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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 IV

EPA 822-B-01-013

AMBIENT WATER QUALITY CRITERIA RECOMMENDATIONS

INFORMATION SUPPORTING THE DEVELOPMENT OF STATE AND TRIBAL NUTRIENT CRITERIA

FOR

RIVERS AND STREAMS IN NUTRIENT ECOREGION IV

Great Plains Grass and Shrublands

including all or parts of:

North Dakota, South Dakota, Montana, Wyoming, Nebraska, Colorado, Kansas, Oklahoma, New Mexico, and Texas,

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

DECEMBER 2001

FOREWORD

This document presents EPA's nutrient criteria for **Rivers and Streams in Nutrient Ecoregion IV**. 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 IV, 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 IV.** Data sets from Legacy STORET, NASQAN, NAWQA, and EPA Region 7 - Central Plains Center for BioAssessment (CPCB), EPA Region 7 - CPCB 2, EPA Region 7 - REMAP, EPA Region 8 - Montana and Wyoming, EPA Region 8 - South Dakota, and EPA Region 8 - North Dakota.were used to assess nutrient conditions from 1990 to 2000.

- **Reference sites/reference conditions in Nutrient Ecoregion IV.** 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 were 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: North Dakota, South Dakota, Montana, Wyoming, Colorado, Kansas, Oklahoma, and Texas. Nebraska indicated that standard or EPA-approved methods were used for some specific nutrient parameters.

The following tables contain a summary of aggregate and level III Ecoregion values for TN, TP, water column chlorophyll *a*, and turbidity.

BASED ON 25th PERCENTILES ONLY

Nutrient Parameters	Aggregate Nutrient Ecoregion IV Reference Conditions
Total phosphorus (μg/L)	23
Total nitrogen (mg/L) (reported)	0.56
Chlorophyll *a* (μg/L) (fluorometric method)	2.4
Turbidity (FTU)	4.21

For subecoregions 26, 28, 30, 31, 43, and 44, the ranges of nutrient parameter reference conditions are as follows:

BASED ON 25th PERCENTILE ONLY

Nutrient Parameters	Range of Level III Subecoregions Reference Conditions
Total phosphorus (μg/L)	8-157*
Total nitrogen (mg/L) (reported)	0.36-0.65
Chlorophyll *a* (μg/L) (fluorometric method)	2-4.4
Turbidity (FTU)	0.73-14.75

* 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-01-013.

ACKNOWLEDGMENTS

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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

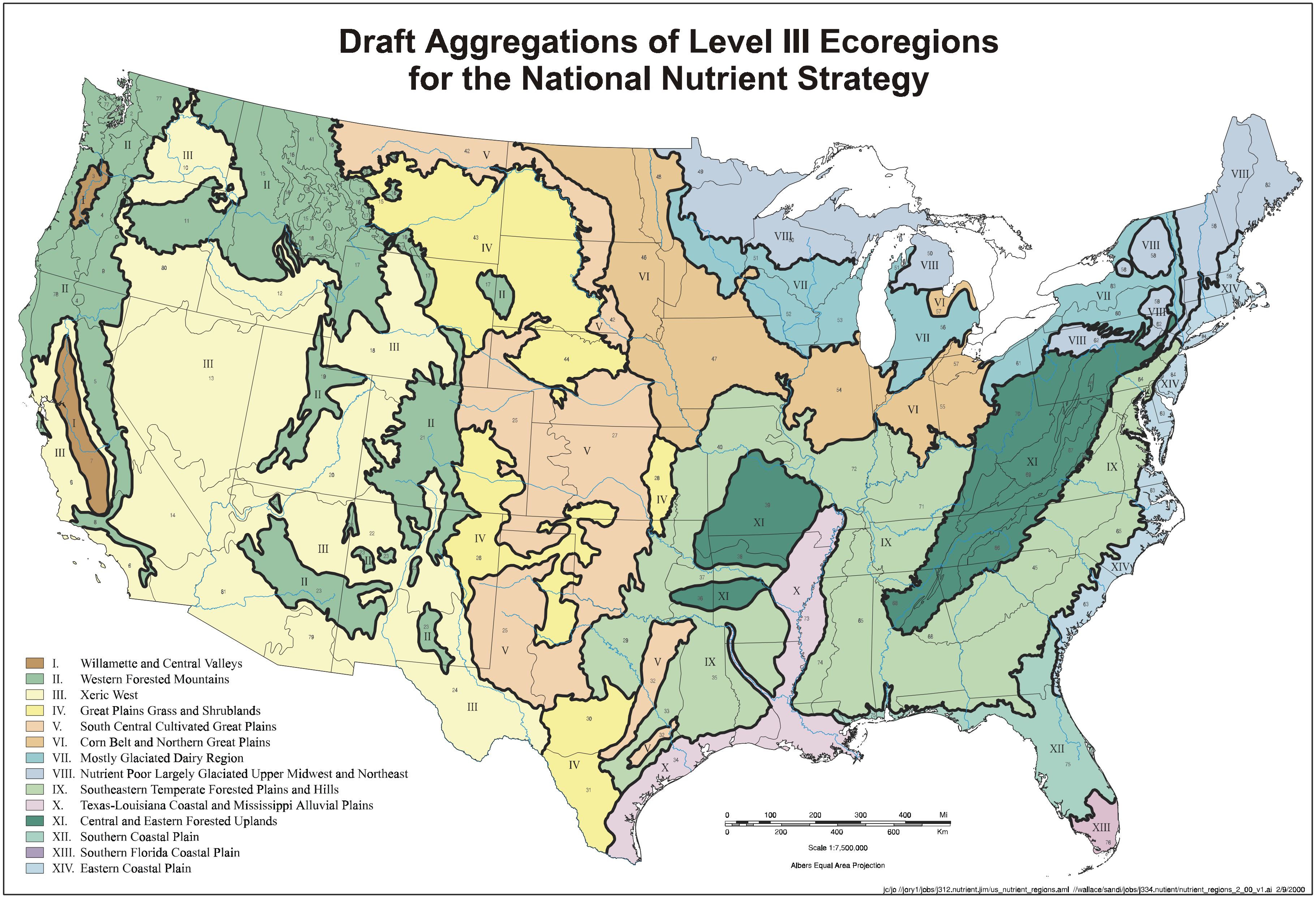


Figure 1a. Fourteen nutrient Ecoregions as delineated by Omernik (2000). Ecoregions were based on geology, land use, ecosystem type, and nutrient conditions.

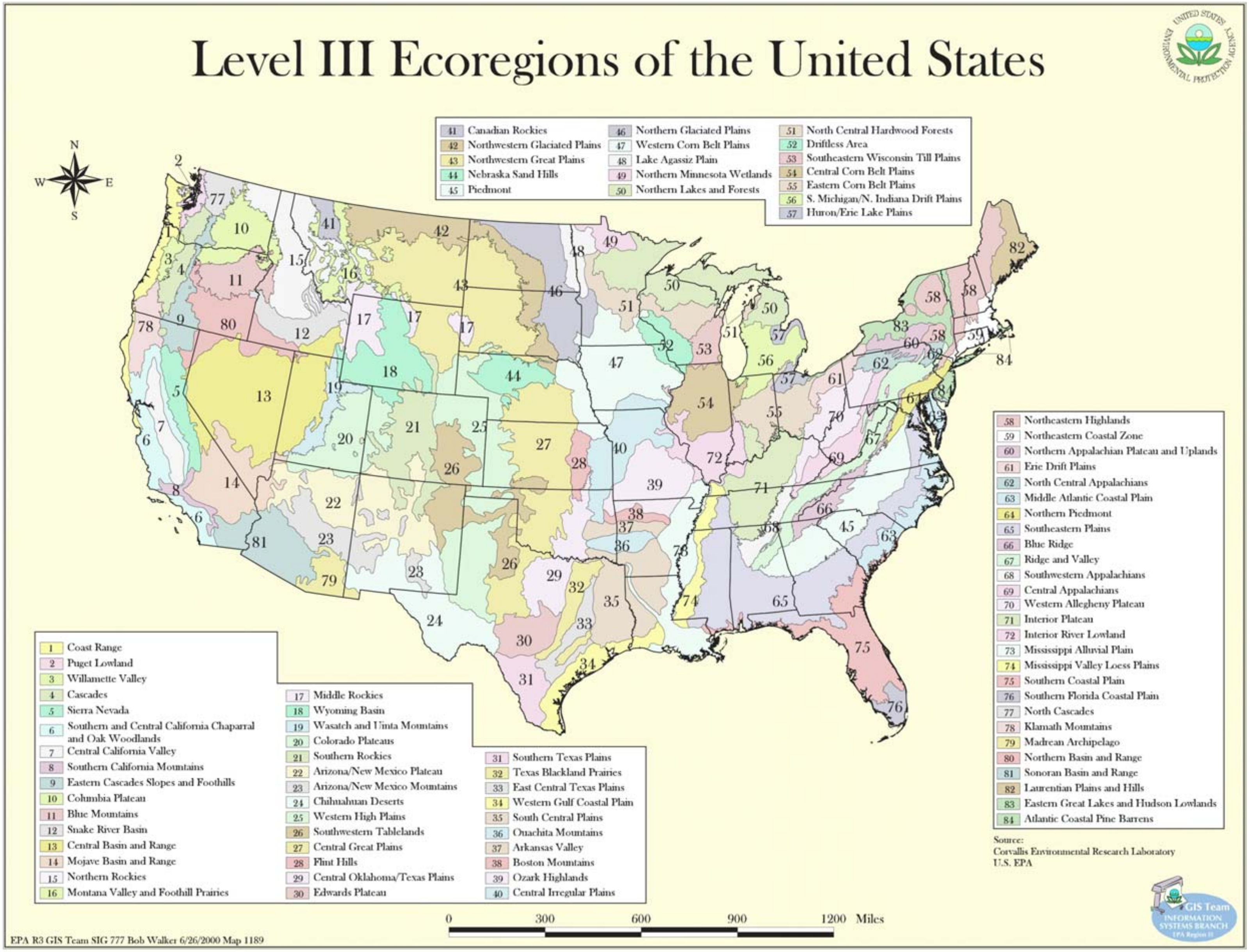


Figure 1b. Level III Ecoregions of the United States.

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 IV

Ecoregion IV is composed of disjunct, grassy, rolling high plains, hills, plateaus, buttes, stabilized sand dunes, and badlands. Northernmost parts were once glaciated and contain hummocky moraines that are studded with wetlands. The average annual freeze-free growing season ranges from only 90 days in the north to 200 days in the south. Rainfall can vary widely from year to year. The average annual precipitation ranges from 10 inches to 24 inches; overall, the Great Plains Grass and Shrublands (IV) is drier than adjoining portions of the Western Forested Mountains (II), Corn Belt - Northern Great Plains (VI), and South Central Cultivated Great Plains (V). Both intermittent and ephemeral streams are common; perennial streams also occur but usually originate outside the region in the Western Forested Mountains (II).

The natural vegetation is dominantly and characteristically short grass prairie with areas of savanna also occurring such as on the Edwards Plateau of Texas and on the stony hills of eastern Montana; woodland is commonly found along stream courses. The region's short grass prairie is distinct from the forests of Ecoregion II, the sagebrush, shadscale, and creosote bush of Ecoregion III, and the tall grass prairie of the Corn Belt and Northern Great Plains (VI).

Today, most of Ecoregion IV is rangeland and is not arable. Cropland is much less common than in the Corn Belt and Northern Great Plains (VI) and the South Central Cultivated Great Plains (V) because of the low and erratic precipitation, limited opportunities for irrigation, and limitations imposed by its soils. Cattle, sheep, and horse grazing are common and have impacted vegetation; when overgrazed, parts of the region are subject to wind erosion. Cattle feedlots and their effects occur throughout the region. Although land use is dominated by grazing activities, some cropland agriculture occurs such as on irrigated land adjacent to rivers and on the till, terraces, and lake plains of north-central Montana.

Much of Ecoregion IV is underlain by moderately soluble sandstone, siltstone, and shale rocks or glacial drift. Parent geology and soil type, glacial drift, and soils significantly affect the alkalinity, dissolved solid, sulfate, salt, and suspended sediment concentrations of streams within Ecoregion IV. Some of these contain easily dissolved minerals and readily contribute dissolved solids to streams. High sulfate concentrations in stream water occur over broad areas and are the product of soil leaching. High suspended sediment concentrations in stream water are found in steep, sparsely vegetated watersheds composed of highly erodible, fine-grained material (USGS, 1993).

Throughout the Great Plains Grass and Shrublands (IV), measured nitrogen and phosphorus levels in streams are generally much lower than in regions dominated by cropland agriculture or urban-suburban development. Where cropland agriculture does occur, fertilizers are used; in these places, both runoff and irrigation return flow carry residues of nitrogen and phosphorus to streams. Locally, however, industries, coal mining, oil production, livestock operations, and municipalities have affected stream quality (USGS, 1993).

3.2 Geographical Boundaries of Aggregate Ecoregion IV

Ecoregion IV is a fragmented region composed of four separate segments in the central portion of the United States where Great Plains grass and shrubs prevail (Figure 2). The largest and most northern segment includes eastern Montana and Wyoming, western North and South Dakota, and continues southwards to central Nebraska.

A second segment begins in southeastern Colorado, continues south to northeastern New Mexico and extends east as a narrow strip running through northern Texas and extending down to central Texas. From Texas the thin segment continues to stretch north to include small portions of western Oklahoma and southwestern Kansas.

A third segment encompasses a portion of eastern Kansas and runs south into a small section of central Oklahoma. The remaining segment encompasses a portion of south central Texas.

3.3 Level III Subecoregions Within Aggregate Ecoregion IV

There are six level III subecoregions contained within Aggregate Ecoregion IV (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.

26. Southwestern Tablelands

Southwestern Tablelands are composed of elevated subhumid grassland and semiarid grazing land. Much of this elevated tableland is in subhumid grassland and semiarid grazing land. The potential natural vegetation in this region is grama-buffalo grass with some mesquite-buffalo grass in the southeast and shinnery (midgrass prairie with open low and shrubs) along the Canadian River.

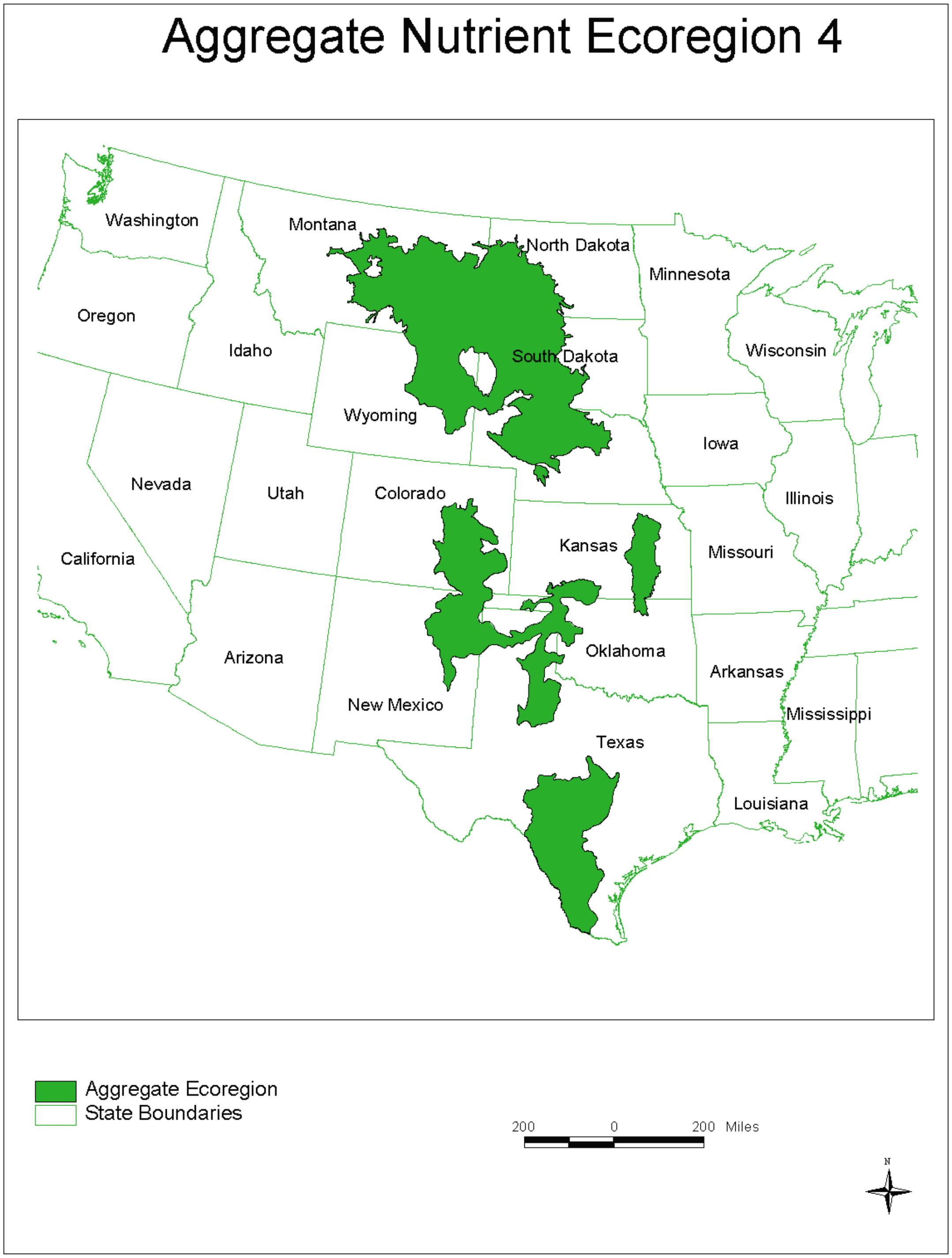


Figure 2. Aggregate Ecoregion IV.

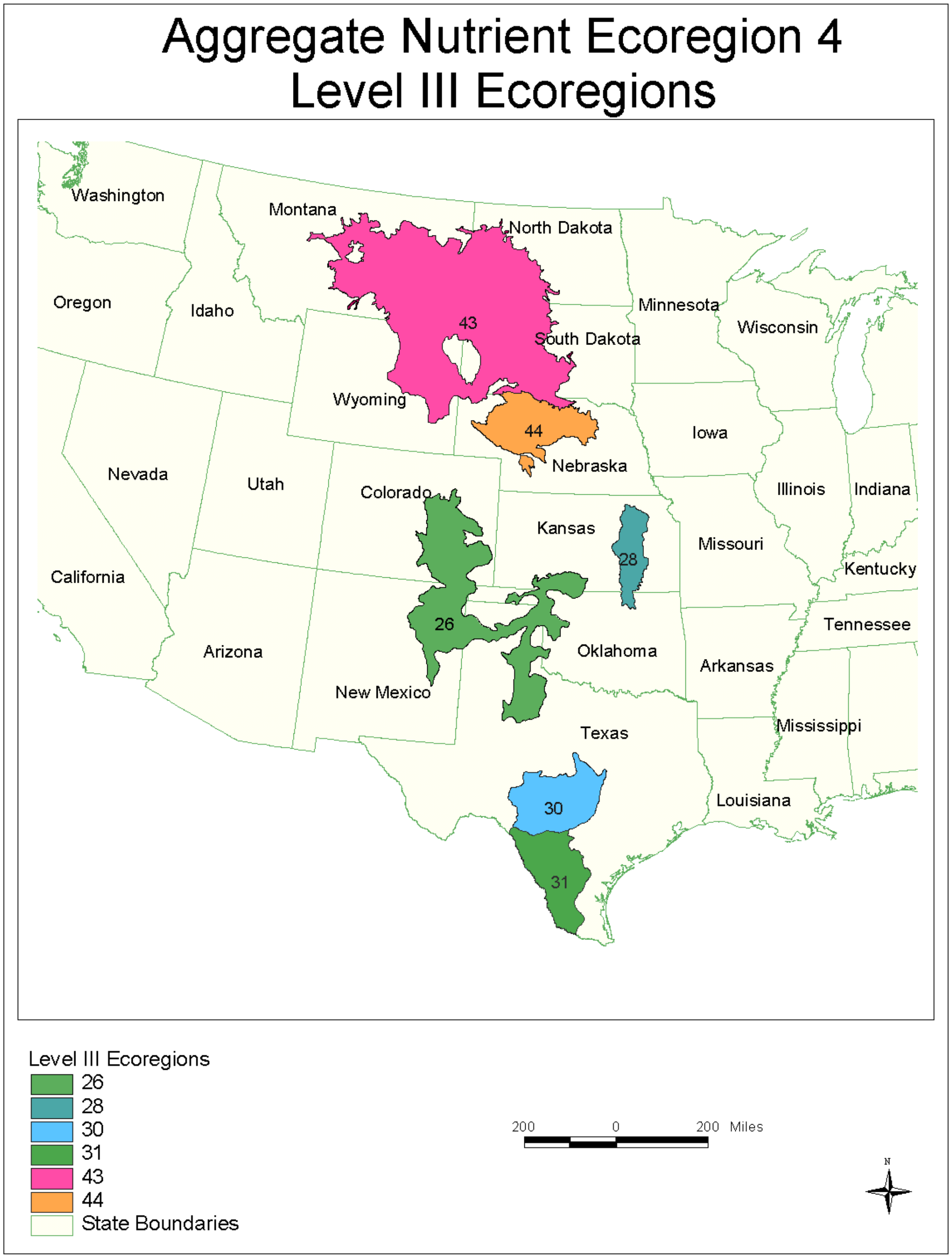


Figure 3. Aggregate Ecoregion IV with level III Ecoregions shown.

28. Flint Hills

Flint Hills is a region of limestone and shale open hills with relatively narrow steep valleys. In contrast to surrounding ecological regions that are mostly in cropland, most of the Flint Hills is grazed by beef cattle. Potential natural vegetation in the region is tallgrass prairie.

30. Edwards Plateau

This Ecoregion is largely a dissected plateau that is hillier in the south and east where it is easily distinguished from bordering ecological regions by a sharp fault line. The region contains a sparse network of perennial streams, but they are relatively clear and cool compared to those of surrounding areas. Originally covered by juniper-oak savanna and mesquite-oak savannah, most of the region is used for grazing beef cattle, sheep, goats, and wildlife. Hunting leases are a major source of income.

31. Southern Texas Plains

This rolling to moderately dissected plain was once covered with grassland and savanna vegetation. Having been subject to long continued grazing, thorny brush is now the predominant vegetation type. This "brush country", as it is called locally, has its greatest extent in Mexico and contains a greater and more distinct diversity of animal life than that found elsewhere in Texas.

43. Northwestern Great Plains

The Northwestern Great Plains Ecoregion encompasses the Missouri Plateau section of the Great Plains. It is a semiarid rolling plain of shale and sandstone punctuated by occasional buttes. Native grasslands, largely replaced on level ground by spring wheat and alfalfa, persist in rangeland areas on broken topography. Agriculture is restricted by the erratic precipitation and limited opportunities for irrigation.

44. Nebraska Sandhills

The Nebraska Sandhills comprise one of the most distinct and homogenous Ecoregions in North America. One of the largest areas of grass stabilized sand dunes in the world, this region is generally devoid of cropland agriculture, and except for some riparian areas in the north and east, the region is treeless. Large portions of this Ecoregion contain numerous lakes and wetlands and have a lack of streams.

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 IV

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, 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, and EPA Region 8 - North Dakota 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 IV (TP, TN, chl *a*, and turbidity)

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 past 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 IV 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: North Dakota, South Dakota, Montana, Wyoming, Colorado, Kansas, Oklahoma, and Texas. Nebraska indicated that standard or EPA-approved methods were used for some specific nutrient parameters. New Mexico did not provide information prior to the publication of this document.

4.4 Data for All Rivers and Streams Within Aggregate Ecoregion IV

Figure 4 shows the location of the sampling stations within each subecoregion. Table 1 presents all data records for all parameters for Aggregate Ecoregion IV 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 to attempt to approximate the preferred approach. 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-f present potential reference conditions for both the Aggregate Ecoregion and the subecoregions using both methods. However, the reference stream column is left blank because EPA does not have reference data and anticipates that States/Tribes will provide information on reference streams. Tables 3a-f 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-f. 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.

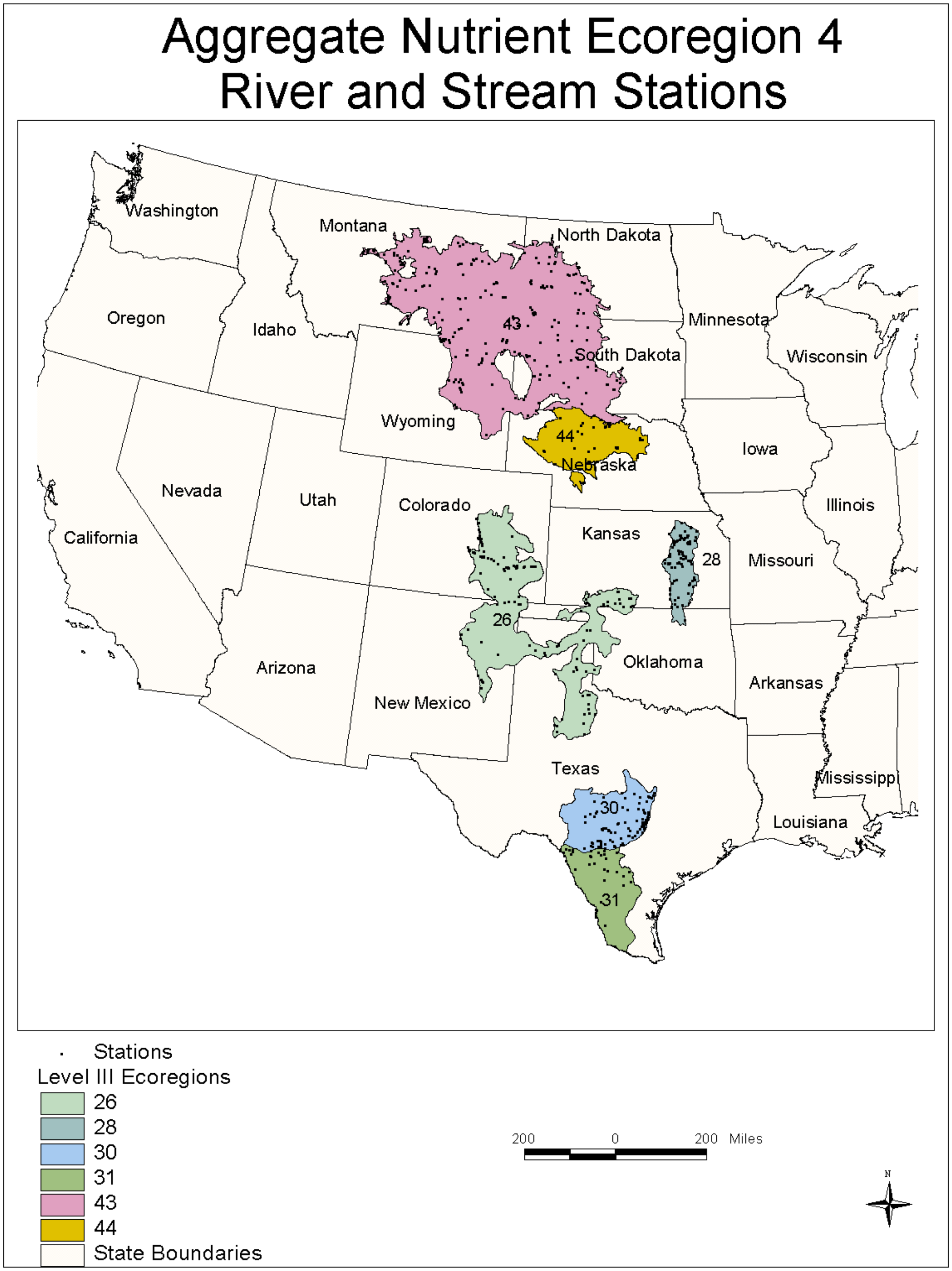


Figure 4. Sampling locations within each level III ecoregion.

Table 1. River and stream records* for Aggregate Ecoregion IV—Great Plains Grass and Shrublands

	Aggregate Ecoregion IV	Sub ecoR 26	Sub ecoR 28	Sub ecoR 30	Sub ecoR 31	Sub ecoR 43	Sub ecoR 44
# of named streams	430	89	69	58	29	158	27
# of stream stations	850	158	109	126	41	373	43
Key nutrient parameters (listed below)							
- # of records for turbidity (all methods)	3,872	720	1,623	806	18	634	65
- # of records for chlorophyll *a* (all methods)	1,009	203	15	505	264	4	18
- # of records for total Kjeldhal nitrogen (TKN)	5,926	1,875	179	1,433	214	1,907	318
- # of records for nitrite + nitrate (NO_2+NO_3)	6,414	1,984	885	785	100	2,364	296
- # of records for total nitrogen (TN)	740	282	43	10	—	353	52
- # of records for total phosphorus (TP)	10,035	1,916	1,788	1,564	439	3,978	350
Total # of records for key nutrient parameters	27,996	6,980	4,533	5,103	1,035	9,240	1,099

*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 IV 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)	212	0.00	4.50	0.24	
NO_2+NO_3-N (mg/L)	299	0.00	8.39	0.05	
TN (mg/L) - calculated				0.61	
TN (mg/L) - reported	65	0.12	5.63	0.56	
TP (µg/L)	341	0	2,070	23	
Turbidity (NTU)	68	0.60	225	14.80	
Turbidity (FTU)	124	0.30	134.88	4.21	
Turbidity (JCU)	6	3.88	38.50	4.85	
Chlorophyll *a* (µg/L) - F	29	1.3	36.5	2.4	
Chlorophyll *a* (µg/L) - S	82	0.2	46.6	0.2	
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 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 IV streams subecoregion 26

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)	41	0.00	1.95	0.22	
NO_2+NO_3-N (mg/L)	69	0.00	6.75	0.04	
TN (mg/L) - calculated				0.26	
TN (mg/L) - reported	19	0.16	2.35	0.45	
TP (µg/L)	66	1	1,720	25	
Turbidity (NTU)	14	7	145	12.40	
Turbidity (FTU)	20	1.35	56.35	4.96	
Turbidity (JCU)	1 (z)	3.88	3.88	3.88 (zz)	
Chlorophyll *a* (µg/L) - F	6	3.4	20	3.4	
Chlorophyll *a* (µg/L) - S	18	0.25	12.01	0.25	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3b. Reference conditions for Ecoregion IV streams subecoregion 28

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	0.10	2.07	0.46	
NO_2+NO_3-N (mg/L)	58	0.01	3.07	0.12	
TN (mg/L) - calculated				0.58	
TN (mg/L) - reported	12	0.32	1.75	0.36	
TP (µg/L)	67	2	465	60	
Turbidity (NTU)	28	11.50	173	19.50	
Turbidity (FTU)	51	0.60	100.48	9.95	
Turbidity (JCU)	1	19	19	19 (zz)	
Chlorophyll *a* (µg/L) - F	10	3.5	34.6	4	
Chlorophyll *a* (µg/L) - S	—	—	—	—	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3c. Reference conditions for Ecoregion IV streams subecoregion 30

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)	47	0.05	1.85	0.18	
NO_2+NO_3-N (mg/L)	41	0.02	2.01	0.09	
TN (mg/L) - calculated				0.27	
TN (mg/L) - reported	1	0.55	0.55	0.55 (zz)	
TP (µg/L)	50	2	1,672	8	
Turbidity (NTU)					
Turbidity (FTU)	28	0.35	64.88	0.73	
Turbidity (JCU)	—	—	—	—	
Chlorophyll *a* (µg/L) - F	—	—	—	—	
Chlorophyll *a* (µg/L) - S	41	0.2	46.6	0.2	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3d. Reference conditions for Ecoregion IV streams subecoregion 31

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)	22	0.10	0.97	0.27	
NO_2+NO_3-N (mg/L)	13	0.03	5.77	0.22	
TN (mg/L) - calculated				0.49	
TN (mg/L) - reported	—	—	—	—	
TP (µg/L)	24	15	170	28	
Turbidity (NTU)	6 (z)	1.90	29	2	
Turbidity (FTU)	1	3.83	3.83	3.83 (zz)	
Turbidity (JCU)	5 (z)	2.60	35.50	3.23	
Chlorophyll *a* (µg/L) - F	—	—	—	—	
Chlorophyll *a* (µg/L) - S	22	0.2	24.4	0.2	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3e. Reference conditions for Ecoregion IV streams subecoregion 43

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)	75	0.06	4.35	0.35	
NO_2+NO_3-N (mg/L)	100	0.00	3.18	0.03	
TN (mg/L) - calculated				0.38	
TN (mg/L) - reported	21	0.35	5.40	0.65	
TP (µg/L)	111	2	1,514	29	
Turbidity (NTU)	9	8.70	225	8.70	
Turbidity (FTU)	24	0.73	124	5.83	
Turbidity (JCU)	4 (z)	5.30	78.70	6.80	
Chlorophyll *a* (µg/L) - F	2	4.4	36.5	4.4 (zz)	
Chlorophyll *a* (µg/L) - S	1 (z)	0.2	0.2	0.2 (zz)	
Chlorophyll *a* (µg/L) - T	—	—	—	—	
Periphyton Chl *a* (mg/m^2)	—	—	—	—	

Table 3f. Reference conditions for Ecoregion IV streams subecoregion 44

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)	11	0.09	1.75	0.30	
NO_2+NO_3-N (mg/L)	19	0.00	4.01	0.05	
TN (mg/L) - calculated				0.35	
TN (mg/L) - reported	12	0.65	1.77	0.80	
TP (µg/L)	23	104	598	157	
Turbidity (NTU)	16	1	100	2	
Turbidity (FTU)	4	14.75	17	14.75	
Turbidity (JCU)	—	—	—	—	
Chlorophyll *a* (µg/L) - F	11	1.3	6.6	2	
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 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 and yearly values, refer to Appendix B, "Descriptive Statistics Data Tables for Level III Subecoregions Within Aggregate Ecoregion."

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.

TN	TP	DIN	SRP	Chlorophyll *a*	Impairment Risk	Source
Periphyton Maximum in mg/m²						
				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).

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 IV** 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

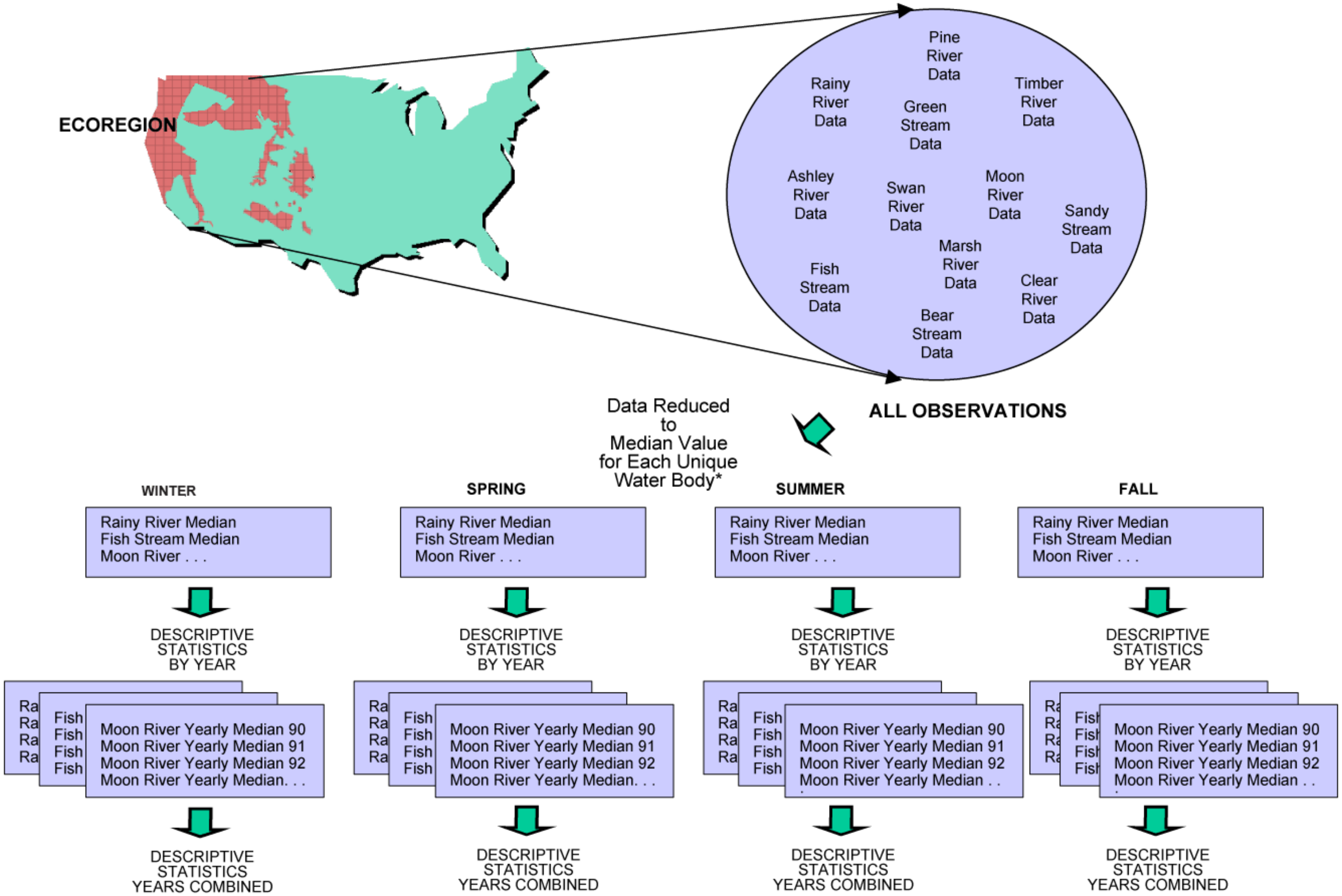
1. **Where data are missing** or are very low in total records for a given parameter, use 25th percentiles for parameters within an adjacent, similar subecoregion within the same aggregate nutrient Ecoregion, **or** when a similar subecoregion cannot be determined, use the 25th percentile for the Aggregate 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.

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*



**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.

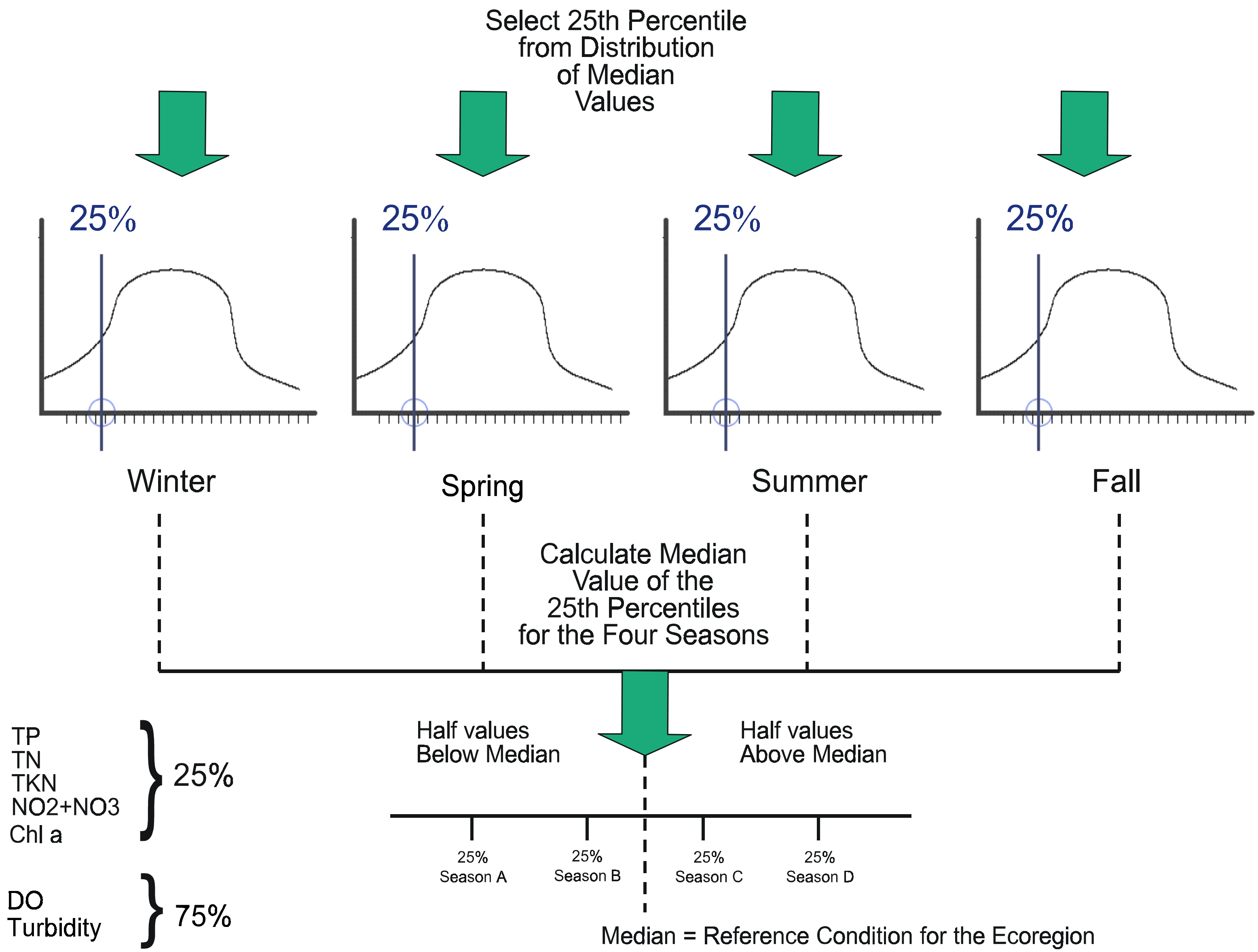


Figure 5b. Illustration of reference condition calculation.

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 IV

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-f in Section 4.0.

- RTAG discussion and rationale for selection of reference sites and conditions in Ecoregion IV. 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 IV

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-f 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:*____
____
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____
____
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*RTAG expert review and consensus:*____
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*Downstream effects:*____
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____
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____

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)

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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: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1999 to 2000
Chloro_A_Fluor_cor_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	29	7.56	.90000	26.80	8.27	1.53	109	0.90	1.80	4.00	11.05	26.80
SPRING	15	8.88	1.3000	36.49	11.72	3.03	132	1.30	2.35	4.65	5.95	36.49
SUMMER	29	14.69	1.6700	52.60	15.56	2.89	106	1.68	4.41	10.40	12.40	49.35

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1999 to 2000
Chloro_A_Pheo_cor_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	15	3.70	.90000	9.20	2.42	0.62	65	0.90	1.80	3.30	4.30	9.20
SPRING	15	2.93	.95000	8.52	2.11	0.55	72	0.95	1.05	2.35	3.99	8.52
SUMMER	15	7.92	2.2900	18.10	4.98	1.29	63	2.29	4.20	5.90	9.68	18.10

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1996
Chloro_A_Phyto_Spec_A_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	53	3.02	.25000	21.00	4.65	0.64	154	0.25	0.25	0.98	3.89	15.95
SPRING	64	3.02	.25000	50.20	6.74	0.84	223	0.25	0.25	1.05	3.08	10.25
SUMMER	82	5.97	.25000	135.00	16.62	1.84	278	0.25	0.25	1.88	4.60	27.00
WINTER	55	2.91	.25000	43.00	7.14	0.96	245	0.25	0.25	0.88	3.14	7.71

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1999
DIP_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	42	74.09	.00000	1307.50	206.22	31.82	278	5.00	6.25	9.16	62.50	180.23
SPRING	31	27.14	5.0000	145.00	42.80	7.69	158	5.00	5.00	7.50	20.00	140.00
SUMMER	44	51.42	5.0000	427.51	85.88	12.95	167	5.00	5.00	12.25	58.75	212.94
WINTER	41	58.90	2.0000	770.00	135.15	21.11	229	5.00	6.00	12.50	41.25	175.00

Data were not always available for all years.

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

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	8	98.53	85.722	111.00	7.61	2.69	8	85.72	93.70	99.51	102.53	111.00
SUMMER	14	104.65	89.412	143.68	15.65	4.18	15	89.41	95.06	98.72	108.74	143.68

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
Dissolved_Oxygen_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	254	9.37	1.0000	14.30	1.93	0.12	21	6.23	8.30	9.48	10.70	12.30
SPRING	278	9.44	6.0000	13.52	1.37	0.08	14	7.25	8.53	9.33	10.50	11.60
SUMMER	310	7.66	1.0000	12.60	1.42	0.08	18	5.50	7.00	7.66	8.30	10.10
WINTER	217	11.24	6.2000	14.60	1.54	0.10	14	8.70	10.00	11.50	12.50	13.30

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
Nitrite_Nitrate_NO2_NO3_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	276	0.67	.00000	9.33	1.16	0.07	173	0.01	0.06	0.25	0.73	2.85
SPRING	257	0.46	.00000	5.87	0.77	0.05	165	0.01	0.04	0.20	0.50	1.72
SUMMER	299	0.48	.00000	7.45	0.79	0.05	167	0.00	0.04	0.20	0.56	1.79
WINTER	211	0.98	.00000	41.85	3.04	0.21	309	0.03	0.20	0.39	0.86	3.15

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1999
Nitrogen_Tot_Kjeldhal_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	175	0.52	.00000	4.00	0.57	0.04	109	0.05	0.20	0.35	0.68	1.35
SPRING	174	0.58	.00000	3.00	0.51	0.04	87	0.05	0.28	0.50	0.70	1.60
SUMMER	212	0.72	.00000	7.80	0.77	0.05	107	0.08	0.30	0.50	0.94	1.80
WINTER	162	0.51	.00000	5.00	0.58	0.05	115	0.05	0.20	0.32	0.65	1.51

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1999 to 2000
Organic_P_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	29	33.05	2.6700	102.35	27.17	5.05	82	2.67	9.86	26.37	44.62	102.35
SPRING	15	56.44	10.750	233.21	58.35	15.07	103	10.75	18.85	42.85	66.30	233.21
SUMMER	29	65.34	14.820	177.75	48.67	9.04	74	14.82	24.83	61.10	81.98	167.90

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1992
Phosph_Ortho_Tot_as_P_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	27	55.32	5.0000	890.00	170.21	32.76	308	5.00	5.00	12.50	25.00	140.00
SPRING	26	44.42	5.0000	300.00	62.75	12.31	141	5.00	7.50	21.88	47.50	135.00
SUMMER	29	28.58	5.0000	130.00	28.26	5.25	99	5.00	7.50	21.25	35.00	85.00
WINTER	27	69.40	5.0000	1027.50	196.33	37.78	283	5.00	5.00	12.50	50.00	155.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
Total_Nitrogen_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	59	0.91	.07250	3.70	0.58	0.08	64	0.21	0.50	0.76	1.25	2.01
SPRING	49	0.90	.13000	3.25	0.64	0.09	71	0.21	0.51	0.74	1.14	1.98
SUMMER	65	1.25	.10500	8.70	1.22	0.15	98	0.39	0.60	1.04	1.33	2.40
WINTER	29	1.34	.25000	7.55	1.40	0.26	104	0.40	0.65	0.85	1.45	3.40

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
Total_Phosphorus_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	298	119.84	2.5000	2240.00	212.96	12.34	178	5.00	21.25	55.00	130.00	415.00
SPRING	304	137.62	.00000	1900.00	217.32	12.46	158	2.50	25.00	71.25	161.25	490.00
SUMMER	341	186.15	.00000	2440.00	287.51	15.57	154	5.00	30.00	100.00	220.00	605.00
WINTER	247	109.02	.00000	1800.00	208.43	13.26	191	2.50	16.25	45.00	95.00	455.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
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	111	15.07	.30000	175.00	20.93	1.99	139	0.70	5.50	9.25	15.30	43.00
SPRING	124	20.32	.40000	150.00	26.47	2.38	130	0.60	3.40	13.91	26.20	55.00
SUMMER	122	23.46	.30000	119.75	22.42	2.03	96	0.70	5.03	17.50	32.95	64.00
WINTER	113	11.50	.30000	98.00	17.51	1.65	152	0.55	2.75	6.00	13.23	60.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 1993
Turbidity_JCU

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	1	19.00	19.000	19.00	.	.	.	19.00	19.00	19.00	19.00	19.00
SPRING	5	17.16	3.3000	58.00	23.21	10.38	135	3.30	4.40	6.10	14.00	58.00
SUMMER	6	26.29	4.4500	78.70	29.13	11.89	111	4.45	5.30	14.15	41.00	78.70
WINTER	6	4.75	.80000	13.00	5.33	2.18	112	0.80	1.20	1.75	10.00	13.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
Turbidity_NTU

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	50	31.71	.93750	154.90	36.13	5.11	114	1.00	3.00	15.50	49.65	100.00
SPRING	20	63.63	.00000	225.00	63.74	14.25	100	1.00	18.60	45.80	86.00	199.00
SUMMER	68	54.17	.60000	319.00	58.81	7.13	109	2.00	14.80	31.00	81.20	170.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Decade and Season
from 1990 to 2000
pH_S_U

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	59	8.25	7.5500	9.08	0.33	0.04	4	7.71	8.04	8.23	8.43	8.88
SPRING	21	8.29	7.3500	9.06	0.37	0.08	4	7.74	8.20	8.35	8.44	8.71
SUMMER	60	8.30	6.3600	10.10	0.69	0.09	8	7.03	7.99	8.24	8.59	9.47
WINTER	2	7.85	7.1250	8.58	1.03	0.73	13	7.13	7.13	7.85	8.58	8.58

Data were not always available for all years.

APPENDIX B

Descriptive Statistics Data Tables for Level III Subecoregions Within Aggregate Ecoregion

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1999 to 2000
Chloro_A_Fluor_cor_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	6	5.32	2.1000	11.05	4.45	1.82	84	2.10	2.10	2.80	11.1	11.1
26	SPRING	3	9.99	4.6500	19.99	8.66	5.00	87	4.65	4.65	5.33	20.0	20.0
26	SUMMER	6	10.47	3.4000	23.20	9.88	4.03	94	3.40	3.40	4.80	23.2	23.2
28	FALL	10	14.60	3.5000	26.80	10.3	3.25	70	3.50	4.00	14.5	24.2	26.8
28	SPRING	5	9.15	1.8000	34.63	14.3	6.40	157	1.80	1.80	2.35	5.15	34.6
28	SUMMER	10	16.20	8.5000	38.30	11.7	3.71	72	8.50	10.4	11.4	12.4	38.3
43	FALL	2	4.50	1.1000	7.90	4.81	3.40	107	1.10	1.10	4.50	7.90	7.90
43	SPRING	1	36.49	36.490	36.49	.	.	.	36.5	36.5	36.5	36.5	36.5
43	SUMMER	2	28.50	4.4070	52.60	34.1	24.1	120	4.41	4.41	28.5	52.6	52.6
44	FALL	11	2.94	.90000	6.60	2.41	0.73	82	0.90	1.10	1.80	5.20	6.60
44	SPRING	6	3.50	1.3000	5.95	1.64	0.67	47	1.30	2.73	3.13	4.77	5.95
44	SUMMER	11	13.11	1.6700	49.35	18.3	5.52	140	1.67	2.00	4.77	12.1	49.3

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1999 to 2000
Chloro_A_Pheo_cor_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	3	2.53	1.4000	4.30	1.55	0.90	61	1.40	1.40	1.90	4.30	4.30
26	SPRING	3	2.21	.95000	4.63	2.10	1.21	95	0.95	0.95	1.05	4.63	4.63
26	SUMMER	3	7.47	2.9000	15.30	6.81	3.93	91	2.90	2.90	4.20	15.3	15.3
28	FALL	5	5.78	2.2000	9.20	2.96	1.33	51	2.20	3.30	6.40	7.80	9.20
28	SPRING	5	2.13	.95000	3.99	1.25	0.56	59	0.95	0.98	2.30	2.41	3.99
28	SUMMER	5	9.16	5.4000	18.10	5.23	2.34	57	5.40	5.90	7.00	9.40	18.1
43	FALL	1	3.40	3.4000	3.40	.	.	.	3.40	3.40	3.40	3.40	3.40
43	SPRING	1	8.52	8.5200	8.52	.	.	.	8.52	8.52	8.52	8.52	8.52
43	SUMMER	1	9.12	9.1200	9.12	.	.	.	9.12	9.12	9.12	9.12	9.12
44	FALL	6	2.60	.90000	4.10	1.34	0.55	52	0.90	1.70	2.40	4.10	4.10
44	SPRING	6	3.02	1.1100	5.43	1.51	0.61	50	1.11	2.10	2.92	3.63	5.43
44	SUMMER	6	6.92	2.2900	16.01	5.09	2.08	74	2.29	3.90	4.82	9.68	16.0

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1996
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	12	2.65	.25000	9.67	3.62	1.05	137	0.25	0.25	0.68	3.99	9.67
26	SPRING	14	3.40	.25000	14.75	4.74	1.27	140	0.25	0.25	1.50	4.76	14.8
26	SUMMER	18	3.38	.25000	14.35	3.63	0.86	107	0.25	0.50	3.15	3.70	14.4
26	WINTER	13	2.14	.25000	4.63	1.86	0.52	87	0.25	0.25	2.48	4.00	4.63
30	FALL	28	3.45	.25000	21.00	5.19	0.98	150	0.25	0.25	1.56	4.00	17.0
30	SPRING	33	3.44	.25000	50.20	8.74	1.52	254	0.25	0.25	1.10	2.30	10.3
30	SUMMER	41	7.08	.25000	135.00	22.4	3.50	316	0.25	0.25	1.07	3.10	39.0
30	WINTER	31	2.56	.25000	43.00	7.62	1.37	298	0.25	0.25	0.63	2.00	4.93
31	FALL	13	2.41	.25000	15.95	4.51	1.25	187	0.25	0.25	0.25	1.10	16.0
31	SPRING	17	1.90	.25000	7.58	2.45	0.59	129	0.25	0.25	0.25	3.10	7.58
31	SUMMER	22	6.27	.25000	35.55	9.40	2.00	150	0.25	0.50	3.02	6.03	27.0
31	WINTER	11	4.83	.25000	32.80	9.60	2.89	199	0.25	0.25	1.20	5.61	32.8
43	SUMMER	1	0.25	.25000	0.25	.	.	.	0.25	0.25	0.25	0.25	0.25

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1999
DIP_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	11	142.24	5.0000	1307.50	389	117	273	5.00	7.50	10.0	25.0	1308
26	SPRING	8	27.34	5.0000	140.00	46.4	16.4	170	5.00	5.00	6.88	25.0	140
26	SUMMER	11	35.59	5.0000	212.94	61.6	18.6	173	5.00	5.00	12.5	31.9	213
26	WINTER	8	60.47	5.0000	417.50	144	51.1	239	5.00	5.00	5.63	20.0	418
28	FALL	5	30.63	.00000	134.56	58.2	26.0	190	0.00	3.49	6.81	8.31	135
28	SPRING	2	61.88	8.7500	115.00	75.1	53.1	121	8.75	8.75	61.9	115	115
28	SUMMER	6	28.66	5.7100	129.37	49.4	20.2	173	5.71	6.91	7.45	15.1	129
28	WINTER	2	94.38	13.750	175.00	114	80.6	121	13.8	13.8	94.4	175	175
30	FALL	1	12.50	12.500	12.50	.	.	.	12.5	12.5	12.5	12.5	12.5
30	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	SUMMER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	WINTER	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
43	FALL	19	20.62	5.0000	112.94	29.1	6.68	141	5.00	5.00	7.50	12.5	113
43	SPRING	19	19.28	5.0000	145.00	33.4	7.66	173	5.00	5.00	7.50	17.5	145
43	SUMMER	20	25.84	5.0000	182.50	43.3	9.69	168	5.00	5.00	10.6	22.5	142
43	WINTER	29	55.16	2.0000	770.00	141	26.3	256	3.00	6.25	12.5	41.3	127
44	FALL	6	165.00	95.570	322.91	84.0	34.3	51	95.6	99.5	146	180	323
44	SPRING	1	127.50	127.50	127.50	.	.	.	128	128	128	128	128
44	SUMMER	6	196.24	100.42	427.51	130	53.0	66	100	117	129	275	428
44	WINTER	1	135.00	135.00	135.00	.	.	.	135	135	135	135	135

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1998 to 1998
Dissolved_Oxygen_percent_sat

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	FALL	8	98.53	85.722	111.00	7.61	2.69	8	85.7	93.7	99.5	103	111
43	SUMMER	14	104.65	89.412	143.68	15.7	4.18	15	89.4	95.1	98.7	109	144

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
Dissolved_Oxygen_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	62	10.20	6.8000	13.23	1.25	0.16	12	8.55	9.45	10.2	11.0	12.5
26	SPRING	63	9.42	6.7000	12.80	1.15	0.15	12	7.90	8.70	9.20	10.3	11.5
26	SUMMER	70	7.66	4.1000	11.95	1.19	0.14	16	5.50	7.10	7.60	8.15	10.1
26	WINTER	52	11.78	9.2000	14.60	1.14	0.16	10	9.58	11.1	11.9	12.6	13.6
28	FALL	55	8.16	4.8000	10.90	1.37	0.18	17	5.28	7.40	8.20	9.10	10.5
28	SPRING	52	9.69	7.9500	13.52	1.12	0.15	12	8.25	8.95	9.40	10.3	11.8
28	SUMMER	58	6.79	1.0000	10.25	1.27	0.17	19	4.60	6.40	6.95	7.45	8.40
28	WINTER	44	12.27	10.300	13.85	0.84	0.13	7	11.0	11.7	12.4	13.0	13.3
30	FALL	34	8.37	4.6000	10.60	1.30	0.22	15	5.60	7.85	8.33	9.30	10.1
30	SPRING	50	8.20	6.1000	10.90	1.01	0.14	12	6.40	7.60	8.03	8.73	10.5
30	SUMMER	50	7.48	3.2000	12.10	1.55	0.22	21	4.20	6.95	7.50	8.00	10.0
30	WINTER	45	10.02	8.2000	12.60	1.09	0.16	11	8.90	9.25	9.73	10.3	12.5
31	FALL	14	7.42	4.1500	9.20	1.42	0.38	19	4.15	6.95	7.93	8.40	9.20
31	SPRING	22	8.37	6.0000	11.40	1.21	0.26	14	6.50	7.70	8.45	9.20	9.80
31	SUMMER	21	7.56	5.9000	8.80	0.88	0.19	12	6.00	6.80	8.00	8.10	8.50
31	WINTER	17	9.31	8.0000	11.60	0.97	0.24	10	8.00	8.70	9.10	9.90	11.6
43	FALL	75	10.57	7.0000	13.60	1.36	0.16	13	8.40	9.70	10.8	11.4	12.8
43	SPRING	79	10.46	8.0000	13.05	1.00	0.11	10	8.80	9.80	10.6	11.1	12.3
43	SUMMER	89	8.18	2.5000	12.60	1.53	0.16	19	5.50	7.50	8.20	8.90	10.8
43	WINTER	56	11.48	6.2000	14.40	1.65	0.22	14	8.40	10.6	11.8	12.7	13.4
44	FALL	14	8.42	1.0000	14.30	3.88	1.04	46	1.00	7.60	9.00	10.8	14.3
44	SPRING	12	8.90	6.7500	11.00	1.48	0.43	17	6.75	7.74	8.99	10.0	11.0
44	SUMMER	22	8.28	7.3000	10.10	0.74	0.16	9	7.40	7.65	8.13	8.70	9.56
44	WINTER	3	11.38	10.350	12.68	1.19	0.69	10	10.4	10.4	11.1	12.7	12.7

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	60	1.05	.00000	8.49	1.46	0.19	140	0.00	0.04	0.42	1.49	3.43
26	SPRING	59	0.69	.00000	5.55	1.05	0.14	153	0.00	0.03	0.21	1.05	2.50
26	SUMMER	69	0.63	.00000	7.45	1.11	0.13	177	0.00	0.04	0.24	0.86	2.30
26	WINTER	47	1.18	.00000	6.05	1.48	0.22	126	0.01	0.21	0.61	1.60	5.11
28	FALL	53	0.50	.00000	3.60	0.65	0.09	130	0.03	0.09	0.26	0.73	1.59
28	SPRING	51	0.35	.00000	1.72	0.40	0.06	115	0.00	0.07	0.23	0.44	1.34
28	SUMMER	58	0.54	.03000	4.49	0.68	0.09	127	0.04	0.14	0.34	0.76	1.77
28	WINTER	43	0.63	.01750	2.54	0.51	0.08	81	0.04	0.26	0.65	0.79	1.48
30	FALL	35	0.50	.01625	9.33	1.55	0.26	308	0.02	0.09	0.21	0.35	0.97
30	SPRING	41	0.32	.02000	1.50	0.35	0.06	110	0.02	0.10	0.19	0.41	1.10
30	SUMMER	40	0.28	.00250	2.51	0.48	0.08	170	0.00	0.04	0.14	0.27	1.30
30	WINTER	41	0.36	.02000	1.20	0.29	0.04	79	0.03	0.12	0.30	0.56	0.82
31	FALL	13	1.72	.06000	5.67	2.02	0.56	117	0.06	0.19	0.94	2.10	5.67
31	SPRING	11	1.45	.03000	5.87	1.87	0.56	129	0.03	0.37	0.53	1.73	5.87
31	SUMMER	13	1.01	.01000	3.87	1.29	0.36	128	0.01	0.15	0.24	1.59	3.87
31	WINTER	11	1.64	.03000	6.58	2.37	0.71	145	0.03	0.24	0.32	2.30	6.58
43	FALL	97	0.44	.00250	3.68	0.67	0.07	153	0.01	0.03	0.16	0.55	2.15
43	SPRING	86	0.29	.00250	1.80	0.40	0.04	136	0.01	0.03	0.15	0.35	1.28
43	SUMMER	100	0.28	.00000	2.67	0.43	0.04	153	0.00	0.02	0.10	0.41	1.07
43	WINTER	66	1.33	.00200	41.85	5.16	0.63	387	0.03	0.13	0.39	0.90	3.03
44	FALL	18	0.76	.00000	4.78	1.10	0.26	144	0.00	0.05	0.55	1.00	4.78
44	SPRING	9	0.69	.00000	2.64	0.83	0.28	120	0.00	0.03	0.47	0.99	2.64
44	SUMMER	19	0.83	.00000	3.87	1.00	0.23	120	0.00	0.10	0.39	1.58	3.87
44	WINTER	3	1.58	.04000	4.14	2.23	1.29	141	0.04	0.04	0.57	4.14	4.14

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1999
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	37	0.42	.00000	1.46	0.36	0.06	86	0.00	0.20	0.31	0.58	1.35
26	SPRING	40	0.49	.00000	3.00	0.53	0.08	109	0.00	0.23	0.40	0.61	1.42
26	SUMMER	41	0.68	.00000	2.30	0.51	0.08	75	0.00	0.36	0.50	0.95	1.65
26	WINTER	35	0.34	.00000	1.60	0.34	0.06	101	0.00	0.05	0.29	0.43	1.05
28	FALL	12	0.97	.14000	4.00	1.00	0.29	103	0.14	0.47	0.75	1.00	4.00
28	SPRING	11	0.87	.07500	2.33	0.56	0.17	64	0.08	0.55	0.80	1.00	2.33
28	SUMMER	18	0.80	.07500	1.80	0.47	0.11	59	0.08	0.46	0.71	1.03	1.80
28	WINTER	8	0.54	.12500	0.85	0.27	0.09	49	0.13	0.33	0.61	0.73	0.85
30	FALL	39	0.37	.05000	1.70	0.35	0.06	93	0.05	0.18	0.28	0.45	1.33
30	SPRING	47	0.43	.05000	2.49	0.46	0.07	108	0.05	0.20	0.29	0.54	1.50
30	SUMMER	45	0.36	.05000	1.99	0.32	0.05	90	0.05	0.18	0.30	0.46	0.80
30	WINTER	45	0.30	.05000	1.61	0.29	0.04	97	0.05	0.11	0.23	0.32	0.90
31	FALL	14	0.46	.12000	1.05	0.34	0.09	72	0.12	0.13	0.31	0.71	1.05
31	SPRING	14	0.42	.08000	0.88	0.23	0.06	54	0.08	0.30	0.35	0.60	0.88
31	SUMMER	22	0.74	.15000	2.40	0.59	0.13	80	0.19	0.29	0.67	0.94	1.95
31	WINTER	13	0.43	.05000	0.88	0.28	0.08	66	0.05	0.26	0.34	0.70	0.88
43	FALL	65	0.55	.05000	3.70	0.52	0.06	95	0.13	0.30	0.40	0.65	1.18
43	SPRING	56	0.76	.05000	2.63	0.51	0.07	67	0.20	0.45	0.62	0.86	1.90
43	SUMMER	75	0.95	.10000	7.80	1.08	0.13	114	0.20	0.40	0.70	1.09	2.65
43	WINTER	58	0.76	.07500	5.00	0.80	0.11	105	0.13	0.30	0.56	0.90	1.82
44	FALL	8	0.96	.00000	3.95	1.30	0.46	136	0.00	0.18	0.55	1.15	3.95
44	SPRING	6	0.57	.12500	1.56	0.51	0.21	89	0.13	0.30	0.43	0.60	1.56
44	SUMMER	11	0.60	.05000	1.60	0.48	0.14	81	0.05	0.30	0.43	0.71	1.60
44	WINTER	3	0.84	.30000	1.90	0.92	0.53	110	0.30	0.30	0.32	1.90	1.90

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1999 to 2000
Organic_P_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	6	40.61	9.6300	102.35	47.8	19.5	118	9.63	9.63	9.86	102	102
26	SPRING	3	53.42	15.780	120.27	58.0	33.5	109	15.8	15.8	24.2	120	120
26	SUMMER	6	55.25	25.880	107.17	40.3	16.5	73	25.9	25.9	32.7	107	107
28	FALL	10	46.86	26.370	65.77	13.5	4.28	29	26.4	44.6	44.6	53.0	65.8
28	SPRING	5	46.50	12.590	100.46	33.7	15.1	72	12.6	25.5	42.9	51.1	100
28	SUMMER	10	56.43	14.820	121.48	39.7	12.6	70	14.8	23.4	61.1	61.3	121
43	FALL	2	30.10	3.8800	56.31	37.1	26.2	123	3.88	3.88	30.1	56.3	56.3
43	SPRING	1	233.21	233.21	233.21	.	.	.	233	233	233	233	233
43	SUMMER	2	101.29	24.830	177.75	108	76.5	107	24.8	24.8	101	178	178
44	FALL	11	16.90	2.6700	31.81	10.4	3.13	62	2.67	3.88	18.7	22.0	31.8
44	SPRING	6	36.78	10.750	66.30	21.4	8.75	58	10.8	18.9	35.8	53.2	66.3
44	SUMMER	11	72.42	15.470	167.90	52.7	15.9	73	15.5	24.8	62.1	82.0	168

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1992
Phosph_Ortho_Tot_as_P_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	8	121.25	5.0000	890.00	311	110	256	5.00	5.00	7.50	25.0	890
26	SPRING	7	53.04	5.0000	300.00	109	41.2	206	5.00	5.00	10.0	23.8	300
26	SUMMER	8	19.22	5.0000	36.25	14.5	5.13	76	5.00	5.63	17.5	33.1	36.3
26	WINTER	8	22.81	5.0000	75.00	22.3	7.88	98	5.00	10.0	16.3	25.0	75.0
28	SPRING	1	20.00	20.000	20.00	.	.	.	20.0	20.0	20.0	20.0	20.0
28	SUMMER	1	20.00	20.000	20.00	.	.	.	20.0	20.0	20.0	20.0	20.0
28	WINTER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	FALL	1	12.50	12.500	12.50	.	.	.	12.5	12.5	12.5	12.5	12.5
30	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	SUMMER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	WINTER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
43	FALL	17	21.84	5.0000	130.00	29.6	7.19	136	5.00	5.00	12.5	20.0	130
43	SPRING	16	38.98	5.0000	115.00	32.3	8.08	83	5.00	10.0	32.5	58.8	115
43	SUMMER	18	28.89	5.0000	85.00	23.3	5.50	81	5.00	7.50	23.1	35.0	85.0
43	WINTER	16	95.39	5.0000	1027.50	252	63.1	265	5.00	6.25	12.5	72.5	1028
44	FALL	1	140.00	140.00	140.00	.	.	.	140	140	140	140	140
44	SPRING	1	135.00	135.00	135.00	.	.	.	135	135	135	135	135
44	SUMMER	1	130.00	130.00	130.00	.	.	.	130	130	130	130	130
44	WINTER	1	155.00	155.00	155.00	.	.	.	155	155	155	155	155

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
Total_Nitrogen_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	16	0.92	.07250	3.70	0.86	0.22	94	0.07	0.46	0.68	1.27	3.70
26	SPRING	14	0.67	.21125	1.75	0.46	0.12	68	0.21	0.45	0.56	0.63	1.75
26	SUMMER	19	1.04	.10500	2.40	0.61	0.14	59	0.11	0.45	1.05	1.35	2.40
26	WINTER	7	1.11	.40000	2.30	0.61	0.23	55	0.40	0.69	1.05	1.30	2.30
28	FALL	11	0.84	.44000	1.28	0.35	0.11	42	0.44	0.56	0.60	1.18	1.28
28	SPRING	7	0.59	.13000	1.60	0.55	0.21	94	0.13	0.20	0.30	1.04	1.60
28	SUMMER	12	1.04	.39000	2.11	0.60	0.17	58	0.39	0.46	1.09	1.25	2.11
28	WINTER	3	0.96	.25000	1.90	0.85	0.49	88	0.25	0.25	0.74	1.90	1.90
30	FALL	1	0.50	.49500	0.50	.	.	.	0.50	0.50	0.50	0.50	0.50
30	SPRING	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30
30	SUMMER	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60
30	WINTER	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60
43	FALL	19	0.80	.21000	1.90	0.43	0.10	55	0.21	0.47	0.65	1.00	1.90
43	SPRING	20	1.15	.30000	3.25	0.77	0.17	67	0.34	0.65	0.85	1.45	3.00
43	SUMMER	21	1.60	.40000	8.70	1.96	0.43	122	0.50	0.70	0.90	1.05	4.73
43	WINTER	17	1.58	.40000	7.55	1.74	0.42	110	0.40	0.65	0.85	1.56	7.55
44	FALL	12	1.17	.50000	2.01	0.48	0.14	41	0.50	0.84	1.21	1.25	2.01
44	SPRING	7	1.04	.74000	1.53	0.29	0.11	28	0.74	0.75	1.13	1.16	1.53
44	SUMMER	12	1.26	.55000	2.33	0.62	0.18	49	0.55	0.78	1.15	1.60	2.33
44	WINTER	1	0.83	.83000	0.83	.	.	.	0.83	0.83	0.83	0.83	0.83

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
Total_Phosphorus_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	59	141.21	2.5000	1540.00	282	36.7	200	10.0	25.0	42.5	100	910
26	SPRING	62	160.49	.00000	1900.00	301	38.2	187	3.75	25.0	50.0	150	630
26	SUMMER	66	238.48	2.5000	2440.00	447	55.1	188	5.00	40.0	91.3	233	735
26	WINTER	53	141.58	.00000	1050.00	254	34.8	179	2.50	20.0	50.0	85.0	1000
28	FALL	60	122.11	2.5000	415.00	89.9	11.6	74	26.4	55.0	95.0	150	298
28	SPRING	59	129.78	10.000	515.00	95.7	12.5	74	11.3	65.0	110	170	345
28	SUMMER	67	184.58	.00000	645.00	131	16.0	71	15.0	92.5	160	230	450
28	WINTER	49	86.33	2.5000	355.00	84.1	12.0	97	10.0	25.0	57.5	118	240
30	FALL	39	113.91	2.5000	2240.00	382	61.2	336	2.50	10.0	21.3	65.0	980
30	SPRING	49	76.76	2.5000	1480.00	224	32.0	292	2.50	10.0	20.0	35.0	220
30	SUMMER	50	85.55	2.5000	1865.00	278	39.4	325	2.50	6.25	20.0	40.0	400
30	WINTER	47	72.11	2.5000	1120.00	191	27.9	266	2.50	2.50	15.0	50.0	200
31	FALL	16	77.34	20.000	200.00	59.9	15.0	77	20.0	35.0	50.0	120	200
31	SPRING	20	53.13	6.2500	140.00	37.9	8.46	71	8.13	20.6	40.0	80.0	125
31	SUMMER	24	91.46	10.000	330.00	85.1	17.4	93	10.0	20.0	62.5	143	255
31	WINTER	15	61.00	20.000	140.00	38.2	9.87	63	20.0	40.0	45.0	85.0	140
43	FALL	103	91.60	2.5000	820.00	136	13.4	149	6.50	20.0	40.0	117	353
43	SPRING	102	164.79	2.5000	1700.00	226	22.4	137	10.0	37.5	80.0	200	565
43	SUMMER	111	198.98	3.0000	1327.50	268	25.4	135	10.0	45.0	100	235	810
43	WINTER	80	126.65	2.5000	1800.00	251	28.0	198	5.94	20.9	50.0	113	480
44	FALL	21	235.30	116.82	750.00	153	33.4	65	118	160	183	250	513
44	SPRING	12	216.30	24.080	447.06	115	33.2	53	24.1	154	193	267	447
44	SUMMER	23	296.20	100.00	1020.00	205	42.6	69	126	170	230	334	530
44	WINTER	3	252.50	107.50	440.00	170	98.3	67	108	108	210	440	440

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
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
26	FALL	20	9.26	.60000	52.70	11.0	2.46	119	0.65	3.98	6.28	11.0	33.3
26	SPRING	20	13.63	1.7000	48.73	13.3	2.97	98	2.24	5.43	7.88	16.6	43.5
26	SUMMER	20	23.44	1.0000	80.00	19.7	4.42	84	1.55	10.0	21.0	32.2	68.0
26	WINTER	20	10.65	2.0000	60.00	12.8	2.85	120	2.03	4.50	6.70	12.6	41.0
28	FALL	49	13.10	4.6500	49.50	9.00	1.29	69	5.50	7.25	10.0	15.0	28.8
28	SPRING	50	22.55	.50000	128.00	19.2	2.71	85	2.75	12.7	18.5	27.6	47.7
28	SUMMER	51	30.20	.70000	119.75	24.7	3.45	82	3.00	15.3	22.0	45.6	87.8
28	WINTER	46	10.94	.45000	81.20	14.5	2.14	133	1.85	4.05	6.80	13.5	24.7
30	FALL	17	11.09	.30000	43.00	13.4	3.24	121	0.30	1.70	5.50	18.0	43.0
30	SPRING	28	12.87	.40000	150.00	29.8	5.62	231	0.40	0.75	2.18	9.65	55.0
30	SUMMER	22	6.77	.30000	33.05	9.32	1.99	138	0.45	0.70	3.03	9.55	23.1
30	WINTER	22	7.86	.40000	86.75	18.5	3.95	236	0.50	0.60	1.10	5.75	20.5
31	FALL	1	18.85	18.850	18.85	.	.	.	18.9	18.9	18.9	18.9	18.9
31	SPRING	1	0.70	.70000	0.70	.	.	.	0.70	0.70	0.70	0.70	0.70
31	SUMMER	1	3.20	3.2000	3.20	.	.	.	3.20	3.20	3.20	3.20	3.20
31	WINTER	1	4.45	4.4500	4.45	.	.	.	4.45	4.45	4.45	4.45	4.45
43	FALL	23	27.24	.85000	175.00	39.7	8.27	146	1.00	5.05	13.5	35.0	100
43	SPRING	24	30.77	.60000	150.00	39.1	7.98	127	1.00	8.69	16.4	28.0	130
43	SUMMER	24	27.41	.90000	70.00	22.1	4.51	81	1.20	6.60	25.8	44.9	64.0
43	WINTER	23	16.90	.30000	98.00	24.8	5.16	147	0.70	2.00	6.50	23.4	80.0
44	FALL	1	12.00	12.000	12.00	.	.	.	12.0	12.0	12.0	12.0	12.0
44	SPRING	1	20.00	20.000	20.00	.	.	.	20.0	20.0	20.0	20.0	20.0
44	SUMMER	4	10.73	6.3000	16.50	4.83	2.42	45	6.30	6.75	10.1	14.7	16.5
44	WINTER	1	17.50	17.500	17.50	.	.	.	17.5	17.5	17.5	17.5	17.5

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1993
Turbidity_JCU

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	SPRING	1	3.30	3.3000	3.30	.	.	.	3.30	3.30	3.30	3.30	3.30
26	SUMMER	1	4.45	4.4500	4.45	.	.	.	4.45	4.45	4.45	4.45	4.45
28	FALL	1	19.00	19.000	19.00	.	.	.	19.0	19.0	19.0	19.0	19.0
28	SUMMER	1	20.00	20.000	20.00	.	.	.	20.0	20.0	20.0	20.0	20.0
28	WINTER	1	10.00	10.000	10.00	.	.	.	10.0	10.0	10.0	10.0	10.0
31	SPRING	4	20.63	4.4000	58.00	25.3	12.6	122	4.40	5.25	10.1	36.0	58.0
31	WINTER	5	3.70	.80000	13.00	5.22	2.34	141	0.80	1.20	1.30	2.20	13.0
43	SUMMER	4	33.33	5.3000	78.70	34.3	17.1	103	5.30	6.80	24.7	59.9	78.7

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
Turbidity_NTU

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	9	26.71	7.0000	54.30	19.7	6.58	74	7.00	12.4	13.0	42.0	54.3
26	SPRING	6	57.97	20.200	170.00	56.7	23.2	98	20.2	21.0	39.3	58.0	170
26	SUMMER	14	53.96	.60000	145.00	45.8	12.2	85	0.60	10.5	56.3	84.0	145
28	FALL	17	28.77	3.0000	98.00	25.4	6.16	88	3.00	12.0	23.0	40.0	98.0
28	SPRING	6	76.19	22.000	173.00	53.7	21.9	71	22.0	48.0	57.6	99.0	173
28	SUMMER	28	66.06	11.500	211.00	60.8	11.5	92	12.0	19.5	39.0	103	180
31	SUMMER	6	10.83	1.9000	29.00	10.8	4.42	100	1.90	2.00	7.55	17.0	29.0
43	FALL	9	43.31	.93750	154.90	59.5	19.8	137	0.94	2.00	3.75	100	155
43	SPRING	2	116.85	8.7000	225.00	153	108	131	8.70	8.70	117	225	225
43	SUMMER	4	103.00	17.000	319.00	145	72.3	140	17.0	21.5	38.0	185	319
44	FALL	15	31.07	1.0000	100.00	38.4	9.90	123	1.00	2.00	2.00	62.0	100
44	SPRING	6	39.00	.00000	127.00	50.7	20.7	130	0.00	2.00	16.0	73.0	127
44	SUMMER	16	37.59	2.0000	88.50	28.5	7.13	76	2.00	15.0	29.0	54.8	88.5

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 2000
pH_S_U

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	FALL	6	8.46	8.3100	8.71	0.19	0.08	2	8.31	8.31	8.36	8.71	8.71
26	SPRING	3	8.49	8.3700	8.69	0.17	0.10	2	8.37	8.37	8.42	8.69	8.69
26	SUMMER	6	8.11	8.0050	8.25	0.10	0.04	1	8.01	8.03	8.09	8.21	8.25
28	FALL	10	7.97	7.7100	8.11	0.15	0.05	2	7.71	7.97	8.04	8.04	8.11
28	SPRING	5	8.21	8.0400	8.35	0.11	0.05	1	8.04	8.20	8.20	8.24	8.35
28	SUMMER	10	7.43	6.3600	8.10	0.61	0.19	8	6.36	6.87	7.45	8.03	8.10
43	FALL	31	8.27	7.5500	8.88	0.31	0.06	4	7.80	8.03	8.28	8.50	8.79
43	SPRING	6	8.22	7.3500	9.06	0.60	0.25	7	7.35	7.89	8.21	8.62	9.06
43	SUMMER	32	8.41	7.5225	10.10	0.53	0.09	6	7.58	8.13	8.33	8.56	9.48
43	WINTER	2	7.85	7.1250	8.58	1.03	0.73	13	7.13	7.13	7.85	8.58	8.58
44	FALL	12	8.32	7.9200	9.08	0.40	0.12	5	7.92	8.08	8.14	8.52	9.08
44	SPRING	7	8.33	7.7400	8.71	0.31	0.12	4	7.74	8.21	8.38	8.58	8.71
44	SUMMER	12	8.81	7.7500	9.68	0.63	0.18	7	7.75	8.24	8.89	9.38	9.68

Data were not always available for all years.

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1999 to 2000
Chloro_A_Fluor_cor_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1999	FALL	6	5.32	2.1000	11.05	4.45	1.82	84	2.10	2.10	2.80	11.05	11.05
26	1999	SUMMER	6	10.47	3.4000	23.20	9.88	4.03	94	3.40	3.40	4.80	23.20	23.20
26	2000	SPRING	3	9.99	4.6500	19.99	8.66	5.00	87	4.65	4.65	5.33	19.99	19.99
28	1999	FALL	10	14.60	3.5000	26.80	10.29	3.25	70	3.50	4.00	14.50	24.20	26.80
28	1999	SUMMER	10	16.20	8.5000	38.30	11.73	3.71	72	8.50	10.40	11.40	12.40	38.30
28	2000	SPRING	5	9.15	1.8000	34.63	14.31	6.40	157	1.80	1.80	2.35	5.15	34.63
43	1999	FALL	2	4.50	1.1000	7.90	4.81	3.40	107	1.10	1.10	4.50	7.90	7.90
43	1999	SUMMER	2	28.50	4.4070	52.60	34.08	24.10	120	4.41	4.41	28.50	52.60	52.60
43	2000	SPRING	1	36.49	36.490	36.49	.	.	.	36.49	36.49	36.49	36.49	36.49
44	1999	FALL	11	2.94	.90000	6.60	2.41	0.73	82	0.90	1.10	1.80	5.20	6.60
44	1999	SUMMER	11	13.11	1.6700	49.35	18.31	5.52	140	1.67	2.00	4.77	12.10	49.35
44	2000	SPRING	6	3.50	1.3000	5.95	1.64	0.67	47	1.30	2.73	3.13	4.77	5.95

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1999 to 2000
Chloro_A_Pheo_cor_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1999	FALL	3	2.53	1.4000	4.30	1.55	0.90	61	1.40	1.40	1.90	4.30	4.30
26	1999	SUMMER	3	7.47	2.9000	15.30	6.81	3.93	91	2.90	2.90	4.20	15.30	15.30
26	2000	SPRING	3	2.21	.95000	4.63	2.10	1.21	95	0.95	0.95	1.05	4.63	4.63
28	1999	FALL	5	5.78	2.2000	9.20	2.96	1.33	51	2.20	3.30	6.40	7.80	9.20
28	1999	SUMMER	5	9.16	5.4000	18.10	5.23	2.34	57	5.40	5.90	7.00	9.40	18.10
28	2000	SPRING	5	2.13	.95000	3.99	1.25	0.56	59	0.95	0.98	2.30	2.41	3.99
43	1999	FALL	1	3.40	3.4000	3.40	.	.	.	3.40	3.40	3.40	3.40	3.40
43	1999	SUMMER	1	9.12	9.1200	9.12	.	.	.	9.12	9.12	9.12	9.12	9.12
43	2000	SPRING	1	8.52	8.5200	8.52	.	.	.	8.52	8.52	8.52	8.52	8.52
44	1999	FALL	6	2.60	.90000	4.10	1.34	0.55	52	0.90	1.70	2.40	4.10	4.10
44	1999	SUMMER	6	6.92	2.2900	16.01	5.09	2.08	74	2.29	3.90	4.82	9.68	16.01
44	2000	SPRING	6	3.02	1.1100	5.43	1.51	0.61	50	1.11	2.10	2.92	3.63	5.43

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1996
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1990	FALL	2	4.88	.25000	9.50	6.54	4.63	134	0.25	0.25	4.88	9.50	9.50
26	1990	SPRING	2	9.65	2.6000	16.70	9.97	7.05	103	2.60	2.60	9.65	16.70	16.70
26	1990	SUMMER	10	4.85	.25000	23.80	6.98	2.21	144	0.25	1.00	2.95	4.60	23.80
26	1990	WINTER	2	10.53	.25000	20.80	14.53	10.28	138	0.25	0.25	10.53	20.80	20.80
26	1991	FALL	3	2.08	1.1000	3.75	1.45	0.84	70	1.10	1.10	1.40	3.75	3.75
26	1991	SPRING	3	12.48	.25000	36.95	21.19	12.23	170	0.25	0.25	0.25	36.95	36.95
26	1991	SUMMER	11	7.41	.25000	33.30	9.22	2.78	125	0.25	2.60	5.40	7.30	33.30
26	1991	WINTER	2	6.93	.25000	13.60	9.44	6.68	136	0.25	0.25	6.93	13.60	13.60
26	1992	FALL	4	5.58	.25000	12.20	6.24	3.12	112	0.25	0.25	4.93	10.90	12.20
26	1992	SPRING	3	4.97	2.3000	6.70	2.34	1.35	47	2.30	2.30	5.90	6.70	6.70
26	1992	SUMMER	12	4.26	.25000	14.35	5.11	1.47	120	0.25	0.25	2.35	6.70	14.35
26	1992	WINTER	4	3.83	.25000	9.00	4.23	2.11	110	0.25	0.38	3.03	7.28	9.00
26	1993	FALL	5	3.05	.25000	7.62	3.84	1.72	126	0.25	0.25	0.25	6.88	7.62
26	1993	SPRING	5	9.91	.25000	31.60	12.93	5.78	130	0.25	2.40	3.26	12.06	31.60
26	1993	SUMMER	6	15.97	.25000	65.63	25.02	10.21	157	0.25	0.25	8.04	13.60	65.63
26	1993	WINTER	2	0.25	.25000	0.25	0.00	0.00	0	0.25	0.25	0.25	0.25	0.25
26	1994	FALL	7	17.76	.25000	68.50	24.46	9.25	138	0.25	0.25	5.70	27.20	68.50
26	1994	SPRING	5	2.76	.25000	12.80	5.61	2.51	203	0.25	0.25	0.25	0.25	12.80
26	1994	SUMMER	5	10.50	.25000	42.40	18.05	8.07	172	0.25	0.25	2.58	7.00	42.40
26	1994	WINTER	4	1.36	.25000	3.14	1.39	0.70	103	0.25	0.25	1.02	2.46	3.14
26	1995	FALL	9	3.72	.25000	15.30	5.33	1.78	143	0.25	0.25	1.40	3.72	15.30
26	1995	SPRING	7	0.70	.25000	1.93	0.76	0.29	110	0.25	0.25	0.25	1.69	1.93
26	1995	SUMMER	8	0.50	.25000	2.22	0.70	0.25	140	0.25	0.25	0.25	0.25	2.22
26	1995	WINTER	6	0.88	.25000	4.00	1.53	0.63	175	0.25	0.25	0.25	0.25	4.00
26	1996	SPRING	10	5.65	.25000	23.60	7.38	2.33	131	0.25	0.25	2.69	9.27	23.60
26	1996	SUMMER	9	13.05	.25000	28.10	9.16	3.05	70	0.25	9.57	10.40	16.30	28.10
26	1996	WINTER	9	4.19	.25000	15.40	4.52	1.51	108	0.25	2.04	3.31	4.36	15.40
30	1990	FALL	10	2.55	.25000	16.00	4.88	1.54	192	0.25	0.25	0.63	2.00	16.00
30	1990	SPRING	12	2.25	.25000	6.90	2.25	0.65	100	0.25	0.53	1.23	4.00	6.90
30	1990	SUMMER	17	4.71	.25000	52.20	12.53	3.04	266	0.25	0.25	1.00	2.00	52.20
30	1990	WINTER	11	5.05	.25000	43.00	12.63	3.81	250	0.25	0.25	1.25	3.00	43.00
30	1991	FALL	12	3.20	.25000	26.00	7.30	2.11	228	0.25	0.25	0.38	2.65	26.00

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1996
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
30	1991	SPRING	8	1.18	.25000	3.30	1.13	0.40	96	0.25	0.25	0.91	1.80	3.30
30	1991	SUMMER	22	4.56	.25000	39.00	8.85	1.89	194	0.25	1.00	1.70	4.00	20.70
30	1991	WINTER	9	0.51	.25000	1.00	0.34	0.11	67	0.25	0.25	0.25	0.88	1.00
30	1992	FALL	5	0.25	.25000	0.25	0.00	0.00	0	0.25	0.25	0.25	0.25	0.25
30	1992	SPRING	15	1.00	.25000	5.00	1.31	0.34	132	0.25	0.25	0.25	1.80	5.00
30	1992	SUMMER	28	7.61	.25000	135.00	25.15	4.75	330	0.25	0.25	1.61	5.85	9.65
30	1992	WINTER	12	1.64	.25000	5.80	1.78	0.51	108	0.25	0.25	1.05	2.75	5.80
30	1993	FALL	7	2.07	.25000	6.23	2.46	0.93	119	0.25	0.25	0.25	4.33	6.23
30	1993	SPRING	16	1.34	.25000	15.50	3.79	0.95	283	0.25	0.25	0.25	0.31	15.50
30	1993	SUMMER	23	2.58	.25000	28.90	6.02	1.25	233	0.25	0.25	0.50	1.81	6.19
30	1993	WINTER	9	0.67	.25000	1.80	0.66	0.22	99	0.25	0.25	0.25	1.00	1.80
30	1994	FALL	18	1.45	.25000	6.76	2.25	0.53	155	0.25	0.25	0.25	1.60	6.76
30	1994	SPRING	13	3.09	.25000	10.70	3.14	0.87	102	0.25	0.25	2.14	5.21	10.70
30	1994	SUMMER	22	1.59	.25000	8.16	2.16	0.46	136	0.25	0.25	0.25	2.67	5.61
30	1994	WINTER	9	1.01	.25000	3.51	1.14	0.38	113	0.25	0.25	0.50	1.60	3.51
30	1995	FALL	18	7.29	.25000	27.30	8.32	1.96	114	0.25	0.25	4.66	8.79	27.30
30	1995	SPRING	18	2.17	.25000	17.00	3.91	0.92	180	0.25	0.25	0.71	2.85	17.00
30	1995	SUMMER	19	1.03	.25000	13.40	3.02	0.69	292	0.25	0.25	0.25	0.25	13.40
30	1995	WINTER	17	2.56	.25000	10.40	3.27	0.79	128	0.25	0.25	1.02	4.00	10.40
30	1996	SPRING	20	7.51	.25000	50.20	12.43	2.78	166	0.25	0.25	3.15	7.02	39.90
30	1996	SUMMER	20	12.75	.25000	78.50	24.43	5.46	192	0.25	0.25	2.33	7.45	74.00
30	1996	WINTER	20	1.25	.25000	6.03	1.77	0.40	142	0.25	0.25	0.25	2.38	5.61
31	1990	FALL	6	4.44	.25000	21.80	8.55	3.49	193	0.25	0.25	0.98	2.40	21.80
31	1990	SPRING	6	2.39	.25000	3.80	1.60	0.65	67	0.25	0.50	3.15	3.50	3.80
31	1990	SUMMER	17	7.01	.25000	28.70	9.33	2.26	133	0.25	0.50	2.00	8.50	28.70
31	1990	WINTER	4	1.38	.25000	3.80	1.68	0.84	122	0.25	0.25	0.73	2.50	3.80
31	1991	FALL	5	2.92	.25000	10.10	4.15	1.85	142	0.25	0.25	1.20	2.80	10.10
31	1991	SPRING	8	2.44	.25000	10.90	3.63	1.28	149	0.25	0.25	0.88	3.05	10.90
31	1991	SUMMER	7	5.52	.25000	20.80	8.08	3.05	146	0.25	1.00	1.00	12.90	20.80
31	1991	WINTER	5	10.81	.25000	52.00	23.03	10.30	213	0.25	0.25	0.25	1.30	52.00
31	1992	FALL	5	1.58	.25000	6.90	2.97	1.33	188	0.25	0.25	0.25	0.25	6.90
31	1992	SPRING	9	0.66	.25000	3.20	0.98	0.33	148	0.25	0.25	0.25	0.25	3.20

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

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
31	1992	SUMMER	12	2.93	.25000	14.90	4.21	1.22	144	0.25	0.25	1.36	3.45	14.90
31	1992	WINTER	3	0.53	.25000	1.10	0.49	0.28	92	0.25	0.25	0.25	1.10	1.10
31	1993	FALL	5	0.25	.25000	0.25	0.00	0.00	0	0.25	0.25	0.25	0.25	0.25
31	1993	SPRING	8	0.80	.25000	3.20	1.09	0.39	137	0.25	0.25	0.25	0.98	3.20
31	1993	SUMMER	15	7.32	.25000	43.30	14.52	3.75	198	0.25	0.25	2.18	4.05	43.30
31	1993	WINTER	4	1.43	.25000	2.20	0.88	0.44	62	0.25	0.75	1.63	2.10	2.20
31	1994	FALL	9	1.46	.25000	6.44	2.43	0.81	166	0.25	0.25	0.25	0.25	6.44
31	1994	SPRING	5	5.25	.25000	14.90	6.26	2.80	119	0.25	0.25	2.82	8.01	14.90
31	1994	SUMMER	10	1.54	.25000	6.68	2.42	0.76	157	0.25	0.25	0.25	1.60	6.68
31	1994	WINTER	7	4.77	.25000	14.00	6.27	2.37	132	0.25	0.25	1.78	13.60	14.00
31	1995	FALL	10	1.81	.25000	7.30	2.27	0.72	126	0.25	0.25	0.95	2.12	7.30
31	1995	SPRING	9	1.56	.25000	4.81	1.99	0.66	128	0.25	0.25	0.25	3.48	4.81
31	1995	SUMMER	9	1.53	.25000	11.80	3.85	1.28	251	0.25	0.25	0.25	0.25	11.80
31	1995	WINTER	4	1.59	.25000	5.61	2.68	1.34	169	0.25	0.25	0.25	2.93	5.61
31	1996	SPRING	7	1.62	.25000	4.76	1.84	0.69	113	0.25	0.25	0.25	3.00	4.76
31	1996	SUMMER	7	10.90	.25000	42.20	14.93	5.64	137	0.25	2.59	4.13	17.80	42.20
31	1996	WINTER	7	1.88	.25000	6.90	2.58	0.98	137	0.25	0.25	0.25	3.87	6.90
43	1992	SUMMER	1	0.25	.25000	0.25	.	.	.	0.25	0.25	0.25	0.25	0.25

Rivers and Streams
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from 1990 to 1999
DIP_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1990	FALL	7	48.57	7.5000	225.00	78.54	29.69	162	7.50	12.50	17.50	40.00	225.00
26	1990	SPRING	7	92.86	5.0000	280.00	108.24	40.91	117	5.00	5.00	20.00	170.00	280.00
26	1990	SUMMER	7	136.07	5.0000	865.00	321.62	121.56	236	5.00	5.00	12.50	30.00	865.00
26	1990	WINTER	7	118.21	7.5000	735.00	272.16	102.87	230	7.50	7.50	15.00	35.00	735.00
26	1991	FALL	7	326.07	5.0000	2200.00	826.45	312.37	253	5.00	5.00	7.50	45.00	2200.0
26	1991	SPRING	6	20.42	5.0000	60.00	21.41	8.74	105	5.00	7.50	10.00	30.00	60.00
26	1991	SUMMER	7	15.71	5.0000	55.00	18.75	7.09	119	5.00	5.00	7.50	25.00	55.00
26	1991	WINTER	7	17.86	5.0000	50.00	17.76	6.71	99	5.00	5.00	5.00	30.00	50.00
26	1992	FALL	7	138.93	5.0000	915.00	342.34	129.39	246	5.00	5.00	5.00	30.00	915.00
26	1992	SPRING	5	18.00	5.0000	70.00	29.07	13.00	161	5.00	5.00	5.00	5.00	70.00
26	1992	SUMMER	7	15.36	5.0000	35.00	13.42	5.07	87	5.00	5.00	5.00	30.00	35.00
26	1992	WINTER	6	27.92	5.0000	100.00	35.86	14.64	128	5.00	7.50	17.50	20.00	100.00
26	1993	FALL	7	257.14	5.0000	1700.00	636.45	240.56	248	5.00	5.00	7.50	50.00	1700.0
26	1993	SPRING	8	35.63	5.0000	210.00	71.09	25.13	200	5.00	5.00	5.00	25.00	210.00
26	1993	SUMMER	7	15.71	5.0000	75.00	26.17	9.89	167	5.00	5.00	5.00	7.50	75.00
26	1993	WINTER	6	7.50	5.0000	20.00	6.12	2.50	82	5.00	5.00	5.00	5.00	20.00
26	1994	FALL	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
26	1994	SPRING	7	12.50	5.0000	25.00	7.36	2.78	59	5.00	7.50	10.00	20.00	25.00
26	1994	SUMMER	6	18.33	5.0000	75.00	27.91	11.40	152	5.00	5.00	6.25	12.50	75.00
26	1994	WINTER	7	153.93	5.0000	1045.00	392.93	148.51	255	5.00	5.00	5.00	7.50	1045.0
26	1995	FALL	1	25.00	25.000	25.00	.	.	.	25.00	25.00	25.00	25.00	25.00
26	1995	SPRING	4	91.88	5.0000	280.00	128.73	64.37	140	5.00	8.75	41.25	175.00	280.00
26	1995	SUMMER	4	13.13	7.5000	17.50	4.27	2.13	33	7.50	10.00	13.75	16.25	17.50
26	1995	WINTER	1	12.50	12.500	12.50	.	.	.	12.50	12.50	12.50	12.50	12.50
26	1999	FALL	3	62.78	15.370	150.57	76.11	43.94	121	15.37	15.37	22.40	150.57	150.57
26	1999	SUMMER	3	89.65	24.150	212.94	106.84	61.69	119	24.15	24.15	31.85	212.94	212.94
28	1990	SPRING	2	60.00	5.0000	115.00	77.78	55.00	130	5.00	5.00	60.00	115.00	115.00
28	1990	SUMMER	1	25.00	25.000	25.00	.	.	.	25.00	25.00	25.00	25.00	25.00
28	1990	WINTER	2	97.50	20.000	175.00	109.60	77.50	112	20.00	20.00	97.50	175.00	175.00
28	1991	SPRING	1	35.00	35.000	35.00	.	.	.	35.00	35.00	35.00	35.00	35.00
28	1991	SUMMER	1	17.50	17.500	17.50	.	.	.	17.50	17.50	17.50	17.50	17.50
28	1992	SPRING	1	15.00	15.000	15.00	.	.	.	15.00	15.00	15.00	15.00	15.00

Aggregate Nutrient Ecoregion: IV
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DIP_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
28	1992	SUMMER	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
28	1992	WINTER	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
28	1993	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
28	1993	SUMMER	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
28	1994	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
28	1995	SPRING	1	12.50	12.500	12.50	.	.	.	12.50	12.50	12.50	12.50	12.50
28	1995	SUMMER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
28	1999	FALL	5	30.63	.00000	134.56	58.18	26.02	190	0.00	3.49	6.81	8.31	134.56
28	1999	SUMMER	5	32.90	5.7100	129.37	54.06	24.18	164	5.71	6.91	7.39	15.10	129.37
30	1990	FALL	1	45.00	45.000	45.00	.	.	.	45.00	45.00	45.00	45.00	45.00
30	1990	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1990	SUMMER	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
30	1991	FALL	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1991	SPRING	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
30	1991	SUMMER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1991	WINTER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1992	SPRING	1	12.50	12.500	12.50	.	.	.	12.50	12.50	12.50	12.50	12.50
30	1992	SUMMER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1992	WINTER	1	12.50	12.500	12.50	.	.	.	12.50	12.50	12.50	12.50	12.50
30	1993	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1993	SUMMER	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
30	1993	WINTER	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
30	1994	FALL	1	12.50	12.500	12.50	.	.	.	12.50	12.50	12.50	12.50	12.50
30	1994	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1994	WINTER	1	17.50	17.500	17.50	.	.	.	17.50	17.50	17.50	17.50	17.50
30	1995	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1995	SUMMER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1995	WINTER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
43	1990	FALL	16	17.81	5.0000	120.00	30.45	7.61	171	5.00	5.00	6.25	12.50	120.00
43	1990	SPRING	15	15.33	5.0000	80.00	20.22	5.22	132	5.00	5.00	7.50	15.00	80.00
43	1990	SUMMER	15	20.17	5.0000	67.50	19.35	5.00	96	5.00	5.00	12.50	27.50	67.50
43	1990	WINTER	14	112.14	5.0000	1300.00	343.20	91.73	306	5.00	5.00	6.25	45.00	1300.0

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	1991	FALL	16	64.38	5.0000	720.00	177.16	44.29	275	5.00	5.00	7.50	32.50	720.00
43	1991	SPRING	15	14.00	5.0000	55.00	14.75	3.81	105	5.00	5.00	7.50	17.50	55.00
43	1991	SUMMER	15	24.67	5.0000	200.00	49.71	12.84	202	5.00	5.00	7.50	15.00	200.00
43	1991	WINTER	14	78.75	5.0000	770.00	202.95	54.24	258	5.00	5.00	10.00	17.50	770.00
43	1992	FALL	16	10.47	5.0000	35.00	8.43	2.11	80	5.00	5.00	6.25	13.75	35.00
43	1992	SPRING	14	18.04	5.0000	160.00	41.23	11.02	229	5.00	5.00	5.00	5.00	160.00
43	1992	SUMMER	18	33.75	5.0000	235.00	63.54	14.98	188	5.00	5.00	7.50	20.00	235.00
43	1992	WINTER	12	39.58	5.0000	185.00	56.85	16.41	144	5.00	5.00	12.50	52.50	185.00
43	1993	FALL	12	13.75	5.0000	45.00	11.56	3.34	84	5.00	6.25	7.50	18.75	45.00
43	1993	SPRING	15	33.90	5.0000	145.00	43.03	11.11	127	5.00	10.00	15.00	42.50	145.00
43	1993	SUMMER	16	115.56	5.0000	1150.00	282.07	70.52	244	5.00	8.75	15.75	95.00	1150.0
43	1993	WINTER	10	60.35	7.5000	275.00	95.64	30.25	158	7.50	7.50	10.00	66.00	275.00
43	1994	FALL	7	7.14	5.0000	12.50	3.04	1.15	43	5.00	5.00	5.00	10.00	12.50
43	1994	SPRING	12	15.33	5.0000	70.00	17.87	5.16	117	5.00	6.25	10.00	16.25	70.00
43	1994	SUMMER	9	17.50	5.0000	65.00	24.24	8.08	139	5.00	5.00	5.00	7.50	65.00
43	1994	WINTER	3	58.33	5.0000	110.00	52.52	30.32	90	5.00	5.00	60.00	110.00	110.00
43	1995	SPRING	6	17.50	5.0000	50.00	19.94	8.14	114	5.00	5.00	5.00	35.00	50.00
43	1995	SUMMER	4	8.13	5.0000	17.50	6.25	3.13	77	5.00	5.00	5.00	11.25	17.50
43	1995	WINTER	2	32.50	5.0000	60.00	38.89	27.50	120	5.00	5.00	32.50	60.00	60.00
43	1999	FALL	1	112.94	112.94	112.94	.	.	.	112.94	112.94	112.94	112.94	112.94
43	1999	SUMMER	1	101.01	101.01	101.01	.	.	.	101.01	101.01	101.01	101.01	101.01
43	1999	WINTER	14	34.25	2.0000	127.00	36.42	9.73	106	2.00	8.00	23.00	48.00	127.00
44	1990	FALL	1	125.00	125.00	125.00	.	.	.	125.00	125.00	125.00	125.00	125.00
44	1990	SPRING	1	125.00	125.00	125.00	.	.	.	125.00	125.00	125.00	125.00	125.00
44	1990	SUMMER	1	125.00	125.00	125.00	.	.	.	125.00	125.00	125.00	125.00	125.00
44	1990	WINTER	1	135.00	135.00	135.00	.	.	.	135.00	135.00	135.00	135.00	135.00
44	1991	FALL	1	145.00	145.00	145.00	.	.	.	145.00	145.00	145.00	145.00	145.00
44	1991	SPRING	1	120.00	120.00	120.00	.	.	.	120.00	120.00	120.00	120.00	120.00
44	1991	SUMMER	1	130.00	130.00	130.00	.	.	.	130.00	130.00	130.00	130.00	130.00
44	1991	WINTER	1	120.00	120.00	120.00	.	.	.	120.00	120.00	120.00	120.00	120.00
44	1992	FALL	1	145.00	145.00	145.00	.	.	.	145.00	145.00	145.00	145.00	145.00
44	1992	SPRING	1	130.00	130.00	130.00	.	.	.	130.00	130.00	130.00	130.00	130.00

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
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from 1990 to 1999
DIP_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
44	1992	SUMMER	1	140.00	140.00	140.00	.	.	.	140.00	140.00	140.00	140.00	140.00
44	1992	WINTER	1	135.00	135.00	135.00	.	.	.	135.00	135.00	135.00	135.00	135.00
44	1993	FALL	1	125.00	125.00	125.00	.	.	.	125.00	125.00	125.00	125.00	125.00
44	1993	SPRING	1	135.00	135.00	135.00	.	.	.	135.00	135.00	135.00	135.00	135.00
44	1993	SUMMER	1	140.00	140.00	140.00	.	.	.	140.00	140.00	140.00	140.00	140.00
44	1993	WINTER	1	140.00	140.00	140.00	.	.	.	140.00	140.00	140.00	140.00	140.00
44	1994	FALL	1	140.00	140.00	140.00	.	.	.	140.00	140.00	140.00	140.00	140.00
44	1994	SPRING	1	125.00	125.00	125.00	.	.	.	125.00	125.00	125.00	125.00	125.00
44	1994	SUMMER	1	135.00	135.00	135.00	.	.	.	135.00	135.00	135.00	135.00	135.00
44	1995	FALL	1	130.00	130.00	130.00	.	.	.	130.00	130.00	130.00	130.00	130.00
44	1995	SPRING	1	140.00	140.00	140.00	.	.	.	140.00	140.00	140.00	140.00	140.00
44	1995	SUMMER	1	100.00	100.00	100.00	.	.	.	100.00	100.00	100.00	100.00	100.00
44	1999	FALL	5	171.00	95.570	322.91	92.41	41.33	54	95.57	99.54	156.76	180.23	322.91
44	1999	SUMMER	5	208.98	100.42	427.51	140.94	63.03	67	100.42	116.83	125.04	275.11	427.51

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
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from 1998 to 1998
Dissolved_Oxygen_percent_sat

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	1998	FALL	8	98.53	85.722	111.00	7.61	2.69	8	85.72	93.70	99.51	102.53	111.00
43	1998	SUMMER	14	104.65	89.412	143.68	15.65	4.18	15	89.41	95.06	98.72	108.74	143.68

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1990	FALL	39	10.19	6.2000	14.10	1.85	0.30	18	7.00	8.80	10.00	11.40	13.30
26	1990	SPRING	37	9.33	7.4000	13.00	1.31	0.22	14	7.65	8.50	8.90	10.20	12.10
26	1990	SUMMER	45	7.97	5.4000	11.95	1.30	0.19	16	6.30	7.30	7.80	8.30	10.55
26	1990	WINTER	28	11.61	8.7500	14.50	1.29	0.24	11	9.20	10.65	11.65	12.40	13.90
26	1991	FALL	38	10.17	7.0000	13.60	1.39	0.23	14	8.00	9.10	10.43	11.00	12.40
26	1991	SPRING	40	9.20	6.4000	12.40	1.31	0.21	14	7.23	8.43	8.90	9.85	11.90
26	1991	SUMMER	42	7.83	5.4000	13.40	1.62	0.25	21	6.20	6.90	7.45	8.10	11.00
26	1991	WINTER	29	11.88	7.7000	14.50	1.39	0.26	12	9.35	11.10	12.10	12.70	13.90
26	1992	FALL	37	10.22	7.8000	13.90	1.37	0.23	13	8.20	9.40	9.80	10.90	13.60
26	1992	SPRING	42	9.08	5.7000	13.20	1.57	0.24	17	7.00	8.00	8.98	10.05	11.40
26	1992	SUMMER	44	7.95	6.4000	13.00	1.27	0.19	16	6.50	7.13	7.78	8.35	10.10
26	1992	WINTER	27	11.68	8.7000	14.70	1.76	0.34	15	8.90	10.60	11.40	13.10	14.60
26	1993	FALL	25	10.36	7.4000	13.40	1.31	0.26	13	8.85	9.55	10.15	10.90	12.75
26	1993	SPRING	25	9.88	8.4500	12.50	1.08	0.22	11	8.65	9.10	9.75	10.30	12.05
26	1993	SUMMER	25	7.46	4.1000	10.35	1.15	0.23	15	6.00	7.10	7.50	8.00	9.10
26	1993	WINTER	23	11.75	9.2000	14.50	1.33	0.28	11	9.40	11.00	11.60	12.70	13.50
26	1994	FALL	20	8.59	6.5000	10.60	0.93	0.21	11	6.85	8.10	8.68	9.00	10.30
26	1994	SPRING	27	9.54	6.2000	14.00	1.44	0.28	15	8.20	8.70	9.10	10.40	11.90
26	1994	SUMMER	26	7.87	5.3000	10.40	1.14	0.22	15	6.60	7.15	7.70	8.65	9.55
26	1994	WINTER	22	11.86	10.000	14.25	0.97	0.21	8	10.60	11.20	12.03	12.40	13.10
26	1995	FALL	22	9.81	7.6000	12.80	1.36	0.29	14	8.00	8.90	9.45	10.60	12.00
26	1995	SPRING	21	9.39	7.2000	11.75	1.14	0.25	12	7.30	8.95	9.40	9.80	11.60
26	1995	SUMMER	23	7.78	5.5000	12.90	1.40	0.29	18	6.30	7.15	7.50	8.10	9.60
26	1995	WINTER	19	11.87	8.0000	14.00	1.70	0.39	14	8.00	10.70	12.65	13.00	14.00
26	1996	FALL	29	9.86	7.2000	12.40	1.44	0.27	15	7.90	8.70	9.80	11.00	12.40
26	1996	SPRING	23	9.77	5.4500	12.70	1.78	0.37	18	6.80	9.00	10.00	11.00	11.70
26	1996	SUMMER	24	7.56	5.8000	9.50	0.95	0.19	13	6.25	6.75	7.48	8.28	9.10
26	1996	WINTER	24	11.63	8.9500	14.60	1.36	0.28	12	9.65	10.53	11.68	12.53	13.35
26	1997	FALL	14	10.40	9.2000	12.00	0.82	0.22	8	9.20	9.60	10.53	10.80	12.00
26	1997	SPRING	17	9.72	8.6500	12.80	1.21	0.29	12	8.65	8.90	9.20	10.10	12.80
26	1997	SUMMER	11	7.89	7.2500	8.40	0.38	0.11	5	7.25	7.60	7.90	8.30	8.40
26	1997	WINTER	21	12.30	10.200	13.60	1.00	0.22	8	10.40	11.60	12.40	13.20	13.40

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1998	WINTER	5	13.74	12.800	14.60	0.66	0.30	5	12.80	13.50	13.80	14.00	14.60
26	1999	FALL	6	11.84	11.020	13.23	1.08	0.44	9	11.02	11.02	11.28	13.23	13.23
26	1999	SUMMER	6	8.09	7.0600	9.67	1.24	0.51	15	7.06	7.06	7.53	9.67	9.67
26	2000	SPRING	3	9.18	8.2500	10.60	1.25	0.72	14	8.25	8.25	8.70	10.60	10.60
26	2000	SUMMER	3	5.63	5.3000	6.30	0.58	0.33	10	5.30	5.30	5.30	6.30	6.30
28	1990	FALL	21	7.57	4.7500	9.95	1.26	0.28	17	5.40	6.85	7.70	8.25	9.75
28	1990	SPRING	21	9.14	6.5000	10.20	0.98	0.21	11	7.15	9.00	9.35	9.80	10.10
28	1990	SUMMER	22	6.84	4.4000	10.25	1.17	0.25	17	5.40	6.40	6.58	7.25	8.60
28	1990	WINTER	8	10.44	8.9000	11.40	0.92	0.33	9	8.90	9.65	10.75	11.20	11.40
28	1991	FALL	20	7.46	4.2000	11.40	1.97	0.44	26	4.50	5.45	7.90	8.40	11.35
28	1991	SPRING	22	8.46	6.4500	11.90	1.41	0.30	17	6.55	7.20	8.53	9.20	10.30
28	1991	SUMMER	23	6.26	2.4000	10.30	1.85	0.39	30	4.20	4.70	6.45	7.10	9.00
28	1991	WINTER	14	12.03	10.000	13.65	1.04	0.28	9	10.00	11.55	12.08	12.75	13.65
28	1992	FALL	27	8.11	5.4000	10.20	1.19	0.23	15	6.00	7.40	8.20	9.30	9.50
28	1992	SPRING	27	8.81	6.2500	12.20	1.29	0.25	15	7.50	8.00	8.70	9.10	11.90
28	1992	SUMMER	28	6.71	3.3000	10.60	1.38	0.26	21	4.40	6.30	6.83	7.35	8.40
28	1992	WINTER	28	11.59	10.200	12.70	0.68	0.13	6	10.30	11.33	11.73	11.98	12.55
28	1993	FALL	22	8.87	6.2500	12.15	1.44	0.31	16	6.45	8.15	8.90	9.55	11.00
28	1993	SPRING	23	9.85	8.9500	10.60	0.43	0.09	4	9.00	9.60	9.85	10.10	10.50
28	1993	SUMMER	23	7.07	6.2000	9.00	0.81	0.17	11	6.20	6.60	6.80	7.25	8.85
28	1993	WINTER	16	12.30	11.000	13.80	0.85	0.21	7	11.00	11.73	12.30	13.03	13.80
28	1994	FALL	23	7.26	2.9000	10.55	2.15	0.45	30	3.10	6.30	7.40	9.20	10.50
28	1994	SPRING	22	9.48	6.7000	13.70	1.66	0.35	18	6.90	8.75	9.20	10.30	12.20
28	1994	SUMMER	27	6.45	1.0000	11.80	1.92	0.37	30	4.60	5.50	6.30	7.20	9.60
28	1994	WINTER	20	12.43	7.7000	14.40	1.66	0.37	13	8.70	11.35	13.05	13.53	14.15
28	1995	FALL	26	8.75	5.1500	11.10	1.46	0.29	17	6.10	8.05	9.03	9.75	10.50
28	1995	SPRING	26	8.98	6.4000	10.50	0.95	0.19	11	7.45	8.50	9.03	9.50	10.50
28	1995	SUMMER	26	7.37	5.7000	9.80	0.98	0.19	13	6.00	6.60	7.28	7.80	9.40
28	1995	WINTER	21	13.03	10.800	14.70	1.03	0.22	8	11.10	12.50	13.15	13.85	14.40
28	1996	FALL	31	8.90	4.5000	11.30	1.58	0.28	18	6.10	7.80	9.00	10.05	11.00
28	1996	SPRING	32	9.69	6.2500	13.70	1.36	0.24	14	8.00	8.98	9.55	10.63	11.55
28	1996	SUMMER	31	6.95	3.1500	10.00	1.49	0.27	21	3.90	6.70	7.15	7.70	9.50

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
28	1996	WINTER	22	12.71	10.700	14.10	0.93	0.20	7	11.10	12.10	12.95	13.45	14.00
28	1997	FALL	27	8.52	3.6000	11.10	1.98	0.38	23	4.95	7.50	8.80	10.10	11.10
28	1997	SPRING	27	9.84	7.7000	11.85	1.13	0.22	11	8.00	9.00	9.80	10.90	11.50
28	1997	SUMMER	27	7.14	4.9500	9.50	1.11	0.21	16	5.20	6.50	7.20	8.00	8.65
28	1997	WINTER	23	12.51	8.3500	14.35	1.24	0.26	10	11.50	11.90	12.60	13.20	14.10
28	1999	FALL	10	7.95	6.9400	9.03	0.80	0.25	10	6.94	7.52	7.64	8.60	9.03
28	1999	SUMMER	6	8.15	7.3200	9.43	1.00	0.41	12	7.32	7.32	7.71	9.43	9.43
28	2000	SPRING	5	11.14	8.1000	13.52	1.97	0.88	18	8.10	10.80	11.48	11.80	13.52
28	2000	SUMMER	5	5.87	5.0000	6.95	0.72	0.32	12	5.00	5.50	5.90	6.00	6.95
30	1990	FALL	12	8.00	5.9000	9.90	1.15	0.33	14	5.90	7.15	8.00	8.85	9.90
30	1990	SPRING	27	8.27	6.2000	10.60	1.07	0.21	13	6.80	7.50	8.10	8.90	10.50
30	1990	SUMMER	28	7.41	3.3000	10.10	1.28	0.24	17	6.10	6.70	7.45	8.05	9.70
30	1990	WINTER	22	10.36	7.7000	12.60	1.16	0.25	11	8.60	9.60	10.35	11.30	11.95
30	1991	FALL	15	8.68	4.2000	13.00	2.15	0.55	25	4.20	7.80	9.05	9.50	13.00
30	1991	SPRING	26	8.02	6.4000	10.20	0.99	0.19	12	6.60	7.10	7.98	8.90	9.50
30	1991	SUMMER	32	7.13	4.1000	12.00	1.72	0.30	24	4.90	5.90	7.08	7.88	10.50
30	1991	WINTER	23	10.33	8.7000	12.25	1.04	0.22	10	8.90	9.30	10.35	11.30	11.85
30	1992	FALL	13	8.01	2.3000	10.60	2.24	0.62	28	2.30	7.30	7.90	9.80	10.60
30	1992	SPRING	25	8.06	5.9000	10.50	1.06	0.21	13	6.20	7.50	8.00	8.75	9.90
30	1992	SUMMER	36	7.63	3.7000	12.10	1.18	0.20	15	6.60	7.05	7.60	8.05	9.10
30	1992	WINTER	28	9.91	8.9000	12.50	0.97	0.18	10	9.10	9.25	9.60	10.10	12.00
30	1993	FALL	7	8.96	7.6000	10.80	1.17	0.44	13	7.60	8.10	8.50	10.30	10.80
30	1993	SPRING	18	8.79	5.7000	13.10	1.59	0.38	18	5.70	8.20	8.90	9.30	13.10
30	1993	SUMMER	24	7.86	5.1000	10.10	1.09	0.22	14	5.90	7.40	7.95	8.30	9.80
30	1993	WINTER	11	10.33	9.5000	12.20	0.74	0.22	7	9.50	9.80	10.30	10.50	12.20
30	1994	FALL	17	8.21	6.7000	9.40	0.70	0.17	9	6.70	7.70	8.30	8.85	9.40
30	1994	SPRING	15	7.93	6.8000	9.75	0.95	0.25	12	6.80	7.10	7.80	8.60	9.75
30	1994	SUMMER	21	7.73	5.1000	9.60	1.40	0.31	18	5.50	6.70	7.90	8.90	9.40
30	1994	WINTER	14	9.63	8.2000	11.50	0.94	0.25	10	8.20	9.00	9.50	10.00	11.50
30	1995	FALL	14	8.89	6.7000	10.90	1.34	0.36	15	6.70	7.80	9.25	9.90	10.90
30	1995	SPRING	20	8.21	6.1000	12.30	1.33	0.30	16	6.15	7.60	8.10	8.78	11.10
30	1995	SUMMER	24	7.03	3.2000	10.90	1.57	0.32	22	4.70	6.05	7.00	7.85	9.10

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
30	1995	WINTER	20	9.56	8.2000	12.40	1.15	0.26	12	8.25	8.80	9.33	9.93	12.10
30	1996	FALL	6	7.51	6.4000	9.20	1.05	0.43	14	6.40	6.75	7.35	8.00	9.20
30	1996	SPRING	19	8.49	6.3000	12.90	1.47	0.34	17	6.30	7.40	8.20	9.30	12.90
30	1996	SUMMER	21	6.81	3.9000	8.40	1.36	0.30	20	4.20	6.25	7.10	7.80	8.40
30	1996	WINTER	17	9.28	6.7000	12.50	1.30	0.32	14	6.70	8.40	9.30	10.00	12.50
30	1997	SPRING	5	8.96	7.9000	9.80	0.74	0.33	8	7.90	8.70	8.90	9.50	9.80
30	1997	WINTER	9	9.66	7.9000	10.70	0.82	0.27	8	7.90	9.60	9.70	10.05	10.70
31	1990	FALL	7	8.17	5.7000	9.60	1.26	0.48	15	5.70	7.50	8.40	8.90	9.60
31	1990	SPRING	7	8.69	6.3000	11.95	1.76	0.67	20	6.30	7.70	8.50	9.60	11.95
31	1990	SUMMER	12	7.57	6.0000	11.10	1.64	0.47	22	6.00	6.25	7.03	8.85	11.10
31	1990	WINTER	7	8.95	7.4000	12.40	1.61	0.61	18	7.40	8.00	8.50	8.95	12.40
31	1991	FALL	7	7.69	6.7000	8.60	0.82	0.31	11	6.70	6.80	8.10	8.40	8.60
31	1991	SPRING	9	8.76	6.6500	13.90	2.31	0.77	26	6.65	7.00	8.20	10.00	13.90
31	1991	SUMMER	8	7.38	5.6000	9.40	1.20	0.42	16	5.60	6.53	7.50	8.00	9.40
31	1991	WINTER	7	9.92	8.0000	13.40	1.77	0.67	18	8.00	9.00	9.10	10.85	13.40
31	1992	FALL	5	7.92	7.4500	8.10	0.27	0.12	3	7.45	8.00	8.00	8.05	8.10
31	1992	SPRING	11	8.52	7.8000	9.50	0.57	0.17	7	7.80	8.10	8.40	9.00	9.50
31	1992	SUMMER	14	6.96	4.5000	10.30	1.25	0.33	18	4.50	6.50	6.85	7.00	10.30
31	1992	WINTER	7	9.20	7.0000	10.65	1.19	0.45	13	7.00	8.50	9.25	10.00	10.65
31	1993	FALL	5	8.84	7.4000	11.40	1.58	0.71	18	7.40	7.70	8.70	9.00	11.40
31	1993	SPRING	10	9.65	8.3000	11.40	1.16	0.37	12	8.30	8.40	9.65	10.25	11.40
31	1993	SUMMER	15	7.82	4.9000	9.50	1.06	0.27	14	4.90	7.20	8.00	8.30	9.50
31	1993	WINTER	7	9.35	8.0500	10.65	0.97	0.37	10	8.05	8.55	9.00	10.30	10.65
31	1994	FALL	7	8.00	6.2000	9.40	1.06	0.40	13	6.20	7.20	8.20	8.80	9.40
31	1994	SPRING	6	7.03	3.6000	8.70	1.87	0.77	27	3.60	6.50	7.43	8.55	8.70
31	1994	SUMMER	10	7.68	5.9000	9.00	0.92	0.29	12	5.90	7.20	7.75	8.30	9.00
31	1994	WINTER	7	8.41	6.8000	11.60	1.53	0.58	18	6.80	7.65	8.00	8.65	11.60
31	1995	FALL	8	6.89	1.5000	9.60	2.70	0.95	39	1.50	5.35	8.10	8.55	9.60
31	1995	SPRING	9	8.33	6.4000	10.00	1.12	0.37	13	6.40	7.90	8.25	8.80	10.00
31	1995	SUMMER	9	8.02	4.8000	13.10	2.34	0.78	29	4.80	6.80	8.40	8.70	13.10
31	1995	WINTER	6	9.28	7.5000	10.35	1.02	0.41	11	7.50	8.80	9.50	10.00	10.35
31	1996	FALL	2	6.10	5.4000	6.80	0.99	0.70	16	5.40	5.40	6.10	6.80	6.80

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
31	1996	SPRING	4	8.03	6.6000	10.40	1.67	0.84	21	6.60	6.90	7.55	9.15	10.40
31	1996	SUMMER	4	6.78	5.9000	8.10	0.99	0.50	15	5.90	6.03	6.55	7.53	8.10
31	1996	WINTER	4	9.98	9.1000	10.80	0.77	0.38	8	9.10	9.35	10.00	10.60	10.80
31	1997	SPRING	1	8.05	8.0500	8.05	.	.	.	8.05	8.05	8.05	8.05	8.05
31	1997	WINTER	2	10.50	10.000	11.00	0.71	0.50	7	10.00	10.00	10.50	11.00	11.00
43	1990	FALL	50	10.76	7.0000	14.60	1.55	0.22	14	8.40	9.65	10.63	11.60	14.00
43	1990	SPRING	59	10.45	7.3000	13.20	1.16	0.15	11	8.00	9.80	10.60	11.30	12.10
43	1990	SUMMER	64	8.45	5.0000	13.50	1.56	0.20	18	6.50	7.50	8.25	9.10	11.60
43	1990	WINTER	45	11.12	7.0000	14.20	1.72	0.26	15	7.40	10.30	11.25	12.45	13.40
43	1991	FALL	48	10.56	7.3000	13.50	1.34	0.19	13	8.00	9.85	10.78	11.25	12.40
43	1991	SPRING	63	10.37	6.8000	13.60	1.43	0.18	14	8.05	9.35	10.45	11.50	12.70
43	1991	SUMMER	56	7.80	4.6000	10.20	1.19	0.16	15	5.50	7.00	7.85	8.78	9.85
43	1991	WINTER	40	11.16	4.0000	13.60	2.11	0.33	19	6.10	10.13	11.73	12.70	13.35
43	1992	FALL	40	10.99	6.7000	13.20	1.23	0.19	11	9.25	10.25	11.10	11.60	12.95
43	1992	SPRING	56	11.13	6.5000	14.00	1.52	0.20	14	9.00	10.00	11.00	12.25	13.65
43	1992	SUMMER	52	8.62	2.5000	12.00	1.79	0.25	21	5.20	8.05	8.45	9.60	11.30
43	1992	WINTER	35	11.77	6.6000	14.20	1.85	0.31	16	8.00	11.00	12.40	13.20	13.85
43	1993	FALL	34	10.88	9.0000	13.70	1.21	0.21	11	9.00	10.05	10.75	11.65	13.20
43	1993	SPRING	42	10.75	8.2000	13.15	1.20	0.19	11	8.80	10.10	10.88	11.60	12.60
43	1993	SUMMER	41	8.40	6.8000	10.90	1.03	0.16	12	7.10	7.60	8.30	8.90	10.60
43	1993	WINTER	30	11.54	7.2000	13.95	1.37	0.25	12	9.10	11.15	11.58	12.60	13.30
43	1994	FALL	32	10.54	7.7500	13.90	1.60	0.28	15	8.50	9.08	10.50	11.65	13.00
43	1994	SPRING	32	10.11	6.9000	13.00	1.42	0.25	14	7.10	9.40	10.20	11.10	12.00
43	1994	SUMMER	33	8.14	4.6000	10.60	1.07	0.19	13	6.60	7.70	8.30	8.70	9.50
43	1994	WINTER	27	11.90	6.5000	13.70	1.68	0.32	14	8.80	10.90	12.40	13.20	13.70
43	1995	FALL	25	10.79	8.4000	14.00	1.07	0.21	10	9.20	10.50	10.70	11.20	12.20
43	1995	SPRING	27	10.56	7.3000	12.60	1.12	0.22	11	8.80	10.10	10.55	11.30	12.20
43	1995	SUMMER	29	7.93	4.8000	10.20	1.31	0.24	17	5.60	6.95	8.30	8.70	9.80
43	1995	WINTER	17	12.43	11.550	13.45	0.58	0.14	5	11.55	11.90	12.50	12.80	13.45
43	1996	FALL	22	11.61	5.4000	14.00	1.90	0.41	16	8.95	10.60	12.10	12.80	13.20
43	1996	SPRING	24	10.69	8.5500	14.30	1.38	0.28	13	9.00	9.70	10.50	11.40	13.20
43	1996	SUMMER	23	9.03	7.2000	12.60	1.14	0.24	13	7.50	8.30	8.90	9.40	10.25

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	1996	WINTER	18	12.05	9.5000	13.40	1.03	0.24	9	9.50	11.75	12.25	12.80	13.40
43	1997	FALL	16	10.98	7.0000	13.50	1.59	0.40	14	7.00	10.05	11.05	11.95	13.50
43	1997	SPRING	17	10.02	8.2000	11.90	1.05	0.25	10	8.20	9.40	9.80	10.70	11.90
43	1997	SUMMER	17	8.49	7.2000	10.20	0.69	0.17	8	7.20	8.20	8.50	8.80	10.20
43	1997	WINTER	15	11.84	7.5000	14.40	2.04	0.53	17	7.50	10.40	12.70	13.30	14.40
43	1998	SPRING	19	11.18	10.300	13.00	0.71	0.16	6	10.30	10.60	11.05	11.60	13.00
43	1998	WINTER	17	12.55	11.600	14.10	0.77	0.19	6	11.60	11.90	12.20	13.40	14.10
43	1999	SUMMER	2	9.26	9.1000	9.42	0.23	0.16	2	9.10	9.10	9.26	9.42	9.42
43	2000	SPRING	1	8.52	8.5200	8.52	.	.	.	8.52	8.52	8.52	8.52	8.52
43	2000	SUMMER	1	9.80	9.8000	9.80	.	.	.	9.80	9.80	9.80	9.80	9.80
44	1990	FALL	3	10.00	9.3000	10.90	0.82	0.47	8	9.30	9.30	9.80	10.90	10.90
44	1990	SPRING	3	9.77	8.5000	10.40	1.10	0.63	11	8.50	8.50	10.40	10.40	10.40
44	1990	SUMMER	3	8.67	7.8000	9.70	0.96	0.55	11	7.80	7.80	8.50	9.70	9.70
44	1990	WINTER	3	11.28	10.600	11.65	0.59	0.34	5	10.60	10.60	11.60	11.65	11.65
44	1991	FALL	3	9.77	7.8000	11.10	1.74	1.00	18	7.80	7.80	10.40	11.10	11.10
44	1991	SPRING	2	9.70	8.1000	11.30	2.26	1.60	23	8.10	8.10	9.70	11.30	11.30
44	1991	SUMMER	3	8.15	7.9500	8.50	0.30	0.18	4	7.95	7.95	8.00	8.50	8.50
44	1991	WINTER	3	11.05	10.000	12.80	1.53	0.88	14	10.00	10.00	10.35	12.80	12.80
44	1992	FALL	6	9.40	7.6000	11.20	1.28	0.52	14	7.60	8.60	9.30	10.40	11.20
44	1992	SPRING	3	9.20	8.7000	10.15	0.82	0.48	9	8.70	8.70	8.75	10.15	10.15
44	1992	SUMMER	3	7.93	7.1000	9.20	1.12	0.64	14	7.10	7.10	7.50	9.20	9.20
44	1992	WINTER	3	11.52	10.600	12.55	0.98	0.57	9	10.60	10.60	11.40	12.55	12.55
44	1993	FALL	2	9.25	7.8000	10.70	2.05	1.45	22	7.80	7.80	9.25	10.70	10.70
44	1993	SPRING	3	10.53	9.0000	12.70	1.93	1.11	18	9.00	9.00	9.90	12.70	12.70
44	1993	SUMMER	5	7.91	7.0000	8.70	0.65	0.29	8	7.00	7.55	8.10	8.20	8.70
44	1993	WINTER	3	11.47	9.3000	13.30	2.02	1.17	18	9.30	9.30	11.80	13.30	13.30
44	1994	FALL	5	10.04	4.3000	14.30	3.80	1.70	38	4.30	8.70	10.80	12.10	14.30
44	1994	SPRING	4	9.94	9.1000	11.00	0.92	0.46	9	9.10	9.18	9.83	10.70	11.00
44	1994	SUMMER	8	8.20	7.2000	10.10	0.88	0.31	11	7.20	7.70	8.00	8.45	10.10
44	1994	WINTER	1	9.00	9.0000	9.00	.	.	.	9.00	9.00	9.00	9.00	9.00
44	1995	FALL	1	11.70	11.700	11.70	.	.	.	11.70	11.70	11.70	11.70	11.70
44	1995	SPRING	1	9.50	9.5000	9.50	.	.	.	9.50	9.50	9.50	9.50	9.50

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
44	1995	SUMMER	1	9.50	9.5000	9.50	.	.	.	9.50	9.50	9.50	9.50	9.50
44	1999	FALL	4	5.70	1.0000	10.40	5.43	2.71	95	1.00	1.00	5.70	10.40	10.40
44	1999	SUMMER	11	8.08	7.4000	9.42	0.55	0.17	7	7.40	7.86	8.00	8.38	9.42
44	2000	SPRING	6	7.92	6.7500	9.67	1.24	0.51	16	6.75	6.84	7.74	8.76	9.67
44	2000	SUMMER	6	8.85	7.2000	10.10	1.23	0.50	14	7.20	7.40	9.35	9.70	10.10

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1990	FALL	41	0.90	.00000	5.00	1.17	0.18	131	0.01	0.04	0.35	1.70	2.80
26	1990	SPRING	37	0.86	.00000	5.60	1.10	0.18	128	0.00	0.10	0.72	1.25	2.70
26	1990	SUMMER	34	0.86	.00000	4.40	1.03	0.18	120	0.00	0.08	0.35	1.50	2.60
26	1990	WINTER	28	1.22	.00000	6.50	1.39	0.26	114	0.01	0.22	0.83	1.57	3.00
26	1991	FALL	39	1.25	.00000	4.70	1.46	0.23	117	0.00	0.13	0.44	2.10	4.50
26	1991	SPRING	40	0.76	.00000	5.15	1.17	0.18	153	0.01	0.02	0.14	1.04	3.35
26	1991	SUMMER	37	0.62	.00000	3.50	0.87	0.14	141	0.00	0.04	0.10	0.81	3.05
26	1991	WINTER	33	1.13	.00000	6.30	1.60	0.28	142	0.00	0.05	0.40	1.30	5.90
26	1992	FALL	39	1.09	.01000	5.00	1.25	0.20	115	0.01	0.10	0.66	1.90	3.80
26	1992	SPRING	42	0.71	.00000	4.90	1.01	0.16	142	0.01	0.16	0.25	1.02	2.90
26	1992	SUMMER	42	0.70	.00250	4.70	0.95	0.15	135	0.01	0.09	0.43	0.87	1.90
26	1992	WINTER	25	0.75	.01000	6.00	1.23	0.25	164	0.02	0.09	0.35	0.82	2.30
26	1993	FALL	21	1.24	.00000	5.50	1.55	0.34	125	0.00	0.14	0.39	1.80	3.70
26	1993	SPRING	19	1.09	.04000	6.40	1.61	0.37	148	0.04	0.17	0.50	1.75	6.40
26	1993	SUMMER	19	1.03	.00000	7.45	1.84	0.42	179	0.00	0.03	0.37	0.91	7.45
26	1993	WINTER	20	1.62	.00000	5.10	1.80	0.40	111	0.00	0.22	1.04	3.16	5.00
26	1994	FALL	12	0.88	.00250	3.90	1.15	0.33	131	0.00	0.01	0.61	1.23	3.90
26	1994	SPRING	21	0.87	.00000	5.80	1.30	0.28	150	0.00	0.07	0.42	1.30	1.96
26	1994	SUMMER	19	74.54	.00000	1400.00	320.98	73.64	431	0.00	0.01	0.65	1.80	1400.0
26	1994	WINTER	19	2.06	.00000	7.90	2.24	0.51	109	0.00	0.32	1.65	2.20	7.90
26	1995	FALL	15	1.33	.00250	8.49	2.31	0.60	173	0.00	0.01	0.23	1.67	8.49
26	1995	SPRING	15	1.19	.01000	5.25	1.69	0.44	142	0.01	0.03	0.28	1.57	5.25
26	1995	SUMMER	17	0.53	.00250	3.80	0.92	0.22	173	0.00	0.05	0.24	0.45	3.80
26	1995	WINTER	10	2.43	.00250	9.29	3.42	1.08	140	0.00	0.04	0.78	4.20	9.29
26	1996	FALL	3	3.00	1.9000	4.50	1.35	0.78	45	1.90	1.90	2.60	4.50	4.50
26	1996	SPRING	11	1.22	.00250	6.30	1.90	0.57	155	0.00	0.02	0.09	1.80	6.30
26	1996	SUMMER	9	0.76	.00000	4.10	1.36	0.45	179	0.00	0.00	0.01	1.00	4.10
26	1996	WINTER	12	1.51	.01000	6.05	1.80	0.52	120	0.01	0.15	0.78	2.37	6.05
26	1997	FALL	7	1.53	.02500	2.95	1.04	0.39	68	0.03	0.60	1.80	2.50	2.95
26	1997	SPRING	4	2.12	.02500	5.50	2.36	1.18	111	0.03	0.71	1.48	3.53	5.50
26	1997	SUMMER	4	0.71	.02500	1.40	0.58	0.29	83	0.03	0.26	0.70	1.15	1.40
26	1997	WINTER	6	2.62	.00000	6.10	2.13	0.87	81	0.00	1.10	2.40	3.70	6.10

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1998	WINTER	6	2.39	.40000	5.10	1.83	0.75	77	0.40	1.00	2.10	3.65	5.10
26	1999	FALL	6	0.50	.01000	1.20	0.56	0.23	110	0.01	0.01	0.30	1.20	1.20
26	1999	SUMMER	6	0.49	.06000	0.86	0.36	0.15	73	0.06	0.06	0.56	0.86	0.86
26	2000	SPRING	3	0.14	.00000	0.32	0.16	0.09	117	0.00	0.00	0.10	0.32	0.32
28	1990	FALL	23	0.59	.00500	6.60	1.36	0.28	229	0.01	0.06	0.25	0.61	1.52
28	1990	SPRING	22	0.35	.11000	0.80	0.22	0.05	63	0.11	0.19	0.27	0.44	0.78
28	1990	SUMMER	23	0.36	.01000	1.17	0.31	0.06	87	0.02	0.17	0.31	0.47	0.97
28	1990	WINTER	10	0.46	.00500	1.69	0.61	0.19	132	0.01	0.01	0.14	1.00	1.69
28	1991	FALL	21	0.21	.00500	0.92	0.30	0.07	142	0.01	0.03	0.07	0.23	0.89
28	1991	SPRING	24	0.25	.00500	1.12	0.30	0.06	121	0.01	0.03	0.16	0.34	0.85
28	1991	SUMMER	25	0.24	.04000	1.16	0.29	0.06	118	0.04	0.05	0.10	0.41	0.78
28	1991	WINTER	16	0.50	.00750	1.70	0.52	0.13	105	0.01	0.09	0.28	0.72	1.70
28	1992	FALL	27	0.51	.00500	2.42	0.62	0.12	121	0.01	0.07	0.27	0.82	2.10
28	1992	SPRING	27	0.23	.00500	0.78	0.22	0.04	96	0.01	0.03	0.12	0.42	0.60
28	1992	SUMMER	27	0.69	.00500	4.49	0.88	0.17	127	0.01	0.20	0.35	0.87	1.75
28	1992	WINTER	28	0.51	.01750	1.48	0.39	0.07	77	0.02	0.20	0.36	0.74	1.15
28	1993	FALL	22	0.86	.05000	1.98	0.56	0.12	65	0.09	0.27	0.83	1.23	1.70
28	1993	SPRING	22	0.83	.03000	1.72	0.53	0.11	64	0.03	0.30	0.94	1.13	1.56
28	1993	SUMMER	23	0.77	.03500	2.06	0.50	0.10	66	0.07	0.40	0.70	1.12	1.77
28	1993	WINTER	16	0.94	.07000	1.88	0.43	0.11	45	0.07	0.73	0.89	1.12	1.88
28	1994	FALL	24	0.24	.00250	1.06	0.32	0.07	132	0.00	0.00	0.08	0.42	0.99
28	1994	SPRING	24	0.49	.00500	1.80	0.43	0.09	89	0.04	0.27	0.38	0.66	1.47
28	1994	SUMMER	30	0.43	.00375	2.44	0.48	0.09	112	0.02	0.11	0.29	0.62	1.04
28	1994	WINTER	22	0.76	.12000	2.54	0.58	0.12	75	0.17	0.34	0.70	1.05	1.63
28	1995	FALL	1	0.49	.49000	0.49	.	.	.	0.49	0.49	0.49	0.49	0.49
28	1995	SPRING	1	0.06	.06000	0.06	.	.	.	0.06	0.06	0.06	0.06	0.06
28	1995	WINTER	1	0.36	.36000	0.36	.	.	.	0.36	0.36	0.36	0.36	0.36
28	1996	SUMMER	3	1.11	.16000	1.81	0.85	0.49	77	0.16	0.16	1.35	1.81	1.81
28	1997	FALL	4	0.52	.07000	1.28	0.53	0.27	101	0.07	0.17	0.37	0.88	1.28
28	1997	SPRING	4	0.60	.15000	1.34	0.55	0.28	92	0.15	0.18	0.46	1.03	1.34
28	1997	SUMMER	4	0.76	.15000	1.55	0.67	0.33	88	0.15	0.21	0.66	1.31	1.55
28	1999	FALL	10	0.42	.00000	0.75	0.31	0.10	75	0.00	0.18	0.42	0.73	0.75

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
28	1999	SUMMER	10	0.67	.24000	1.77	0.61	0.19	91	0.24	0.28	0.34	0.71	1.77
28	2000	SPRING	5	0.02	.00000	0.07	0.03	0.01	169	0.00	0.00	0.00	0.02	0.07
30	1990	FALL	11	0.24	.02000	1.10	0.33	0.10	136	0.02	0.03	0.13	0.30	1.10
30	1990	SPRING	19	0.38	.02500	1.60	0.39	0.09	102	0.03	0.15	0.30	0.50	1.60
30	1990	SUMMER	20	0.38	.02500	1.60	0.45	0.10	118	0.03	0.03	0.20	0.58	1.40
30	1990	WINTER	18	0.39	.02000	2.22	0.52	0.12	133	0.02	0.10	0.20	0.50	2.22
30	1991	FALL	8	0.38	.01000	1.90	0.64	0.23	167	0.01	0.08	0.10	0.40	1.90
30	1991	SPRING	24	0.33	.01000	1.50	0.34	0.07	105	0.01	0.13	0.22	0.42	1.10
30	1991	SUMMER	21	0.25	.01000	1.40	0.32	0.07	125	0.01	0.09	0.15	0.25	0.63
30	1991	WINTER	19	0.41	.02500	0.80	0.27	0.06	65	0.03	0.12	0.40	0.62	0.80
30	1992	FALL	10	0.51	.09000	1.30	0.39	0.12	78	0.09	0.19	0.39	0.72	1.30
30	1992	SPRING	21	0.58	.07000	1.50	0.45	0.10	77	0.10	0.13	0.55	0.97	1.20
30	1992	SUMMER	19	0.62	.01000	5.80	1.29	0.30	207	0.01	0.07	0.23	0.70	5.80
30	1992	WINTER	19	0.63	.14000	1.40	0.39	0.09	62	0.14	0.27	0.59	1.00	1.40
30	1993	SUMMER	1	0.14	.14000	0.14	.	.	.	0.14	0.14	0.14	0.14	0.14
30	1993	WINTER	1	0.08	.07700	0.08	.	.	.	0.08	0.08	0.08	0.08	0.08
30	1994	FALL	17	0.20	.03000	0.43	0.11	0.03	58	0.03	0.09	0.22	0.26	0.43
30	1994	WINTER	3	0.12	.02000	0.29	0.15	0.09	129	0.02	0.02	0.04	0.29	0.29
30	1995	FALL	18	0.69	.00250	9.33	2.16	0.51	312	0.00	0.01	0.23	0.35	9.33
30	1995	SPRING	19	0.19	.02000	0.82	0.20	0.05	105	0.02	0.05	0.15	0.26	0.82
30	1995	SUMMER	19	0.21	.00250	2.51	0.56	0.13	270	0.00	0.02	0.09	0.16	2.51
30	1995	WINTER	18	0.32	.03000	0.82	0.24	0.06	76	0.03	0.08	0.30	0.52	0.82
30	1996	WINTER	3	0.03	.00250	0.08	0.04	0.02	119	0.00	0.00	0.02	0.08	0.08
31	1990	FALL	2	3.28	1.9000	4.65	1.94	1.38	59	1.90	1.90	3.28	4.65	4.65
31	1990	SPRING	1	1.35	1.3500	1.35	.	.	.	1.35	1.35	1.35	1.35	1.35
31	1990	SUMMER	1	1.35	1.3500	1.35	.	.	.	1.35	1.35	1.35	1.35	1.35
31	1990	WINTER	1	1.80	1.8000	1.80	.	.	.	1.80	1.80	1.80	1.80	1.80
31	1991	FALL	2	1.22	.33000	2.10	1.25	0.89	103	0.33	0.33	1.22	2.10	2.10
31	1991	SPRING	1	1.50	1.5000	1.50	.	.	.	1.50	1.50	1.50	1.50	1.50
31	1991	SUMMER	3	0.97	.01000	1.59	0.84	0.49	87	0.01	0.01	1.30	1.59	1.59
31	1991	WINTER	2	1.30	.30000	2.30	1.41	1.00	109	0.30	0.30	1.30	2.30	2.30
31	1992	FALL	1	6.90	6.9000	6.90	.	.	.	6.90	6.90	6.90	6.90	6.90

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
31	1992	SPRING	1	0.39	.38500	0.39	.	.	.	0.39	0.39	0.39	0.39	0.39
31	1992	SUMMER	2	3.24	2.6150	3.87	0.89	0.63	27	2.62	2.62	3.24	3.87	3.87
31	1992	WINTER	1	2.49	2.4900	2.49	.	.	.	2.49	2.49	2.49	2.49	2.49
31	1994	FALL	3	4.86	1.0600	7.86	3.47	2.00	71	1.06	1.06	5.67	7.86	7.86
31	1994	WINTER	5	0.24	.03000	0.41	0.15	0.07	63	0.03	0.15	0.29	0.32	0.41
31	1995	FALL	10	1.21	.06000	3.95	1.44	0.46	119	0.06	0.18	0.53	1.60	3.95
31	1995	SPRING	9	1.57	.03000	5.87	2.06	0.69	131	0.03	0.37	0.53	1.73	5.87
31	1995	SUMMER	8	0.78	.15000	3.28	1.14	0.40	145	0.15	0.17	0.24	1.00	3.28
31	1995	WINTER	4	3.55	.24000	6.58	3.12	1.56	88	0.24	0.90	3.70	6.21	6.58
31	1996	SUMMER	1	0.03	.03000	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
43	1990	FALL	46	0.30	.00500	3.00	0.56	0.08	184	0.01	0.03	0.08	0.30	1.40
43	1990	SPRING	38	0.17	.00200	1.80	0.32	0.05	186	0.00	0.01	0.03	0.20	0.75
43	1990	SUMMER	40	0.64	.00200	15.00	2.37	0.37	368	0.00	0.03	0.11	0.30	1.75
43	1990	WINTER	26	1.00	.02500	11.00	2.16	0.42	216	0.03	0.22	0.40	1.09	3.30
43	1991	FALL	55	0.47	.00100	5.20	0.93	0.13	200	0.00	0.03	0.16	0.33	2.90
43	1991	SPRING	63	0.40	.00500	3.10	0.62	0.08	156	0.01	0.02	0.20	0.45	1.76
43	1991	SUMMER	58	0.35	.00250	2.50	0.50	0.07	142	0.01	0.02	0.11	0.52	1.40
43	1991	WINTER	35	0.81	.01750	6.05	1.29	0.22	160	0.02	0.14	0.40	0.90	4.80
43	1992	FALL	63	0.22	.00250	1.72	0.37	0.05	172	0.00	0.02	0.03	0.32	0.94
43	1992	SPRING	61	0.19	.00250	2.30	0.41	0.05	214	0.01	0.02	0.03	0.19	1.10
43	1992	SUMMER	68	0.21	.00100	1.60	0.32	0.04	157	0.00	0.01	0.08	0.22	0.99
43	1992	WINTER	29	0.65	.02000	4.10	0.91	0.17	141	0.10	0.21	0.28	0.60	2.85
43	1993	FALL	22	0.34	.02000	1.09	0.35	0.07	103	0.03	0.03	0.17	0.59	0.97
43	1993	SPRING	23	0.49	.00200	1.96	0.50	0.10	101	0.03	0.19	0.32	0.78	1.70
43	1993	SUMMER	25	0.29	.02000	1.00	0.24	0.05	84	0.03	0.11	0.22	0.45	0.74
43	1993	WINTER	19	0.76	.00200	3.20	0.88	0.20	116	0.00	0.20	0.45	0.80	3.20
43	1994	FALL	19	0.69	.02000	4.23	1.03	0.24	150	0.02	0.10	0.30	0.80	4.23
43	1994	SPRING	20	0.23	.02500	0.96	0.26	0.06	112	0.03	0.05	0.15	0.29	0.91
43	1994	SUMMER	18	0.44	.01000	1.62	0.50	0.12	115	0.01	0.03	0.16	0.80	1.62
43	1994	WINTER	11	0.43	.02500	1.90	0.55	0.16	127	0.03	0.08	0.20	0.60	1.90
43	1995	FALL	15	0.70	.01000	3.00	0.84	0.22	119	0.01	0.10	0.40	1.30	3.00
43	1995	SPRING	14	0.50	.09000	1.28	0.41	0.11	82	0.09	0.20	0.35	0.70	1.28

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	1995	SUMMER	18	0.23	.01000	1.10	0.25	0.06	112	0.01	0.10	0.12	0.30	1.10
43	1995	WINTER	10	0.55	.10000	1.80	0.48	0.15	87	0.10	0.35	0.40	0.60	1.80
43	1996	FALL	13	0.61	.02500	3.10	0.92	0.26	150	0.03	0.10	0.10	0.90	3.10
43	1996	SPRING	15	0.78	.10000	3.50	0.86	0.22	111	0.10	0.20	0.60	1.06	3.50
43	1996	SUMMER	12	0.45	.03000	1.60	0.54	0.16	119	0.03	0.10	0.15	0.65	1.60
43	1996	WINTER	8	0.92	.20000	3.00	0.91	0.32	100	0.20	0.30	0.66	1.10	3.00
43	1997	FALL	16	1.12	.01000	3.68	1.08	0.27	96	0.01	0.51	0.63	1.70	3.68
43	1997	SPRING	20	0.59	.04500	3.51	0.77	0.17	131	0.05	0.20	0.39	0.77	2.31
43	1997	SUMMER	19	0.58	.01000	2.67	0.65	0.15	112	0.01	0.03	0.42	0.92	2.67
43	1997	WINTER	15	1.31	.26000	4.40	1.04	0.27	79	0.26	0.69	1.00	1.90	4.40
43	1998	SPRING	19	0.51	.01000	2.60	0.69	0.16	136	0.01	0.03	0.30	0.57	2.60
43	1998	SUMMER	10	0.26	.10000	0.50	0.17	0.06	68	0.10	0.10	0.20	0.40	0.50
43	1998	WINTER	19	1.09	.20000	3.40	0.87	0.20	80	0.20	0.30	1.06	1.33	3.40
43	1999	FALL	2	0.63	.60000	0.65	0.04	0.03	6	0.60	0.60	0.63	0.65	0.65
43	1999	SUMMER	2	0.34	.00000	0.67	0.47	0.34	141	0.00	0.00	0.34	0.67	0.67
43	1999	WINTER	21	2.67	.10000	41.85	9.04	1.97	339	0.10	0.10	0.50	0.90	4.80
43	2000	SPRING	1	0.08	.08000	0.08	.	.	.	0.08	0.08	0.08	0.08	0.08
44	1990	FALL	3	2.33	.39000	6.10	3.27	1.89	140	0.39	0.39	0.50	6.10	6.10
44	1990	SPRING	3	1.04	.00500	2.82	1.54	0.89	148	0.01	0.01	0.30	2.82	2.82
44	1990	SUMMER	3	1.62	.37000	4.10	2.14	1.24	132	0.37	0.37	0.40	4.10	4.10
44	1990	WINTER	3	2.03	.04000	5.44	2.97	1.71	147	0.04	0.04	0.60	5.44	5.44
44	1991	FALL	3	2.00	.48000	5.01	2.60	1.50	130	0.48	0.48	0.52	5.01	5.01
44	1991	SPRING	2	0.21	.02000	0.40	0.27	0.19	128	0.02	0.02	0.21	0.40	0.40
44	1991	SUMMER	3	1.54	.30000	3.93	2.07	1.20	135	0.30	0.30	0.39	3.93	3.93
44	1991	WINTER	3	1.74	.04000	4.68	2.56	1.48	147	0.04	0.04	0.50	4.68	4.68
44	1992	FALL	3	1.76	.21000	4.55	2.42	1.40	137	0.21	0.21	0.53	4.55	4.55
44	1992	SPRING	3	1.49	.02250	4.01	2.19	1.27	147	0.02	0.02	0.43	4.01	4.01
44	1992	SUMMER	3	1.46	.15500	3.87	2.09	1.21	143	0.16	0.16	0.36	3.87	3.87
44	1992	WINTER	3	1.18	.04500	2.94	1.54	0.89	131	0.05	0.05	0.55	2.94	2.94
44	1993	FALL	2	1.73	.51000	2.94	1.72	1.22	100	0.51	0.51	1.73	2.94	2.94
44	1993	SPRING	3	0.97	.04500	2.46	1.30	0.75	134	0.05	0.05	0.41	2.46	2.46
44	1993	SUMMER	2	2.03	.45000	3.61	2.23	1.58	110	0.45	0.45	2.03	3.61	3.61

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
44	1993	WINTER	3	1.60	.03000	4.14	2.22	1.28	139	0.03	0.03	0.62	4.14	4.14
44	1994	FALL	5	0.13	.00000	0.51	0.22	0.10	170	0.00	0.00	0.00	0.14	0.51
44	1994	SPRING	2	1.37	.49000	2.24	1.24	0.88	91	0.49	0.49	1.37	2.24	2.24
44	1994	SUMMER	7	1.28	.00000	3.63	1.33	0.50	104	0.00	0.07	1.31	2.17	3.63
44	1994	WINTER	1	2.78	2.7800	2.78	.	.	.	2.78	2.78	2.78	2.78	2.78
44	1995	SPRING	1	0.51	.51000	0.51	.	.	.	0.51	0.51	0.51	0.51	0.51
44	1999	FALL	11	0.72	.05000	1.36	0.44	0.13	61	0.05	0.55	0.68	1.00	1.36
44	1999	SUMMER	11	0.55	.00000	1.61	0.58	0.18	106	0.00	0.10	0.31	0.67	1.61
44	2000	SPRING	6	0.52	.00000	1.06	0.45	0.19	87	0.00	0.03	0.53	0.99	1.06

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1999
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1990	FALL	27	0.33	.00000	1.70	0.35	0.07	107	0.00	0.00	0.30	0.40	0.80
26	1990	SPRING	26	0.49	.00000	1.25	0.38	0.07	78	0.00	0.00	0.51	0.70	1.05
26	1990	SUMMER	28	0.69	.00000	2.20	0.50	0.09	73	0.00	0.40	0.50	0.97	1.80
26	1990	WINTER	24	0.72	.00000	5.60	1.19	0.24	164	0.00	0.00	0.35	0.90	2.37
26	1991	FALL	23	0.55	.00000	2.00	0.52	0.11	94	0.00	0.10	0.40	1.10	1.25
26	1991	SPRING	26	0.56	.00000	1.60	0.45	0.09	79	0.00	0.27	0.50	0.70	1.60
26	1991	SUMMER	26	0.63	.00000	1.80	0.52	0.10	83	0.00	0.20	0.45	0.95	1.60
26	1991	WINTER	26	0.46	.00000	2.40	0.55	0.11	119	0.00	0.08	0.30	0.60	1.49
26	1992	FALL	18	0.35	.05000	1.35	0.31	0.07	87	0.05	0.20	0.30	0.50	1.35
26	1992	SPRING	23	0.61	.00000	3.00	0.84	0.17	136	0.00	0.05	0.25	1.00	2.80
26	1992	SUMMER	21	0.61	.05000	2.60	0.72	0.16	118	0.05	0.20	0.35	0.50	2.30
26	1992	WINTER	16	0.38	.05000	1.70	0.39	0.10	102	0.05	0.20	0.28	0.43	1.70
26	1993	FALL	20	0.48	.00000	1.39	0.41	0.09	86	0.03	0.10	0.36	0.78	1.25
26	1993	SPRING	21	0.72	.05000	2.21	0.66	0.15	92	0.13	0.30	0.45	1.02	2.16
26	1993	SUMMER	20	0.88	.00000	4.10	1.21	0.27	137	0.04	0.20	0.30	1.26	4.10
26	1993	WINTER	15	0.73	.05000	2.70	0.73	0.19	100	0.05	0.30	0.40	0.83	2.70
26	1994	FALL	14	0.67	.00000	3.05	0.76	0.20	112	0.00	0.30	0.50	0.65	3.05
26	1994	SPRING	20	0.49	.00000	1.80	0.48	0.11	98	0.00	0.19	0.33	0.66	1.63
26	1994	SUMMER	19	0.92	.00000	7.20	1.56	0.36	170	0.00	0.35	0.40	0.95	7.20
26	1994	WINTER	18	0.42	.00000	1.70	0.45	0.11	106	0.00	0.10	0.34	0.50	1.70
26	1995	FALL	17	0.47	.00000	1.80	0.44	0.11	93	0.00	0.23	0.30	0.70	1.80
26	1995	SPRING	17	0.80	.23000	3.00	0.69	0.17	87	0.23	0.40	0.60	0.82	3.00
26	1995	SUMMER	19	0.68	.00000	2.32	0.57	0.13	85	0.00	0.25	0.48	0.87	2.32
26	1995	WINTER	11	0.50	.05000	1.20	0.37	0.11	75	0.05	0.25	0.34	0.90	1.20
26	1996	FALL	10	0.28	.00000	0.85	0.28	0.09	100	0.00	0.05	0.24	0.40	0.85
26	1996	SPRING	17	0.50	.00000	1.86	0.45	0.11	91	0.00	0.27	0.40	0.54	1.86
26	1996	SUMMER	15	0.60	.00000	1.45	0.40	0.10	67	0.00	0.30	0.70	0.85	1.45
26	1996	WINTER	14	0.42	.00000	1.05	0.35	0.09	82	0.00	0.20	0.32	0.50	1.05
26	1997	FALL	7	0.70	.00000	1.50	0.66	0.25	94	0.00	0.00	0.65	1.40	1.50
26	1997	SPRING	10	0.23	.00000	0.70	0.21	0.07	93	0.00	0.05	0.16	0.35	0.70
26	1997	SUMMER	3	0.79	.32000	1.45	0.59	0.34	74	0.32	0.32	0.60	1.45	1.45
26	1997	WINTER	13	0.26	.00000	1.50	0.43	0.12	165	0.00	0.00	0.05	0.30	1.50

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1999
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1998	WINTER	6	0.07	.00000	0.40	0.16	0.07	245	0.00	0.00	0.00	0.00	0.40
28	1990	FALL	3	0.95	.30000	1.51	0.61	0.35	64	0.30	0.30	1.05	1.51	1.51
28	1990	SPRING	4	0.58	.20000	0.80	0.29	0.14	50	0.20	0.35	0.65	0.80	0.80
28	1990	SUMMER	2	0.85	.70000	1.00	0.21	0.15	25	0.70	0.70	0.85	1.00	1.00
28	1990	WINTER	7	0.44	.12500	0.75	0.24	0.09	55	0.13	0.25	0.34	0.70	0.75
28	1991	FALL	1	0.32	.32000	0.32	.	.	.	0.32	0.32	0.32	0.32	0.32
28	1991	SPRING	3	1.16	.20000	2.33	1.08	0.62	93	0.20	0.20	0.96	2.33	2.33
28	1991	SUMMER	7	1.35	.30000	5.00	1.63	0.62	121	0.30	0.50	0.81	1.10	5.00
28	1991	WINTER	3	0.93	.67000	1.38	0.39	0.22	42	0.67	0.67	0.74	1.38	1.38
28	1992	FALL	1	0.67	.67000	0.67	.	.	.	0.67	0.67	0.67	0.67	0.67
28	1992	SPRING	1	0.08	.07500	0.08	.	.	.	0.08	0.08	0.08	0.08	0.08
28	1992	SUMMER	1	0.08	.07500	0.08	.	.	.	0.08	0.08	0.08	0.08	0.08
28	1992	WINTER	2	0.20	.07500	0.33	0.18	0.13	89	0.08	0.08	0.20	0.33	0.33
28	1993	SPRING	1	0.08	.07500	0.08	.	.	.	0.08	0.08	0.08	0.08	0.08
28	1993	SUMMER	4	0.77	.07500	1.60	0.63	0.32	82	0.08	0.34	0.70	1.20	1.60
28	1994	FALL	7	0.73	.40000	1.24	0.35	0.13	48	0.40	0.45	0.57	1.20	1.24
28	1994	SPRING	2	0.42	.10000	0.73	0.45	0.32	107	0.10	0.10	0.42	0.73	0.73
28	1994	SUMMER	7	0.96	.33000	1.80	0.57	0.22	60	0.33	0.35	0.93	1.42	1.80
28	1994	WINTER	1	0.03	.02500	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
28	1995	FALL	1	0.14	.14000	0.14	.	.	.	0.14	0.14	0.14	0.14	0.14
28	1995	SPRING	2	0.36	.07500	0.64	0.40	0.28	112	0.08	0.08	0.36	0.64	0.64
28	1995	SUMMER	2	0.27	.07500	0.46	0.27	0.19	102	0.08	0.08	0.27	0.46	0.46
28	1995	WINTER	1	1.31	1.3100	1.31	.	.	.	1.31	1.31	1.31	1.31	1.31
28	1996	SPRING	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
28	1996	SUMMER	4	0.58	.40000	0.80	0.17	0.09	30	0.40	0.45	0.55	0.70	0.80
28	1997	FALL	4	1.53	.40000	4.00	1.67	0.83	109	0.40	0.55	0.85	2.50	4.00
28	1997	SPRING	4	0.93	.55000	1.10	0.25	0.13	27	0.55	0.78	1.03	1.08	1.10
28	1997	SUMMER	4	1.43	.70000	3.20	1.19	0.60	83	0.70	0.71	0.91	2.15	3.20
30	1990	FALL	12	0.41	.20000	0.54	0.11	0.03	28	0.20	0.35	0.40	0.51	0.54
30	1990	SPRING	23	0.49	.05000	1.50	0.46	0.10	93	0.05	0.05	0.30	0.80	1.45
30	1990	SUMMER	22	0.33	.05000	0.70	0.21	0.05	65	0.05	0.13	0.33	0.50	0.60
30	1990	WINTER	19	0.39	.05000	1.60	0.40	0.09	101	0.05	0.14	0.25	0.52	1.60

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1999
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
30	1991	FALL	12	0.34	.05000	1.00	0.27	0.08	80	0.05	0.14	0.30	0.41	1.00
30	1991	SPRING	24	0.46	.05000	1.70	0.38	0.08	83	0.05	0.20	0.30	0.80	0.80
30	1991	SUMMER	23	0.38	.05000	1.60	0.37	0.08	97	0.05	0.05	0.30	0.58	0.95
30	1991	WINTER	23	0.40	.10000	0.90	0.18	0.04	44	0.18	0.30	0.40	0.50	0.70
30	1992	FALL	11	0.51	.05000	2.20	0.67	0.20	131	0.05	0.05	0.40	0.50	2.20
30	1992	SPRING	26	0.30	.05000	1.10	0.35	0.07	115	0.05	0.05	0.09	0.44	1.00
30	1992	SUMMER	21	0.35	.05000	1.95	0.45	0.10	130	0.05	0.05	0.20	0.51	0.90
30	1992	WINTER	24	0.30	.05000	2.80	0.57	0.12	191	0.05	0.05	0.05	0.31	0.80
30	1993	FALL	7	0.33	.05000	0.79	0.31	0.12	94	0.05	0.16	0.17	0.77	0.79
30	1993	SPRING	18	0.26	.05000	0.54	0.13	0.03	51	0.05	0.16	0.27	0.33	0.54
30	1993	SUMMER	25	0.26	.05000	0.72	0.19	0.04	72	0.05	0.11	0.20	0.31	0.70
30	1993	WINTER	12	0.18	.05000	0.61	0.18	0.05	100	0.05	0.08	0.11	0.19	0.61
30	1994	FALL	24	0.45	.10000	2.25	0.56	0.11	123	0.11	0.15	0.30	0.40	1.95
30	1994	SPRING	15	0.34	.14000	0.77	0.14	0.04	41	0.14	0.28	0.31	0.38	0.77
30	1994	SUMMER	15	0.43	.19000	0.70	0.18	0.05	42	0.19	0.30	0.32	0.63	0.70
30	1994	WINTER	16	0.37	.05000	1.50	0.45	0.11	123	0.05	0.05	0.25	0.45	1.50
30	1995	FALL	18	0.33	.09000	1.45	0.30	0.07	91	0.09	0.19	0.27	0.35	1.45
30	1995	SPRING	22	0.54	.05000	3.10	0.79	0.17	147	0.10	0.19	0.26	0.45	2.70
30	1995	SUMMER	25	0.29	.05000	1.64	0.31	0.06	106	0.05	0.14	0.23	0.30	0.58
30	1995	WINTER	20	0.21	.05000	0.53	0.13	0.03	61	0.05	0.12	0.18	0.31	0.46
30	1996	FALL	6	0.10	.05000	0.30	0.10	0.04	96	0.05	0.05	0.05	0.13	0.30
30	1996	SPRING	27	0.44	.05000	2.27	0.45	0.09	102	0.05	0.20	0.30	0.71	0.90
30	1996	SUMMER	25	0.57	.05000	2.34	0.55	0.11	97	0.13	0.22	0.33	0.80	1.86
30	1996	WINTER	23	0.34	.05000	2.69	0.53	0.11	157	0.05	0.16	0.21	0.33	0.64
30	1997	SPRING	8	0.59	.05000	3.00	1.02	0.36	172	0.05	0.05	0.09	0.70	3.00
30	1997	WINTER	8	0.17	.05000	1.00	0.34	0.12	199	0.05	0.05	0.05	0.05	1.00
31	1990	FALL	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30
31	1990	SPRING	1	0.18	.17500	0.18	.	.	.	0.18	0.18	0.18	0.18	0.18
31	1990	SUMMER	7	0.66	.20000	2.40	0.79	0.30	120	0.20	0.23	0.30	0.80	2.40
31	1990	WINTER	1	0.35	.35000	0.35	.	.	.	0.35	0.35	0.35	0.35	0.35
31	1991	FALL	2	0.45	.05000	0.85	0.57	0.40	126	0.05	0.05	0.45	0.85	0.85
31	1991	SPRING	1	0.35	.35000	0.35	.	.	.	0.35	0.35	0.35	0.35	0.35

Aggregate Nutrient Ecoregion: IV
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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
31	1991	SUMMER	1	0.55	.55000	0.55	.	.	.	0.55	0.55	0.55	0.55	0.55
31	1991	WINTER	2	0.38	.05000	0.70	0.46	0.33	123	0.05	0.05	0.38	0.70	0.70
31	1992	FALL	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
31	1992	SPRING	2	0.40	.30000	0.50	0.14	0.10	35	0.30	0.30	0.40	0.50	0.50
31	1992	SUMMER	1	0.13	.12500	0.13	.	.	.	0.13	0.13	0.13	0.13	0.13
31	1992	WINTER	1	1.00	1.0000	1.00	.	.	.	1.00	1.00	1.00	1.00	1.00
31	1993	FALL	5	0.31	.11000	0.52	0.15	0.07	49	0.11	0.25	0.29	0.39	0.52
31	1993	SPRING	7	0.25	.07000	0.72	0.22	0.08	88	0.07	0.08	0.25	0.28	0.72
31	1993	SUMMER	15	0.53	.10000	1.95	0.49	0.13	93	0.10	0.22	0.33	0.63	1.95
31	1993	WINTER	4	0.36	.16000	0.61	0.19	0.09	52	0.16	0.24	0.34	0.48	0.61
31	1994	FALL	9	0.47	.12000	1.37	0.40	0.13	85	0.12	0.16	0.34	0.60	1.37
31	1994	SPRING	5	0.56	.21000	1.02	0.32	0.14	57	0.21	0.34	0.51	0.73	1.02
31	1994	SUMMER	7	0.83	.19000	2.70	0.90	0.34	108	0.19	0.29	0.42	1.28	2.70
31	1994	WINTER	6	0.47	.06000	0.88	0.32	0.13	68	0.06	0.23	0.46	0.70	0.88
31	1995	FALL	11	0.47	.11000	0.96	0.31	0.09	66	0.11	0.18	0.32	0.73	0.96
31	1995	SPRING	9	0.38	.08000	0.75	0.24	0.08	63	0.08	0.24	0.33	0.62	0.75
31	1995	SUMMER	5	0.68	.30000	0.96	0.30	0.13	44	0.30	0.44	0.76	0.94	0.96
31	1995	WINTER	4	0.39	.24000	0.59	0.17	0.08	43	0.24	0.25	0.37	0.53	0.59
31	1996	FALL	2	0.45	.20000	0.70	0.35	0.25	79	0.20	0.20	0.45	0.70	0.70
31	1996	SPRING	9	0.46	.20000	1.01	0.24	0.08	52	0.20	0.30	0.39	0.54	1.01
31	1996	SUMMER	8	0.81	.23000	1.91	0.57	0.20	70	0.23	0.32	0.76	1.11	1.91
31	1996	WINTER	9	0.42	.05000	0.86	0.30	0.10	72	0.05	0.25	0.34	0.70	0.86
31	1997	SPRING	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
31	1997	WINTER	2	0.38	.05000	0.70	0.46	0.33	123	0.05	0.05	0.38	0.70	0.70
43	1990	FALL	37	0.56	.05000	1.70	0.40	0.07	72	0.05	0.30	0.50	0.70	1.60
43	1990	SPRING	33	0.91	.05000	3.50	0.80	0.14	87	0.13	0.40	0.70	1.10	2.95
43	1990	SUMMER	36	1.25	.20000	7.85	1.68	0.28	134	0.25	0.50	0.83	1.20	7.80
43	1990	WINTER	23	0.67	.05000	1.98	0.54	0.11	80	0.08	0.30	0.55	0.80	1.70
43	1991	FALL	41	0.65	.05000	3.30	0.71	0.11	108	0.13	0.30	0.40	0.65	1.70
43	1991	SPRING	40	0.99	.05000	4.90	0.96	0.15	97	0.09	0.45	0.65	0.98	2.90
43	1991	SUMMER	42	1.03	.10000	10.00	1.57	0.24	152	0.20	0.40	0.63	1.00	2.95
43	1991	WINTER	29	0.57	.05000	1.80	0.47	0.09	82	0.08	0.20	0.45	0.73	1.65

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	1992	FALL	41	0.41	.07500	1.70	0.27	0.04	67	0.10	0.30	0.40	0.50	0.80
43	1992	SPRING	36	0.54	.02500	2.60	0.44	0.07	83	0.08	0.30	0.45	0.63	1.10
43	1992	SUMMER	42	0.78	.07500	2.50	0.69	0.11	88	0.10	0.30	0.50	1.00	2.30
43	1992	WINTER	21	0.73	.07500	5.00	1.06	0.23	146	0.20	0.30	0.37	0.60	1.80
43	1993	FALL	24	0.48	.05000	3.80	0.73	0.15	154	0.05	0.23	0.30	0.45	0.95
43	1993	SPRING	31	0.77	.20000	2.00	0.45	0.08	58	0.20	0.45	0.60	1.00	1.55
43	1993	SUMMER	32	0.88	.07500	6.00	1.22	0.22	138	0.08	0.30	0.43	1.00	4.30
43	1993	WINTER	19	0.57	.07500	3.50	0.76	0.17	134	0.08	0.20	0.40	0.60	3.50
43	1994	FALL	22	0.67	.02500	3.70	0.76	0.16	113	0.20	0.30	0.45	0.60	1.45
43	1994	SPRING	23	0.60	.03750	1.15	0.33	0.07	55	0.08	0.35	0.50	0.85	1.10
43	1994	SUMMER	27	0.98	.20000	5.90	1.11	0.21	114	0.20	0.40	0.70	1.05	2.60
43	1994	WINTER	10	0.35	.20000	0.60	0.11	0.03	31	0.20	0.30	0.30	0.40	0.60
43	1995	FALL	7	0.48	.02500	1.18	0.46	0.17	94	0.03	0.03	0.30	0.96	1.18
43	1995	SPRING	13	1.05	.30000	2.80	0.76	0.21	72	0.30	0.60	0.80	1.40	2.80
43	1995	SUMMER	22	0.71	.12500	2.65	0.56	0.12	79	0.20	0.40	0.50	1.00	1.50
43	1995	WINTER	8	0.52	.05000	1.70	0.58	0.20	111	0.05	0.05	0.40	0.75	1.70
43	1996	FALL	7	0.98	.25000	3.45	1.14	0.43	116	0.25	0.30	0.60	1.20	3.45
43	1996	SPRING	10	1.19	.10000	2.95	0.92	0.29	77	0.10	0.55	0.75	1.90	2.95
43	1996	SUMMER	10	0.75	.05000	2.00	0.65	0.21	87	0.05	0.20	0.65	1.30	2.00
43	1996	WINTER	4	1.26	.30000	2.00	0.80	0.40	64	0.30	0.60	1.36	1.91	2.00
43	1997	FALL	3	0.83	.60000	1.10	0.25	0.15	30	0.60	0.60	0.80	1.10	1.10
43	1997	SPRING	7	0.70	.05000	1.18	0.42	0.16	60	0.05	0.30	0.70	1.10	1.18
43	1997	SUMMER	5	0.80	.45000	1.30	0.37	0.16	46	0.45	0.50	0.70	1.05	1.30
43	1997	WINTER	5	1.04	.20000	2.60	0.91	0.41	88	0.20	0.70	0.80	0.90	2.60
43	1998	WINTER	2	0.70	.30000	1.10	0.57	0.40	81	0.30	0.30	0.70	1.10	1.10
43	1999	WINTER	21	0.87	.10000	3.49	0.69	0.15	80	0.13	0.58	0.66	1.02	1.51
44	1990	FALL	3	0.65	.30000	0.85	0.30	0.17	47	0.30	0.30	0.79	0.85	0.85
44	1990	SPRING	3	0.54	.12500	1.00	0.44	0.25	81	0.13	0.13	0.50	1.00	1.00
44	1990	SUMMER	3	0.71	.40000	1.20	0.43	0.25	60	0.40	0.40	0.53	1.20	1.20
44	1990	WINTER	3	0.55	.30000	0.75	0.23	0.13	42	0.30	0.30	0.61	0.75	0.75
44	1991	FALL	3	0.87	.12500	2.19	1.15	0.66	131	0.13	0.13	0.30	2.19	2.19
44	1991	SPRING	2	0.36	.12500	0.60	0.34	0.24	93	0.13	0.13	0.36	0.60	0.60

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Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
44	1991	SUMMER	3	1.07	.40000	1.78	0.69	0.40	65	0.40	0.40	1.02	1.78	1.78
44	1991	WINTER	3	0.79	.12500	1.94	1.00	0.58	127	0.13	0.13	0.30	1.94	1.94
44	1992	FALL	6	0.67	.05000	1.61	0.64	0.26	95	0.05	0.08	0.55	1.18	1.61
44	1992	SPRING	3	0.62	.07500	1.67	0.90	0.52	145	0.08	0.08	0.13	1.67	1.67
44	1992	SUMMER	3	0.95	.30000	1.84	0.79	0.46	84	0.30	0.30	0.71	1.84	1.84
44	1992	WINTER	3	0.94	.30000	2.02	0.94	0.54	100	0.30	0.30	0.51	2.02	2.02
44	1993	FALL	2	0.90	.40000	1.40	0.71	0.50	79	0.40	0.40	0.90	1.40	1.40
44	1993	SPRING	3	0.63	.12500	1.46	0.73	0.42	115	0.13	0.13	0.30	1.46	1.46
44	1993	SUMMER	2	0.79	.35000	1.23	0.62	0.44	79	0.35	0.35	0.79	1.23	1.23
44	1993	WINTER	3	0.46	.07500	1.18	0.62	0.36	136	0.08	0.08	0.13	1.18	1.18
44	1994	FALL	3	1.38	.00000	3.95	2.23	1.28	161	0.00	0.00	0.20	3.95	3.95
44	1994	SPRING	5	0.68	.25000	1.75	0.62	0.28	90	0.25	0.30	0.50	0.60	1.75
44	1994	SUMMER	10	0.58	.05000	1.60	0.51	0.16	87	0.05	0.30	0.41	0.61	1.60
44	1994	WINTER	1	1.90	1.9000	1.90	.	.	.	1.90	1.90	1.90	1.90	1.90
44	1995	FALL	1	0.40	.40000	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40
44	1995	SPRING	1	0.40	.40000	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40
44	1995	SUMMER	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
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Organic_P_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1999	FALL	6	40.61	9.6300	102.35	47.82	19.52	118	9.63	9.63	9.86	102.35	102.35
26	1999	SUMMER	6	55.25	25.880	107.17	40.33	16.47	73	25.88	25.88	32.69	107.17	107.17
26	2000	SPRING	3	53.42	15.780	120.27	58.05	33.51	109	15.78	15.78	24.21	120.27	120.27
28	1999	FALL	10	46.86	26.370	65.77	13.54	4.28	29	26.37	44.55	44.62	52.98	65.77
28	1999	SUMMER	10	56.43	14.820	121.48	39.72	12.56	70	14.82	23.40	61.10	61.33	121.48
28	2000	SPRING	5	46.50	12.590	100.46	33.69	15.06	72	12.59	25.46	42.85	51.12	100.46
43	1999	FALL	2	30.10	3.8800	56.31	37.07	26.22	123	3.88	3.88	30.10	56.31	56.31
43	1999	SUMMER	2	101.29	24.830	177.75	108.13	76.46	107	24.83	24.83	101.29	177.75	177.75
43	2000	SPRING	1	233.21	233.21	233.21	.	.	.	233.21	233.21	233.21	233.21	233.21
44	1999	FALL	11	16.90	2.6700	31.81	10.40	3.13	62	2.67	3.88	18.70	22.03	31.81
44	1999	SUMMER	11	72.42	15.470	167.90	52.70	15.89	73	15.47	24.83	62.14	81.98	167.90
44	2000	SPRING	6	36.78	10.750	66.30	21.43	8.75	58	10.75	18.85	35.79	53.20	66.30

Aggregate Nutrient Ecoregion: IV
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Descriptive Statistics by Subecoregion, Year and Season
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Phosph_Ortho_Tot_as_P_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1990	FALL	8	38.75	5.0000	240.00	81.49	28.81	210	5.00	5.00	10.00	17.50	240.00
26	1990	WINTER	2	30.00	20.000	40.00	14.14	10.00	47	20.00	20.00	30.00	40.00	40.00
26	1991	FALL	8	275.00	5.0000	2100.00	737.50	260.75	268	5.00	7.50	10.00	30.00	2100.0
26	1991	SPRING	7	84.29	5.0000	515.00	190.41	71.97	226	5.00	5.00	7.50	42.50	515.00
26	1991	SUMMER	8	23.13	5.0000	62.50	22.94	8.11	99	5.00	5.00	12.50	41.25	62.50
26	1991	WINTER	8	21.88	5.0000	60.00	18.70	6.61	85	5.00	7.50	17.50	30.00	60.00
26	1992	FALL	8	120.94	5.0000	890.00	310.98	109.95	257	5.00	5.00	5.00	26.25	890.00
26	1992	SPRING	6	23.75	5.0000	85.00	31.53	12.87	133	5.00	5.00	8.75	30.00	85.00
26	1992	SUMMER	8	15.31	5.0000	40.00	15.38	5.44	100	5.00	5.00	8.75	25.00	40.00
26	1992	WINTER	7	23.57	5.0000	90.00	30.24	11.43	128	5.00	5.00	20.00	20.00	90.00
28	1991	SPRING	1	30.00	30.000	30.00	.	.	.	30.00	30.00	30.00	30.00	30.00
28	1991	SUMMER	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
28	1992	SPRING	1	10.00	10.000	10.00	.	.	.	10.00	10.00	10.00	10.00	10.00
28	1992	SUMMER	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
28	1992	WINTER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1990	FALL	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
30	1991	FALL	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1991	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1991	SUMMER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1991	WINTER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1992	SPRING	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1992	SUMMER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
30	1992	WINTER	1	5.00	5.0000	5.00	.	.	.	5.00	5.00	5.00	5.00	5.00
43	1990	FALL	13	28.85	5.0000	110.00	32.67	9.06	113	5.00	5.00	20.00	40.00	110.00
43	1990	WINTER	7	192.86	5.0000	1300.00	488.24	184.54	253	5.00	5.00	5.00	20.00	1300.0
43	1991	FALL	16	65.16	5.0000	700.00	171.41	42.85	263	5.00	5.00	15.00	35.00	700.00
43	1991	SPRING	15	49.17	5.0000	160.00	51.49	13.30	105	5.00	5.00	32.50	90.00	160.00
43	1991	SUMMER	14	25.36	5.0000	110.00	36.81	9.84	145	5.00	5.00	5.00	20.00	110.00
43	1991	WINTER	14	80.71	5.0000	755.00	199.24	53.25	247	5.00	5.00	11.25	20.00	755.00
43	1992	FALL	16	19.69	5.0000	130.00	30.54	7.63	155	5.00	5.00	10.00	20.00	130.00
43	1992	SPRING	14	32.50	5.0000	180.00	45.60	12.19	140	5.00	5.00	20.00	40.00	180.00
43	1992	SUMMER	18	28.89	5.0000	65.00	20.53	4.84	71	5.00	10.00	25.00	45.00	65.00

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1992
Phosph_Ortho_Tot_as_P_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	1992	WINTER	12	45.83	5.0000	170.00	57.83	16.70	126	5.00	5.00	15.00	80.00	170.00
44	1990	FALL	1	130.00	130.00	130.00	.	.	.	130.00	130.00	130.00	130.00	130.00
44	1991	FALL	1	140.00	140.00	140.00	.	.	.	140.00	140.00	140.00	140.00	140.00
44	1991	SPRING	1	120.00	120.00	120.00	.	.	.	120.00	120.00	120.00	120.00	120.00
44	1991	SUMMER	1	110.00	110.00	110.00	.	.	.	110.00	110.00	110.00	110.00	110.00
44	1991	WINTER	1	160.00	160.00	160.00	.	.	.	160.00	160.00	160.00	160.00	160.00
44	1992	FALL	1	150.00	150.00	150.00	.	.	.	150.00	150.00	150.00	150.00	150.00
44	1992	SPRING	1	150.00	150.00	150.00	.	.	.	150.00	150.00	150.00	150.00	150.00
44	1992	SUMMER	1	150.00	150.00	150.00	.	.	.	150.00	150.00	150.00	150.00	150.00
44	1992	WINTER	1	150.00	150.00	150.00	.	.	.	150.00	150.00	150.00	150.00	150.00

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Total_Nitrogen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1990	FALL	8	0.67	.20000	2.10	0.62	0.22	93	0.20	0.35	0.44	0.75	2.10
26	1990	SPRING	9	0.90	.30000	1.85	0.48	0.16	53	0.30	0.60	0.80	1.10	1.85
26	1990	SUMMER	11	1.06	.30000	3.60	1.03	0.31	97	0.30	0.40	0.50	1.35	3.60
26	1990	WINTER	7	2.01	.40000	6.10	1.90	0.72	95	0.40	0.85	1.40	2.30	6.10
26	1991	FALL	7	1.45	.20000	5.60	1.95	0.74	135	0.20	0.30	0.65	2.20	5.60
26	1991	SPRING	8	0.84	.31000	1.95	0.63	0.22	75	0.31	0.48	0.58	1.18	1.95
26	1991	SUMMER	8	0.93	.30000	2.05	0.66	0.23	71	0.30	0.44	0.64	1.48	2.05
26	1991	WINTER	6	0.81	.46000	1.30	0.37	0.15	45	0.46	0.50	0.75	1.10	1.30
26	1992	FALL	6	0.93	.20000	2.80	0.95	0.39	102	0.20	0.45	0.58	1.00	2.80
26	1992	SPRING	4	0.48	.25000	0.84	0.27	0.13	56	0.25	0.28	0.42	0.69	0.84
26	1992	SUMMER	6	1.00	.27000	1.90	0.70	0.29	71	0.27	0.40	0.85	1.70	1.90
26	1992	WINTER	6	0.63	.29000	1.00	0.29	0.12	46	0.29	0.30	0.66	0.87	1.00
26	1993	FALL	5	1.39	.40000	4.60	1.81	0.81	131	0.40	0.44	0.60	0.89	4.60
26	1993	SPRING	8	0.61	.26000	1.64	0.45	0.16	74	0.26	0.34	0.47	0.67	1.64
26	1993	SUMMER	6	1.37	.20000	4.90	1.81	0.74	132	0.20	0.20	0.64	1.64	4.90
26	1993	WINTER	3	0.79	.35000	1.30	0.48	0.28	61	0.35	0.35	0.72	1.30	1.30
26	1994	FALL	1	1.00	1.0000	1.00	.	.	.	1.00	1.00	1.00	1.00	1.00
26	1994	SPRING	5	0.50	.30000	0.64	0.15	0.07	29	0.30	0.40	0.51	0.63	0.64
26	1994	SUMMER	5	141.87	.35000	700.10	312.08	139.57	220	0.35	0.39	0.40	8.10	700.10
26	1994	WINTER	3	3.18	.45000	8.60	4.69	2.71	147	0.45	0.45	0.50	8.60	8.60
26	1995	SPRING	3	1.09	.53000	2.15	0.92	0.53	84	0.53	0.53	0.59	2.15	2.15
26	1995	SUMMER	3	0.51	.42000	0.64	0.11	0.07	22	0.42	0.42	0.48	0.64	0.64
26	1997	FALL	1	0.07	.07250	0.07	.	.	.	0.07	0.07	0.07	0.07	0.07
26	1997	SPRING	1	0.11	.11250	0.11	.	.	.	0.11	0.11	0.11	0.11	0.11
26	1997	SUMMER	1	0.11	.10500	0.11	.	.	.	0.11	0.11	0.11	0.11	0.11
26	1999	FALL	6	0.84	.48000	1.27	0.36	0.15	43	0.48	0.48	0.76	1.27	1.27
26	1999	SUMMER	6	1.12	1.0450	1.27	0.11	0.05	10	1.05	1.05	1.05	1.27	1.27
26	2000	SPRING	3	0.54	.32000	0.78	0.23	0.13	43	0.32	0.32	0.51	0.78	0.78
28	1990	SPRING	2	1.58	1.5500	1.60	0.04	0.03	2	1.55	1.55	1.58	1.60	1.60
28	1990	SUMMER	1	0.90	.90000	0.90	.	.	.	0.90	0.90	0.90	0.90	0.90
28	1990	WINTER	3	1.24	.25000	1.90	0.87	0.50	70	0.25	0.25	1.57	1.90	1.90
28	1991	SPRING	1	0.53	.53000	0.53	.	.	.	0.53	0.53	0.53	0.53	0.53

Aggregate Nutrient Ecoregion: IV
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Total_Nitrogen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
28	1991	SUMMER	2	1.01	.81000	1.20	0.28	0.19	27	0.81	0.81	1.01	1.20	1.20
28	1991	WINTER	1	0.74	.74000	0.74	.	.	.	0.74	0.74	0.74	0.74	0.74
28	1992	FALL	1	1.28	1.2800	1.28	.	.	.	1.28	1.28	1.28	1.28	1.28
28	1992	WINTER	1	0.34	.34000	0.34	.	.	.	0.34	0.34	0.34	0.34	0.34
28	1999	FALL	10	0.79	.44000	1.18	0.34	0.11	43	0.44	0.56	0.60	1.18	1.18
28	1999	SUMMER	10	1.07	.39000	2.11	0.66	0.21	62	0.39	0.46	1.12	1.25	2.11
28	2000	SPRING	5	0.29	.13000	0.61	0.19	0.08	64	0.13	0.20	0.22	0.30	0.61
30	1990	FALL	1	0.50	.50000	0.50	.	.	.	0.50	0.50	0.50	0.50	0.50
30	1990	SPRING	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30
30	1990	SUMMER	1	0.90	.90000	0.90	.	.	.	0.90	0.90	0.90	0.90	0.90
30	1991	SUMMER	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30
30	1991	WINTER	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60
30	1992	SPRING	1	0.31	.31000	0.31	.	.	.	0.31	0.31	0.31	0.31	0.31
30	1994	FALL	1	0.49	.49000	0.49	.	.	.	0.49	0.49	0.49	0.49	0.49
30	1994	SPRING	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30
43	1990	FALL	15	0.77	.30000	1.90	0.50	0.13	64	0.30	0.40	0.65	1.10	1.90
43	1990	SPRING	15	1.19	.30000	3.80	1.10	0.28	93	0.30	0.50	0.80	1.45	3.80
43	1990	SUMMER	15	2.76	.70000	9.05	3.16	0.82	115	0.70	0.80	1.10	2.30	9.05
43	1990	WINTER	14	2.18	.30000	13.00	3.29	0.88	151	0.30	0.60	1.03	2.30	13.00
43	1991	FALL	15	1.53	.36000	5.10	1.49	0.39	98	0.36	0.51	0.79	2.05	5.10
43	1991	SPRING	14	2.67	.40000	7.60	2.07	0.55	78	0.40	0.91	2.30	3.95	7.60
43	1991	SUMMER	15	1.93	.40000	12.00	2.91	0.75	151	0.40	0.65	1.00	1.80	12.00
43	1991	WINTER	13	1.48	.20000	7.55	1.91	0.53	129	0.20	0.70	0.76	1.20	7.55
43	1992	FALL	14	0.68	.20000	2.50	0.59	0.16	87	0.20	0.36	0.56	0.62	2.50
43	1992	SPRING	13	0.66	.30000	1.98	0.46	0.13	69	0.30	0.42	0.50	0.71	1.98
43	1992	SUMMER	16	1.30	.20000	4.00	1.17	0.29	90	0.20	0.48	0.74	1.95	4.00
43	1992	WINTER	11	1.31	.57000	2.50	0.78	0.23	59	0.57	0.64	0.93	2.20	2.50
43	1993	FALL	10	0.58	.30000	1.00	0.25	0.08	43	0.30	0.40	0.47	0.69	1.00
43	1993	SPRING	15	1.24	.32000	3.20	0.86	0.22	69	0.32	0.70	0.86	1.40	3.20
43	1993	SUMMER	14	1.32	.28000	6.60	1.58	0.42	119	0.28	0.64	0.93	1.10	6.60
43	1993	WINTER	8	2.03	.56000	5.20	1.65	0.58	81	0.56	0.90	1.18	3.15	5.20
43	1994	FALL	6	0.82	.22000	2.10	0.78	0.32	94	0.22	0.25	0.46	1.45	2.10

Aggregate Nutrient Ecoregion: IV
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Total_Nitrogen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	1994	SPRING	10	1.42	.65000	4.55	1.16	0.37	82	0.65	0.90	1.03	1.20	4.55
43	1994	SUMMER	10	4.01	.20000	27.00	8.30	2.62	207	0.20	0.50	0.68	2.85	27.00
43	1994	WINTER	3	1.32	.65000	2.20	0.80	0.46	61	0.65	0.65	1.10	2.20	2.20
43	1995	SPRING	6	1.74	.42000	4.30	1.53	0.62	88	0.42	0.45	1.25	2.80	4.30
43	1995	SUMMER	4	0.50	.40000	0.60	0.09	0.05	18	0.40	0.43	0.50	0.58	0.60
43	1995	WINTER	2	1.43	.65000	2.20	1.10	0.78	77	0.65	0.65	1.43	2.20	2.20
43	1999	FALL	2	0.91	.87000	0.95	0.06	0.04	6	0.87	0.87	0.91	0.95	0.95
43	1999	SUMMER	2	0.90	.76000	1.04	0.20	0.14	22	0.76	0.76	0.90	1.04	1.04
43	2000	SPRING	1	1.40	1.4000	1.40	.	.	.	1.40	1.40	1.40	1.40	1.40
44	1990	FALL	1	0.80	.80000	0.80	.	.	.	0.80	0.80	0.80	0.80	0.80
44	1990	SPRING	1	0.80	.80000	0.80	.	.	.	0.80	0.80	0.80	0.80	0.80
44	1990	SUMMER	1	0.80	.80000	0.80	.	.	.	0.80	0.80	0.80	0.80	0.80
44	1990	WINTER	1	0.90	.90000	0.90	.	.	.	0.90	0.90	0.90	0.90	0.90
44	1991	FALL	1	0.83	.83000	0.83	.	.	.	0.83	0.83	0.83	0.83	0.83
44	1991	SPRING	1	1.00	1.0000	1.00	.	.	.	1.00	1.00	1.00	1.00	1.00
44	1991	SUMMER	1	0.79	.79000	0.79	.	.	.	0.79	0.79	0.79	0.79	0.79
44	1991	WINTER	1	0.80	.80000	0.80	.	.	.	0.80	0.80	0.80	0.80	0.80
44	1992	SUMMER	1	0.64	.64000	0.64	.	.	.	0.64	0.64	0.64	0.64	0.64
44	1992	WINTER	1	0.83	.83000	0.83	.	.	.	0.83	0.83	0.83	0.83	0.83
44	1993	FALL	1	0.91	.91000	0.91	.	.	.	0.91	0.91	0.91	0.91	0.91
44	1993	SPRING	1	0.71	.71000	0.71	.	.	.	0.71	0.71	0.71	0.71	0.71
44	1993	SUMMER	1	0.95	.95000	0.95	.	.	.	0.95	0.95	0.95	0.95	0.95
44	1994	FALL	1	0.71	.71000	0.71	.	.	.	0.71	0.71	0.71	0.71	0.71
44	1994	SPRING	1	0.74	.74000	0.74	.	.	.	0.74	0.74	0.74	0.74	0.74
44	1994	SUMMER	1	0.53	.53000	0.53	.	.	.	0.53	0.53	0.53	0.53	0.53
44	1995	SPRING	1	0.91	.91000	0.91	.	.	.	0.91	0.91	0.91	0.91	0.91
44	1999	FALL	11	1.20	.50000	2.01	0.49	0.15	41	0.50	0.87	1.25	1.25	2.01
44	1999	SUMMER	11	1.30	.55000	2.33	0.63	0.19	48	0.55	0.76	1.33	1.60	2.33
44	2000	SPRING	6	1.08	.74000	1.53	0.30	0.12	28	0.74	0.75	1.14	1.16	1.53

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Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1990	FALL	33	207.05	.00000	2000.00	442.06	76.95	214	2.50	30.00	55.00	190.00	1700.0
26	1990	SPRING	32	188.43	.00000	1350.00	307.73	54.40	163	0.00	13.75	50.00	279.25	930.00
26	1990	SUMMER	38	132.49	.00000	940.00	219.59	35.62	166	2.50	30.00	60.00	140.00	940.00
26	1990	WINTER	29	218.53	.00000	1600.00	373.82	69.42	171	0.00	30.00	60.00	190.00	970.00
26	1991	FALL	29	270.86	.00000	2600.00	581.17	107.92	215	10.00	20.00	70.00	210.00	1900.0
26	1991	SPRING	33	247.86	.00000	2400.00	496.32	86.40	200	6.25	30.00	65.00	170.00	1130.0
26	1991	SUMMER	34	281.54	.00000	2440.00	566.99	97.24	201	0.00	30.00	87.50	270.00	2400.0
26	1991	WINTER	31	176.33	.00000	2100.00	391.75	70.36	222	2.50	20.00	50.00	100.00	620.00
26	1992	FALL	30	175.24	2.5000	1500.00	352.15	64.29	201	2.50	10.00	30.00	180.00	980.00
26	1992	SPRING	35	230.29	.00000	2400.00	531.56	89.85	231	0.00	10.00	20.00	175.00	1800.0
26	1992	SUMMER	35	204.16	2.5000	1200.00	290.10	49.04	142	2.50	20.00	80.00	320.00	1040.0
26	1992	WINTER	28	119.11	5.0000	1000.00	216.03	40.83	181	10.00	20.00	50.00	100.00	660.00
26	1993	FALL	30	244.92	.00000	2100.00	553.24	101.01	226	2.50	20.00	30.00	125.00	2100.0
26	1993	SPRING	28	259.94	3.7500	1400.00	327.70	61.93	126	10.00	40.00	156.00	367.50	1010.0
26	1993	SUMMER	27	657.87	2.5000	9100.00	1801.5	346.69	274	5.00	30.00	110.00	300.00	2200.0
26	1993	WINTER	25	149.49	.00000	1500.00	356.38	71.28	238	0.00	3.75	30.00	90.00	1105.0
26	1994	FALL	20	183.75	20.000	910.00	258.41	57.78	141	25.00	42.50	80.00	195.00	900.00
26	1994	SPRING	33	189.96	2.5000	1550.00	353.29	61.50	186	2.50	20.00	80.00	180.00	1390.0
26	1994	SUMMER	28	396.74	2.5000	6105.00	1148.6	217.07	290	5.00	37.50	107.50	220.00	1285.0
26	1994	WINTER	26	188.94	.00000	1135.00	346.28	67.91	183	0.00	5.00	30.00	180.00	1135.0
26	1995	FALL	22	95.68	20.000	850.00	176.69	37.67	185	20.00	25.00	42.50	85.00	230.00
26	1995	SPRING	23	223.48	10.000	1100.00	279.46	58.27	125	20.00	50.00	100.00	270.00	665.00
26	1995	SUMMER	23	202.50	2.5000	730.00	220.23	45.92	109	20.00	50.00	90.00	330.00	650.00
26	1995	WINTER	17	197.21	2.5000	1500.00	434.43	105.37	220	2.50	2.50	20.00	50.00	1500.0
26	1996	FALL	18	132.29	2.5000	830.00	251.17	59.20	190	2.50	10.00	25.63	90.00	830.00
26	1996	SPRING	25	77.80	2.5000	730.00	154.68	30.94	199	2.50	10.00	20.00	70.00	260.00
26	1996	SUMMER	23	262.28	2.5000	1280.00	330.10	68.83	126	20.00	40.00	170.00	260.00	1010.0
26	1996	WINTER	22	122.44	2.5000	910.00	203.95	43.48	167	10.00	20.00	55.00	115.00	390.00
26	1997	FALL	15	194.33	25.000	840.00	236.20	60.99	122	25.00	55.00	90.00	255.00	840.00
26	1997	SPRING	16	127.19	2.5000	540.00	156.37	39.09	123	2.50	11.25	45.00	240.00	540.00
26	1997	SUMMER	12	358.33	10.000	1500.00	437.41	126.27	122	10.00	75.00	155.00	525.00	1500.0
26	1997	WINTER	18	93.40	2.5000	750.00	178.82	42.15	191	2.50	16.25	40.00	70.00	750.00

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Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1998	WINTER	7	240.71	60.000	600.00	217.49	82.20	90	60.00	70.00	180.00	490.00	600.00
26	1999	FALL	6	103.39	25.230	252.92	115.86	47.30	112	25.23	25.23	32.03	252.92	252.92
26	1999	SUMMER	6	144.89	50.030	320.11	135.88	55.47	94	50.03	50.03	64.54	320.11	320.11
26	2000	SPRING	3	144.76	23.040	379.65	203.47	117.47	141	23.04	23.04	31.59	379.65	379.65
28	1990	FALL	23	131.74	20.000	540.00	122.52	25.55	93	30.00	45.00	100.00	165.00	305.00
28	1990	SPRING	23	176.96	10.000	935.00	202.82	42.29	115	20.00	60.00	110.00	235.00	485.00
28	1990	SUMMER	24	185.42	30.000	570.00	138.83	28.34	75	55.00	90.00	130.00	260.00	510.00
28	1990	WINTER	13	64.23	20.000	270.00	79.21	21.97	123	20.00	20.00	30.00	60.00	270.00
28	1991	FALL	21	175.95	10.000	710.00	184.68	40.30	105	10.00	65.00	110.00	190.00	660.00
28	1991	SPRING	24	177.50	40.000	845.00	190.51	38.89	107	45.00	75.00	102.50	195.00	515.00
28	1991	SUMMER	27	160.37	10.000	610.00	129.40	24.90	81	20.00	110.00	135.00	180.00	450.00
28	1991	WINTER	16	136.34	1.5000	630.00	185.87	46.47	136	1.50	27.50	60.00	172.50	630.00
28	1992	FALL	27	156.11	10.000	570.00	141.10	27.16	90	10.00	60.00	120.00	215.00	450.00
28	1992	SPRING	27	109.03	3.7500	480.00	112.00	21.56	103	10.00	50.00	70.00	120.00	380.00
28	1992	SUMMER	27	366.81	3.7500	1660.00	365.54	70.35	100	100.00	135.00	270.00	455.00	1270.0
28	1992	WINTER	28	172.32	10.000	1450.00	276.64	52.28	161	10.00	30.00	102.50	195.00	465.00
28	1993	FALL	22	167.73	10.000	590.00	155.82	33.22	93	45.00	70.00	92.50	210.00	480.00
28	1993	SPRING	23	217.77	3.7500	730.00	196.55	40.98	90	10.00	60.00	140.00	380.00	560.00
28	1993	SUMMER	26	335.19	10.000	820.00	244.42	47.94	73	10.00	150.00	252.50	580.00	795.00
28	1993	WINTER	16	85.94	10.000	270.00	86.53	21.63	101	10.00	10.00	60.00	127.50	270.00
28	1994	FALL	27	122.69	2.5000	585.00	137.18	26.40	112	10.00	50.00	80.00	140.00	410.00
28	1994	SPRING	25	137.40	10.000	410.00	92.21	18.44	67	10.00	70.00	150.00	180.00	305.00
28	1994	SUMMER	30	219.50	.00000	550.00	159.12	29.05	72	20.00	65.00	225.00	340.00	500.00
28	1994	WINTER	22	56.93	2.5000	225.00	65.26	13.91	115	10.00	10.00	37.50	75.00	210.00
28	1995	FALL	26	96.35	25.000	310.00	67.71	13.28	70	25.00	50.00	72.50	130.00	230.00
28	1995	SPRING	27	380.14	11.250	1090.00	290.91	55.98	77	22.50	150.00	340.00	570.00	955.00
28	1995	SUMMER	27	174.40	3.7500	960.00	200.03	38.50	115	10.00	50.00	120.00	190.00	450.00
28	1995	WINTER	24	85.94	2.5000	505.00	127.59	26.04	148	2.50	10.00	30.00	120.00	355.00
28	1996	FALL	31	127.26	40.000	300.00	79.33	14.25	62	40.00	70.00	100.00	185.00	290.00
28	1996	SPRING	32	126.64	2.5000	370.00	83.04	14.68	66	30.00	65.00	120.00	170.00	310.00
28	1996	SUMMER	34	219.26	40.000	590.00	136.98	23.49	62	60.00	120.00	175.00	310.00	470.00
28	1996	WINTER	23	101.63	2.5000	430.00	90.29	18.83	89	35.00	50.00	80.00	110.00	240.00

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
28	1997	FALL	29	229.48	20.000	840.00	210.69	39.12	92	50.00	85.00	180.00	280.00	820.00
28	1997	SPRING	29	116.21	11.250	440.00	88.80	16.49	76	21.25	50.00	100.00	150.00	235.00
28	1997	SUMMER	29	246.55	20.000	700.00	160.27	29.76	65	70.00	130.00	210.00	340.00	560.00
28	1997	WINTER	23	119.40	10.000	355.00	97.86	20.41	82	10.00	20.00	120.00	200.00	260.00
28	1999	FALL	10	77.49	26.370	200.33	65.71	20.78	85	26.37	51.36	52.93	56.47	200.33
28	1999	SUMMER	10	89.32	22.210	190.70	66.45	21.01	74	22.21	30.31	76.20	127.19	190.70
28	2000	SPRING	5	49.69	15.420	106.93	35.58	15.91	72	15.42	25.46	46.74	53.91	106.93
30	1990	FALL	14	50.89	2.5000	200.00	56.42	15.08	111	2.50	10.00	35.00	70.00	200.00
30	1990	SPRING	26	43.99	2.5000	250.00	62.80	12.32	143	2.50	2.50	15.00	60.00	200.00
30	1990	SUMMER	30	48.67	2.5000	400.00	90.05	16.44	185	2.50	2.50	20.00	40.00	280.00
30	1990	WINTER	24	104.90	2.5000	870.00	198.25	40.47	189	2.50	2.50	20.00	115.00	500.00
30	1991	FALL	16	148.91	2.5000	1380.00	350.28	87.57	235	2.50	7.50	32.50	75.00	1380.0
30	1991	SPRING	28	97.50	2.5000	1015.00	219.99	41.57	226	2.50	2.50	10.00	55.00	560.00
30	1991	SUMMER	33	64.92	2.5000	1020.00	184.27	32.08	284	2.50	2.50	11.25	30.00	350.00
30	1991	WINTER	25	74.80	2.5000	1220.00	241.28	48.26	323	2.50	2.50	10.00	50.00	150.00
30	1992	FALL	12	37.71	2.5000	140.00	40.86	11.80	108	2.50	2.50	40.00	55.00	140.00
30	1992	SPRING	31	40.77	2.5000	550.00	100.88	18.12	247	2.50	2.50	2.50	40.00	130.00
30	1992	SUMMER	38	52.89	2.5000	635.00	115.80	18.78	219	2.50	2.50	10.00	50.00	290.00
30	1992	WINTER	29	49.48	2.5000	460.00	90.38	16.78	183	2.50	2.50	25.00	70.00	200.00
30	1993	FALL	7	217.14	10.000	980.00	355.75	134.46	164	10.00	10.00	20.00	320.00	980.00
30	1993	SPRING	16	95.31	2.5000	800.00	193.32	48.33	203	2.50	15.00	45.00	75.00	800.00
30	1993	SUMMER	25	94.70	2.5000	950.00	222.19	44.44	235	10.00	10.00	20.00	30.00	605.00
30	1993	WINTER	13	124.52	2.5000	1330.00	362.70	100.59	291	2.50	10.00	20.00	50.00	1330.0
30	1994	FALL	23	37.83	2.5000	260.00	64.50	13.45	171	2.50	2.50	2.50	60.00	180.00
30	1994	SPRING	15	65.25	2.5000	540.00	138.98	35.88	213	2.50	6.25	20.00	40.00	540.00
30	1994	SUMMER	22	99.66	2.5000	720.00	197.58	42.12	198	2.50	10.00	22.50	40.00	500.00
30	1994	WINTER	16	86.25	2.5000	720.00	189.36	47.34	220	2.50	2.50	20.00	50.00	720.00
30	1995	FALL	18	148.61	10.000	2240.00	522.20	123.08	351	10.00	20.00	20.00	30.00	2240.0
30	1995	SPRING	22	112.33	2.5000	1480.00	315.48	67.26	281	2.50	2.50	15.63	45.00	310.00
30	1995	SUMMER	25	91.50	2.5000	1650.00	327.14	65.43	358	2.50	10.00	20.00	30.00	210.00
30	1995	WINTER	20	26.88	2.5000	230.00	50.82	11.36	189	2.50	10.00	10.00	20.00	155.00
30	1996	FALL	6	3.75	2.5000	10.00	3.06	1.25	82	2.50	2.50	2.50	2.50	10.00

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
30	1996	SPRING	26	122.16	2.5000	1200.00	305.60	59.93	250	2.50	10.00	20.00	30.00	1080.0
30	1996	SUMMER	25	179.76	2.5000	2080.00	441.00	88.20	245	2.50	10.00	30.00	45.00	780.00
30	1996	WINTER	23	143.26	2.5000	2220.00	471.59	98.33	329	2.50	6.25	20.00	30.00	650.00
30	1997	SPRING	8	74.06	2.5000	390.00	134.99	47.72	182	2.50	2.50	2.50	95.00	390.00
30	1997	WINTER	8	8.44	2.5000	50.00	16.79	5.94	199	2.50	2.50	2.50	2.50	50.00
31	1990	FALL	7	116.43	40.000	345.00	107.58	40.66	92	40.00	40.00	100.00	140.00	345.00
31	1990	SPRING	7	73.21	2.5000	180.00	58.57	22.14	80	2.50	40.00	50.00	100.00	180.00
31	1990	SUMMER	18	113.89	10.000	330.00	95.69	22.56	84	10.00	30.00	100.00	160.00	330.00
31	1990	WINTER	7	57.14	15.000	135.00	49.82	18.83	87	15.00	20.00	40.00	120.00	135.00
31	1991	FALL	5	82.00	20.000	180.00	62.61	28.00	76	20.00	40.00	70.00	100.00	180.00
31	1991	SPRING	9	60.00	20.000	150.00	43.01	14.34	72	20.00	30.00	50.00	80.00	150.00
31	1991	SUMMER	8	95.63	20.000	210.00	82.70	29.24	86	20.00	30.00	52.50	185.00	210.00
31	1991	WINTER	7	57.14	10.000	140.00	43.86	16.58	77	10.00	20.00	60.00	70.00	140.00
31	1992	FALL	6	51.67	20.000	125.00	37.51	15.31	73	20.00	30.00	42.50	50.00	125.00
31	1992	SPRING	11	44.77	2.5000	140.00	38.28	11.54	86	2.50	20.00	40.00	60.00	140.00
31	1992	SUMMER	13	100.00	10.000	310.00	97.32	26.99	97	10.00	20.00	90.00	140.00	310.00
31	1992	WINTER	7	74.29	20.000	275.00	89.83	33.95	121	20.00	20.00	50.00	60.00	275.00
31	1993	FALL	5	68.00	40.000	120.00	33.47	14.97	49	40.00	40.00	60.00	80.00	120.00
31	1993	SPRING	8	43.75	10.000	110.00	30.68	10.85	70	10.00	30.00	30.00	55.00	110.00
31	1993	SUMMER	15	64.67	2.5000	180.00	53.73	13.87	83	2.50	10.00	70.00	110.00	180.00
31	1993	WINTER	4	77.50	20.000	170.00	66.52	33.26	86	20.00	30.00	60.00	125.00	170.00
31	1994	FALL	8	52.81	2.5000	140.00	50.56	17.88	96	2.50	20.00	30.00	90.00	140.00
31	1994	SPRING	5	84.50	2.5000	230.00	93.95	42.01	111	2.50	10.00	60.00	120.00	230.00
31	1994	SUMMER	10	61.50	2.5000	160.00	55.87	17.67	91	2.50	20.00	45.00	110.00	160.00
31	1994	WINTER	7	56.07	2.5000	120.00	39.79	15.04	71	2.50	30.00	50.00	80.00	120.00
31	1995	FALL	11	83.64	20.000	240.00	82.98	25.02	99	20.00	30.00	40.00	190.00	240.00
31	1995	SPRING	9	58.06	2.5000	120.00	48.31	16.10	83	2.50	20.00	40.00	100.00	120.00
31	1995	SUMMER	9	74.44	10.000	220.00	75.52	25.17	101	10.00	20.00	40.00	90.00	220.00
31	1995	WINTER	4	55.00	20.000	110.00	38.73	19.36	70	20.00	30.00	45.00	80.00	110.00
31	1996	FALL	2	31.25	2.5000	60.00	40.66	28.75	130	2.50	2.50	31.25	60.00	60.00
31	1996	SPRING	9	58.33	10.000	220.00	63.25	21.08	108	10.00	25.00	40.00	50.00	220.00
31	1996	SUMMER	9	79.58	10.000	240.00	88.08	29.36	111	10.00	16.25	40.00	100.00	240.00

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
31	1996	WINTER	9	53.33	10.000	150.00	41.83	13.94	78	10.00	20.00	50.00	60.00	150.00
31	1997	SPRING	1	10.00	10.000	10.00	.	.	.	10.00	10.00	10.00	10.00	10.00
31	1997	WINTER	2	30.00	30.000	30.00	0.00	0.00	0	30.00	30.00	30.00	30.00	30.00
43	1990	FALL	63	110.16	2.5000	1010.00	170.55	21.49	155	3.75	20.00	50.00	130.00	520.00
43	1990	SPRING	67	163.26	2.5000	1200.00	225.51	27.55	138	5.00	35.00	70.00	190.00	635.00
43	1990	SUMMER	67	268.02	5.0000	2000.00	392.82	47.99	147	20.00	50.00	120.00	310.00	1185.0
43	1990	WINTER	49	230.00	2.5000	1870.00	408.11	58.30	177	3.75	30.00	70.00	240.00	1440.0
43	1991	FALL	70	178.44	2.5000	1735.00	348.75	41.68	195	3.75	20.00	50.00	160.00	960.00
43	1991	SPRING	75	322.53	2.5000	3550.00	582.02	67.21	180	10.00	40.00	120.00	270.00	1650.0
43	1991	SUMMER	73	232.38	5.0000	1580.00	321.14	37.59	138	12.50	50.00	120.00	255.00	1100.0
43	1991	WINTER	48	129.35	2.5000	1405.00	278.53	40.20	215	5.00	20.00	40.00	92.50	905.00
43	1992	FALL	82	92.52	3.7500	1200.00	174.15	19.23	188	5.00	20.00	37.50	90.00	330.00
43	1992	SPRING	78	141.81	2.5000	1200.00	226.26	25.62	160	5.00	30.00	70.00	140.00	510.00
43	1992	SUMMER	81	300.75	3.7500	7100.00	826.31	91.81	275	7.00	40.00	95.00	220.00	1000.0
43	1992	WINTER	41	161.25	3.7500	1700.00	326.57	51.00	203	5.00	20.00	45.00	110.00	650.00
43	1993	FALL	44	132.19	2.5000	1350.00	242.66	36.58	184	3.75	18.75	40.00	140.00	630.00
43	1993	SPRING	52	270.10	5.0000	1700.00	333.71	46.28	124	20.00	42.50	150.00	362.50	1000.0
43	1993	SUMMER	49	243.49	3.7500	1925.00	330.47	47.21	136	20.00	40.00	127.50	350.00	780.00
43	1993	WINTER	38	180.36	2.5000	1200.00	248.29	40.28	138	3.75	25.00	80.00	230.00	635.00
43	1994	FALL	41	181.16	2.5000	1165.00	250.45	39.11	138	2.50	30.00	90.00	180.00	710.00
43	1994	SPRING	41	212.33	2.5000	1700.00	295.46	46.14	139	10.00	40.00	100.00	235.00	550.00
43	1994	SUMMER	42	169.92	3.0000	745.00	190.38	29.38	112	10.00	40.00	96.50	230.00	570.00
43	1994	WINTER	32	209.13	2.5000	1900.00	410.77	72.62	196	3.50	20.00	50.00	162.50	1190.0
43	1995	FALL	25	187.92	10.000	910.00	281.13	56.23	150	10.00	20.00	75.00	175.00	895.00
43	1995	SPRING	29	349.46	3.7500	2750.00	560.67	104.11	160	10.00	70.00	150.00	330.00	1250.0
43	1995	SUMMER	39	290.96	2.5000	2360.00	536.84	85.96	185	2.50	40.00	70.00	240.00	2020.0
43	1995	WINTER	27	256.06	2.5000	1250.00	351.67	67.68	137	2.50	20.00	80.00	375.00	1020.0
43	1996	FALL	25	158.04	10.000	580.00	169.16	33.83	107	16.00	40.00	80.00	210.00	460.00
43	1996	SPRING	28	379.52	2.5000	1840.00	438.41	82.85	116	12.00	107.50	265.00	450.00	1620.0
43	1996	SUMMER	26	201.36	16.250	540.00	161.09	31.59	80	20.00	75.00	155.00	280.00	460.00
43	1996	WINTER	22	213.41	2.5000	770.00	188.20	40.12	88	2.50	50.00	180.00	300.00	465.00
43	1997	FALL	16	169.22	2.5000	660.00	211.54	52.88	125	2.50	15.00	95.00	210.00	660.00

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	1997	SPRING	21	540.64	2.5000	2370.00	642.72	140.25	119	10.00	71.00	230.00	680.00	1590.0
43	1997	SUMMER	21	239.05	30.000	870.00	216.56	47.26	91	60.00	100.00	165.00	270.00	620.00
43	1997	WINTER	21	208.21	30.000	900.00	206.50	45.06	99	40.00	65.00	150.00	300.00	480.00
43	1998	SPRING	19	164.21	30.000	530.00	141.50	32.46	86	30.00	60.00	125.00	210.00	530.00
43	1998	WINTER	21	103.99	2.5000	580.00	130.65	28.51	126	2.50	20.00	50.00	150.00	210.00
43	1999	FALL	2	104.59	92.360	116.82	17.30	12.23	17	92.36	92.36	104.59	116.82	116.82
43	1999	SUMMER	2	159.74	125.84	193.63	47.93	33.90	30	125.84	125.84	159.74	193.63	193.63
43	1999	WINTER	21	152.29	10.000	646.00	178.00	38.84	117	13.00	43.00	80.00	186.50	547.00
43	2000	SPRING	1	301.55	301.55	301.55	.	.	.	301.55	301.55	301.55	301.55	301.55
44	1990	FALL	3	265.00	180.00	405.00	122.17	70.53	46	180.00	180.00	210.00	405.00	405.00
44	1990	SPRING	3	243.33	110.00	410.00	152.75	88.19	63	110.00	110.00	210.00	410.00	410.00
44	1990	SUMMER	3	300.00	180.00	530.00	199.25	115.04	66	180.00	180.00	190.00	530.00	530.00
44	1990	WINTER	3	213.33	100.00	350.00	126.62	73.11	59	100.00	100.00	190.00	350.00	350.00
44	1991	FALL	3	380.00	80.000	850.00	412.19	237.98	108	80.00	80.00	210.00	850.00	850.00
44	1991	SPRING	2	165.00	120.00	210.00	63.64	45.00	39	120.00	120.00	165.00	210.00	210.00
44	1991	SUMMER	3	348.33	170.00	665.00	274.97	158.75	79	170.00	170.00	210.00	665.00	665.00
44	1991	WINTER	3	290.00	120.00	570.00	244.34	141.07	84	120.00	120.00	180.00	570.00	570.00
44	1992	FALL	6	239.17	160.00	475.00	118.68	48.45	50	160.00	160.00	210.00	220.00	475.00
44	1992	SPRING	3	218.33	115.00	360.00	126.92	73.28	58	115.00	115.00	180.00	360.00	360.00
44	1992	SUMMER	3	300.00	170.00	530.00	199.75	115.33	67	170.00	170.00	200.00	530.00	530.00
44	1992	WINTER	3	238.33	115.00	370.00	127.70	73.73	54	115.00	115.00	230.00	370.00	370.00
44	1993	FALL	2	390.00	230.00	550.00	226.27	160.00	58	230.00	230.00	390.00	550.00	550.00
44	1993	SPRING	3	180.00	110.00	290.00	96.44	55.68	54	110.00	110.00	140.00	290.00	290.00
44	1993	SUMMER	5	245.00	155.00	420.00	103.92	46.48	42	155.00	180.00	230.00	240.00	420.00
44	1993	WINTER	3	241.67	55.000	440.00	192.76	111.29	80	55.00	55.00	230.00	440.00	440.00
44	1994	FALL	5	334.00	170.00	750.00	240.27	107.45	72	170.00	180.00	250.00	320.00	750.00
44	1994	SPRING	5	248.00	140.00	530.00	160.53	71.79	65	140.00	160.00	190.00	220.00	530.00
44	1994	SUMMER	10	364.50	100.00	1020.00	307.07	97.10	84	100.00	170.00	225.00	520.00	1020.0
44	1994	WINTER	1	580.00	580.00	580.00	.	.	.	580.00	580.00	580.00	580.00	580.00
44	1995	FALL	1	210.00	210.00	210.00	.	.	.	210.00	210.00	210.00	210.00	210.00
44	1995	SPRING	1	250.00	250.00	250.00	.	.	.	250.00	250.00	250.00	250.00	250.00
44	1995	SUMMER	1	190.00	190.00	190.00	.	.	.	190.00	190.00	190.00	190.00	190.00

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
44	1999	FALL	11	182.62	116.82	338.71	83.59	25.20	46	116.82	117.60	182.90	188.57	338.71
44	1999	SUMMER	11	271.59	125.84	489.65	130.00	39.20	48	125.84	140.51	268.32	333.54	489.65
44	2000	SPRING	6	225.52	24.080	447.06	140.54	57.38	62	24.08	167.97	217.09	279.81	447.06

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

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1990	FALL	13	9.88	.50000	53.50	13.56	3.76	137	0.50	3.80	6.60	10.10	53.50
26	1990	SPRING	14	14.22	2.0000	47.50	12.01	3.21	84	2.00	6.00	10.75	19.50	47.50
26	1990	SUMMER	15	22.80	2.8000	100.00	27.17	7.01	119	2.80	4.60	12.30	31.70	100.00
26	1990	WINTER	12	19.33	2.4000	150.00	41.31	11.93	214	2.40	4.90	7.15	11.25	150.00
26	1991	FALL	12	29.65	2.5000	150.00	54.67	15.78	184	2.50	3.80	7.65	10.50	150.00
26	1991	SPRING	13	18.85	1.0000	86.50	24.55	6.81	130	1.00	4.00	11.65	21.30	86.50
26	1991	SUMMER	12	13.25	.50000	53.00	15.06	4.35	114	0.50	3.65	6.75	20.00	53.00
26	1991	WINTER	14	14.10	1.6000	60.00	15.61	4.17	111	1.60	3.75	8.75	21.10	60.00
26	1992	FALL	17	7.91	.50000	27.00	6.66	1.62	84	0.50	4.00	6.00	10.50	27.00
26	1992	SPRING	15	12.44	1.2000	40.00	10.70	2.76	86	1.20	4.45	10.80	15.70	40.00
26	1992	SUMMER	16	24.82	1.0000	83.00	25.11	6.28	101	1.00	4.45	13.43	37.38	83.00
26	1992	WINTER	15	21.42	.30000	150.00	36.96	9.54	173	0.30	5.70	11.00	18.10	150.00
26	1993	FALL	14	15.20	.70000	100.00	25.48	6.81	168	0.70	3.00	6.00	17.50	100.00
26	1993	SPRING	15	28.37	2.0000	98.50	35.87	9.26	126	2.00	3.90	8.00	67.50	98.50
26	1993	SUMMER	13	19.67	1.1000	56.00	17.12	4.75	87	1.10	4.00	16.00	29.00	56.00
26	1993	WINTER	12	19.00	1.0000	55.00	18.13	5.23	95	1.00	3.75	13.45	31.00	55.00
26	1994	FALL	9	10.67	1.0000	29.00	9.94	3.31	93	1.00	3.00	7.00	13.00	29.00
26	1994	SPRING	14	14.89	.60000	75.00	21.08	5.64	142	0.60	1.20	9.50	17.00	75.00
26	1994	SUMMER	12	17.40	1.0000	80.00	22.94	6.62	132	1.00	2.58	8.80	22.50	80.00
26	1994	WINTER	11	5.91	1.0000	13.10	4.32	1.30	73	1.00	1.50	6.20	9.90	13.10
26	1995	FALL	9	7.31	2.5000	14.05	3.92	1.31	54	2.50	5.00	5.30	10.55	14.05
26	1995	SPRING	11	27.44	2.0000	180.00	52.59	15.86	192	2.00	3.00	6.00	39.50	180.00
26	1995	SUMMER	11	27.85	4.0000	58.00	17.45	5.26	63	4.00	10.00	29.40	39.00	58.00
26	1995	WINTER	7	9.00	2.0000	36.00	12.40	4.69	138	2.00	2.00	4.00	12.00	36.00
26	1996	FALL	9	7.00	2.0000	16.00	4.47	1.49	64	2.00	4.00	5.00	9.00	16.00
26	1996	SPRING	10	6.14	1.0000	14.70	4.50	1.42	73	1.00	3.10	5.25	9.80	14.70
26	1996	SUMMER	10	41.55	3.7000	101.00	32.42	10.25	78	3.70	10.70	38.50	57.20	101.00
26	1996	WINTER	9	7.02	2.0000	14.20	4.20	1.40	60	2.00	4.70	5.25	10.70	14.20
26	1997	FALL	8	13.83	7.0000	24.50	6.10	2.16	44	7.00	9.53	12.50	17.53	24.50
26	1997	SPRING	8	20.38	1.0000	54.50	20.35	7.20	100	1.00	5.00	11.25	37.50	54.50
26	1997	SUMMER	8	40.25	5.0000	187.00	60.75	21.48	151	5.00	10.00	19.00	36.00	187.00
26	1997	WINTER	7	6.43	2.0000	14.00	3.87	1.46	60	2.00	4.00	5.00	8.00	14.00

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1998	WINTER	1	2.00	2.0000	2.00	.	.	.	2.00	2.00	2.00	2.00	2.00
28	1990	FALL	22	16.24	6.6000	33.00	7.64	1.63	47	8.10	11.00	13.68	19.50	30.45
28	1990	SPRING	20	26.51	2.4000	92.50	22.68	5.07	86	2.75	8.55	18.75	41.83	71.75
28	1990	SUMMER	16	28.51	1.0000	80.80	21.44	5.36	75	1.00	16.15	20.75	35.25	80.80
28	1990	WINTER	9	4.49	.40000	10.70	3.08	1.03	69	0.40	2.70	3.70	5.10	10.70
28	1991	FALL	21	16.76	4.5000	50.75	12.11	2.64	72	6.35	10.00	13.30	16.75	45.00
28	1991	SPRING	24	21.76	1.5000	67.50	18.67	3.81	86	3.25	9.55	15.35	31.60	65.50
28	1991	SUMMER	24	27.78	.70000	132.50	27.30	5.57	98	5.00	13.75	19.25	30.05	70.70
28	1991	WINTER	15	7.69	1.2000	13.10	3.32	0.86	43	1.20	5.60	6.65	10.15	13.10
28	1992	FALL	26	20.08	8.2000	70.00	15.27	2.99	76	8.30	10.00	16.00	22.00	54.00
28	1992	SPRING	27	16.62	.30000	33.60	6.91	1.33	42	3.50	12.70	15.65	20.80	28.10
28	1992	SUMMER	24	54.31	.30000	185.00	39.38	8.04	73	12.50	27.83	47.50	70.00	119.75
28	1992	WINTER	27	20.77	.50000	81.20	18.27	3.52	88	3.10	9.10	14.00	26.50	48.10
28	1993	FALL	22	19.42	2.0000	113.00	28.41	6.06	146	3.75	7.00	11.25	14.00	97.00
28	1993	SPRING	22	45.91	.80000	121.00	36.87	7.86	80	9.00	20.00	29.50	68.50	112.00
28	1993	SUMMER	21	49.12	.60000	115.00	40.81	8.91	83	9.50	18.00	23.00	95.50	110.00
28	1993	WINTER	16	19.33	3.0000	88.00	25.82	6.45	134	3.00	4.50	7.95	18.35	88.00
28	1994	FALL	22	10.02	5.0000	21.50	5.13	1.09	51	5.00	6.00	8.00	12.00	21.00
28	1994	SPRING	22	37.68	2.6000	128.00	37.87	8.07	100	2.70	11.20	20.75	63.00	113.00
28	1994	SUMMER	24	36.63	1.0000	157.00	43.08	8.79	118	3.50	9.25	17.50	52.50	124.00
28	1994	WINTER	21	6.13	1.0000	20.50	6.44	1.40	105	1.30	2.05	2.80	8.55	20.00
28	1995	FALL	25	7.35	4.0000	20.00	3.15	0.63	43	5.00	5.50	7.00	8.25	11.00
28	1995	SPRING	24	53.83	.50000	159.00	42.09	8.59	78	7.00	15.00	48.00	83.25	115.00
28	1995	SUMMER	26	22.21	1.4000	149.00	30.19	5.92	136	3.00	5.00	11.50	24.00	58.50
28	1995	WINTER	23	5.18	1.0000	20.00	4.81	1.00	93	1.50	2.00	3.00	6.50	14.00
28	1996	FALL	31	14.06	1.0000	58.00	12.34	2.22	88	2.00	6.50	9.00	18.00	35.50
28	1996	SPRING	32	16.83	.30000	75.50	16.56	2.93	98	2.00	5.90	13.30	21.00	62.50
28	1996	SUMMER	32	43.44	6.5000	151.50	42.44	7.50	98	10.00	13.75	21.00	65.25	138.00
28	1996	WINTER	23	10.94	1.3500	63.00	13.57	2.83	124	2.15	2.75	5.75	14.90	27.90
28	1997	FALL	26	32.70	2.3000	190.00	50.61	9.93	155	5.80	9.00	12.45	26.00	185.00
28	1997	SPRING	27	17.82	3.7000	47.00	10.42	2.01	58	4.15	9.80	16.55	26.00	34.50
28	1997	SUMMER	25	36.23	4.5000	102.00	28.25	5.65	78	5.55	17.00	22.00	48.50	88.00

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
28	1997	WINTER	23	15.06	1.0500	72.80	19.33	4.03	128	1.30	2.70	4.50	21.50	54.80
30	1990	FALL	6	10.78	.30000	37.00	13.88	5.67	129	0.30	0.30	6.53	14.00	37.00
30	1990	SPRING	22	13.81	.30000	96.00	27.07	5.77	196	0.40	0.70	2.70	11.00	90.00
30	1990	SUMMER	18	3.31	.30000	23.00	5.65	1.33	171	0.30	0.40	0.78	3.60	23.00
30	1990	WINTER	12	15.75	.40000	165.00	47.11	13.60	299	0.40	0.50	1.00	3.63	165.00
30	1991	FALL	8	12.24	.30000	38.50	14.91	5.27	122	0.30	2.30	5.75	21.50	38.50
30	1991	SPRING	20	14.80	.40000	150.00	36.43	8.15	246	0.40	0.55	1.20	3.45	113.38
30	1991	SUMMER	18	9.19	.30000	65.00	16.23	3.83	177	0.30	1.00	2.38	9.60	65.00
30	1991	WINTER	17	10.98	.30000	51.00	14.92	3.62	136	0.30	0.60	6.30	14.00	51.00
30	1992	FALL	7	20.44	.40000	69.00	24.77	9.36	121	0.40	1.70	17.00	35.00	69.00
30	1992	SPRING	19	8.59	.40000	81.50	19.87	4.56	231	0.40	0.40	0.70	4.20	81.50
30	1992	SUMMER	16	11.91	.45000	53.00	16.65	4.16	140	0.45	0.53	2.35	18.50	53.00
30	1992	WINTER	19	4.93	.60000	23.00	6.90	1.58	140	0.60	0.70	1.00	8.40	23.00
30	1993	FALL	1	0.70	.70000	0.70	.	.	.	0.70	0.70	0.70	0.70	0.70
30	1993	SPRING	6	5.42	.30000	23.00	8.89	3.63	164	0.30	0.50	1.30	6.10	23.00
30	1993	SUMMER	3	2.00	.40000	4.10	1.90	1.10	95	0.40	0.40	1.50	4.10	4.10
30	1993	WINTER	7	5.80	.70000	18.00	6.21	2.35	107	0.70	1.80	2.90	10.00	18.00
30	1994	FALL	5	23.25	5.1000	53.00	19.62	8.78	84	5.10	6.15	23.00	29.00	53.00
30	1994	SPRING	2	2.38	1.2500	3.50	1.59	1.13	67	1.25	1.25	2.38	3.50	3.50
30	1994	SUMMER	1	26.00	26.000	26.00	.	.	.	26.00	26.00	26.00	26.00	26.00
30	1994	WINTER	6	29.50	.30000	170.00	68.86	28.11	233	0.30	0.40	0.45	5.40	170.00
30	1995	SPRING	2	37.25	35.000	39.50	3.18	2.25	9	35.00	35.00	37.25	39.50	39.50
30	1995	SUMMER	3	0.38	.30000	0.45	0.08	0.04	20	0.30	0.30	0.40	0.45	0.45
30	1995	WINTER	2	0.38	.30000	0.45	0.11	0.08	28	0.30	0.30	0.38	0.45	0.45
30	1996	FALL	2	0.30	.30000	0.30	0.00	0.00	0	0.30	0.30	0.30	0.30	0.30
30	1996	SPRING	4	23.68	.60000	55.00	27.48	13.74	116	0.60	0.60	19.55	46.75	55.00
30	1996	SUMMER	2	19.80	6.6000	33.00	18.67	13.20	94	6.60	6.60	19.80	33.00	33.00
30	1997	SPRING	2	0.75	.45000	1.05	0.42	0.30	57	0.45	0.45	0.75	1.05	1.05
30	1997	WINTER	3	0.43	.30000	0.60	0.15	0.09	35	0.30	0.30	0.40	0.60	0.60
31	1995	FALL	1	35.00	35.000	35.00	.	.	.	35.00	35.00	35.00	35.00	35.00
31	1996	FALL	1	2.70	2.7000	2.70	.	.	.	2.70	2.70	2.70	2.70	2.70
31	1996	SPRING	1	0.70	.70000	0.70	.	.	.	0.70	0.70	0.70	0.70	0.70

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
31	1996	SUMMER	1	3.20	3.2000	3.20	.	.	.	3.20	3.20	3.20	3.20	3.20
31	1996	WINTER	1	4.90	4.9000	4.90	.	.	.	4.90	4.90	4.90	4.90	4.90
31	1997	WINTER	1	4.00	4.0000	4.00	.	.	.	4.00	4.00	4.00	4.00	4.00
43	1990	FALL	21	23.76	1.0000	100.00	26.57	5.80	112	1.00	2.20	20.00	35.00	68.00
43	1990	SPRING	17	14.76	.85000	50.00	14.25	3.46	97	0.85	4.00	10.00	19.00	50.00
43	1990	SUMMER	18	40.77	.90000	190.00	53.42	12.59	131	0.90	2.00	23.75	53.50	190.00
43	1990	WINTER	17	25.93	.70000	100.00	32.80	7.96	127	0.70	4.00	7.80	36.75	100.00
43	1991	FALL	17	23.80	2.0000	110.00	30.27	7.34	127	2.00	6.90	12.00	28.00	110.00
43	1991	SPRING	16	39.60	1.0000	180.00	50.55	12.64	128	1.00	5.30	19.00	52.00	180.00
43	1991	SUMMER	20	42.90	2.0000	150.00	38.02	8.50	89	2.00	9.65	36.50	64.00	121.50
43	1991	WINTER	19	18.05	1.0000	100.00	29.32	6.73	162	1.00	3.00	5.10	14.90	100.00
43	1992	FALL	17	23.22	.62500	180.00	44.79	10.86	193	0.63	3.00	6.70	16.00	180.00
43	1992	SPRING	19	18.34	.50000	120.00	26.90	6.17	147	0.50	2.00	12.00	24.50	120.00
43	1992	SUMMER	19	27.69	.90000	83.00	26.99	6.19	97	0.90	2.00	17.50	51.00	83.00
43	1992	WINTER	15	24.71	1.0000	96.00	32.63	8.43	132	1.00	2.30	13.00	29.00	96.00
43	1993	FALL	12	32.58	.70000	170.00	52.59	15.18	161	0.70	1.75	4.00	56.00	170.00
43	1993	SPRING	12	27.08	.25000	140.00	37.67	10.88	139	0.25	5.08	20.50	30.25	140.00
43	1993	SUMMER	13	28.22	.50000	118.50	39.47	10.95	140	0.50	2.00	5.70	33.00	118.50
43	1993	WINTER	13	3.26	.25000	17.00	4.51	1.25	138	0.25	0.70	2.00	3.60	17.00
43	1994	FALL	8	10.08	1.0000	30.00	11.84	4.19	118	1.00	2.50	4.90	17.40	30.00
43	1994	SPRING	14	64.13	.25000	150.00	56.96	15.22	89	0.25	2.00	77.25	100.00	150.00
43	1994	SUMMER	12	24.70	1.2000	170.00	48.09	13.88	195	1.20	2.00	7.03	20.50	170.00
43	1994	WINTER	4	18.68	1.0000	39.00	17.11	8.56	92	1.00	4.85	17.35	32.50	39.00
43	1995	FALL	4	10.88	3.0000	32.00	14.13	7.07	130	3.00	3.00	4.25	18.75	32.00
43	1995	SPRING	4	58.13	8.0000	180.00	81.77	40.89	141	8.00	11.25	22.25	105.00	180.00
43	1995	SUMMER	11	12.37	.60000	28.00	9.92	2.99	80	0.60	1.00	14.00	21.00	28.00
43	1995	WINTER	4	12.55	.60000	22.50	10.05	5.03	80	0.60	4.35	13.55	20.75	22.50
43	1996	FALL	6	11.08	1.0000	27.50	10.57	4.31	95	1.00	3.00	8.50	18.00	27.50
43	1996	SPRING	4	22.00	3.0000	52.00	22.11	11.05	100	3.00	5.50	16.50	38.50	52.00
43	1996	SUMMER	6	16.25	2.0000	37.00	16.17	6.60	99	2.00	2.00	12.25	32.00	37.00
43	1996	WINTER	3	62.33	1.0000	140.00	70.92	40.95	114	1.00	1.00	46.00	140.00	140.00
43	1997	FALL	3	9.67	2.0000	19.00	8.62	4.98	89	2.00	2.00	8.00	19.00	19.00

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	1997	SPRING	4	12.63	3.0000	23.50	10.16	5.08	80	3.00	4.00	12.00	21.25	23.50
43	1997	SUMMER	5	10.20	1.5000	27.50	11.62	5.20	114	1.50	2.00	3.00	17.00	27.50
43	1997	WINTER	5	22.46	.30000	82.00	34.26	15.32	153	0.30	2.00	7.00	21.00	82.00
43	1998	WINTER	2	6.00	3.0000	9.00	4.24	3.00	71	3.00	3.00	6.00	9.00	9.00
44	1990	FALL	1	12.00	12.000	12.00	.	.	.	12.00	12.00	12.00	12.00	12.00
44	1990	SPRING	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
44	1990	SUMMER	1	6.50	6.5000	6.50	.	.	.	6.50	6.50	6.50	6.50	6.50
44	1990	WINTER	1	15.00	15.000	15.00	.	.	.	15.00	15.00	15.00	15.00	15.00
44	1991	FALL	1	15.00	15.000	15.00	.	.	.	15.00	15.00	15.00	15.00	15.00
44	1991	SPRING	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
44	1991	SUMMER	1	15.00	15.000	15.00	.	.	.	15.00	15.00	15.00	15.00	15.00
44	1991	WINTER	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
44	1992	FALL	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
44	1992	SPRING	1	5.50	5.5000	5.50	.	.	.	5.50	5.50	5.50	5.50	5.50
44	1992	WINTER	1	17.00	17.000	17.00	.	.	.	17.00	17.00	17.00	17.00	17.00
44	1993	FALL	1	17.00	17.000	17.00	.	.	.	17.00	17.00	17.00	17.00	17.00
44	1993	SPRING	1	22.00	22.000	22.00	.	.	.	22.00	22.00	22.00	22.00	22.00
44	1993	SUMMER	4	11.85	6.3000	21.00	6.76	3.38	57	6.30	6.75	10.05	16.95	21.00
44	1993	WINTER	1	18.00	18.000	18.00	.	.	.	18.00	18.00	18.00	18.00	18.00
44	1994	FALL	1	6.90	6.9000	6.90	.	.	.	6.90	6.90	6.90	6.90	6.90
44	1994	SPRING	1	19.50	19.500	19.50	.	.	.	19.50	19.50	19.50	19.50	19.50
44	1994	SUMMER	1	18.00	18.000	18.00	.	.	.	18.00	18.00	18.00	18.00	18.00

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1993
Turbidity_JCU

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1990	SPRING	1	4.60	4.6000	4.60	.	.	.	4.60	4.60	4.60	4.60	4.60
26	1991	SUMMER	1	3.00	3.0000	3.00	.	.	.	3.00	3.00	3.00	3.00	3.00
26	1992	SPRING	1	2.00	2.0000	2.00	.	.	.	2.00	2.00	2.00	2.00	2.00
26	1992	SUMMER	1	5.90	5.9000	5.90	.	.	.	5.90	5.90	5.90	5.90	5.90
28	1990	FALL	1	13.00	13.000	13.00	.	.	.	13.00	13.00	13.00	13.00	13.00
28	1990	SUMMER	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
28	1990	WINTER	1	84.00	84.000	84.00	.	.	.	84.00	84.00	84.00	84.00	84.00
28	1991	FALL	1	19.00	19.000	19.00	.	.	.	19.00	19.00	19.00	19.00	19.00
28	1991	SUMMER	1	10.10	10.100	10.10	.	.	.	10.10	10.10	10.10	10.10	10.10
28	1991	WINTER	1	4.50	4.5000	4.50	.	.	.	4.50	4.50	4.50	4.50	4.50
28	1992	FALL	1	29.00	29.000	29.00	.	.	.	29.00	29.00	29.00	29.00	29.00
28	1992	SUMMER	1	62.20	62.200	62.20	.	.	.	62.20	62.20	62.20	62.20	62.20
28	1992	WINTER	1	10.00	10.000	10.00	.	.	.	10.00	10.00	10.00	10.00	10.00
31	1993	SPRING	4	20.63	4.4000	58.00	25.27	12.63	122	4.40	5.25	10.05	36.00	58.00
31	1993	WINTER	5	3.70	.80000	13.00	5.22	2.34	141	0.80	1.20	1.30	2.20	13.00
43	1990	SUMMER	4	33.33	5.3000	78.70	34.30	17.15	103	5.30	6.80	24.65	59.85	78.70

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Turbidity_NTU

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1990	SPRING	1	58.00	58.000	58.00	.	.	.	58.00	58.00	58.00	58.00	58.00
26	1990	SUMMER	5	10.36	.60000	34.50	14.05	6.28	136	0.60	1.30	4.90	10.50	34.50
26	1991	SPRING	1	32.50	32.500	32.50	.	.	.	32.50	32.50	32.50	32.50	32.50
26	1993	FALL	1	18.20	18.200	18.20	.	.	.	18.20	18.20	18.20	18.20	18.20
26	1993	SPRING	1	43.60	43.600	43.60	.	.	.	43.60	43.60	43.60	43.60	43.60
26	1994	SUMMER	2	47.50	31.000	64.00	23.33	16.50	49	31.00	31.00	47.50	64.00	64.00
26	1995	FALL	2	51.40	12.400	90.40	55.15	39.00	107	12.40	12.40	51.40	90.40	90.40
26	1995	SPRING	1	47.50	47.500	47.50	.	.	.	47.50	47.50	47.50	47.50	47.50
26	1995	SUMMER	1	81.40	81.400	81.40	.	.	.	81.40	81.40	81.40	81.40	81.40
26	1996	SPRING	1	37.10	37.100	37.10	.	.	.	37.10	37.10	37.10	37.10	37.10
26	1997	FALL	1	49.65	49.650	49.65	.	.	.	49.65	49.65	49.65	49.65	49.65
26	1997	SPRING	1	7.90	7.9000	7.90	.	.	.	7.90	7.90	7.90	7.90	7.90
26	1997	SUMMER	1	12.70	12.700	12.70	.	.	.	12.70	12.70	12.70	12.70	12.70
26	1999	FALL	6	20.67	7.0000	42.00	16.74	6.83	81	7.00	7.00	13.00	42.00	42.00
26	1999	SUMMER	6	116.33	59.000	206.00	70.35	28.72	60	59.00	59.00	84.00	206.00	206.00
26	2000	SPRING	3	75.33	21.000	170.00	82.28	47.51	109	21.00	21.00	35.00	170.00	170.00
26	2000	SUMMER	3	73.00	23.000	112.00	45.51	26.27	62	23.00	23.00	84.00	112.00	112.00
28	1990	SUMMER	10	34.69	11.500	149.20	41.59	13.15	120	11.50	13.20	19.50	35.40	149.20
28	1991	SUMMER	2	14.50	5.0000	24.00	13.44	9.50	93	5.00	5.00	14.50	24.00	24.00
28	1993	SUMMER	2	26.00	25.000	27.00	1.41	1.00	5	25.00	25.00	26.00	27.00	27.00
28	1994	FALL	5	41.60	14.000	98.00	32.97	14.74	79	14.00	24.00	32.00	40.00	98.00
28	1994	SUMMER	5	59.00	17.000	170.00	62.84	28.10	107	17.00	31.00	32.00	45.00	170.00
28	1995	FALL	1	10.00	10.000	10.00	.	.	.	10.00	10.00	10.00	10.00	10.00
28	1996	SUMMER	2	29.50	12.000	47.00	24.75	17.50	84	12.00	12.00	29.50	47.00	47.00
28	1997	FALL	1	75.15	75.150	75.15	.	.	.	75.15	75.15	75.15	75.15	75.15
28	1997	SPRING	1	65.15	65.150	65.15	.	.	.	65.15	65.15	65.15	65.15	65.15
28	1997	SUMMER	1	85.30	85.300	85.30	.	.	.	85.30	85.30	85.30	85.30	85.30
28	1999	FALL	10	19.60	3.0000	43.00	14.14	4.47	72	3.00	12.00	17.00	23.00	43.00
28	1999	SUMMER	10	120.80	21.000	251.00	82.84	26.20	69	21.00	64.00	120.00	148.00	251.00
28	2000	SPRING	5	78.40	22.000	173.00	59.76	26.73	76	22.00	48.00	50.00	99.00	173.00
28	2000	SUMMER	5	158.40	42.000	358.00	129.65	57.98	82	42.00	60.00	121.00	211.00	358.00
31	1990	SUMMER	6	10.83	1.9000	29.00	10.84	4.42	100	1.90	2.00	7.55	17.00	29.00

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
Turbidity_NTU

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	1992	SUMMER	1	50.00	50.000	50.00	.	.	.	50.00	50.00	50.00	50.00	50.00
43	1993	FALL	1	0.10	.10000	0.10	.	.	.	0.10	0.10	0.10	0.10	0.10
43	1994	FALL	2	1.88	1.7500	2.00	0.18	0.13	9	1.75	1.75	1.88	2.00	2.00
43	1994	SUMMER	1	17.00	17.000	17.00	.	.	.	17.00	17.00	17.00	17.00	17.00
43	1995	FALL	4	7.15	2.6000	17.00	6.63	3.32	93	2.60	3.40	4.50	10.90	17.00
43	1996	FALL	4	77.94	.67500	305.00	151.38	75.69	194	0.68	1.74	3.05	154.15	305.00
43	1996	SPRING	1	8.70	8.7000	8.70	.	.	.	8.70	8.70	8.70	8.70	8.70
43	1997	FALL	4	7.10	1.2000	23.50	10.94	5.47	154	1.20	1.35	1.85	12.85	23.50
43	1999	FALL	2	102.00	100.00	104.00	2.83	2.00	3	100.00	100.00	102.00	104.00	104.00
43	1999	SUMMER	2	88.00	26.000	150.00	87.68	62.00	100	26.00	26.00	88.00	150.00	150.00
43	2000	SPRING	1	225.00	225.00	225.00	.	.	.	225.00	225.00	225.00	225.00	225.00
43	2000	SUMMER	1	488.00	488.00	488.00	.	.	.	488.00	488.00	488.00	488.00	488.00
44	1994	FALL	4	61.50	8.0000	92.00	37.85	18.93	62	8.00	35.00	73.00	88.00	92.00
44	1994	SUMMER	5	32.40	2.0000	82.00	29.85	13.35	92	2.00	20.00	28.00	30.00	82.00
44	1999	FALL	11	20.00	1.0000	100.00	33.53	10.11	168	1.00	2.00	2.00	53.00	100.00
44	1999	SUMMER	11	35.64	11.000	88.00	30.82	9.29	86	11.00	13.00	15.00	56.00	88.00
44	2000	SPRING	6	39.00	.00000	127.00	50.70	20.70	130	0.00	2.00	16.00	73.00	127.00
44	2000	SUMMER	6	50.67	15.000	121.00	40.39	16.49	80	15.00	19.00	42.00	65.00	121.00

Aggregate Nutrient Ecoregion: IV
Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
pH_S_U

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
26	1999	FALL	6	8.46	8.3100	8.71	0.19	0.08	2	8.31	8.31	8.36	8.71	8.71
26	1999	SUMMER	6	8.03	8.0050	8.04	0.02	0.01	0	8.01	8.01	8.03	8.04	8.04
26	2000	SPRING	3	8.49	8.3700	8.69	0.17	0.10	2	8.37	8.37	8.42	8.69	8.69
26	2000	SUMMER	3	8.37	8.2800	8.45	0.09	0.05	1	8.28	8.28	8.39	8.45	8.45
28	1999	FALL	10	7.97	7.7100	8.11	0.15	0.05	2	7.71	7.97	8.04	8.04	8.11
28	1999	SUMMER	10	7.21	6.3600	8.10	0.71	0.22	10	6.36	6.83	6.87	7.91	8.10
28	2000	SPRING	5	8.21	8.0400	8.35	0.11	0.05	1	8.04	8.20	8.20	8.24	8.35
28	2000	SUMMER	5	8.07	7.9250	8.19	0.11	0.05	1	7.93	8.00	8.09	8.15	8.19
43	1990	FALL	6	8.08	7.3000	8.45	0.50	0.21	6	7.30	7.58	8.36	8.42	8.45
43	1990	SPRING	1	7.10	7.1000	7.10	.	.	.	7.10	7.10	7.10	7.10	7.10
43	1990	SUMMER	7	8.35	7.1500	8.91	0.58	0.22	7	7.15	8.28	8.41	8.77	8.91
43	1990	WINTER	1	7.65	7.6500	7.65	.	.	.	7.65	7.65	7.65	7.65	7.65
43	1991	FALL	3	8.13	7.7500	8.40	0.34	0.20	4	7.75	7.75	8.25	8.40	8.40
43	1991	SPRING	1	7.35	7.3500	7.35	.	.	.	7.35	7.35	7.35	7.35	7.35
43	1991	SUMMER	2	7.96	7.5000	8.41	0.64	0.46	8	7.50	7.50	7.96	8.41	8.41
43	1991	WINTER	1	6.60	6.6000	6.60	.	.	.	6.60	6.60	6.60	6.60	6.60
43	1992	FALL	7	8.35	7.4850	8.88	0.47	0.18	6	7.49	7.98	8.54	8.58	8.88
43	1992	SPRING	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
43	1992	SUMMER	4	8.10	7.5000	9.27	0.81	0.40	10	7.50	7.58	7.81	8.62	9.27
43	1993	FALL	3	7.90	7.5500	8.30	0.38	0.22	5	7.55	7.55	7.84	8.30	8.30
43	1993	SPRING	1	7.20	7.2000	7.20	.	.	.	7.20	7.20	7.20	7.20	7.20
43	1993	SUMMER	3	7.63	7.0750	7.90	0.48	0.28	6	7.08	7.08	7.90	7.90	7.90
43	1994	FALL	7	8.08	7.7000	8.45	0.26	0.10	3	7.70	7.90	8.10	8.35	8.45
43	1994	SPRING	2	7.74	7.6000	7.88	0.20	0.14	3	7.60	7.60	7.74	7.88	7.88
43	1994	SUMMER	7	8.22	7.7000	8.90	0.41	0.16	5	7.70	7.88	8.20	8.45	8.90
43	1994	WINTER	1	8.58	8.5800	8.58	.	.	.	8.58	8.58	8.58	8.58	8.58
43	1995	FALL	4	8.26	8.1000	8.40	0.13	0.06	2	8.10	8.18	8.28	8.35	8.40
43	1995	SPRING	2	8.74	8.4200	9.06	0.45	0.32	5	8.42	8.42	8.74	9.06	9.06
43	1995	SUMMER	2	9.30	9.0000	9.60	0.42	0.30	5	9.00	9.00	9.30	9.60	9.60
43	1996	FALL	4	7.95	7.6000	8.10	0.24	0.12	3	7.60	7.80	8.05	8.10	8.10
43	1996	SPRING	2	7.95	7.9000	8.00	0.07	0.05	1	7.90	7.90	7.95	8.00	8.00
43	1996	SUMMER	2	9.15	8.2000	10.10	1.34	0.95	15	8.20	8.20	9.15	10.10	10.10

Rivers and Streams
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 2000
pH_S_U

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
43	1997	FALL	4	8.03	7.8000	8.10	0.15	0.07	2	7.80	7.95	8.10	8.10	8.10
43	1997	SUMMER	1	7.36	7.3600	7.36	.	.	.	7.36	7.36	7.36	7.36	7.36
43	1998	FALL	9	8.47	8.0300	8.79	0.25	0.08	3	8.03	8.33	8.42	8.68	8.79
43	1998	SUMMER	15	8.33	7.8950	8.60	0.23	0.06	3	7.90	8.14	8.43	8.53	8.60
43	1999	FALL	2	8.36	8.2800	8.43	0.11	0.08	1	8.28	8.28	8.36	8.43	8.43
43	1999	SUMMER	2	8.40	8.2400	8.56	0.23	0.16	3	8.24	8.24	8.40	8.56	8.56
43	2000	SPRING	1	8.62	8.6200	8.62	.	.	.	8.62	8.62	8.62	8.62	8.62
43	2000	SUMMER	1	10.40	10.400	10.40	.	.	.	10.40	10.40	10.40	10.40	10.40
44	1992	SUMMER	1	8.00	8.0000	8.00	.	.	.	8.00	8.00	8.00	8.00	8.00
44	1993	FALL	1	8.40	8.4000	8.40	.	.	.	8.40	8.40	8.40	8.40	8.40
44	1993	SPRING	1	7.80	7.8000	7.80	.	.	.	7.80	7.80	7.80	7.80	7.80
44	1993	SUMMER	1	8.15	8.1500	8.15	.	.	.	8.15	8.15	8.15	8.15	8.15
44	1994	FALL	1	8.20	8.2000	8.20	.	.	.	8.20	8.20	8.20	8.20	8.20
44	1994	SPRING	1	8.25	8.2500	8.25	.	.	.	8.25	8.25	8.25	8.25	8.25
44	1994	SUMMER	1	8.40	8.4000	8.40	.	.	.	8.40	8.40	8.40	8.40	8.40
44	1995	FALL	1	8.00	8.0000	8.00	.	.	.	8.00	8.00	8.00	8.00	8.00
44	1995	SPRING	1	8.30	8.3000	8.30	.	.	.	8.30	8.30	8.30	8.30	8.30
44	1995	SUMMER	1	8.30	8.3000	8.30	.	.	.	8.30	8.30	8.30	8.30	8.30
44	1999	FALL	11	8.33	7.9200	9.08	0.42	0.13	5	7.92	8.08	8.08	8.52	9.08
44	1999	SUMMER	11	8.29	7.7500	8.71	0.36	0.11	4	7.75	8.07	8.26	8.66	8.71
44	2000	SPRING	6	8.34	7.7400	8.71	0.34	0.14	4	7.74	8.21	8.41	8.58	8.71
44	2000	SUMMER	6	10.40	10.100	10.70	0.23	0.09	2	10.10	10.20	10.40	10.60	10.70

APPENDIX C

Quality Control/Quality Assurance Rules

INDUS
CORPORATION
Knowledge-Based Solutions

Continued Support for the Compilation and Analysis of National Nutrient Data

9 Nutrient Ecoregion/Waterbody Type Summary Chapters

Prepared for:

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Contract Number:68-C-99-226
Task Number:07
Subtask Number:4

August 27, 2001

CONTENTS

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