER	27	9.95	7.1000	13.80	1.60	0.31	16	7.80	8.91	9.90	11.00	12.60
62	1998	WINTER	48	11.96	8.4500	14.60	1.48	0.21	12	9.20	11.18	12.50	13.00	13.75
82	1990	FALL	2	11.20	10.300	12.10	1.27	0.90	11	10.30	10.30	11.20	12.10	12.10
82	1990	SPRING	2	14.15	13.700	14.60	0.64	0.45	4	13.70	13.70	14.15	14.60	14.60
82	1990	SUMMER	2	8.63	8.5500	8.70	0.11	0.08	1	8.55	8.55	8.63	8.70	8.70
82	1990	WINTER	2	14.28	14.250	14.30	0.04	0.03	0	14.25	14.25	14.28	14.30	14.30
82	1991	FALL	2	8.95	8.4000	9.50	0.78	0.55	9	8.40	8.40	8.95	9.50	9.50
82	1991	SPRING	1	14.10	14.100	14.10	.	.	.	14.10	14.10	14.10	14.10	14.10
82	1991	SUMMER	1	8.50	8.5000	8.50	.	.	.	8.50	8.50	8.50	8.50	8.50
82	1991	WINTER	2	13.40	13.200	13.60	0.28	0.20	2	13.20	13.20	13.40	13.60	13.60
82	1992	FALL	1	10.30	10.300	10.30	.	.	.	10.30	10.30	10.30	10.30	10.30
82	1992	SPRING	1	13.60	13.600	13.60	.	.	.	13.60	13.60	13.60	13.60	13.60
82	1992	SUMMER	2	8.10	7.9000	8.30	0.28	0.20	3	7.90	7.90	8.10	8.30	8.30
82	1992	WINTER	2	14.03	13.850	14.20	0.25	0.17	2	13.85	13.85	14.03	14.20	14.20
82	1993	FALL	1	12.60	12.600	12.60	.	.	.	12.60	12.60	12.60	12.60	12.60
82	1993	SPRING	2	12.65	11.000	14.30	2.33	1.65	18	11.00	11.00	12.65	14.30	14.30
82	1993	SUMMER	2	8.63	8.5000	8.75	0.18	0.13	2	8.50	8.50	8.63	8.75	8.75
82	1993	WINTER	1	14.20	14.200	14.20	.	.	.	14.20	14.20	14.20	14.20	14.20
82	1994	SPRING	1	14.40	14.400	14.40	.	.	.	14.40	14.40	14.40	14.40	14.40
82	1994	SUMMER	1	8.30	8.3000	8.30	.	.	.	8.30	8.30	8.30	8.30	8.30
82	1994	WINTER	1	14.70	14.700	14.70	.	.	.	14.70	14.70	14.70	14.70	14.70
82	1995	SPRING	1	11.90	11.900	11.90	.	.	.	11.90	11.90	11.90	11.90	11.90
82	1995	SUMMER	1	8.10	8.1000	8.10	.	.	.	8.10	8.10	8.10	8.10	8.10

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	1990	FALL	12	0.02	.00250	0.10	0.03	0.01	140	0.00	0.00	0.01	0.03	0.10
49	1990	SPRING	12	0.05	.01000	0.10	0.04	0.01	84	0.01	0.01	0.04	0.09	0.10
49	1990	SUMMER	11	0.02	.00250	0.12	0.03	0.01	150	0.00	0.01	0.01	0.02	0.12
49	1990	WINTER	2	0.10	.09500	0.10	0.00	0.00	4	0.10	0.10	0.10	0.10	0.10
49	1991	FALL	10	0.02	.00250	0.06	0.02	0.01	88	0.00	0.01	0.02	0.03	0.06
49	1991	SPRING	6	0.14	.00250	0.51	0.19	0.08	138	0.00	0.02	0.08	0.13	0.51
49	1991	SUMMER	6	0.04	.01000	0.08	0.03	0.01	82	0.01	0.02	0.02	0.08	0.08
49	1991	WINTER	5	0.15	.03750	0.33	0.11	0.05	78	0.04	0.09	0.10	0.17	0.33
49	1992	FALL	11	0.03	.00250	0.07	0.02	0.01	84	0.00	0.01	0.02	0.05	0.07
49	1992	SPRING	11	0.04	.01000	0.07	0.02	0.01	54	0.01	0.02	0.04	0.07	0.07
49	1992	SUMMER	11	0.07	.00250	0.58	0.17	0.05	237	0.00	0.01	0.02	0.03	0.58
49	1992	WINTER	10	0.14	.02625	0.23	0.07	0.02	54	0.03	0.08	0.17	0.20	0.23
49	1993	FALL	2	0.04	.03500	0.05	0.01	0.01	25	0.04	0.04	0.04	0.05	0.05
49	1993	SPRING	3	0.15	.03000	0.32	0.15	0.09	101	0.03	0.03	0.10	0.32	0.32
49	1993	SUMMER	3	0.08	.03000	0.14	0.06	0.03	71	0.03	0.03	0.07	0.14	0.14
49	1993	WINTER	3	0.12	.09500	0.16	0.04	0.02	30	0.10	0.10	0.10	0.16	0.16
49	1994	FALL	6	0.02	.01000	0.08	0.03	0.01	133	0.01	0.01	0.01	0.01	0.08
49	1994	SPRING	2	0.06	.01000	0.11	0.07	0.05	118	0.01	0.01	0.06	0.11	0.11
49	1994	SUMMER	2	0.08	.01000	0.15	0.10	0.07	124	0.01	0.01	0.08	0.15	0.15
49	1994	WINTER	6	0.12	.01000	0.51	0.20	0.08	167	0.01	0.01	0.04	0.10	0.51
49	1995	FALL	5	0.01	.01000	0.01	0.00	0.00	0	0.01	0.01	0.01	0.01	0.01
49	1995	SPRING	5	0.04	.01000	0.06	0.03	0.01	68	0.01	0.01	0.05	0.06	0.06
49	1995	SUMMER	5	0.01	.01000	0.01	0.00	0.00	0	0.01	0.01	0.01	0.01	0.01
49	1995	WINTER	5	0.11	.08000	0.13	0.02	0.01	18	0.08	0.10	0.10	0.12	0.13
49	1997	FALL	5	0.01	.01000	0.01	0.00	0.00	0	0.01	0.01	0.01	0.01	0.01
49	1997	WINTER	5	0.03	.01000	0.06	0.03	0.01	91	0.01	0.01	0.01	0.06	0.06
50	1990	FALL	54	0.12	.00250	0.97	0.22	0.03	181	0.00	0.03	0.04	0.08	0.91
50	1990	SPRING	58	0.23	.00375	2.30	0.39	0.05	166	0.02	0.06	0.10	0.20	1.20
50	1990	SUMMER	69	0.11	.00000	1.20	0.20	0.02	173	0.00	0.02	0.04	0.10	0.43
50	1990	WINTER	65	0.27	.00500	1.70	0.34	0.04	124	0.02	0.11	0.18	0.28	1.10
50	1991	FALL	70	0.18	.00000	2.95	0.47	0.06	267	0.00	0.01	0.03	0.10	0.92
50	1991	SPRING	43	0.19	.00250	1.46	0.33	0.05	170	0.02	0.04	0.10	0.16	1.15

Aggregate Nutrient Ecoregion: VIII
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from 1990 to 1998
Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	1991	SUMMER	50	0.13	.00000	1.70	0.28	0.04	213	0.00	0.01	0.03	0.13	0.75
50	1991	WINTER	39	0.29	.01000	1.40	0.36	0.06	124	0.01	0.09	0.17	0.30	1.28
50	1992	FALL	51	0.07	.00250	0.73	0.11	0.02	153	0.00	0.02	0.04	0.10	0.20
50	1992	SPRING	32	0.16	.00250	1.45	0.27	0.05	161	0.00	0.04	0.10	0.16	0.52
50	1992	SUMMER	41	0.11	.00250	1.00	0.22	0.03	194	0.00	0.00	0.03	0.08	0.40
50	1992	WINTER	41	0.37	.00250	2.20	0.46	0.07	125	0.05	0.12	0.20	0.34	1.19
50	1993	FALL	51	0.08	.00000	0.77	0.17	0.02	219	0.00	0.00	0.01	0.07	0.60
50	1993	SPRING	43	0.12	.00250	1.50	0.24	0.04	190	0.00	0.02	0.07	0.14	0.35
50	1993	SUMMER	45	0.13	.00250	2.05	0.35	0.05	273	0.00	0.00	0.04	0.08	0.60
50	1993	WINTER	35	0.23	.02000	1.05	0.20	0.03	87	0.04	0.12	0.19	0.27	0.79
50	1994	FALL	36	0.15	.00250	2.10	0.38	0.06	248	0.00	0.01	0.03	0.10	0.75
50	1994	SPRING	25	0.13	.00250	0.50	0.13	0.03	104	0.00	0.06	0.09	0.13	0.45
50	1994	SUMMER	60	0.09	.00250	2.90	0.38	0.05	443	0.00	0.00	0.00	0.06	0.21
50	1994	WINTER	28	0.17	.01000	0.99	0.19	0.04	110	0.01	0.07	0.13	0.21	0.42
50	1995	FALL	23	0.18	.00250	2.90	0.60	0.12	338	0.00	0.01	0.03	0.10	0.30
50	1995	SPRING	22	0.23	.00250	1.90	0.39	0.08	169	0.01	0.08	0.12	0.20	0.60
50	1995	SUMMER	53	0.09	.00250	1.48	0.23	0.03	239	0.00	0.00	0.02	0.09	0.48
50	1995	WINTER	24	0.23	.01000	0.51	0.17	0.04	75	0.01	0.10	0.17	0.42	0.46
50	1996	FALL	12	0.57	.00250	3.70	1.10	0.32	194	0.00	0.01	0.05	0.63	3.70
50	1996	SPRING	13	0.22	.00250	1.80	0.50	0.14	223	0.00	0.01	0.03	0.13	1.80
50	1996	SUMMER	14	0.31	.00250	2.30	0.61	0.16	198	0.00	0.02	0.08	0.22	2.30
50	1996	WINTER	9	0.30	.00250	0.85	0.32	0.11	106	0.00	0.08	0.22	0.27	0.85
50	1997	FALL	20	0.10	.00250	0.60	0.18	0.04	189	0.00	0.00	0.01	0.11	0.60
50	1997	SPRING	7	0.47	.00250	3.20	1.20	0.46	257	0.00	0.00	0.01	0.05	3.20
50	1997	SUMMER	7	0.14	.00250	1.00	0.38	0.14	260	0.00	0.00	0.00	0.00	1.00
50	1997	WINTER	15	0.20	.01000	0.64	0.24	0.06	121	0.01	0.01	0.09	0.31	0.64
50	1998	FALL	8	0.06	.02500	0.16	0.05	0.02	93	0.03	0.03	0.03	0.09	0.16
50	1998	SPRING	6	0.12	.02500	0.36	0.13	0.05	107	0.03	0.03	0.08	0.15	0.36
50	1998	SUMMER	7	0.27	.02500	1.29	0.46	0.18	170	0.03	0.03	0.03	0.34	1.29
50	1998	WINTER	7	0.25	.02500	0.65	0.21	0.08	86	0.03	0.05	0.22	0.33	0.65
58	1990	FALL	37	0.48	.00250	1.52	0.49	0.08	103	0.00	0.13	0.27	0.85	1.40
58	1990	SPRING	32	0.57	.02500	1.20	0.35	0.06	61	0.04	0.30	0.50	0.91	1.10

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
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Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1990	SUMMER	40	0.48	.01125	2.90	0.55	0.09	114	0.05	0.17	0.30	0.56	1.48
58	1990	WINTER	37	0.75	.06500	2.04	0.52	0.09	70	0.13	0.36	0.58	1.19	1.78
58	1991	FALL	32	0.70	.01000	5.56	1.07	0.19	153	0.05	0.16	0.33	0.81	2.75
58	1991	SPRING	31	0.67	.02000	1.99	0.54	0.10	80	0.03	0.28	0.49	0.94	1.64
58	1991	SUMMER	54	0.54	.01000	4.15	0.76	0.10	139	0.02	0.08	0.27	0.70	2.07
58	1991	WINTER	45	0.59	.00250	1.80	0.48	0.07	82	0.03	0.25	0.43	0.81	1.57
58	1992	FALL	23	0.90	.01750	5.70	1.44	0.30	159	0.03	0.10	0.48	0.91	4.69
58	1992	SPRING	35	0.52	.00250	2.50	0.57	0.10	110	0.00	0.15	0.29	0.71	1.83
58	1992	SUMMER	45	0.48	.00625	3.90	0.70	0.10	145	0.01	0.09	0.18	0.65	1.52
58	1992	WINTER	36	0.72	.01750	2.00	0.52	0.09	72	0.18	0.33	0.50	1.08	1.94
58	1993	FALL	33	0.45	.00250	4.11	0.81	0.14	179	0.00	0.02	0.14	0.52	1.90
58	1993	SPRING	33	0.39	.01000	1.76	0.43	0.08	111	0.04	0.14	0.24	0.48	1.33
58	1993	SUMMER	45	0.60	.01000	4.09	0.92	0.14	154	0.02	0.16	0.22	0.55	2.56
58	1993	WINTER	39	0.55	.04550	1.83	0.46	0.07	83	0.07	0.24	0.31	1.04	1.35
58	1994	FALL	28	0.40	.00000	3.20	0.71	0.14	180	0.04	0.08	0.13	0.36	2.30
58	1994	SPRING	32	0.41	.04000	1.85	0.48	0.09	118	0.05	0.16	0.21	0.45	1.78
58	1994	SUMMER	47	0.39	.00250	3.59	0.71	0.10	181	0.03	0.09	0.14	0.28	2.03
58	1994	WINTER	41	0.51	.00250	1.70	0.45	0.07	87	0.04	0.24	0.33	0.64	1.45
58	1995	FALL	18	0.37	.00000	1.30	0.38	0.09	104	0.00	0.12	0.18	0.80	1.30
58	1995	SPRING	26	0.28	.00250	0.96	0.25	0.05	89	0.02	0.11	0.23	0.29	0.93
58	1995	SUMMER	30	0.27	.00000	1.90	0.35	0.06	133	0.02	0.12	0.18	0.23	0.88
58	1995	WINTER	21	0.43	.02000	1.95	0.45	0.10	105	0.04	0.21	0.28	0.46	1.10
58	1996	FALL	13	0.22	.06000	0.71	0.20	0.06	91	0.06	0.10	0.12	0.25	0.71
58	1996	SPRING	13	0.31	.04850	0.74	0.20	0.06	65	0.05	0.23	0.27	0.32	0.74
58	1996	SUMMER	13	0.24	.05500	0.69	0.21	0.06	86	0.06	0.10	0.17	0.24	0.69
58	1996	WINTER	13	0.41	.10000	1.16	0.36	0.10	88	0.10	0.13	0.31	0.39	1.16
58	1997	FALL	16	0.42	.00000	2.35	0.64	0.16	153	0.00	0.11	0.16	0.40	2.35
58	1997	SPRING	17	0.34	.06600	0.93	0.21	0.05	63	0.07	0.20	0.34	0.46	0.93
58	1997	SUMMER	17	0.40	.03000	1.31	0.36	0.09	90	0.03	0.17	0.24	0.40	1.31
58	1997	WINTER	15	0.43	.10200	1.33	0.36	0.09	84	0.10	0.21	0.26	0.63	1.33
58	1998	FALL	10	0.24	.01500	0.78	0.25	0.08	105	0.02	0.10	0.14	0.24	0.78
58	1998	SPRING	10	0.19	.04800	0.48	0.14	0.04	72	0.05	0.10	0.14	0.28	0.48

Aggregate Nutrient Ecoregion: VIII
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from 1990 to 1998
Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1998	SUMMER	10	0.24	.04500	0.70	0.22	0.07	92	0.05	0.11	0.14	0.31	0.70
58	1998	WINTER	10	0.36	.10300	0.92	0.29	0.09	82	0.10	0.20	0.22	0.50	0.92
62	1990	FALL	16	0.25	.02500	0.64	0.17	0.04	68	0.03	0.11	0.22	0.38	0.64
62	1990	SPRING	18	0.42	.02000	1.05	0.26	0.06	62	0.02	0.20	0.37	0.60	1.05
62	1990	SUMMER	33	0.23	.00500	0.91	0.17	0.03	76	0.04	0.13	0.16	0.31	0.46
62	1990	WINTER	10	0.45	.14000	0.80	0.19	0.06	43	0.14	0.33	0.40	0.59	0.80
62	1991	FALL	9	0.10	.00000	0.29	0.09	0.03	87	0.00	0.04	0.10	0.11	0.29
62	1991	SPRING	10	0.38	.07000	0.55	0.16	0.05	41	0.07	0.28	0.40	0.52	0.55
62	1991	SUMMER	35	0.34	.05000	1.56	0.26	0.04	77	0.07	0.20	0.32	0.43	0.72
62	1991	WINTER	7	0.45	.08500	0.59	0.18	0.07	40	0.09	0.34	0.50	0.55	0.59
62	1992	FALL	20	0.26	.01000	0.70	0.22	0.05	85	0.01	0.09	0.19	0.42	0.70
62	1992	SPRING	9	0.28	.04500	0.41	0.13	0.04	45	0.05	0.22	0.25	0.40	0.41
62	1992	SUMMER	41	0.21	.01000	0.84	0.19	0.03	92	0.01	0.08	0.14	0.27	0.55
62	1992	WINTER	7	0.39	.06000	0.63	0.22	0.08	56	0.06	0.28	0.29	0.63	0.63
62	1993	FALL	17	0.20	.01000	0.72	0.21	0.05	109	0.01	0.06	0.12	0.19	0.72
62	1993	SPRING	37	0.13	.01000	0.68	0.14	0.02	108	0.01	0.02	0.08	0.19	0.44
62	1993	SUMMER	38	0.28	.01500	1.04	0.21	0.03	76	0.07	0.13	0.23	0.33	0.81
62	1993	WINTER	9	0.30	.06500	0.50	0.12	0.04	39	0.07	0.25	0.30	0.34	0.50
62	1994	FALL	29	0.18	.00000	1.19	0.24	0.05	136	0.00	0.03	0.10	0.24	0.56
62	1994	SPRING	10	0.24	.00000	0.48	0.13	0.04	53	0.00	0.20	0.23	0.29	0.48
62	1994	SUMMER	27	0.20	.00500	1.11	0.22	0.04	114	0.01	0.05	0.13	0.28	0.42
62	1994	WINTER	31	0.23	.00500	0.55	0.15	0.03	68	0.01	0.11	0.20	0.34	0.54
62	1995	FALL	31	0.18	.00500	1.18	0.26	0.05	149	0.01	0.01	0.07	0.23	0.65
62	1995	SPRING	31	0.23	.01250	0.57	0.17	0.03	73	0.02	0.06	0.23	0.34	0.53
62	1995	SUMMER	34	0.22	.00500	1.79	0.31	0.05	139	0.02	0.07	0.12	0.29	0.51
62	1995	WINTER	33	0.28	.00500	0.84	0.24	0.04	84	0.01	0.06	0.29	0.38	0.82
62	1996	FALL	31	0.18	.00000	0.63	0.16	0.03	91	0.01	0.05	0.14	0.30	0.57
62	1996	SPRING	31	0.19	.00000	0.54	0.16	0.03	82	0.01	0.03	0.22	0.34	0.48
62	1996	SUMMER	32	0.23	.00500	1.01	0.21	0.04	90	0.03	0.09	0.18	0.30	0.60
62	1996	WINTER	8	0.23	.06100	0.34	0.08	0.03	37	0.06	0.19	0.25	0.28	0.34
62	1997	FALL	5	0.10	.05800	0.17	0.05	0.02	48	0.06	0.06	0.09	0.11	0.17
62	1997	SPRING	27	0.18	.00500	0.64	0.16	0.03	87	0.01	0.03	0.21	0.27	0.45

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
62	1997	SUMMER	27	0.26	.00500	2.03	0.38	0.07	147	0.03	0.10	0.18	0.23	0.61
62	1997	WINTER	4	0.16	.06350	0.24	0.07	0.04	46	0.06	0.11	0.17	0.21	0.24
62	1998	FALL	4	0.12	.03650	0.16	0.06	0.03	48	0.04	0.08	0.14	0.16	0.16
62	1998	SPRING	4	0.10	.00000	0.23	0.10	0.05	93	0.00	0.04	0.09	0.17	0.23
62	1998	SUMMER	4	0.07	.00000	0.16	0.07	0.03	88	0.00	0.03	0.07	0.12	0.16
62	1998	WINTER	4	0.17	.02800	0.31	0.12	0.06	68	0.03	0.09	0.17	0.25	0.31
82	1990	FALL	3	0.04	.03750	0.05	0.01	0.00	17	0.04	0.04	0.04	0.05	0.05
82	1990	SPRING	4	0.18	.10000	0.30	0.10	0.05	55	0.10	0.10	0.15	0.25	0.30
82	1990	SUMMER	2	0.10	.10000	0.10	0.00	0.00	0	0.10	0.10	0.10	0.10	0.10
82	1990	WINTER	4	0.14	.10000	0.20	0.04	0.02	31	0.10	0.11	0.14	0.18	0.20
82	1991	FALL	2	0.08	.06250	0.10	0.03	0.02	33	0.06	0.06	0.08	0.10	0.10
82	1991	SPRING	4	0.14	.05700	0.25	0.08	0.04	58	0.06	0.09	0.13	0.19	0.25
82	1991	SUMMER	3	0.10	.05400	0.15	0.05	0.03	49	0.05	0.05	0.09	0.15	0.15
82	1991	WINTER	4	0.11	.05400	0.19	0.06	0.03	59	0.05	0.06	0.09	0.16	0.19
82	1992	FALL	2	0.10	.08400	0.11	0.02	0.01	19	0.08	0.08	0.10	0.11	0.11
82	1992	SPRING	4	0.11	.02500	0.18	0.07	0.04	65	0.03	0.05	0.11	0.17	0.18
82	1992	SUMMER	4	0.06	.02500	0.09	0.03	0.01	45	0.03	0.04	0.07	0.08	0.09
82	1992	WINTER	4	0.13	.06300	0.20	0.06	0.03	46	0.06	0.08	0.13	0.18	0.20
82	1993	FALL	2	0.07	.05800	0.08	0.01	0.01	19	0.06	0.06	0.07	0.08	0.08
82	1993	SPRING	4	0.11	.05500	0.16	0.05	0.03	48	0.06	0.06	0.11	0.16	0.16
82	1993	SUMMER	3	0.10	.08450	0.14	0.03	0.02	29	0.08	0.08	0.09	0.14	0.14
82	1993	WINTER	4	0.21	.16000	0.28	0.05	0.03	25	0.16	0.17	0.20	0.25	0.28
82	1994	SPRING	2	0.11	.06800	0.16	0.07	0.05	57	0.07	0.07	0.11	0.16	0.16
82	1994	SUMMER	1	0.15	.15000	0.15	.	.	.	0.15	0.15	0.15	0.15	0.15
82	1994	WINTER	3	0.14	.05900	0.26	0.10	0.06	73	0.06	0.06	0.11	0.26	0.26
82	1995	SPRING	1	0.10	.10000	0.10	.	.	.	0.10	0.10	0.10	0.10	0.10
82	1995	SUMMER	1	0.08	.07500	0.08	.	.	.	0.08	0.08	0.08	0.08	0.08

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	1990	FALL	12	0.75	.32000	1.15	0.29	0.08	39	0.32	0.49	0.82	1.00	1.15
49	1990	SPRING	13	0.91	.36000	1.76	0.39	0.11	43	0.36	0.66	0.90	1.01	1.76
49	1990	SUMMER	13	0.93	.39000	1.40	0.30	0.08	33	0.39	0.70	0.90	1.11	1.40
49	1990	WINTER	3	0.86	.51500	1.50	0.56	0.32	65	0.52	0.52	0.55	1.50	1.50
49	1991	FALL	10	0.92	.50000	1.48	0.34	0.11	36	0.50	0.61	0.86	1.20	1.48
49	1991	SPRING	6	0.81	.45000	1.30	0.29	0.12	36	0.45	0.68	0.72	0.96	1.30
49	1991	SUMMER	6	0.97	.51500	2.20	0.61	0.25	63	0.52	0.75	0.79	0.81	2.20
49	1991	WINTER	5	1.09	.60000	2.30	0.72	0.32	66	0.60	0.64	0.71	1.22	2.30
49	1992	FALL	12	0.98	.02500	1.66	0.50	0.14	51	0.03	0.61	1.03	1.37	1.66
49	1992	SPRING	12	0.94	.06000	1.71	0.49	0.14	52	0.06	0.61	0.93	1.34	1.71
49	1992	SUMMER	12	0.67	.02500	1.40	0.42	0.12	62	0.03	0.35	0.72	0.83	1.40
49	1992	WINTER	11	0.79	.02500	1.37	0.40	0.12	50	0.03	0.50	0.89	1.10	1.37
49	1993	FALL	3	0.74	.40000	1.00	0.31	0.18	42	0.40	0.40	0.81	1.00	1.00
49	1993	SPRING	4	1.19	.46500	2.48	0.90	0.45	76	0.47	0.58	0.90	1.79	2.48
49	1993	SUMMER	3	0.77	.50000	1.25	0.42	0.24	55	0.50	0.50	0.55	1.25	1.25
49	1993	WINTER	4	0.50	.02500	1.10	0.44	0.22	88	0.03	0.23	0.45	0.78	1.10
49	1994	FALL	2	0.98	.71000	1.25	0.38	0.27	39	0.71	0.71	0.98	1.25	1.25
49	1994	SPRING	3	0.74	.55000	0.90	0.18	0.10	24	0.55	0.55	0.76	0.90	0.90
49	1994	SUMMER	3	0.95	.74000	1.20	0.23	0.13	25	0.74	0.74	0.90	1.20	1.20
49	1994	WINTER	3	0.89	.40000	1.80	0.79	0.45	88	0.40	0.40	0.48	1.80	1.80
49	1995	SPRING	1	0.80	.80000	0.80	.	.	.	0.80	0.80	0.80	0.80	0.80
49	1995	SUMMER	1	1.20	1.2000	1.20	.	.	.	1.20	1.20	1.20	1.20	1.20
49	1995	WINTER	1	0.95	.95000	0.95	.	.	.	0.95	0.95	0.95	0.95	0.95
50	1990	FALL	52	0.68	.14000	1.90	0.36	0.05	53	0.20	0.44	0.64	0.84	1.21
50	1990	SPRING	58	0.78	.28000	4.55	0.57	0.08	74	0.30	0.51	0.70	0.85	1.55
50	1990	SUMMER	84	0.69	.26000	1.75	0.29	0.03	42	0.35	0.47	0.61	0.81	1.20
50	1990	WINTER	57	0.57	.10000	1.20	0.28	0.04	49	0.23	0.39	0.50	0.82	1.19
50	1991	FALL	69	0.54	.05000	1.90	0.37	0.04	68	0.15	0.34	0.49	0.60	1.30
50	1991	SPRING	44	0.71	.10000	1.20	0.25	0.04	36	0.39	0.54	0.68	0.86	1.18
50	1991	SUMMER	52	0.70	.07000	1.60	0.30	0.04	43	0.30	0.50	0.70	0.89	1.40
50	1991	WINTER	37	0.59	.10000	1.49	0.32	0.05	53	0.20	0.40	0.53	0.71	1.49
50	1992	FALL	56	0.54	.12000	1.50	0.25	0.03	47	0.14	0.40	0.49	0.67	1.04

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	1992	SPRING	38	0.61	.02500	1.65	0.39	0.06	65	0.03	0.30	0.52	0.83	1.65
50	1992	SUMMER	44	0.56	.02500	1.80	0.35	0.05	63	0.03	0.30	0.53	0.78	1.10
50	1992	WINTER	40	0.58	.02500	1.68	0.39	0.06	68	0.06	0.30	0.50	0.71	1.48
50	1993	FALL	65	0.50	.05000	1.70	0.26	0.03	52	0.17	0.34	0.48	0.60	0.98
50	1993	SPRING	51	0.58	.17500	2.55	0.36	0.05	62	0.20	0.40	0.51	0.75	1.06
50	1993	SUMMER	57	0.62	.07000	1.30	0.25	0.03	41	0.26	0.41	0.60	0.80	1.04
50	1993	WINTER	50	0.44	.02500	2.80	0.45	0.06	102	0.03	0.20	0.35	0.50	1.20
50	1994	FALL	47	0.63	.02500	2.40	0.41	0.06	66	0.05	0.40	0.56	0.79	1.30
50	1994	SPRING	46	0.69	.05000	3.80	0.58	0.09	84	0.05	0.40	0.60	0.77	1.50
50	1994	SUMMER	72	0.80	.25000	2.60	0.37	0.04	46	0.30	0.53	0.74	1.00	1.25
50	1994	WINTER	44	0.38	.05000	1.01	0.28	0.04	74	0.05	0.13	0.30	0.59	1.00
50	1995	FALL	18	0.43	.05000	1.90	0.45	0.11	104	0.05	0.05	0.40	0.63	1.90
50	1995	SPRING	14	0.49	.13750	0.77	0.17	0.05	35	0.14	0.40	0.43	0.60	0.77
50	1995	SUMMER	83	0.63	.00000	2.20	0.41	0.05	66	0.08	0.30	0.60	0.86	1.30
50	1995	WINTER	12	0.38	.10000	1.20	0.30	0.09	79	0.10	0.21	0.30	0.40	1.20
50	1996	FALL	10	0.36	.05000	0.81	0.28	0.09	76	0.05	0.11	0.35	0.60	0.81
50	1996	SPRING	11	0.39	.12500	1.02	0.26	0.08	68	0.13	0.13	0.40	0.45	1.02
50	1996	SUMMER	11	0.35	.07500	0.78	0.26	0.08	74	0.08	0.14	0.30	0.63	0.78
50	1996	WINTER	7	0.36	.05000	1.20	0.39	0.15	107	0.05	0.13	0.20	0.40	1.20
50	1997	FALL	27	0.39	.05000	1.30	0.37	0.07	93	0.05	0.13	0.20	0.80	1.00
50	1997	SPRING	12	0.38	.08750	0.58	0.18	0.05	48	0.09	0.21	0.44	0.52	0.58
50	1997	SUMMER	24	0.37	.05000	1.10	0.33	0.07	89	0.08	0.13	0.23	0.56	1.00
50	1997	WINTER	6	0.22	.10000	0.47	0.16	0.07	73	0.10	0.13	0.13	0.40	0.47
50	1998	FALL	1	0.46	.45500	0.46	.	.	.	0.46	0.46	0.46	0.46	0.46
50	1998	WINTER	7	0.21	.05000	1.06	0.37	0.14	177	0.05	0.05	0.08	0.13	1.06
58	1990	FALL	24	0.47	.05000	1.25	0.36	0.07	76	0.05	0.16	0.44	0.66	1.25
58	1990	SPRING	22	0.41	.17500	1.00	0.21	0.04	51	0.20	0.25	0.36	0.53	0.70
58	1990	SUMMER	29	0.39	.05000	1.15	0.32	0.06	83	0.05	0.10	0.31	0.60	0.91
58	1990	WINTER	33	0.53	.07500	1.44	0.36	0.06	68	0.08	0.29	0.46	0.74	1.37
58	1991	FALL	27	0.48	.05000	1.20	0.35	0.07	72	0.05	0.16	0.40	0.75	1.11
58	1991	SPRING	29	0.58	.07500	1.84	0.40	0.07	69	0.15	0.36	0.45	0.90	1.30
58	1991	SUMMER	39	0.53	.07000	1.64	0.39	0.06	73	0.07	0.23	0.42	0.75	1.40

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1991	WINTER	36	0.43	.05000	1.48	0.36	0.06	84	0.05	0.18	0.35	0.52	1.47
58	1992	FALL	23	0.38	.05000	1.02	0.29	0.06	77	0.05	0.14	0.30	0.60	0.90
58	1992	SPRING	27	0.35	.05000	1.03	0.28	0.05	81	0.05	0.18	0.29	0.41	1.03
58	1992	SUMMER	35	0.36	.05000	1.18	0.31	0.05	87	0.05	0.14	0.24	0.50	1.15
58	1992	WINTER	35	0.40	.05000	1.41	0.36	0.06	89	0.05	0.10	0.32	0.55	1.36
58	1993	FALL	43	0.31	.05000	1.28	0.29	0.04	93	0.05	0.10	0.20	0.50	0.81
58	1993	SPRING	46	0.29	.05000	1.45	0.26	0.04	89	0.05	0.12	0.20	0.39	0.82
58	1993	SUMMER	69	0.33	.05000	1.97	0.33	0.04	99	0.05	0.10	0.25	0.49	1.10
58	1993	WINTER	52	0.30	.05000	1.33	0.30	0.04	100	0.05	0.10	0.19	0.41	1.17
58	1994	FALL	53	0.29	.05000	1.06	0.25	0.03	86	0.05	0.11	0.20	0.40	0.80
58	1994	SPRING	54	0.22	.05000	0.80	0.20	0.03	90	0.05	0.05	0.15	0.30	0.79
58	1994	SUMMER	84	0.28	.05000	1.50	0.29	0.03	103	0.05	0.08	0.18	0.40	0.95
58	1994	WINTER	54	0.30	.05000	1.26	0.28	0.04	95	0.05	0.10	0.25	0.38	1.03
58	1995	FALL	40	0.30	.02500	1.30	0.31	0.05	104	0.05	0.06	0.16	0.48	1.05
58	1995	SPRING	41	0.28	.05000	0.93	0.23	0.04	83	0.05	0.10	0.23	0.33	0.80
58	1995	SUMMER	52	0.31	.02750	1.43	0.30	0.04	98	0.05	0.06	0.20	0.50	0.95
58	1995	WINTER	42	0.30	.04000	1.30	0.32	0.05	107	0.05	0.08	0.19	0.40	1.16
58	1996	FALL	22	0.41	.05000	0.96	0.21	0.05	51	0.13	0.30	0.40	0.50	0.73
58	1996	SPRING	24	0.43	.04500	1.10	0.27	0.05	63	0.17	0.30	0.33	0.50	1.06
58	1996	SUMMER	29	0.37	.05000	0.96	0.22	0.04	59	0.10	0.20	0.31	0.45	0.90
58	1996	WINTER	24	0.38	.04250	1.34	0.33	0.07	86	0.05	0.20	0.30	0.47	1.32
58	1997	FALL	14	0.37	.08000	1.08	0.29	0.08	79	0.08	0.17	0.25	0.50	1.08
58	1997	SPRING	19	0.30	.13000	0.80	0.16	0.04	52	0.13	0.20	0.29	0.34	0.80
58	1997	SUMMER	25	0.29	.10000	1.23	0.28	0.06	97	0.10	0.10	0.19	0.33	0.97
58	1997	WINTER	22	0.45	.05000	1.19	0.32	0.07	70	0.05	0.25	0.38	0.50	1.09
58	1998	FALL	10	0.43	.12500	1.05	0.33	0.11	76	0.13	0.16	0.36	0.48	1.05
58	1998	SPRING	10	0.37	.18300	0.71	0.20	0.06	54	0.18	0.21	0.29	0.61	0.71
58	1998	SUMMER	10	0.44	.15950	1.00	0.30	0.09	68	0.16	0.21	0.35	0.59	1.00
58	1998	WINTER	10	0.51	.22250	1.10	0.34	0.11	67	0.22	0.27	0.34	0.86	1.10
62	1990	FALL	12	0.18	.02500	0.40	0.13	0.04	76	0.03	0.05	0.18	0.30	0.40
62	1990	SPRING	15	0.12	.02500	0.32	0.08	0.02	66	0.03	0.08	0.10	0.14	0.32
62	1990	SUMMER	31	0.24	.02500	0.79	0.15	0.03	64	0.10	0.14	0.20	0.32	0.51

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
62	1990	WINTER	11	0.31	.13000	0.74	0.20	0.06	66	0.13	0.15	0.28	0.46	0.74
62	1991	FALL	9	0.17	.06000	0.37	0.12	0.04	72	0.06	0.08	0.10	0.25	0.37
62	1991	SPRING	10	0.28	.07500	0.67	0.22	0.07	80	0.08	0.13	0.17	0.37	0.67
62	1991	SUMMER	36	0.23	.02500	0.72	0.14	0.02	61	0.08	0.13	0.18	0.31	0.50
62	1991	WINTER	7	0.36	.07500	0.74	0.26	0.10	73	0.08	0.10	0.38	0.62	0.74
62	1992	FALL	20	0.29	.02500	2.19	0.48	0.11	162	0.03	0.05	0.17	0.39	1.36
62	1992	SPRING	9	0.21	.07500	0.41	0.12	0.04	59	0.08	0.10	0.18	0.29	0.41
62	1992	SUMMER	43	0.21	.02500	0.90	0.20	0.03	94	0.03	0.11	0.16	0.26	0.62
62	1992	WINTER	7	0.35	.12000	0.51	0.13	0.05	36	0.12	0.30	0.39	0.44	0.51
62	1993	FALL	19	0.41	.04500	1.59	0.39	0.09	94	0.05	0.14	0.28	0.66	1.59
62	1993	SPRING	39	0.41	.05000	3.18	0.51	0.08	124	0.07	0.19	0.34	0.40	1.39
62	1993	SUMMER	45	0.36	.05000	0.78	0.18	0.03	50	0.08	0.20	0.37	0.45	0.69
62	1993	WINTER	12	0.18	.05000	0.44	0.13	0.04	70	0.05	0.10	0.13	0.27	0.44
62	1994	FALL	8	0.18	.08650	0.38	0.10	0.04	59	0.09	0.11	0.14	0.22	0.38
62	1994	SPRING	13	0.20	.06400	0.46	0.12	0.03	60	0.06	0.10	0.20	0.27	0.46
62	1994	SUMMER	15	0.22	.07500	0.39	0.10	0.03	46	0.08	0.14	0.22	0.30	0.39
62	1994	WINTER	12	0.19	.05000	0.52	0.15	0.04	78	0.05	0.10	0.11	0.24	0.52
62	1995	FALL	7	0.23	.08900	0.42	0.13	0.05	57	0.09	0.13	0.17	0.34	0.42
62	1995	SPRING	8	0.24	.08100	0.45	0.12	0.04	51	0.08	0.15	0.21	0.31	0.45
62	1995	SUMMER	10	0.19	.07500	0.39	0.09	0.03	48	0.08	0.15	0.17	0.25	0.39
62	1995	WINTER	10	0.20	.04500	0.47	0.16	0.05	78	0.05	0.09	0.15	0.39	0.47
62	1996	FALL	9	0.25	.12450	0.38	0.08	0.03	35	0.12	0.20	0.21	0.30	0.38
62	1996	SPRING	10	0.23	.03500	0.40	0.13	0.04	58	0.04	0.12	0.22	0.33	0.40
62	1996	SUMMER	8	0.20	.12800	0.34	0.08	0.03	41	0.13	0.14	0.18	0.26	0.34
62	1996	WINTER	9	0.18	.05000	0.41	0.13	0.04	71	0.05	0.10	0.12	0.26	0.41
62	1997	FALL	4	0.21	.10000	0.35	0.13	0.07	62	0.10	0.10	0.21	0.33	0.35
62	1997	SPRING	7	0.17	.05000	0.33	0.12	0.04	70	0.05	0.05	0.12	0.32	0.33
62	1997	SUMMER	4	0.31	.16150	0.45	0.13	0.06	41	0.16	0.21	0.31	0.41	0.45
62	1997	WINTER	7	0.16	.05000	0.40	0.15	0.06	92	0.05	0.05	0.10	0.34	0.40
62	1998	FALL	4	0.19	.10600	0.27	0.09	0.05	50	0.11	0.11	0.19	0.27	0.27
62	1998	SPRING	4	0.15	.05000	0.25	0.10	0.05	66	0.05	0.07	0.16	0.24	0.25
62	1998	SUMMER	4	0.20	.11800	0.28	0.07	0.04	37	0.12	0.14	0.19	0.26	0.28

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
62	1998	WINTER	5	0.14	.05000	0.28	0.12	0.05	84	0.05	0.05	0.07	0.27	0.28
82	1990	FALL	3	0.50	.40000	0.70	0.17	0.10	35	0.40	0.40	0.40	0.70	0.70
82	1990	SPRING	4	0.22	.07500	0.40	0.16	0.08	72	0.08	0.09	0.20	0.35	0.40
82	1990	SUMMER	4	0.48	.35000	0.70	0.16	0.08	33	0.35	0.38	0.43	0.58	0.70
82	1990	WINTER	4	0.58	.30000	1.00	0.30	0.15	52	0.30	0.40	0.50	0.75	1.00
82	1991	FALL	2	0.40	.40000	0.40	0.00	0.00	0	0.40	0.40	0.40	0.40	0.40
82	1991	SPRING	4	0.28	.10000	0.40	0.13	0.06	46	0.10	0.20	0.30	0.35	0.40
82	1991	SUMMER	3	0.43	.30000	0.50	0.12	0.07	27	0.30	0.30	0.50	0.50	0.50
82	1991	WINTER	4	0.28	.20000	0.35	0.06	0.03	23	0.20	0.23	0.28	0.33	0.35
82	1992	FALL	2	0.30	.20000	0.40	0.14	0.10	47	0.20	0.20	0.30	0.40	0.40
82	1992	SPRING	4	0.12	.07500	0.20	0.06	0.03	47	0.08	0.09	0.10	0.15	0.20
82	1992	SUMMER	4	0.19	.10000	0.30	0.09	0.04	46	0.10	0.13	0.18	0.25	0.30
82	1992	WINTER	4	0.25	.20000	0.30	0.04	0.02	16	0.20	0.23	0.25	0.28	0.30
82	1993	FALL	2	0.40	.40000	0.40	0.00	0.00	0	0.40	0.40	0.40	0.40	0.40
82	1993	SPRING	4	0.40	.30000	0.50	0.12	0.06	29	0.30	0.30	0.40	0.50	0.50
82	1993	SUMMER	4	0.21	.15000	0.30	0.06	0.03	30	0.15	0.18	0.20	0.25	0.30
82	1993	WINTER	4	0.20	.10000	0.40	0.14	0.07	71	0.10	0.10	0.15	0.30	0.40
82	1994	SPRING	3	0.27	.20000	0.30	0.06	0.03	22	0.20	0.20	0.30	0.30	0.30
82	1994	SUMMER	3	0.33	.30000	0.40	0.06	0.03	17	0.30	0.30	0.30	0.40	0.40
82	1994	WINTER	3	0.47	.20000	0.80	0.31	0.18	65	0.20	0.20	0.40	0.80	0.80
82	1995	SPRING	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
82	1995	SUMMER	1	0.35	.35000	0.35	.	.	.	0.35	0.35	0.35	0.35	0.35

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Phosph_Ortho_Tot_as_P_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	1990	FALL	2	10.00	10.000	10.00	0.00	0.00	0	10.00	10.00	10.00	10.00	10.00
49	1990	WINTER	1	30.00	30.000	30.00	.	.	.	30.00	30.00	30.00	30.00	30.00
49	1991	FALL	2	25.00	20.000	30.00	7.07	5.00	28	20.00	20.00	25.00	30.00	30.00
49	1991	SPRING	2	22.50	5.0000	40.00	24.75	17.50	110	5.00	5.00	22.50	40.00	40.00
49	1991	SUMMER	2	83.75	17.500	150.00	93.69	66.25	112	17.50	17.50	83.75	150.00	150.00
49	1991	WINTER	2	12.50	10.000	15.00	3.54	2.50	28	10.00	10.00	12.50	15.00	15.00
49	1992	FALL	2	20.00	10.000	30.00	14.14	10.00	71	10.00	10.00	20.00	30.00	30.00
49	1992	SPRING	2	20.00	20.000	20.00	0.00	0.00	0	20.00	20.00	20.00	20.00	20.00
49	1992	SUMMER	2	23.75	7.5000	40.00	22.98	16.25	97	7.50	7.50	23.75	40.00	40.00
49	1992	WINTER	2	17.50	15.000	20.00	3.54	2.50	20	15.00	15.00	17.50	20.00	20.00
50	1990	FALL	9	8.33	5.0000	20.00	6.61	2.20	79	5.00	5.00	5.00	5.00	20.00
50	1990	WINTER	5	8.00	5.0000	12.50	4.11	1.84	51	5.00	5.00	5.00	12.50	12.50
50	1991	FALL	12	11.88	5.0000	30.00	8.60	2.48	72	5.00	5.00	7.50	20.00	30.00
50	1991	SPRING	14	10.71	5.0000	40.00	11.24	3.00	105	5.00	5.00	5.00	10.00	40.00
50	1991	SUMMER	13	8.27	5.0000	20.00	5.53	1.53	67	5.00	5.00	5.00	10.00	20.00
50	1991	WINTER	14	9.46	5.0000	35.00	8.04	2.15	85	5.00	5.00	5.00	12.50	35.00
50	1992	FALL	9	7.22	5.0000	20.00	5.07	1.69	70	5.00	5.00	5.00	5.00	20.00
50	1992	SPRING	12	12.08	5.0000	60.00	16.16	4.67	134	5.00	5.00	5.00	12.50	60.00
50	1992	SUMMER	14	8.93	5.0000	20.00	6.33	1.69	71	5.00	5.00	5.00	12.50	20.00
50	1992	WINTER	14	10.71	5.0000	25.00	8.05	2.15	75	5.00	5.00	5.00	20.00	25.00
50	1998	WINTER	1	35.00	35.000	35.00	.	.	.	35.00	35.00	35.00	35.00	35.00
58	1990	FALL	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
58	1990	WINTER	3	6.67	5.0000	10.00	2.89	1.67	43	5.00	5.00	5.00	10.00	10.00
58	1991	FALL	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
58	1991	SPRING	3	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
58	1991	SUMMER	4	6.25	5.0000	10.00	2.50	1.25	40	5.00	5.00	5.00	7.50	10.00
58	1991	WINTER	4	7.50	5.0000	10.00	2.89	1.44	38	5.00	5.00	7.50	10.00	10.00
58	1992	FALL	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
58	1992	SPRING	3	11.67	5.0000	20.00	7.64	4.41	65	5.00	5.00	10.00	20.00	20.00
58	1992	SUMMER	2	17.50	5.0000	30.00	17.68	12.50	101	5.00	5.00	17.50	30.00	30.00
58	1992	WINTER	5	9.00	5.0000	20.00	6.52	2.92	72	5.00	5.00	5.00	10.00	20.00
62	1990	FALL	2	10.00	10.000	10.00	0.00	0.00	0	10.00	10.00	10.00	10.00	10.00

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Phosph_Ortho_Tot_as_P_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
62	1991	FALL	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
62	1991	SPRING	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
62	1991	SUMMER	4	9.75	1.0000	28.00	12.31	6.16	126	1.00	3.00	5.00	16.50	28.00
62	1991	WINTER	2	20.00	20.000	20.00	0.00	0.00	0	20.00	20.00	20.00	20.00	20.00
62	1992	FALL	3	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
62	1992	SPRING	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
62	1992	SUMMER	3	7.50	1.0000	20.00	10.83	6.25	144	1.00	1.00	1.50	20.00	20.00
62	1992	WINTER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
62	1993	SPRING	1	8.00	8.0000	8.00	.	.	.	8.00	8.00	8.00	8.00	8.00
62	1993	SUMMER	4	7.25	2.0000	14.00	5.04	2.52	70	2.00	3.75	6.50	10.75	14.00
62	1994	FALL	1	170.00	170.00	170.00	.	.	.	170.00	170.00	170.00	170.00	170.00
62	1994	SUMMER	23	2.13	.50000	15.00	3.63	0.76	170	1.00	1.00	1.00	1.00	12.00
62	1995	FALL	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
62	1997	FALL	10	11.05	5.0000	21.00	4.86	1.54	44	5.00	6.00	11.50	14.00	21.00
82	1990	FALL	3	6.67	5.0000	10.00	2.89	1.67	43	5.00	5.00	5.00	10.00	10.00
82	1990	WINTER	2	7.50	5.0000	10.00	3.54	2.50	47	5.00	5.00	7.50	10.00	10.00
82	1991	FALL	2	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
82	1991	SPRING	4	13.75	5.0000	20.00	7.50	3.75	55	5.00	7.50	15.00	20.00	20.00
82	1991	SUMMER	3	5.00	5.0000	5.00	0.00	0.00	0	5.00	5.00	5.00	5.00	5.00
82	1991	WINTER	4	10.00	5.0000	12.50	3.54	1.77	35	5.00	7.50	11.25	12.50	12.50
82	1992	FALL	2	20.00	20.000	20.00	0.00	0.00	0	20.00	20.00	20.00	20.00	20.00
82	1992	SPRING	4	10.00	5.0000	20.00	7.07	3.54	71	5.00	5.00	7.50	15.00	20.00
82	1992	SUMMER	4	11.25	5.0000	20.00	7.50	3.75	67	5.00	5.00	10.00	17.50	20.00
82	1992	WINTER	4	7.50	5.0000	12.50	3.54	1.77	47	5.00	5.00	6.25	10.00	12.50

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Total_Nitrogen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	1990	FALL	2	0.65	.50000	0.80	0.21	0.15	33	0.50	0.50	0.65	0.80	0.80
49	1990	SPRING	2	0.95	.90000	1.00	0.07	0.05	7	0.90	0.90	0.95	1.00	1.00
49	1990	SUMMER	2	1.05	.70000	1.40	0.49	0.35	47	0.70	0.70	1.05	1.40	1.40
49	1990	WINTER	2	1.06	.62000	1.50	0.62	0.44	59	0.62	0.62	1.06	1.50	1.50
49	1991	FALL	2	0.95	.70000	1.20	0.35	0.25	37	0.70	0.70	0.95	1.20	1.20
49	1991	SPRING	2	1.33	.85000	1.80	0.67	0.48	51	0.85	0.85	1.33	1.80	1.80
49	1991	SUMMER	2	1.50	.80000	2.20	0.99	0.70	66	0.80	0.80	1.50	2.20	2.20
49	1991	WINTER	2	1.50	.70000	2.30	1.13	0.80	75	0.70	0.70	1.50	2.30	2.30
49	1992	FALL	2	0.83	.55000	1.10	0.39	0.28	47	0.55	0.55	0.83	1.10	1.10
49	1992	SPRING	2	0.67	.58000	0.76	0.13	0.09	19	0.58	0.58	0.67	0.76	0.76
49	1992	SUMMER	2	1.22	.43500	2.00	1.11	0.78	91	0.44	0.44	1.22	2.00	2.00
49	1992	WINTER	2	0.92	.53000	1.30	0.54	0.39	60	0.53	0.53	0.92	1.30	1.30
49	1993	FALL	1	0.45	.45000	0.45	.	.	.	0.45	0.45	0.45	0.45	0.45
49	1993	SPRING	2	1.10	.80000	1.40	0.42	0.30	39	0.80	0.80	1.10	1.40	1.40
49	1993	SUMMER	2	0.97	.53500	1.40	0.61	0.43	63	0.54	0.54	0.97	1.40	1.40
49	1993	WINTER	2	0.93	.55500	1.30	0.53	0.37	57	0.56	0.56	0.93	1.30	1.30
49	1994	FALL	1	1.30	1.3000	1.30	.	.	.	1.30	1.30	1.30	1.30	1.30
49	1994	SPRING	2	0.78	.55000	1.00	0.32	0.23	41	0.55	0.55	0.78	1.00	1.00
49	1994	SUMMER	2	1.10	1.0000	1.20	0.14	0.10	13	1.00	1.00	1.10	1.20	1.20
49	1994	WINTER	2	1.19	.48000	1.90	1.00	0.71	84	0.48	0.48	1.19	1.90	1.90
50	1990	FALL	10	0.64	.30000	1.20	0.27	0.08	42	0.30	0.50	0.55	0.80	1.20
50	1990	SPRING	13	0.86	.50000	2.20	0.55	0.15	63	0.50	0.50	0.70	0.80	2.20
50	1990	SUMMER	14	0.68	.30000	1.20	0.27	0.07	39	0.30	0.50	0.65	0.80	1.20
50	1990	WINTER	12	0.73	.40000	1.70	0.39	0.11	53	0.40	0.47	0.60	0.88	1.70
50	1991	FALL	14	0.46	.12500	0.84	0.24	0.06	52	0.13	0.30	0.47	0.65	0.84
50	1991	SPRING	12	0.70	.40000	1.00	0.19	0.05	27	0.40	0.57	0.67	0.82	1.00
50	1991	SUMMER	15	0.57	.12500	1.15	0.30	0.08	52	0.13	0.40	0.59	0.73	1.15
50	1991	WINTER	18	1.22	.36000	4.24	1.12	0.26	92	0.36	0.52	0.76	1.15	4.24
50	1992	FALL	11	0.56	.30000	1.10	0.22	0.07	39	0.30	0.40	0.55	0.69	1.10
50	1992	SPRING	17	0.95	.20000	2.67	0.68	0.17	72	0.20	0.55	0.68	0.91	2.67
50	1992	SUMMER	20	0.63	.20000	2.14	0.44	0.10	69	0.25	0.35	0.45	0.89	1.62
50	1992	WINTER	17	0.97	.45000	2.23	0.60	0.15	62	0.45	0.54	0.78	0.97	2.23

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
Total_Nitrogen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	1993	FALL	7	0.41	.30000	0.78	0.17	0.06	41	0.30	0.30	0.40	0.40	0.78
50	1993	SPRING	19	0.89	.20000	2.41	0.60	0.14	68	0.20	0.50	0.60	1.07	2.41
50	1993	SUMMER	18	1.13	.40000	4.05	1.12	0.26	99	0.40	0.44	0.67	1.20	4.05
50	1993	WINTER	18	0.81	.39000	2.06	0.48	0.11	59	0.39	0.46	0.66	1.00	2.06
50	1994	FALL	5	0.55	.40000	0.79	0.17	0.08	32	0.40	0.40	0.50	0.68	0.79
50	1994	SPRING	9	0.51	.20000	0.78	0.17	0.06	33	0.20	0.46	0.49	0.58	0.78
50	1994	SUMMER	8	0.46	.30000	0.67	0.14	0.05	30	0.30	0.35	0.45	0.56	0.67
50	1994	WINTER	7	0.48	.37000	0.57	0.07	0.03	15	0.37	0.42	0.48	0.56	0.57
50	1995	FALL	2	0.60	.49000	0.70	0.15	0.11	25	0.49	0.49	0.60	0.70	0.70
50	1995	SPRING	6	0.51	.40000	0.64	0.09	0.04	18	0.40	0.47	0.48	0.60	0.64
50	1995	SUMMER	8	0.52	.30000	1.16	0.28	0.10	54	0.30	0.37	0.43	0.54	1.16
50	1995	WINTER	4	0.46	.36000	0.53	0.08	0.04	17	0.36	0.39	0.47	0.52	0.53
58	1990	FALL	4	0.53	.50000	0.60	0.05	0.02	10	0.50	0.50	0.50	0.55	0.60
58	1990	SPRING	3	0.50	.30000	0.70	0.20	0.12	40	0.30	0.30	0.50	0.70	0.70
58	1990	SUMMER	2	0.55	.50000	0.60	0.07	0.05	13	0.50	0.50	0.55	0.60	0.60
58	1990	WINTER	2	0.90	.70000	1.10	0.28	0.20	31	0.70	0.70	0.90	1.10	1.10
58	1991	FALL	2	0.58	.57000	0.59	0.01	0.01	2	0.57	0.57	0.58	0.59	0.59
58	1991	SPRING	1	1.50	1.5000	1.50	.	.	.	1.50	1.50	1.50	1.50	1.50
58	1991	SUMMER	2	0.74	.61000	0.86	0.18	0.13	24	0.61	0.61	0.74	0.86	0.86
58	1991	WINTER	2	0.72	.65000	0.80	0.10	0.07	14	0.65	0.65	0.72	0.80	0.80
58	1992	FALL	1	0.28	.28000	0.28	.	.	.	0.28	0.28	0.28	0.28	0.28
58	1992	SPRING	1	0.27	.27000	0.27	.	.	.	0.27	0.27	0.27	0.27	0.27
58	1992	SUMMER	1	0.49	.49000	0.49	.	.	.	0.49	0.49	0.49	0.49	0.49
58	1992	WINTER	2	0.65	.46500	0.84	0.27	0.19	41	0.47	0.47	0.65	0.84	0.84
58	1993	FALL	2	0.23	.20000	0.27	0.05	0.03	20	0.20	0.20	0.23	0.27	0.27
58	1993	SPRING	2	0.50	.49000	0.50	0.01	0.01	1	0.49	0.49	0.50	0.50	0.50
58	1993	SUMMER	1	0.32	.32000	0.32	.	.	.	0.32	0.32	0.32	0.32	0.32
58	1993	WINTER	1	0.45	.45000	0.45	.	.	.	0.45	0.45	0.45	0.45	0.45
58	1994	FALL	5	0.57	.19000	1.09	0.40	0.18	70	0.19	0.32	0.36	0.91	1.09
58	1994	SPRING	2	0.56	.50000	0.62	0.08	0.06	15	0.50	0.50	0.56	0.62	0.62
58	1994	SUMMER	1	0.33	.33000	0.33	.	.	.	0.33	0.33	0.33	0.33	0.33
58	1994	WINTER	2	0.62	.45000	0.78	0.23	0.17	38	0.45	0.45	0.62	0.78	0.78

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Total_Nitrogen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1995	FALL	1	0.54	.53500	0.54	.	.	.	0.54	0.54	0.54	0.54	0.54
58	1995	SPRING	1	0.31	.31000	0.31	.	.	.	0.31	0.31	0.31	0.31	0.31
58	1995	SUMMER	1	0.44	.44000	0.44	.	.	.	0.44	0.44	0.44	0.44	0.44
58	1995	WINTER	1	0.85	.84500	0.85	.	.	.	0.85	0.85	0.85	0.85	0.85
58	1996	SPRING	1	0.53	.53000	0.53	.	.	.	0.53	0.53	0.53	0.53	0.53
58	1996	WINTER	1	1.12	1.1150	1.12	.	.	.	1.12	1.12	1.12	1.12	1.12
58	1997	WINTER	1	0.54	.54000	0.54	.	.	.	0.54	0.54	0.54	0.54	0.54
62	1990	FALL	1	0.70	.70000	0.70	.	.	.	0.70	0.70	0.70	0.70	0.70
62	1990	SUMMER	1	0.70	.70000	0.70	.	.	.	0.70	0.70	0.70	0.70	0.70
62	1990	WINTER	1	0.70	.70000	0.70	.	.	.	0.70	0.70	0.70	0.70	0.70
62	1993	SPRING	4	3.67	1.0650	5.42	2.00	1.00	54	1.07	2.11	4.10	5.23	5.42
62	1993	SUMMER	14	0.91	.08000	5.87	1.48	0.40	162	0.08	0.17	0.56	0.74	5.87
62	1994	SPRING	25	1.90	.08900	12.63	2.91	0.58	154	0.15	0.30	0.51	2.03	7.16
62	1994	SUMMER	9	2.72	.14800	16.26	5.16	1.72	190	0.15	0.68	0.73	1.64	16.26
62	1995	SPRING	17	0.64	.16400	2.57	0.64	0.15	99	0.16	0.23	0.43	0.75	2.57
62	1995	SUMMER	9	0.67	.30200	1.65	0.47	0.16	70	0.30	0.36	0.44	0.94	1.65
62	1996	SUMMER	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60
62	1997	FALL	10	0.43	.16000	1.12	0.33	0.10	77	0.16	0.21	0.32	0.37	1.12
62	1998	FALL	1	0.24	.24000	0.24	.	.	.	0.24	0.24	0.24	0.24	0.24
62	1998	SPRING	1	0.55	.55000	0.55	.	.	.	0.55	0.55	0.55	0.55	0.55
62	1998	SUMMER	1	0.34	.34000	0.34	.	.	.	0.34	0.34	0.34	0.34	0.34
62	1998	WINTER	1	0.58	.57500	0.58	.	.	.	0.58	0.58	0.58	0.58	0.58
82	1990	FALL	3	0.53	.40000	0.80	0.23	0.13	43	0.40	0.40	0.40	0.80	0.80
82	1990	SPRING	2	0.55	.40000	0.70	0.21	0.15	39	0.40	0.40	0.55	0.70	0.70
82	1990	SUMMER	4	0.50	.40000	0.70	0.14	0.07	28	0.40	0.40	0.45	0.60	0.70
82	1990	WINTER	4	0.73	.50000	1.10	0.26	0.13	35	0.50	0.58	0.66	0.89	1.10
82	1991	FALL	2	0.48	.46000	0.50	0.03	0.02	6	0.46	0.46	0.48	0.50	0.50
82	1991	SPRING	3	0.50	.42000	0.64	0.12	0.07	25	0.42	0.42	0.43	0.64	0.64
82	1991	SUMMER	3	0.54	.44000	0.60	0.09	0.05	16	0.44	0.44	0.59	0.60	0.60
82	1991	WINTER	4	0.41	.32500	0.53	0.09	0.04	21	0.33	0.35	0.39	0.47	0.53
82	1992	FALL	2	0.41	.32000	0.49	0.12	0.09	30	0.32	0.32	0.41	0.49	0.49
82	1992	SPRING	1	0.28	.28000	0.28	.	.	.	0.28	0.28	0.28	0.28	0.28

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Total_Nitrogen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
82	1992	SUMMER	3	0.34	.28000	0.39	0.06	0.03	17	0.28	0.28	0.36	0.39	0.39
82	1992	WINTER	4	0.40	.35000	0.46	0.05	0.03	13	0.35	0.36	0.39	0.44	0.46
82	1993	FALL	2	0.47	.46000	0.48	0.01	0.01	3	0.46	0.46	0.47	0.48	0.48
82	1993	SPRING	4	0.51	.36000	0.66	0.13	0.07	26	0.36	0.41	0.51	0.62	0.66
82	1993	SUMMER	4	0.32	.26000	0.38	0.05	0.03	16	0.26	0.28	0.32	0.36	0.38
82	1993	WINTER	3	0.44	.34000	0.58	0.12	0.07	28	0.34	0.34	0.41	0.58	0.58
82	1994	SPRING	3	0.34	.27000	0.46	0.10	0.06	30	0.27	0.27	0.30	0.46	0.46
82	1994	SUMMER	3	0.38	.30000	0.55	0.14	0.08	38	0.30	0.30	0.30	0.55	0.55
82	1994	WINTER	3	0.62	.26000	1.10	0.43	0.25	69	0.26	0.26	0.51	1.10	1.10
82	1995	SPRING	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30
82	1995	SUMMER	1	0.43	.42500	0.43	.	.	.	0.43	0.43	0.43	0.43	0.43

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Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	1990	FALL	12	42.92	15.000	70.00	15.73	4.54	37	15.00	30.00	40.00	55.00	70.00
49	1990	SPRING	13	49.33	20.000	100.00	21.25	5.89	43	20.00	40.00	50.00	60.00	100.00
49	1990	SUMMER	13	55.38	20.000	110.00	25.37	7.04	46	20.00	30.00	50.00	70.00	110.00
49	1990	WINTER	3	41.67	25.000	60.00	17.56	10.14	42	25.00	25.00	40.00	60.00	60.00
49	1991	FALL	11	59.09	10.000	135.00	33.68	10.15	57	10.00	40.00	60.00	70.00	135.00
49	1991	SPRING	7	55.71	20.000	110.00	35.05	13.25	63	20.00	30.00	40.00	100.00	110.00
49	1991	SUMMER	7	77.86	10.000	240.00	75.93	28.70	98	10.00	40.00	50.00	85.00	240.00
49	1991	WINTER	6	118.33	10.000	470.00	178.82	73.00	151	10.00	20.00	35.00	140.00	470.00
49	1992	FALL	15	48.67	15.000	90.00	20.22	5.22	42	15.00	35.00	40.00	60.00	90.00
49	1992	SPRING	15	45.83	11.250	70.00	15.94	4.11	35	11.25	40.00	46.25	60.00	70.00
49	1992	SUMMER	10	61.50	25.000	120.00	27.29	8.63	44	25.00	40.00	60.00	70.00	120.00
49	1992	WINTER	13	40.48	20.000	95.00	22.84	6.34	56	20.00	30.00	35.00	40.00	95.00
49	1993	FALL	3	33.33	10.000	60.00	25.17	14.53	75	10.00	10.00	30.00	60.00	60.00
49	1993	SPRING	4	66.25	50.000	90.00	17.97	8.98	27	50.00	52.50	62.50	80.00	90.00
49	1993	SUMMER	3	61.67	30.000	100.00	35.47	20.48	58	30.00	30.00	55.00	100.00	100.00
49	1993	WINTER	4	36.88	12.500	60.00	19.51	9.76	53	12.50	23.75	37.50	50.00	60.00
49	1994	FALL	6	30.42	2.5000	85.00	29.00	11.84	95	2.50	10.00	27.50	30.00	85.00
49	1994	SPRING	3	70.00	35.000	110.00	37.75	21.79	54	35.00	35.00	65.00	110.00	110.00
49	1994	SUMMER	3	73.33	50.000	100.00	25.17	14.53	34	50.00	50.00	70.00	100.00	100.00
49	1994	WINTER	6	39.17	10.000	130.00	45.21	18.46	115	10.00	15.00	25.00	30.00	130.00
49	1995	SPRING	1	30.00	30.000	30.00	.	.	.	30.00	30.00	30.00	30.00	30.00
49	1995	SUMMER	1	70.00	70.000	70.00	.	.	.	70.00	70.00	70.00	70.00	70.00
49	1995	WINTER	2	77.50	30.000	125.00	67.18	47.50	87	30.00	30.00	77.50	125.00	125.00
50	1990	FALL	72	37.58	2.5000	220.00	44.70	5.27	119	3.75	10.00	25.00	37.50	135.50
50	1990	SPRING	75	45.13	7.5000	401.00	57.77	6.67	128	9.50	20.00	30.00	50.00	125.00
50	1990	SUMMER	102	40.07	2.5000	580.00	66.60	6.59	166	3.75	10.00	20.00	40.00	115.00
50	1990	WINTER	76	48.22	.00000	1170.00	138.34	15.87	287	2.50	10.00	20.00	38.50	150.00
50	1991	FALL	92	45.73	.00000	710.00	98.45	10.26	215	2.50	10.00	20.00	37.00	157.00
50	1991	SPRING	68	44.16	2.5000	290.00	42.01	5.09	95	10.00	20.00	30.00	60.00	105.00
50	1991	SUMMER	82	52.30	2.5000	560.00	82.74	9.14	158	7.00	20.00	30.00	50.00	180.00
50	1991	WINTER	48	31.61	3.7500	240.00	36.75	5.30	116	3.75	12.00	21.63	37.50	70.50
50	1992	FALL	69	41.28	.00000	460.00	65.95	7.94	160	5.00	20.00	23.50	40.00	105.00

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Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	1992	SPRING	59	42.03	2.5000	230.00	37.08	4.83	88	3.75	20.00	40.00	55.00	110.00
50	1992	SUMMER	69	56.00	2.5000	640.00	96.06	11.56	172	3.75	20.00	30.00	50.00	220.00
50	1992	WINTER	63	51.10	2.5000	305.00	63.35	7.98	124	3.75	14.00	30.00	55.00	200.00
50	1993	FALL	71	24.76	2.5000	100.00	19.98	2.37	81	2.50	10.00	20.00	32.50	70.00
50	1993	SPRING	65	36.03	6.2500	110.00	26.29	3.26	73	8.50	20.00	30.00	45.00	90.00
50	1993	SUMMER	80	44.04	2.5000	480.00	60.53	6.77	137	5.00	14.50	30.00	50.00	115.00
50	1993	WINTER	63	60.63	2.0000	677.50	122.59	15.44	202	2.50	5.00	20.00	45.00	290.00
50	1994	FALL	49	38.33	2.5000	290.00	44.34	6.33	116	7.00	20.00	27.50	44.00	100.00
50	1994	SPRING	51	62.77	2.0000	850.00	120.72	16.90	192	2.00	20.00	36.50	65.00	160.00
50	1994	SUMMER	85	45.17	2.5000	160.00	35.45	3.84	78	6.00	20.00	40.00	50.00	120.00
50	1994	WINTER	49	33.68	2.0000	100.00	27.94	3.99	83	6.25	12.50	21.00	45.00	96.00
50	1995	FALL	25	46.49	2.5000	565.00	109.86	21.97	236	2.50	5.00	26.25	40.00	71.00
50	1995	SPRING	22	31.40	5.0000	95.00	25.52	5.44	81	5.00	11.25	20.00	50.00	90.00
50	1995	SUMMER	93	68.36	2.5000	700.00	128.85	13.36	188	2.50	10.00	30.00	61.25	310.00
50	1995	WINTER	18	31.63	2.5000	90.00	26.15	6.16	83	2.50	5.00	30.00	50.00	90.00
50	1996	FALL	17	30.68	2.0000	117.00	27.67	6.71	90	2.00	13.50	20.00	35.00	117.00
50	1996	SPRING	27	37.86	3.0000	157.50	37.04	7.13	98	3.50	12.50	30.00	45.50	130.00
50	1996	SUMMER	27	50.61	2.5000	235.00	57.41	11.05	113	2.50	20.00	40.00	50.00	200.00
50	1996	WINTER	10	27.75	2.5000	40.00	11.21	3.54	40	2.50	20.00	30.00	35.00	40.00
50	1997	FALL	27	54.86	11.250	140.00	34.34	6.61	63	20.00	30.00	40.00	70.00	140.00
50	1997	SPRING	10	26.00	5.0000	60.00	15.60	4.93	60	5.00	20.00	22.50	30.00	60.00
50	1997	SUMMER	21	71.43	20.000	210.00	47.65	10.40	67	20.00	45.00	60.00	80.00	160.00
50	1997	WINTER	7	20.79	3.5000	30.00	12.00	4.54	58	3.50	4.50	27.50	30.00	30.00
50	1998	FALL	2	57.00	44.000	70.00	18.38	13.00	32	44.00	44.00	57.00	70.00	70.00
50	1998	SPRING	2	47.50	30.000	65.00	24.75	17.50	52	30.00	30.00	47.50	65.00	65.00
50	1998	SUMMER	1	52.50	52.500	52.50	.	.	.	52.50	52.50	52.50	52.50	52.50
50	1998	WINTER	10	45.00	30.000	90.00	17.32	5.48	38	30.00	35.00	40.00	50.00	90.00
58	1990	FALL	41	47.37	2.5000	360.00	67.28	10.51	142	3.75	10.00	20.00	69.50	170.00
58	1990	SPRING	39	37.12	3.7500	260.00	46.76	7.49	126	5.00	12.00	25.00	40.00	140.00
58	1990	SUMMER	77	32.25	2.5000	320.00	53.62	6.11	166	2.50	7.00	10.00	40.00	125.00
58	1990	WINTER	43	77.76	2.5000	790.00	148.38	22.63	191	3.75	12.00	30.00	42.00	300.00
58	1991	FALL	33	77.92	2.5000	870.00	176.72	30.76	227	2.50	10.00	20.00	55.00	580.00

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Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1991	SPRING	34	48.67	3.0000	310.00	64.68	11.09	133	3.75	11.00	29.50	60.00	240.00
58	1991	SUMMER	58	60.56	1.0000	925.00	132.95	17.46	220	2.50	10.00	20.00	55.50	300.00
58	1991	WINTER	46	33.15	2.5000	230.00	49.12	7.24	148	2.50	10.00	16.88	36.00	125.00
58	1992	FALL	25	92.30	1.5000	860.00	211.69	42.34	229	2.50	10.00	30.00	60.00	710.00
58	1992	SPRING	35	45.15	2.5000	410.00	92.06	15.56	204	2.50	8.00	20.00	45.00	400.00
58	1992	SUMMER	45	51.27	2.5000	470.00	95.97	14.31	187	2.50	5.00	20.00	60.00	170.00
58	1992	WINTER	38	51.72	2.5000	360.00	72.46	11.75	140	2.50	10.00	31.00	60.00	275.00
58	1993	FALL	46	47.79	2.5000	1100.00	160.59	23.68	336	2.50	5.00	11.25	35.00	90.00
58	1993	SPRING	44	39.27	2.5000	530.00	82.99	12.51	211	2.50	10.00	18.50	35.25	120.00
58	1993	SUMMER	66	47.56	2.5000	570.00	91.51	11.26	192	2.50	5.00	20.00	36.25	170.00
58	1993	WINTER	51	45.96	2.5000	260.00	60.91	8.53	133	2.50	9.00	30.00	55.00	210.00
58	1994	FALL	51	59.54	2.5000	900.00	162.22	22.72	272	2.50	10.00	20.00	36.00	187.50
58	1994	SPRING	55	37.58	2.5000	390.00	65.11	8.78	173	2.50	10.00	20.00	40.00	90.00
58	1994	SUMMER	90	44.72	1.0000	710.00	99.30	10.47	222	2.50	5.00	20.00	40.00	120.00
58	1994	WINTER	61	28.75	2.5000	250.00	42.80	5.48	149	2.50	3.75	15.00	35.00	90.00
58	1995	FALL	41	52.23	2.5000	890.00	139.22	21.74	267	2.50	5.00	20.00	50.00	100.00
58	1995	SPRING	47	38.05	2.5000	480.00	84.75	12.36	223	2.50	5.00	14.00	33.00	90.00
58	1995	SUMMER	63	42.17	2.5000	705.00	106.16	13.38	252	2.50	2.50	10.00	30.00	150.00
58	1995	WINTER	47	31.41	2.5000	355.00	57.47	8.38	183	2.50	10.00	20.00	30.00	115.00
58	1996	FALL	25	60.92	2.5000	460.00	90.47	18.09	149	3.50	20.00	40.00	70.00	170.00
58	1996	SPRING	27	55.76	2.5000	350.00	86.02	16.56	154	2.50	10.00	30.00	49.00	290.00
58	1996	SUMMER	32	51.31	1.0000	550.00	95.92	16.96	187	2.50	12.50	31.00	55.00	140.00
58	1996	WINTER	28	53.39	2.5000	295.00	63.53	12.01	119	3.00	13.25	29.50	67.50	180.00
58	1997	FALL	12	19.00	2.0000	53.00	15.05	4.34	79	2.00	10.00	15.00	23.25	53.00
58	1997	SPRING	18	17.64	2.0000	38.00	10.14	2.39	58	2.00	12.00	17.00	25.00	38.00
58	1997	SUMMER	14	25.32	3.0000	65.00	20.56	5.50	81	3.00	11.00	17.25	43.00	65.00
58	1997	WINTER	25	44.83	2.5000	300.00	80.28	16.06	179	2.50	9.50	17.00	32.00	300.00
58	1998	FALL	10	20.10	2.5000	45.50	11.90	3.76	59	2.50	13.00	17.25	29.00	45.50
58	1998	SPRING	10	18.40	1.0000	32.00	9.06	2.86	49	1.00	14.00	17.50	25.00	32.00
58	1998	SUMMER	11	24.86	3.5000	76.00	19.73	5.95	79	3.50	12.00	18.50	32.50	76.00
58	1998	WINTER	12	15.25	2.0000	29.00	8.64	2.49	57	2.00	9.50	12.25	24.25	29.00
62	1990	FALL	58	30.31	2.5000	75.00	17.39	2.28	57	3.75	20.00	30.00	40.00	60.00

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Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
62	1990	SPRING	57	35.86	4.5000	165.00	32.34	4.28	90	9.00	20.00	25.00	40.00	105.00
62	1990	SUMMER	74	29.24	3.7500	140.00	23.36	2.72	80	5.00	14.00	30.00	40.00	80.00
62	1990	WINTER	53	27.89	3.7500	70.00	13.30	1.83	48	7.50	20.00	30.00	30.00	60.00
62	1991	FALL	50	30.59	3.7500	120.00	21.83	3.09	71	6.00	17.50	24.00	40.00	70.00
62	1991	SPRING	50	27.33	3.7500	140.00	19.68	2.78	72	9.00	19.00	20.00	30.00	50.00
62	1991	SUMMER	77	25.73	2.5000	110.00	17.15	1.95	67	5.00	20.00	20.00	30.00	60.00
62	1991	WINTER	50	28.55	3.7500	75.00	17.00	2.40	60	8.00	20.00	25.75	30.00	70.00
62	1992	FALL	61	25.53	2.5000	90.00	17.37	2.22	68	3.75	10.00	21.00	35.00	50.00
62	1992	SPRING	48	22.35	3.7500	59.50	11.98	1.73	54	5.00	15.00	20.75	29.25	40.00
62	1992	SUMMER	81	24.65	5.0000	70.00	13.16	1.46	53	10.00	15.00	20.00	30.00	50.00
62	1992	WINTER	51	27.25	5.0000	310.00	41.75	5.85	153	9.00	10.00	20.00	30.00	50.00
62	1993	FALL	60	27.03	2.5000	130.00	20.56	2.65	76	2.50	13.00	20.00	37.50	57.50
62	1993	SPRING	81	18.56	2.5000	80.00	16.13	1.79	87	2.50	2.50	18.00	25.00	48.00
62	1993	SUMMER	94	23.05	2.0000	115.00	19.36	2.00	84	2.50	10.00	20.00	30.00	60.00
62	1993	WINTER	52	22.62	2.5000	53.00	10.74	1.49	47	7.00	17.75	20.00	30.00	40.00
62	1994	FALL	49	22.67	4.0000	60.00	13.50	1.93	60	5.00	10.50	20.00	31.50	45.00
62	1994	SPRING	75	28.21	1.0000	326.00	40.16	4.64	142	5.00	10.00	20.00	33.00	84.00
62	1994	SUMMER	76	25.89	5.0000	103.00	19.13	2.19	74	5.00	10.00	22.00	30.00	70.00
62	1994	WINTER	52	24.36	5.0000	68.00	15.52	2.15	64	5.00	10.00	20.00	30.00	50.00
62	1995	FALL	47	32.28	6.5000	65.00	14.64	2.14	45	11.00	25.00	30.00	45.00	60.00
62	1995	SPRING	67	28.98	.00000	130.00	21.52	2.63	74	6.00	18.00	22.50	35.00	70.00
62	1995	SUMMER	58	32.61	5.0000	100.00	18.33	2.41	56	8.00	20.00	30.00	44.50	60.00
62	1995	WINTER	50	26.66	3.0000	80.00	16.06	2.27	60	5.00	20.00	20.00	30.00	60.00
62	1996	FALL	49	16.08	5.0000	40.00	10.17	1.45	63	5.00	9.00	12.50	20.00	40.00
62	1996	SPRING	50	11.54	4.5000	28.00	6.56	0.93	57	5.00	5.00	10.00	20.00	22.50
62	1996	SUMMER	51	13.42	2.5000	30.00	7.74	1.08	58	5.00	5.00	12.50	20.00	30.00
62	1996	WINTER	52	14.62	2.5000	50.00	10.09	1.40	69	5.00	5.00	10.75	20.00	30.00
62	1997	FALL	59	13.00	5.0000	45.00	8.90	1.16	68	5.00	8.50	10.00	14.50	40.00
62	1997	SPRING	52	9.66	5.0000	30.00	6.33	0.88	66	5.00	5.00	8.25	10.75	29.00
62	1997	SUMMER	50	13.44	4.5000	40.00	8.22	1.16	61	5.00	7.00	10.00	20.00	30.00
62	1997	WINTER	52	9.48	2.5000	35.00	7.51	1.04	79	4.00	5.00	6.00	10.00	30.00
62	1998	FALL	5	8.60	5.0000	12.00	2.88	1.29	33	5.00	7.00	8.00	11.00	12.00

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
62	1998	SPRING	5	9.70	5.0000	15.00	3.87	1.73	40	5.00	8.00	8.50	12.00	15.00
62	1998	SUMMER	5	9.90	5.0000	13.00	3.54	1.58	36	5.00	7.50	11.00	13.00	13.00
62	1998	WINTER	51	11.46	4.0000	30.00	7.41	1.04	65	5.00	5.00	10.00	13.00	30.00
82	1990	FALL	3	33.33	20.000	50.00	15.28	8.82	46	20.00	20.00	30.00	50.00	50.00
82	1990	SPRING	4	25.00	20.000	30.00	5.77	2.89	23	20.00	20.00	25.00	30.00	30.00
82	1990	SUMMER	4	82.50	20.000	180.00	77.62	38.81	94	20.00	20.00	65.00	145.00	180.00
82	1990	WINTER	4	27.50	10.000	40.00	12.58	6.29	46	10.00	20.00	30.00	35.00	40.00
82	1991	FALL	2	30.00	30.000	30.00	0.00	0.00	0	30.00	30.00	30.00	30.00	30.00
82	1991	SPRING	4	28.44	3.7500	60.00	23.66	11.83	83	3.75	11.88	25.00	45.00	60.00
82	1991	SUMMER	4	20.88	11.000	30.00	10.55	5.28	51	11.00	11.75	21.25	30.00	30.00
82	1991	WINTER	4	21.25	15.000	30.00	6.29	3.15	30	15.00	17.50	20.00	25.00	30.00
82	1992	FALL	2	35.00	30.000	40.00	7.07	5.00	20	30.00	30.00	35.00	40.00	40.00
82	1992	SPRING	4	8.44	3.7500	20.00	7.73	3.87	92	3.75	4.38	5.00	12.50	20.00
82	1992	SUMMER	4	18.75	10.000	25.00	6.29	3.15	34	10.00	15.00	20.00	22.50	25.00
82	1992	WINTER	4	17.50	5.0000	35.00	15.00	7.50	86	5.00	5.00	15.00	30.00	35.00
82	1993	FALL	2	20.00	20.000	20.00	0.00	0.00	0	20.00	20.00	20.00	20.00	20.00
82	1993	SPRING	4	35.00	10.000	60.00	23.80	11.90	68	10.00	15.00	35.00	55.00	60.00
82	1993	SUMMER	5	34.50	7.5000	90.00	32.52	14.54	94	7.50	20.00	20.00	35.00	90.00
82	1993	WINTER	4	32.50	5.0000	90.00	40.10	20.05	123	5.00	5.00	17.50	60.00	90.00
82	1994	SPRING	3	11.67	5.0000	20.00	7.64	4.41	65	5.00	5.00	10.00	20.00	20.00
82	1994	SUMMER	3	21.67	5.0000	40.00	17.56	10.14	81	5.00	5.00	20.00	40.00	40.00
82	1994	WINTER	3	30.00	20.000	50.00	17.32	10.00	58	20.00	20.00	20.00	50.00	50.00
82	1995	SPRING	1	3.75	3.7500	3.75	.	.	.	3.75	3.75	3.75	3.75	3.75
82	1995	SUMMER	1	17.50	17.500	17.50	.	.	.	17.50	17.50	17.50	17.50	17.50

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	1990	FALL	1	1.50	1.5000	1.50	.	.	.	1.50	1.50	1.50	1.50	1.50
49	1990	SPRING	1	5.20	5.2000	5.20	.	.	.	5.20	5.20	5.20	5.20	5.20
49	1990	SUMMER	1	10.00	10.000	10.00	.	.	.	10.00	10.00	10.00	10.00	10.00
49	1990	WINTER	1	2.50	2.5000	2.50	.	.	.	2.50	2.50	2.50	2.50	2.50
49	1991	FALL	1	5.60	5.6000	5.60	.	.	.	5.60	5.60	5.60	5.60	5.60
49	1991	SPRING	1	3.00	3.0000	3.00	.	.	.	3.00	3.00	3.00	3.00	3.00
49	1991	SUMMER	1	2.50	2.5000	2.50	.	.	.	2.50	2.50	2.50	2.50	2.50
49	1991	WINTER	1	3.80	3.8000	3.80	.	.	.	3.80	3.80	3.80	3.80	3.80
49	1992	FALL	1	9.70	9.7000	9.70	.	.	.	9.70	9.70	9.70	9.70	9.70
49	1992	SPRING	1	3.60	3.6000	3.60	.	.	.	3.60	3.60	3.60	3.60	3.60
49	1992	SUMMER	1	9.40	9.4000	9.40	.	.	.	9.40	9.40	9.40	9.40	9.40
49	1992	WINTER	1	2.10	2.1000	2.10	.	.	.	2.10	2.10	2.10	2.10	2.10
49	1993	SUMMER	1	5.90	5.9000	5.90	.	.	.	5.90	5.90	5.90	5.90	5.90
49	1993	WINTER	1	4.40	4.4000	4.40	.	.	.	4.40	4.40	4.40	4.40	4.40
49	1994	FALL	5	3.08	2.0000	3.90	0.90	0.40	29	2.00	2.20	3.60	3.70	3.90
49	1994	WINTER	5	2.38	1.3000	3.10	0.77	0.34	32	1.30	2.00	2.40	3.10	3.10
49	1995	FALL	5	3.24	1.5000	6.50	1.99	0.89	62	1.50	1.80	2.90	3.50	6.50
49	1995	SPRING	5	2.74	1.1000	3.90	1.20	0.54	44	1.10	2.10	2.70	3.90	3.90
49	1995	SUMMER	5	3.30	1.0000	5.70	1.68	0.75	51	1.00	2.90	3.40	3.50	5.70
49	1995	WINTER	5	2.22	1.0000	3.50	1.01	0.45	46	1.00	1.70	1.90	3.00	3.50
49	1997	FALL	5	7.46	2.5000	12.00	3.52	1.57	47	2.50	6.10	7.70	9.00	12.00
49	1997	WINTER	5	4.92	2.6000	6.50	1.67	0.75	34	2.60	3.80	5.50	6.20	6.50
50	1990	FALL	41	10.93	.70000	80.00	18.73	2.92	171	1.05	1.65	3.00	6.00	53.00
50	1990	SPRING	36	3.58	.60000	32.00	5.46	0.91	152	0.70	1.43	1.95	3.40	11.00
50	1990	SUMMER	59	3.60	.50000	53.00	6.87	0.89	191	0.90	1.30	2.00	4.10	8.30
50	1990	WINTER	35	2.89	.60000	23.00	3.82	0.65	132	0.80	1.25	1.95	3.00	8.50
50	1991	FALL	61	4.83	.40000	33.50	6.85	0.88	142	0.90	1.50	2.00	4.40	18.50
50	1991	SPRING	41	7.71	.50000	61.00	11.91	1.86	154	0.90	1.80	3.00	8.00	31.00
50	1991	SUMMER	42	5.50	.50000	49.50	8.82	1.36	160	1.00	1.50	2.55	4.80	20.50
50	1991	WINTER	21	7.47	1.0000	96.00	20.37	4.44	273	1.40	1.90	2.50	4.10	9.00
50	1992	FALL	21	4.02	.60000	28.00	6.25	1.36	156	0.85	1.40	1.90	4.00	14.25
50	1992	SPRING	19	5.26	1.0000	37.00	8.20	1.88	156	1.00	1.50	2.25	6.00	37.00

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	1992	SUMMER	26	3.35	.50000	14.00	3.45	0.68	103	0.60	1.00	2.20	4.00	10.90
50	1992	WINTER	22	5.58	.70000	42.00	9.25	1.97	166	0.80	1.40	1.90	4.80	19.00
50	1993	FALL	23	2.20	.30000	16.00	3.27	0.68	149	0.40	0.70	1.40	1.90	4.95
50	1993	SPRING	23	8.17	.60000	110.00	22.58	4.71	276	0.65	1.70	2.10	3.50	19.00
50	1993	SUMMER	30	6.61	.40000	110.00	19.84	3.62	300	0.50	1.00	1.68	4.60	14.00
50	1993	WINTER	14	4.12	.70000	15.00	4.64	1.24	113	0.70	1.50	1.95	5.00	15.00
50	1994	FALL	17	6.37	1.0000	30.00	8.10	1.97	127	1.00	2.40	3.20	4.90	30.00
50	1994	SPRING	13	5.38	.70000	31.00	8.06	2.24	150	0.70	1.65	3.05	5.90	31.00
50	1994	SUMMER	14	5.37	.80000	23.85	7.79	2.08	145	0.80	1.10	2.10	5.00	23.85
50	1994	WINTER	18	2.41	.90000	6.50	1.60	0.38	66	0.90	1.20	1.75	3.20	6.50
50	1995	FALL	21	2.84	.80000	8.90	1.92	0.42	68	1.10	1.70	2.00	3.00	6.50
50	1995	SPRING	18	6.38	.90000	28.00	7.83	1.84	123	0.90	1.70	2.98	7.70	28.00
50	1995	SUMMER	18	3.75	.90000	20.50	5.18	1.22	138	0.90	1.30	2.05	2.50	20.50
50	1995	WINTER	21	3.39	.50000	10.95	2.63	0.57	78	1.00	1.70	2.40	4.70	7.95
50	1996	FALL	14	7.25	.60000	28.00	9.88	2.64	136	0.60	0.90	2.13	13.00	28.00
50	1996	SPRING	15	3.52	.70000	20.00	5.09	1.31	145	0.70	1.10	1.60	2.35	20.00
50	1996	SUMMER	14	4.73	.90000	23.75	6.74	1.80	143	0.90	1.40	2.30	4.00	23.75
50	1996	WINTER	15	2.35	.55000	4.30	1.41	0.36	60	0.55	1.00	2.25	4.00	4.30
50	1997	FALL	15	2.70	.80000	6.60	1.47	0.38	55	0.80	1.80	2.70	2.80	6.60
50	1997	SPRING	1	1.20	1.2000	1.20	.	.	.	1.20	1.20	1.20	1.20	1.20
50	1997	SUMMER	4	5.80	2.2000	10.00	3.89	1.94	67	2.20	2.50	5.50	9.10	10.00
50	1997	WINTER	15	4.44	1.5000	22.00	5.27	1.36	119	1.50	1.70	2.60	4.40	22.00
50	1998	SPRING	5	4.90	1.7000	8.00	2.89	1.29	59	1.70	2.00	5.80	7.00	8.00
50	1998	WINTER	7	2.39	.90000	3.20	0.91	0.34	38	0.90	1.50	2.65	3.20	3.20
58	1990	FALL	18	1.52	.25000	10.00	2.26	0.53	149	0.25	0.25	1.10	1.50	10.00
58	1990	SPRING	13	1.33	.25000	3.00	1.03	0.29	77	0.25	0.25	1.10	2.15	3.00
58	1990	SUMMER	17	2.29	.25000	9.70	2.80	0.68	122	0.25	0.25	1.20	2.70	9.70
58	1990	WINTER	20	1.38	.25000	4.70	1.25	0.28	91	0.25	0.38	1.05	1.65	4.13
58	1991	FALL	12	1.33	.25000	2.90	0.99	0.29	75	0.25	0.48	1.15	2.08	2.90
58	1991	SPRING	13	1.60	.25000	4.00	0.91	0.25	57	0.25	1.50	1.50	1.80	4.00
58	1991	SUMMER	27	1.30	.25000	3.90	1.18	0.23	91	0.25	0.25	1.00	2.40	3.50
58	1991	WINTER	25	0.96	.25000	3.50	0.83	0.17	86	0.25	0.25	0.80	1.30	2.50

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1992	FALL	5	1.23	.25000	3.95	1.55	0.69	126	0.25	0.30	0.75	0.90	3.95
58	1992	SPRING	14	0.83	.25000	2.75	0.78	0.21	94	0.25	0.25	0.48	1.10	2.75
58	1992	SUMMER	14	1.25	.25000	9.10	2.42	0.65	193	0.25	0.25	0.25	0.60	9.10
58	1992	WINTER	14	3.21	.25000	20.30	5.64	1.51	176	0.25	0.25	0.99	1.80	20.30
58	1993	FALL	12	0.57	.25000	2.75	0.74	0.21	130	0.25	0.25	0.25	0.48	2.75
58	1993	SPRING	9	1.83	.25000	6.00	1.81	0.60	99	0.25	0.25	2.00	2.10	6.00
58	1993	SUMMER	19	0.99	.25000	7.50	1.67	0.38	168	0.25	0.25	0.25	1.10	7.50
58	1993	WINTER	14	1.08	.25000	3.70	1.02	0.27	95	0.25	0.25	0.66	1.85	3.70
58	1994	FALL	9	1.29	.25000	7.00	2.21	0.74	171	0.25	0.25	0.25	1.00	7.00
58	1994	SPRING	10	1.61	.25000	5.80	2.16	0.68	135	0.25	0.25	0.75	1.20	5.80
58	1994	SUMMER	21	1.15	.25000	6.00	1.61	0.35	140	0.25	0.25	0.25	1.85	4.20
58	1994	WINTER	20	1.29	.25000	11.00	2.43	0.54	188	0.25	0.25	0.28	1.19	7.30
58	1995	FALL	6	1.78	.25000	6.50	2.41	0.98	135	0.25	0.25	0.95	1.80	6.50
58	1995	SPRING	13	1.37	.25000	9.50	2.84	0.79	207	0.25	0.25	0.25	0.25	9.50
58	1995	SUMMER	20	1.21	.25000	10.00	2.23	0.50	184	0.25	0.25	0.25	1.60	6.60
58	1995	WINTER	12	1.39	.25000	6.00	1.76	0.51	127	0.25	0.25	0.38	2.45	6.00
58	1996	FALL	3	8.97	7.4000	11.00	1.84	1.07	21	7.40	7.40	8.50	11.00	11.00
58	1996	SPRING	1	11.00	11.000	11.00	.	.	.	11.00	11.00	11.00	11.00	11.00
58	1996	SUMMER	4	4.50	.30000	10.00	4.08	2.04	91	0.30	1.70	3.85	7.30	10.00
58	1996	WINTER	4	3.85	.30000	9.00	3.70	1.85	96	0.30	1.40	3.05	6.30	9.00
58	1997	SPRING	1	7.00	7.0000	7.00	.	.	.	7.00	7.00	7.00	7.00	7.00
58	1997	SUMMER	1	6.50	6.5000	6.50	.	.	.	6.50	6.50	6.50	6.50	6.50
58	1997	WINTER	2	4.60	3.8000	5.40	1.13	0.80	25	3.80	3.80	4.60	5.40	5.40
62	1990	FALL	8	2.96	.30000	8.00	2.47	0.87	84	0.30	1.30	2.30	4.08	8.00
62	1990	SPRING	14	4.49	.20000	10.25	3.04	0.81	68	0.20	2.50	4.00	5.80	10.25
62	1990	SUMMER	9	4.48	.30000	10.00	3.14	1.05	70	0.30	2.00	4.65	6.80	10.00
62	1990	WINTER	7	3.11	.30000	14.00	4.86	1.84	156	0.30	0.80	1.10	2.50	14.00
62	1991	FALL	2	0.45	.30000	0.60	0.21	0.15	47	0.30	0.30	0.45	0.60	0.60
62	1991	SPRING	5	1.12	.30000	1.60	0.52	0.23	46	0.30	1.00	1.20	1.50	1.60
62	1991	SUMMER	7	2.35	.40000	5.60	2.14	0.81	91	0.40	0.70	0.90	4.10	5.60
62	1991	WINTER	3	1.73	.30000	3.90	1.91	1.10	110	0.30	0.30	1.00	3.90	3.90
62	1992	FALL	4	5.00	.60000	11.00	4.59	2.29	92	0.60	1.50	4.20	8.50	11.00

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
62	1992	SPRING	2	0.45	.40000	0.50	0.07	0.05	16	0.40	0.40	0.45	0.50	0.50
62	1992	SUMMER	5	3.50	2.0000	6.30	1.77	0.79	51	2.00	2.50	2.50	4.20	6.30
62	1992	WINTER	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
62	1993	SPRING	3	1.10	.80000	1.50	0.36	0.21	33	0.80	0.80	1.00	1.50	1.50
62	1993	SUMMER	1	2.00	2.0000	2.00	.	.	.	2.00	2.00	2.00	2.00	2.00
62	1993	WINTER	1	0.35	.35000	0.35	.	.	.	0.35	0.35	0.35	0.35	0.35
62	1994	FALL	23	10.43	6.0000	19.00	4.09	0.85	39	6.00	7.00	8.50	14.00	18.50
62	1994	SPRING	2	1.65	.30000	3.00	1.91	1.35	116	0.30	0.30	1.65	3.00	3.00
62	1994	SUMMER	20	11.57	.30000	24.00	5.30	1.19	46	3.15	7.50	11.50	15.00	21.00
62	1994	WINTER	26	10.44	.35000	19.00	4.22	0.83	40	5.00	8.00	10.00	13.00	19.00
62	1995	FALL	23	7.15	1.0000	10.00	2.10	0.44	29	4.50	6.00	7.00	8.50	10.00
62	1995	SPRING	25	8.30	6.0000	15.00	2.09	0.42	25	6.00	7.00	7.50	9.00	11.50
62	1995	SUMMER	28	8.03	.30000	15.00	3.03	0.57	38	2.00	6.75	8.00	9.00	13.50
62	1995	WINTER	27	7.84	.30000	13.50	2.73	0.52	35	2.00	7.00	8.00	9.00	12.50
62	1996	FALL	25	10.36	5.0000	23.50	4.92	0.98	48	5.50	7.50	9.00	11.00	20.50
62	1996	SPRING	25	10.12	.50000	18.50	3.27	0.65	32	7.00	8.50	10.00	11.00	15.00
62	1996	SUMMER	26	9.42	5.0000	21.00	3.60	0.71	38	5.50	7.00	8.25	11.00	15.00
62	1996	WINTER	1	8.00	8.0000	8.00	.	.	.	8.00	8.00	8.00	8.00	8.00
62	1997	FALL	1	6.80	6.8000	6.80	.	.	.	6.80	6.80	6.80	6.80	6.80
62	1997	SPRING	23	7.67	1.5000	12.50	2.22	0.46	29	5.00	6.50	8.00	9.00	11.00
62	1997	SUMMER	23	5.47	2.3750	11.00	1.88	0.39	34	2.50	5.00	5.00	6.00	8.00
62	1997	WINTER	1	2.00	2.0000	2.00	.	.	.	2.00	2.00	2.00	2.00	2.00
62	1998	FALL	1	2.50	2.5000	2.50	.	.	.	2.50	2.50	2.50	2.50	2.50
62	1998	SPRING	1	2.00	2.0000	2.00	.	.	.	2.00	2.00	2.00	2.00	2.00
62	1998	SUMMER	3	2.75	.25000	4.00	2.17	1.25	79	0.25	0.25	4.00	4.00	4.00
62	1998	WINTER	1	8.50	8.5000	8.50	.	.	.	8.50	8.50	8.50	8.50	8.50
82	1990	FALL	2	7.50	5.0000	10.00	3.54	2.50	47	5.00	5.00	7.50	10.00	10.00
82	1990	SPRING	2	3.15	1.5000	4.80	2.33	1.65	74	1.50	1.50	3.15	4.80	4.80
82	1990	SUMMER	2	1.75	1.7000	1.80	0.07	0.05	4	1.70	1.70	1.75	1.80	1.80
82	1990	WINTER	2	2.43	2.2000	2.65	0.32	0.23	13	2.20	2.20	2.43	2.65	2.65
82	1991	FALL	2	1.60	1.5000	1.70	0.14	0.10	9	1.50	1.50	1.60	1.70	1.70
82	1991	SPRING	2	3.75	3.0000	4.50	1.06	0.75	28	3.00	3.00	3.75	4.50	4.50

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
82	1991	SUMMER	1	1.40	1.4000	1.40	.	.	.	1.40	1.40	1.40	1.40	1.40
82	1991	WINTER	2	1.95	1.9000	2.00	0.07	0.05	4	1.90	1.90	1.95	2.00	2.00
82	1992	FALL	1	1.20	1.2000	1.20	.	.	.	1.20	1.20	1.20	1.20	1.20
82	1992	SPRING	2	2.05	1.6000	2.50	0.64	0.45	31	1.60	1.60	2.05	2.50	2.50
82	1992	SUMMER	2	1.48	1.4500	1.50	0.04	0.02	2	1.45	1.45	1.48	1.50	1.50
82	1992	WINTER	2	1.10	.85000	1.35	0.35	0.25	32	0.85	0.85	1.10	1.35	1.35
82	1993	FALL	1	1.00	1.0000	1.00	.	.	.	1.00	1.00	1.00	1.00	1.00
82	1993	SPRING	2	2.70	1.7000	3.70	1.41	1.00	52	1.70	1.70	2.70	3.70	3.70
82	1993	SUMMER	2	1.10	.50000	1.70	0.85	0.60	77	0.50	0.50	1.10	1.70	1.70
82	1993	WINTER	2	1.30	.90000	1.70	0.57	0.40	44	0.90	0.90	1.30	1.70	1.70
82	1994	SPRING	1	1.00	1.0000	1.00	.	.	.	1.00	1.00	1.00	1.00	1.00
82	1994	SUMMER	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30
82	1994	WINTER	1	1.70	1.7000	1.70	.	.	.	1.70	1.70	1.70	1.70	1.70
82	1995	SPRING	1	1.10	1.1000	1.10	.	.	.	1.10	1.10	1.10	1.10	1.10
82	1995	SUMMER	1	1.30	1.3000	1.30	.	.	.	1.30	1.30	1.30	1.30	1.30

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
49	1993	FALL	1	8.10	8.1000	8.10	.	.	.	8.10	8.10	8.10	8.10	8.10
49	1993	SPRING	1	7.80	7.8000	7.80	.	.	.	7.80	7.80	7.80	7.80	7.80
49	1993	SUMMER	1	7.90	7.9000	7.90	.	.	.	7.90	7.90	7.90	7.90	7.90
49	1993	WINTER	1	7.40	7.4000	7.40	.	.	.	7.40	7.40	7.40	7.40	7.40
49	1994	FALL	1	7.85	7.8500	7.85	.	.	.	7.85	7.85	7.85	7.85	7.85
49	1994	SPRING	1	7.80	7.8000	7.80	.	.	.	7.80	7.80	7.80	7.80	7.80
49	1994	SUMMER	1	8.00	8.0000	8.00	.	.	.	8.00	8.00	8.00	8.00	8.00
49	1994	WINTER	1	7.30	7.3000	7.30	.	.	.	7.30	7.30	7.30	7.30	7.30
49	1995	SPRING	1	8.10	8.1000	8.10	.	.	.	8.10	8.10	8.10	8.10	8.10
49	1995	SUMMER	1	8.10	8.1000	8.10	.	.	.	8.10	8.10	8.10	8.10	8.10
49	1995	WINTER	1	7.45	7.4500	7.45	.	.	.	7.45	7.45	7.45	7.45	7.45
50	1990	FALL	7	7.86	7.4000	8.30	0.34	0.13	4	7.40	7.55	7.95	8.15	8.30
50	1990	SPRING	7	7.85	7.3000	8.45	0.46	0.17	6	7.30	7.50	7.70	8.35	8.45
50	1990	SUMMER	7	8.00	7.5000	8.50	0.37	0.14	5	7.50	7.70	7.90	8.40	8.50
50	1990	WINTER	7	7.77	7.5000	8.20	0.27	0.10	4	7.50	7.55	7.60	8.00	8.20
50	1991	FALL	7	7.96	7.5000	8.60	0.38	0.14	5	7.50	7.70	7.90	8.35	8.60
50	1991	SPRING	7	7.78	7.2500	8.35	0.39	0.15	5	7.25	7.45	7.80	8.15	8.35
50	1991	SUMMER	7	7.96	7.5000	8.60	0.39	0.15	5	7.50	7.70	7.80	8.30	8.60
50	1991	WINTER	7	7.77	7.3000	8.15	0.32	0.12	4	7.30	7.60	7.65	8.15	8.15
50	1992	FALL	7	7.94	7.4000	8.40	0.35	0.13	4	7.40	7.70	7.90	8.30	8.40
50	1992	SPRING	7	7.72	7.0000	8.25	0.51	0.19	7	7.00	7.40	7.55	8.25	8.25
50	1992	SUMMER	7	8.01	7.3000	8.50	0.45	0.17	6	7.30	7.70	8.00	8.40	8.50
50	1992	WINTER	7	7.82	7.2000	8.40	0.43	0.16	5	7.20	7.45	7.80	8.20	8.40
50	1993	FALL	10	7.94	7.4000	8.50	0.31	0.10	4	7.40	7.80	7.85	8.15	8.50
50	1993	SPRING	10	7.75	6.8500	8.40	0.48	0.15	6	6.85	7.60	7.68	8.15	8.40
50	1993	SUMMER	10	7.87	7.4000	8.40	0.29	0.09	4	7.40	7.70	7.80	8.00	8.40
50	1993	WINTER	10	7.69	6.7000	8.35	0.48	0.15	6	6.70	7.40	7.65	8.05	8.35
50	1994	FALL	10	7.91	7.5000	8.40	0.32	0.10	4	7.50	7.60	7.95	8.15	8.40
50	1994	SPRING	10	7.68	6.5000	8.35	0.52	0.17	7	6.50	7.55	7.68	8.05	8.35
50	1994	SUMMER	10	7.95	7.4000	8.40	0.34	0.11	4	7.40	7.80	7.95	8.30	8.40
50	1994	WINTER	10	7.68	6.9000	8.15	0.35	0.11	5	6.90	7.55	7.70	7.80	8.15
50	1995	FALL	8	7.93	7.5000	8.30	0.31	0.11	4	7.50	7.65	7.95	8.20	8.30

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
50	1995	SPRING	6	7.31	6.4000	7.90	0.49	0.20	7	6.40	7.30	7.38	7.50	7.90
50	1995	SUMMER	6	7.98	7.6000	8.40	0.34	0.14	4	7.60	7.60	7.98	8.30	8.40
50	1995	WINTER	10	7.66	6.8000	8.60	0.50	0.16	6	6.80	7.40	7.58	8.00	8.60
50	1996	FALL	4	8.20	7.7000	8.60	0.42	0.21	5	7.70	7.85	8.25	8.55	8.60
50	1996	SPRING	5	7.84	7.2500	8.25	0.42	0.19	5	7.25	7.55	8.00	8.15	8.25
50	1996	SUMMER	4	8.38	7.9000	8.90	0.46	0.23	5	7.90	8.00	8.35	8.75	8.90
50	1996	WINTER	5	7.73	7.4000	8.15	0.31	0.14	4	7.40	7.50	7.65	7.95	8.15
50	1997	FALL	6	8.07	7.6000	8.40	0.28	0.11	3	7.60	8.00	8.05	8.30	8.40
50	1997	WINTER	6	8.03	7.7000	8.30	0.25	0.10	3	7.70	7.80	8.05	8.30	8.30
50	1998	FALL	7	8.05	7.4100	8.53	0.43	0.16	5	7.41	7.73	8.02	8.51	8.53
50	1998	SPRING	6	8.07	7.6700	8.47	0.33	0.13	4	7.67	7.69	8.17	8.27	8.47
50	1998	SUMMER	6	8.16	7.5900	8.85	0.41	0.17	5	7.59	7.97	8.14	8.25	8.85
50	1998	WINTER	7	7.74	7.3000	8.15	0.32	0.12	4	7.30	7.45	7.75	8.10	8.15
58	1990	FALL	122	6.37	4.1000	8.72	0.99	0.09	16	4.63	5.70	6.48	7.08	7.71
58	1990	SPRING	119	6.27	4.5800	8.08	0.92	0.08	15	4.80	5.50	6.31	6.92	7.82
58	1990	SUMMER	155	6.81	4.9000	9.70	0.74	0.06	11	5.38	6.49	6.80	7.18	8.04
58	1990	WINTER	79	6.45	4.4000	8.13	0.90	0.10	14	5.00	5.85	6.38	7.14	7.98
58	1991	FALL	109	6.34	4.3000	8.16	0.98	0.09	15	4.71	5.60	6.43	7.11	7.92
58	1991	SPRING	118	6.49	4.6000	8.05	0.82	0.08	13	5.00	5.89	6.58	7.14	7.64
58	1991	SUMMER	150	6.84	4.5800	8.25	0.70	0.06	10	5.44	6.49	6.88	7.27	8.04
58	1991	WINTER	102	6.41	4.5000	8.12	0.90	0.09	14	5.01	5.80	6.47	7.08	7.68
58	1992	FALL	113	6.70	4.6000	8.50	0.79	0.07	12	5.20	6.35	6.79	7.21	8.02
58	1992	SPRING	97	6.36	4.6500	8.19	0.85	0.09	13	4.95	5.71	6.44	7.00	7.80
58	1992	SUMMER	151	6.97	4.5000	8.29	0.79	0.06	11	5.31	6.55	7.13	7.55	7.93
58	1992	WINTER	103	6.25	4.5000	8.30	0.90	0.09	14	4.89	5.50	6.36	6.88	7.70
58	1993	FALL	9	7.86	7.1500	8.70	0.50	0.17	6	7.15	7.50	7.85	8.30	8.70
58	1993	SPRING	109	6.24	4.3500	8.20	0.88	0.08	14	4.90	5.46	6.25	6.96	7.55
58	1993	SUMMER	142	6.98	4.9000	8.72	0.72	0.06	10	5.63	6.55	7.03	7.49	8.10
58	1993	WINTER	8	7.41	6.7500	8.05	0.55	0.19	7	6.75	6.93	7.40	7.90	8.05
58	1994	FALL	8	7.00	5.8000	8.30	0.81	0.29	12	5.80	6.40	7.08	7.48	8.30
58	1994	SPRING	8	7.18	6.4000	8.30	0.69	0.24	10	6.40	6.68	6.98	7.70	8.30
58	1994	SUMMER	18	7.00	6.2000	8.20	0.53	0.13	8	6.20	6.60	6.98	7.10	8.20

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
58	1994	WINTER	8	7.09	6.3500	8.15	0.64	0.22	9	6.35	6.78	6.88	7.45	8.15
58	1995	FALL	6	7.25	6.5000	8.70	0.78	0.32	11	6.50	6.80	7.05	7.40	8.70
58	1995	SPRING	6	6.91	6.1000	8.55	0.87	0.36	13	6.10	6.30	6.73	7.05	8.55
58	1995	SUMMER	16	7.01	6.6000	8.60	0.48	0.12	7	6.60	6.70	6.90	7.10	8.60
58	1995	WINTER	8	6.83	5.8000	8.00	0.77	0.27	11	5.80	6.25	6.80	7.38	8.00
58	1996	FALL	1	8.30	8.3000	8.30	.	.	.	8.30	8.30	8.30	8.30	8.30
58	1996	SUMMER	12	6.81	6.3000	8.20	0.49	0.14	7	6.30	6.58	6.65	6.90	8.20
58	1996	WINTER	1	8.00	8.0000	8.00	.	.	.	8.00	8.00	8.00	8.00	8.00
58	1997	SUMMER	54	7.50	6.5000	8.00	0.37	0.05	5	6.75	7.30	7.55	7.75	8.00
58	1998	SUMMER	36	7.14	6.1000	7.40	0.29	0.05	4	6.50	7.10	7.20	7.30	7.40
62	1990	FALL	3	6.21	5.4600	7.37	1.01	0.58	16	5.46	5.46	5.82	7.37	7.37
62	1990	SPRING	5	5.93	3.4350	7.18	1.46	0.65	25	3.44	6.00	6.36	6.69	7.18
62	1990	SUMMER	4	5.70	3.1000	7.55	1.90	0.95	33	3.10	4.37	6.08	7.04	7.55
62	1990	WINTER	1	7.91	7.9100	7.91	.	.	.	7.91	7.91	7.91	7.91	7.91
62	1991	FALL	1	7.25	7.2500	7.25	.	.	.	7.25	7.25	7.25	7.25	7.25
62	1991	SPRING	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
62	1991	SUMMER	5	7.02	6.5900	7.65	0.44	0.20	6	6.59	6.65	6.95	7.25	7.65
62	1991	WINTER	1	7.15	7.1500	7.15	.	.	.	7.15	7.15	7.15	7.15	7.15
62	1992	FALL	3	6.01	3.6000	7.52	2.11	1.22	35	3.60	3.60	6.90	7.52	7.52
62	1992	SPRING	1	7.56	7.5600	7.56	.	.	.	7.56	7.56	7.56	7.56	7.56
62	1992	SUMMER	6	6.47	4.2350	7.63	1.25	0.51	19	4.24	6.00	6.75	7.48	7.63
62	1992	WINTER	1	7.30	7.3000	7.30	.	.	.	7.30	7.30	7.30	7.30	7.30
62	1993	FALL	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
62	1993	SPRING	6	7.54	6.7500	8.29	0.61	0.25	8	6.75	7.00	7.53	8.14	8.29
62	1993	SUMMER	19	7.47	6.3100	8.55	0.70	0.16	9	6.31	7.08	7.52	7.95	8.55
62	1993	WINTER	2	6.85	6.8000	6.90	0.07	0.05	1	6.80	6.80	6.85	6.90	6.90
62	1994	FALL	1	7.25	7.2500	7.25	.	.	.	7.25	7.25	7.25	7.25	7.25
62	1994	SPRING	25	7.49	3.0000	8.82	1.21	0.24	16	5.22	7.40	7.62	8.12	8.65
62	1994	SUMMER	35	6.76	3.7500	9.10	1.19	0.20	18	4.15	6.30	6.80	7.75	8.50
62	1994	WINTER	2	6.78	6.7000	6.85	0.11	0.08	2	6.70	6.70	6.78	6.85	6.85
62	1995	FALL	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
62	1995	SPRING	18	7.48	4.9700	8.55	1.02	0.24	14	4.97	7.26	7.62	8.23	8.55

Aggregate Nutrient Ecoregion: VIII
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1998
pH_S_U

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
62	1995	SUMMER	11	7.25	4.8700	8.38	0.92	0.28	13	4.87	6.84	7.30	7.76	8.38
62	1995	WINTER	2	7.03	6.7500	7.30	0.39	0.27	6	6.75	6.75	7.03	7.30	7.30
62	1996	FALL	2	7.14	6.5000	7.78	0.90	0.64	13	6.50	6.50	7.14	7.78	7.78
62	1996	SPRING	2	7.30	7.1000	7.50	0.28	0.20	4	7.10	7.10	7.30	7.50	7.50
62	1996	SUMMER	2	6.80	6.3000	7.30	0.71	0.50	10	6.30	6.30	6.80	7.30	7.30
62	1996	WINTER	1	6.20	6.2000	6.20	.	.	.	6.20	6.20	6.20	6.20	6.20
62	1997	FALL	11	6.50	2.8500	7.90	1.64	0.49	25	2.85	4.80	7.00	7.70	7.90
62	1997	SPRING	2	6.93	6.6000	7.25	0.46	0.32	7	6.60	6.60	6.93	7.25	7.25
62	1997	SUMMER	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
62	1997	WINTER	3	6.85	6.5000	7.05	0.30	0.18	4	6.50	6.50	7.00	7.05	7.05
62	1998	FALL	3	7.43	7.4000	7.45	0.03	0.02	0	7.40	7.40	7.45	7.45	7.45
62	1998	SPRING	2	7.20	7.1000	7.30	0.14	0.10	2	7.10	7.10	7.20	7.30	7.30
62	1998	SUMMER	28	7.08	3.3000	8.10	1.18	0.22	17	4.35	7.28	7.45	7.58	8.10
62	1998	WINTER	3	7.00	6.6000	7.70	0.61	0.35	9	6.60	6.60	6.70	7.70	7.70
82	1991	SUMMER	1	8.56	8.5600	8.56	.	.	.	8.56	8.56	8.56	8.56	8.56

APPENDIX C

Quality Control/Quality Assurance Rules

Continued Support for the Compilation and Analysis of National Nutrient Data

9 Nutrient Ecoregion/Waterbody Type Summary Chapters

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1.0 BACKGROUND

The Nutrient Criteria Program initiated the development of a national Nutrient Criteria Database application that is used to store and analyze nutrient data. The ultimate use of these data is to derive ecoregion specific nutrient criteria. EPA converted STOrage and RETrieval (STORET) legacy data, National Stream Quality Accounting Network (NASQAN) data, National Water-Quality Assessment (NAWQA) data, and other relevant nutrient data from universities and States/Tribes into the database. The data imported into the Nutrient Criteria Database are used to develop national nutrient criteria recommendations.

1.1 Purpose

The purpose of this deliverable is to provide EPA with information regarding the database used to create the statistical reports which will be used to derive ecoregion-specific nutrient criteria for Level III ecoregions. There are fourteen aggregate nutrient ecoregions. Each aggregate nutrient ecoregion is divided into smaller ecoregions (subecoregions) referred to as Level III ecoregions. EPA will determine criteria for the waterbody types and Level III ecoregions within the following aggregate nutrient ecoregions:

- Lakes and Reservoirs
  - Aggregate Nutrient ecoregions: 3, 4, 5, and 14

- Rivers and Streams
  - Aggregate Nutrient ecoregions: 1, 4, 5, 8, and 10

1.2 References

This section lists documents that contain baselines, standards, guidelines, policies, and references that apply to the data analysis. Listed editions were valid at the time of publication. All documents are subject to revision, but these specific editions govern the concepts described in this document.

Nutrient Criteria Technical Guidance Document: Lakes and Reservoirs (Draft). EPA, Office of Water, EPA 822-D-99-001, April 1999.

Nutrient Criteria Technical Guidance Manual: Rivers and Streams (Draft). EPA, Office of Water, EPA 822-D-99-003, September 1999.

Guidance for Data Quality Assessment: Practical Methods for Data Analysis. EPA, Office of Research and Development, EPA QA/G-9, January 1998.

2.0 QA/QC PROCEDURES

In order to develop nutrient criteria, EPA needed to obtain nutrient data from the states. EPA requested nutrient data from the states and forwarded the data sets to INDUS via e-mail and/or US mail. In addition, EPA tasked INDUS to convert data from three national data sets. EPA provided INDUS with a Legacy STORET extraction to convert into the database. The United States Geologic Survey (USGS) sent INDUS a CD-ROM with NASQAN data to convert. INDUS downloaded NAWQA files from the USGS Web site to convert the data. In total, INDUS converted and imported the following national and state data sets into the Nutrient Criteria Database:

- Legacy STORET
- NAWQA
- NASQAN
- EPA Region 1
- EPA Region 2 - Lake Champlain Monitoring Project
- EPA Region 2 - NYSDEC Finger Lakes Monitoring Program
- EPA Region 2 - NY Citizens Lake Assessment Program
- EPA Region 2 - Lake Classification and Inventory Survey
- EPA Region 2 - NYCDEP (1990-1998)
- EPA Region 2 - NYCDEP (Storm Event data)
- EPA Region 2 - New Jersey Nutrient Data (Tidal Waters)
- EPA Region 5
- EPA Region 3
- EPA Region 3 - Nitrite Data
- EPA Region 3 - Choptank River files
- EPA Region 4 - Tennessee Valley Authority
- EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
- EPA Region 7 - REMAP
- EPA Region 2 - Delaware River Basin Commission (1990-1998)
- EPA Region 3 - PA Lake Data
- EPA Region 3 - University of Delaware
- EPA Region 10
- University of Auburn
- EPA Region 8 - MT and WY
- EPA Region 9
- Suffolk County
- NYCDEC
- NY Lakes Morphometry
- EPA Region 8 - South Dakota
- EPA Region 8 - Colorado Reservoir
- EPA Region 4
- EPA Region 10 - Lake Data
- EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
- EPA Region 8 - North Dakota
- EPA Region 8 - Eagle River
- EPA Region 8 - Utah
- Florida

As part of the conversion process, INDUS performed a number of Quality Assurance/Quality Control (QA/QC) steps to ensure that the data were properly converted into the Nutrient Criteria Database. Sections 2.1 and 2.2 explain the steps performed by INDUS to convert the data.

2.1 National Data Sets

INDUS converted three national data sets into the Nutrient Criteria Database: Legacy STORET data, NASQAN data, and NAWQA data. A previous EPA contractor performed the extraction of Legacy STORET data and documented the QA/QC procedures used on the data. This documentation is included in Appendix A. INDUS performed minimal QA/QC on the Legacy STORET data set because the previous contractor completed the steps outlined in Appendix A. INDUS and EPA also agreed to convert the NAWQA and NASQAN data sets with minimal QA/QC on the assumption that the source agency, the USGS, QA/QC'd the data.

For each of the three national data sets, INDUS ran queries to determine if 1) samples existed without results and 2) if stations existed without samples. Per Task Order Project Officer (TOPO) direction, these records were deleted from the system. For analysis purposes, EPA determined that there was no need to keep station records with no samples and sample records with no results. INDUS also confirmed that each data set contained no duplicate records.

In addition, INDUS deleted all composite results from the Legacy STORET data. Per TOPO direction, it was decided that composite sample results would not be used in the statistical analysis.

2.2 State Data

Each state data set was delivered in a unique format. Many of the data sets were delivered to INDUS without corresponding documentation. INDUS analyzed each state data set in order to determine which parameters should be converted for analysis. INDUS obtained a master parameter table from EPA and converted the parameters in the state data sets according to those that were present in the EPA parameter table. INDUS converted all of the data elements in the state data sets that mapped directly to the Nutrient Criteria Database; data elements that did not map to the Nutrient Criteria Database were not converted. In some cases, state data elements that did not directly map into the Oracle database were inserted into a comment field within the database. Also, INDUS maintained an internal record of which state data elements were inserted into the comment field.

As part of the data clean-up efforts, INDUS determined whether or not there were any duplicate records in the state data sets and deleted the duplicate records. INDUS checked the waterbody, station, and sample entities for duplicate records. However, if there was not enough information provided to determine duplicates such as sampling date, there was no way for INDUS to locate duplicate records. In addition, INDUS deleted station records with no samples and sample records with no results. INDUS also deleted waterbody records that were not associated with a station. In each case, INDUS maintained an internal record of how many records were deleted.

If INDUS encountered referential integrity errors, such as samples that referred to stations that did not exist, or if INDUS was unsure of whether a record was a duplicate, INDUS contacted the agency directly via e-mail or phone to resolve any issues that arose. INDUS saved an electronic copy of each e-mail correspondence with the states to ensure that a record of the decision was maintained.

Finally, INDUS examined the remark codes of each result record in the state data sets. INDUS mapped the remark codes to the STORET remark codes listed in Table 2 of Appendix A. If any of the state result records were associated with remark codes marked as "Delete" in Table 2 of Appendix A, the result records were not converted into the database.

2.3 Laboratory Methods

Many of the state data sets did not contain laboratory method information. In addition, laboratory method information was not available for the three national data sets. In order to determine missing laboratory method information, EPA tasked another contractor to contact the data owners to obtain the laboratory method. In some cases, the data owners responded and the laboratory methods were added to the database. In other cases, the methods are unknown.

2.4 Waterbody Name and Class Information

A large percentage of the data did not have waterbody-specific information. The only waterbody information contained in the three national data sets was the waterbody name, which was embedded in the station 'location description' field. Most of the state data sets contained waterbody name information; however, much of the data were duplicated throughout the data sets. Therefore, the waterbody information was cleaned manually. For the three national data sets, the 'location description' field was extracted from the station table and moved to a temporary table. The 'location description' field was sorted alphabetically. Unique waterbodies were grouped together based on name similarity and whether or not the waterbodies fell within the same county, state, and waterbody type. Finally, the 'location description' field was edited to include only waterbody name information, not descriptive information. For example, 110 MILE CREEK AT POMONA DAM OUTFLOW, KS PO-2 was edited to 110 MILE CREEK. Also, if 100 MILE CREEK was listed ten times in New York, but in four different counties, four 100 MILE CREEK waterbody records were created.

Similar steps were taken to eliminate duplicate waterbody records in the state data sets. If a number of records had similar waterbody names and fell within the same state, county, and waterbody type, the records were grouped to create a unique waterbody record.

Most of the waterbody data did not contain depth, surface area, and volume measurements. EPA needed this information to classify waterbody types. EPA attempted to obtain waterbody class information from the states. EPA sent waterbody files to the regional coordinators and requested that certain class information be completed by each state. The state response was poor; therefore, EPA was not able to perform statistical analysis for the waterbody types by class.

2.5 Ecoregion Data

Aggregate nutrient ecoregions and Level III ecoregions were added to the database using the station latitude and longitude coordinates, the county centroid, or HUC (Hydrological Unit Code) centroid. If a station was lacking latitude and longitude coordinates and county information, the data were not included in the statistical analysis. Appendix B lists the steps taken to add the two ecoregion types (aggregate and Level III) to the Nutrient Criteria Database. The ecoregion names were pulled from aggregate nutrient ecoregion and Level III ecoregion Geographical Information System (GIS) coverages. In summary, the station latitude and longitude coordinates were used to determine the ecoregion under the following circumstances:

- The latitude and longitude coordinates fell within the county/state listed in the station table.
- The county data were missing.

The county centroid was used to determine the ecoregions under the following circumstances:

- The latitude and longitude coordinates were missing, but the state/county information was available.
- The latitude and longitude coordinates fell outside the county/state/HUC listed in the station table. The county information was assumed to be correct; therefore, the county centroid was used.

The HUC centroid was used to determine the ecoregions under the following circumstances:

- The latitude and longitude coordinates and county were missing, but the HUC information was available.

If the latitude and longitude coordinates fell outside the continental US county coverage file (i.e., the point fell in the ocean or Mexico/Canada), the nearest ecoregion was assigned to the station.

3.0 STATISTICAL ANALYSIS REPORTS

Aggregate nutrient ecoregion tables were created by extracting all observations for a specific aggregate nutrient ecoregion from the Nutrient Criteria Database. Then, the data were reduced to create tables containing only the yearly median values. To create these tables, the median value for each waterbody was calculated using all observations for each waterbody by Level III ecoregion, state, county, year, and season. Tables of decade median values were created from the yearly median tables by calculating the median for each waterbody by Level III ecoregion, state, county, decade and season.

The Data Source and the Remark Code reports were created using all observations (all reported values). All the other reports were created from either the yearly median tables or the decade median tables. In other words, the descriptive statistics and regressions were run using the median values for each waterbody and not the individual reported values.

Statistical analyses were performed under the assumption that this data set is a random sample. If this assumption cannot be verified, the observations may or may not be valid. Values below the 1st and 99th percentile were removed from the Legacy STORET database prior to the creation of the national database. Also, data were treated according to the Legacy STORET remark codes in Appendix A.

The following contains a list of each report and the purpose for creating each report:

- Data Source—Created to provide a count of the amount of data and to identify the source(s).
- Remark Codes—Created to provide a description of the data.
- Median of Each Waterbody by Year—This was an intermediate step performed to obtain a median value for each waterbody to be used in the yearly descriptive statistics reports and the regression models.
- Median of Each Waterbody by Decade—This was an intermediate step performed to obtain a median value for each waterbody to be used in the decade descriptive statistics.
- Descriptive Statistics—Created to provide EPA with the desired statistics for setting criteria levels.
- Regression Models—Created to examine the relationships between biological and nutrient variables.

Note: Separate reports were created for each season.

3.1 Data Source Reports

Data source reports were presented in the following formats:

- The number and percentage of data from each data source were summarized in tables for each aggregate nutrient ecoregion by season and waterbody type.

- The number and percentage of data from each data source were summarized in tables for each aggregate nutrient ecoregion for all seasons and waterbody type.

- The number and percentage of data from each data source were summarized in tables for each Level III ecoregion by season and waterbody type.

The ‘Frequency’ represents the number of data values from a specific data source for each parameter by data source. The ‘Row Pct’ represents the percentage of data from a specific data source for each parameter.

3.2 Remark Code Reports

Remark code reports were presented in the following formats:

- The number and percentage of data associated with a particular remark code for each parameter were summarized in tables by Level III ecoregion by decade and season.

- The number and percentage of data associated with a particular remark code for each parameter were summarized in tables by Level III ecoregion by year and season.

The 'Frequency' represents the number of data values corresponding to the remark code in the column. The 'Row Pct' represents the percentage of data that was associated with the remark code in that row.

In the database, remark codes that were entered by the states were mapped to Legacy STORET remark codes. Prior to the analysis, the data were treated according to these remark codes. For example, if the remark code was 'K,' then the reported value was divided by two. Appendix A contains a complete list of Legacy STORET remark codes.

Note: For the reports, a remark code of 'Z' indicates that no remark codes were recorded. It does not correspond to Legacy STORET code 'Z.'

3.3 Median of Each Waterbody

To reduce the data and to ensure heavily sampled waterbodies or years were not over represented in the analysis, median value tables (described above) were created. The yearly median tables and decade median tables were delivered to the EPA in electronic format as csv (comma separated value or comma delimited) files.

3.4 Descriptive Statistic Reports

The number of waterbodies, median, mean, minimum, maximum, 5^{th}, 25^{th} , 75^{th} , 95^{th} percentiles, standard deviation, standard error, and coefficient of variation were calculated. The tables (described above) containing the decade median values for each waterbody for each parameter were used to create descriptive statistics reports for:

- Level III ecoregions by decade and season
- Aggregate nutrient ecoregions by decade and season

In addition, the tables containing the yearly median values for each waterbody for each parameter were used to create descriptive statistics reports for:

- Level III ecoregions by year and season

3.5 Regression Models

Simple linear regressions using the least squares method were performed to examine the relationships between biological and nutrient variables in lakes and reservoirs, and rivers and streams. Regressions were performed using the yearly median tables. Chlorophyll(s) in micrograms per liter (ug/L), Secchi in meters (m), Dissolved Oxygen in milligrams per liter (mg/L), Turbidity, and pH were the biological variables in these models. Secchi data were used in the lake and reservoir models, and Turbidity data were used in the river and stream models.

The nutrient variables in these models include: Total Phosphorus in ug/L, Total Nitrogen in mg/L, Total Kjeldahl Nitrogen in mg/L, and Nitrate and Nitrite in mg/L.

4.0 TIME PERIOD

Data collected from January 1990 to December 2000 were used in the statistical analysis reports. To capture seasonal differences, the data were classified as follows:

- Aggregate nutrient ecoregions: 6, 7, and 8
  - Spring: April to May
  - Summer: June to August
  - Fall: September to October
  - Winter: November to March
- Aggregate nutrient ecoregions: 1, 2, 3, 4, 5, 9, 10, 11, 12, 13, and 14
  - Spring: March to May
  - Summer: June to August
  - Fall: September to November
  - Winter: December to February

5.0 DATA SOURCES AND PARAMETERS FOR THE AGGREGATE NUTRIENT ECOREGIONS

This section provides information for the nutrient aggregate ecoregions that were analyzed by waterbody type. Each section lists the data sources for the aggregate nutrient ecoregion including: 1) the data sources, 2) the parameters included in the analysis, and 3) the Level III ecoregions within the aggregate nutrient ecoregions.

Note: For analysis purposes, data for the following parameters were grouped together and reported under Phosphorous, Dissolved Inorganic (DIP):

Phosphorus, Dissolved Inorganic (DIP)
Phosphorus, Dissolved (DP)
Phosphorus, Dissolved Reactive (DRP)
Orthophosphate, dissolved, mg/L as P
Orthophosphate (OPO4_PO4)

5.1 Lakes and Reservoirs

5.1.1 Aggregate Nutrient Ecoregion 3

Data Sources:

Legacy STORET
EPA Region 10
EPA Region 8 - Colorado Reservoir

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

Level III ecoregions:

6, 10, 12, 13, 18, 20, 22, 24, 80, 81

5.1.2 Aggregate Nutrient Ecoregion 4

Data Sources:

Legacy STORET
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

Parameters:

Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)

Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

Level III ecoregions:

26, 28, 30, 31, 43, 44

5.1.3 Aggregate Nutrient Ecoregion 5

Data sources:

Legacy STORET
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

Parameters:

Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

Level III ecoregions:

25, 27, 32, 42

5.1.4 Aggregate Nutrient Ecoregion 14

Data sources:

Legacy STORET
Region 2 - NY Citizens Lake Assessment Program
Region 2 - NYCDEP (1990-1998)
EPA Region 1

Parameters:

CHLB (ug/L)
CHLC (ug/L)
Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric, uncorrected (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

Level III ecoregions:

59, 63, 84

5.2 Rivers and Streams

5.2.1 Aggregate Nutrient Ecoregion 1

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 10

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Periphyton, spectrophotometric, uncorrected (mg/sqm)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P(ug/L)
Turbidity (FTU)

Turbidity (NTU)
Turbidity (JCU)
pH

Level III ecoregions:

3, 7

5.2.2 Aggregate Nutrient Ecoregion 4

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
EPA Region 7 - REMAP
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Pheophytin, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Organic_P (ug/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P(ug/L)
Turbidity (FTU)
Turbidity (NTU)
Turbidity (JCU)
pH

Level III ecoregions:

26, 28, 30, 31, 43, 44

5.2.3 Aggregate Nutrient Ecoregion 5

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
EPA Region 7 - REMAP
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Pheophytin, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Organic_P (ug/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P (ug/L)
Turbidity (FTU)
Turbidity (NTU)
Turbidity (JCU)
pH

Level III ecoregions:

25, 27, 32, 42

5.2.4 Aggregate Nutrient Ecoregion 8

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 2 - NYCDEP (1990-1998)
EPA Region 1

EPA Region 3
EPA Region 5

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric, uncorrected (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P (ug/L)
Turbidity (FTU)
Turbidity (NTU)
pH

Level III ecoregions:

49, 50, 58, 62, 82

5.2.5 Aggregate Nutrient Ecoregion 10

Data sources:

Legacy STORET
NASQAN
EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
EPA Region 7 - REMAP

Parameters:
Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Pheophytin, corrected (ug/L)
Chlorophyll A, Phytoplankton, chromotographic- fluorometric (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Chlorophyll B, Phytoplankton, chromotographic- fluorometric (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)

Nitrogen, Total Kjeldhal (TKN) (mg/L)
Organic_P (ug/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P(ug/L)
Turbidity (FTU)
Turbidity (NTU)
Turbidity (JCU)
pH

Level III ecoregions:

34, 73

APPENDIX A. Process Used to QA/QC the Legacy STORET Nutrient Data Set

1. STORET water quality parameters and Station and Sample data items were retrieved from USEPA's mainframe computer. Table 1 lists all retrieved parameters and data items.

TABLE 1: PARAMETERS AND DATA ITEMS RETRIEVED FROM STORET

Parameters Retrieved (STORET Parameter Code)	Station Data Items Included (STORET Item Name)	Sample Data Items Included (STORET Item Name)
TN - mg/l (600) TKN - mg/l (625) Total Ammonia (NH3+NH4) - mg/l (610) Total NO2+NO3 - mg/l (630) Total Nitrite - mg/l (615) Total Nitrate - mg/l (620) Organic N - mg/L (605) TP - mg/l (665) Chlor *a* - ug/L (spectrophotometric method, 32211) Chlor *a* - ug/L (fluorometric method corrected, 32209) Chlor *a* - ug/L (trichromatic method corrected, 32210) Secchi Transp. - inches (77) Secchi Transp. - meters (78) +Turbidity JCUs (70) +Turbidity FTUs (76) +Turbidity NTUs field (82078) +Turbidity NTUs lab (82079) +DO - mg/L (300) +Water Temperature (degrees C, 10/degrees F, 11)	Station Type (TYPE) Agency Code (AGENCY) Station No. (STATION) Latitude - std. decimal degrees (LATSTD) Longitude - std. decimal degrees (LONGSTD) Station Location (LOCNAME) County Name (CONAME) State Name (STNAME) Ecoregion Name - Level III (ECONAME) Ecoregion Code -Level III (ECOREG) Station Elevation (ELEV) Hydrologic Unit Code (CATUNIT) RF1 Segment and Mile (RCHMIL) RF1ON/OFF tag (ONOFF)	Sample Date (DATE) Sample Time (TIME) Sample Depth (DEPTH) Composite Sample Code (SAMPMETH)
+ If data record available at a station included data only for this or other such marked parameters, data record was deleted from data set.		

The following set of retrieval rules were applied to the retrieval process:

- Data were retrieved for waterbodies specified only as **'lake', 'stream', 'reservoir', or 'estuary'** under "Station Type" parameter**.** Any stations specified as 'well,' 'spring,' or 'outfall' were eliminated from the retrieved data set.

- Data were retrieved for station types described as 'ambient' (e.g., no pipe or facility discharge data) under the "Station Type" parameter.

- Data were retrieved that were designated as 'water' samples only. This includes 'bottom' and 'vertically integrated' water samples.

- Data were retrieved that were designated as either 'grab' samples and 'composite' samples (mean result only).

- No limits were specified for sample depths.
- Data were retrieved for all fifty states, Puerto Rico, and the District of Columbia.
- The time period specified for data retrieval was January 1990 to September 1998.
- No data marked as "Retired Data" (i.e., data from a generally unknown source) were retrieved.
- Data marked as "National Urban Runoff data" (i.e., data associated with sampling conducted after storm events to assess nonpoint source pollutants) were included in the retrieval. Such data are part of STORET's 'Archived' data.
- Intensive survey data (i.e., data collected as part of specific studies) were retrieved.

2. Any values falling below the 1st percentile and any values falling above the 99th percentile were transformed into 'missing' values (i.e., values were effectively removed from the data set, but were not permanently eliminated).

3. Based on the STORET 'Remark Code' associated with each retrieved data point, the following rules were applied (Table 2):

TABLE 2: STORET REMARK CODE RULES

STORET Remark Code	Keep or Delete Data Point
blank - Data not remarked.	Keep
A - Value reported is the mean of two or more determinations.	Keep
B - Results based upon colony counts outside the acceptable ranges.	Delete
C -Calculated. Value stored was not measured directly, but was calculated from other data available.	Keep
D - Field measurement.	Keep
E - Extra sample taken in compositing process.	Delete
F - In the case of species, F indicates female sex.	Delete
G - Value reported is the maximum of two or more determinations.	Delete
H - Value based on field kit determination; results may not be accurate.	Delete
I - The value reported is less than the practical quantification limit and greater than or equal to the method detection limit.	Keep, but used one-half the reported value as the new value.
J - Estimated. Value shown is not a result of analytical measurement.	Delete

TABLE 2: STORET REMARK CODE RULES	
K - Off-scale low. Actual value not known, but known to be less than value shown.	Keep, but used one-half the reported value as the new value.
L - Off-scale high. Actual value not known, but known to be greater than value shown.	Keep
M -Presence of material verified, but not quantified. Indicates a positive detection, at a level too low to permit accurate quantification.	Keep, but used one half the reported value as the new value.
N -Presumptive evidence of presence of material.	Delete
O -Sample for, but analysis lost. Accompanying value is not meaningful for analysis.	Delete
P -Too numerous to count.	Delete
Q -Sample held beyond normal holding time.	Delete
R -Significant rain in the past 48 hours.	Delete
S -Laboratory test.	Keep
T -Value reported is less than the criteria of detection.	Keep, but replaced reported value with 0.
U -Material was analyzed for, but not detected. Value stored is the limit of detection for the process in use.	Keep, but replaced reported value with 0.
V -Indicates the analyte was detected in both the sample and associated method blank.	Delete
W -Value observed is less than the lowest value reportable under remark "T."	Keep, but replaced reported value with 0.
X -Value is quasi vertically-integrated sample.	No data point with this remark code in data set.
Y -Laboratory analysis from unpreserved sample. Data may not be accurate.	Delete
Z -Too many colonies were present to count.	Delete
If a parameter (excluding water temperature) value was less than or equal to zero and no remark code was present, the value was transformed into a missing value. Rationale - Parameter concentrations should never be zero without a proper explanation. A method detection limit should at least be listed	

4. Station records were eliminated from the data set if any of the following descriptors were present within the "Station Type" parameter:

- **MONITR -** Source monitoring site, which monitors a known problem or to detect a specific problem.
- **HAZARD -** Site of hazardous or toxic wastes or substances.
- **ANPOOL -** Anchialine pool, underground pools with subsurface connections to watertable and ocean.
- **DOWN -** Downstream (i.e., within a potentially polluted area) from a facility which has a potential to pollute.
- **IMPDMT -** Impoundment. Includes waste pits, treatment lagoons, and settling and evaporation ponds.
- **STMSWR -** Storm water sewer.
- **LNDFL** - Landfill.
- **CMBMI -** Combined municipal and industrial facilities.
- **CMBSRC -** Combined source (intake and outfall).

Rationale - these descriptors potentially indicate a station location that at which an ambient water sample would not be obtained (i.e., such sampling locations are potentially biased) or the sample location is not located within one of the designated water body types (i.e, ANPOOL).

5. Station records were eliminated from data set if the station location did not fall within any established cataloging unit boundaries based on their latitude and longitude.

6. Using nutrient ecoregion GIS coverage provided by USEPA, all station locations with latitude and longitude coordinates were tagged with a nutrient ecoregion identifier (nutrient region identifiers are values 1 - 14) and the associated nutrient ecoregion name. Because no nutrient ecoregions exist for Alaska, Hawaii, and Puerto Rico, stations located in these states were tagged with "dummy" nutrient ecoregion numbers (20 = Alaska, 21 = Hawaii, 22 = Puerto Rico).

7. Using information provided by TVA, 59 station locations that were marked as 'stream' locations under the "Station Type" parameter were changed to 'reservoir' locations.

8. The nutrient data retrieved from STORET were assessed for the presence of duplicate data records. The duplicate data identification process consisted of three steps: 1) identification of records that matched exactly in terms of each variable retrieved; 2) identification of records that matched exactly in terms of each variable retrieved except for their station identification numbers; and 3) identification of records that matched exactly in terms of each variable retrieved except for their collecting agency codes. The data duplication assessment procedures were conducted using SAS programs.

Prior to initiating the data duplication assessment process, the STORET nutrient data set contained:

41,210 station records
924,420 sample records

- Identification of exactly matching records
  All data records were sorted to identify those records that matched exactly. For two records to match exactly, all variables retrieved had to be the same. For example, they had to have the same water quality parameters, parameter results and associated remark codes, and have the same station data item and sample data item information. Exactly matching records were considered to be exact duplicates, and one duplicate record of each identified matching set were eliminated from the nutrient data set. A total of 924 sample records identified as duplicates by this process were eliminated from the data set.

- Identification of matching records with the exception of station identification number
  All data records were sorted to identify those records that matched exactly except for their station identification number (i.e., they had the same water quality parameters, parameter results and associated remark codes, and the same station and sample data item information with the exception of station identification number). Although the station identification numbers were different, the latitude and longitude for the stations were the same indicating a duplication of station data due to the existence of two station identification numbers for the same station. For each set of matching records, one of the station identification numbers was randomly selected and its associated data were eliminated from the data set. A total of 686 sample records were eliminated from the data set through this process.

- Identification of matching records with the exception of collecting agency codes
  All data records were sorted to identify those records that matched exactly except for their collecting agency codes (i.e., they had the same water quality parameters, parameter results and associated remark codes, and the same station and sample data item information with the exception of agency code). The presence of two matching data records each with a different agency code attached to it suggested that one agency had utilized data collected by the other agency and had entered the data into STORET without realizing that it already had been placed in STORET by the other agency. No matching records with greater than two different agency codes were identified. For determining which record to delete from the data set, the following rules were developed:

  - If one of the matching records had a USGS agency code, the USGS record was retained and the other record was deleted.
  - Higher level agency monitoring program data were retained. For example, federal program data (indicated by a “1" at the beginning of the STORET agency code) were retained against state (indicated by a “2") and local (indicated by values higher than 2) program data.
  - If two matching records had the same level agency code, the record from the agency with the greater number of overall observations (potentially indicating the data set as the source data set) was retained.

  A total of 2,915 sample records were eliminated through this process.

As a result of the duplicate data identification process, a total of 4,525 sample records and 36 individual station records were removed from the STORET nutrient data set. The resulting nutrient data set contains the following:

41,174 station records
919,895 sample records

APPENDIX B. Process for Adding Aggregate Nutrient Ecoregions and Level III Ecoregions

The flag_id tracks the type of changes that were made to the data. There are a total of eight flags that are used to describe the changes made to the data. The flags are defined as follows:

1—The latitude and longitude coordinates match the county that was provided. If the HUC was null, it was updated based on the latitude and longitude coordinates. The ecoregions were determined by using the latitude and longitude coordinates.

2—The county and HUC are available, but the latitude and/or longitude coordinates are missing. Therefore, the centroid of the intersection of the county and HUC was used to determine the ecoregions and the latitude and longitude coordinates. If the HUC and county did not intersect, the county centroid was used to determine the ecoregions and the latitude and longitude coordinates.

3—The county is available, but the HUC and the latitude and/or longitude coordinates are missing. Therefore, the county centroid was used to determine the ecoregions, HUC, and the latitude and longitude coordinates.

4—The HUC is available, but the county is not and the latitude and/or longitude coordinates are missing. Therefore, the HUC centroid was used to determine the ecoregions, county, and the latitude and longitude coordinates.

5—The county is missing, but the latitude and longitude coordinates are available. Note: A county is considered missing if it is invalid. In other words, if the county entered did not exist in the state, it was considered null. Therefore, the latitude and longitude coordinates were used to determine the ecoregions, county, and HUC (if it was missing).

6—The latitude and longitude coordinates did not match the county that was provided, but they did match the HUC. Therefore, the county centroid was used to determine ecoregion values.

7—The latitude and longitude coordinates did not match the county or the HUC that was provided (including null HUCs). Therefore, the county centroid was used to determine ecoregion values.

8—The latitude and longitude coordinates were missing, but the ecoregions were provided by the state.
The ecoregions provided by the states were used as the ecoregion values.

APPENDIX C. Glossary

Coefficient of Variation - A measure of variability. The standard deviation divided by the mean multiplied by 100.

Maximum - The highest value.

Mean – A measure of central tendency. The arithmetic average.

Median – A measure of central tendency. The value which cuts the distribution in half, such that half of the values are above the median, and half of the values are below the median. Also called the 50th percentile or middle value.

Minimum - The lowest value.

Standard Deviation – A measure of variability. The square root of the variance with the variance defined as the sum of the squared deviations divided by the sample size minus one.

Standard Error - A measure of variability. The standard deviation divided by the square root of the sample size.

5^{th} % - the 5^{th} percentile

25^{th} % - the 25^{th} percentile, the first quartile.

75^{th} % - the 75^{th} percentile, the third quartile.

95^{th} % - the 95^{th} percentile