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Estimated Nitrogen Loads from Selected Tributaries in Connecticut Draining to Long Island Sound, 1999–2009

Scientific Investigations Report 2013-5171

U.S. Department of the Interior
U.S. Geological Survey

Cover. Photograph of the junction of the Yantic and Shetucket Rivers, where they combine to make the Thames River Estuary, Norwich, Connecticut. Courtesy of the Office of Long Island Sound Programs (OLISP), Bureau of Water Protection and Land Reuse, Connecticut Department of Energy and Environmental Protection (CT DEEP).

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Conversion Factors and Datum

Multiply	By	To obtain
	Length	
foot (ft)	0.3048	meter (m)
	Area	
square mile (mi^2)	259.0	hectare (ha)
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
million gallons (Mgal)	3,785	cubic meter (m^3)
cubic foot (ft^3)	0.02832	cubic meter (m^3)
	Flow rate	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per second per square mile [$(ft^3/s)/mi^2$]	0.01093	cubic meter per second per square kilometer [$(m^3/s)/km^2$]
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)
	Mass	
pounds per square mile per year [$(lb/mi^2)/yr$]	0 .001751	kilogram per hectare per year [(kg/ha)/yr]

Abbreviations

AMLE	Adjusted Maximum Likelihood Estimation
CCMP	Comprehensive Conservation and Management Plan
CTDEEP	Connecticut Department of Energy and Environmental Protection
GLS	Generalized Least Squares
LISS	Long Island Sound Study
LOADEST	load estimator
MLE	Maximum Likelihood Estimation
NCE	Nitrogen Credit Exchange
NLCD	National Land Cover Data
NWIS	National Water Information System
NWQL	National Water Quality Laboratory
OLS	ordinary least squares
QA/QC	Quality Assurance and quality control
SPARROW	SPAtially Referenced Regressions on Watershed attributes
TMDL	Total maximum daily load
USEPA	U.S. Environmental Protection Agency
WWTF	wastewater-treatment facility

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Estimated Nitrogen Loads from Selected Tributaries in Connecticut Draining to Long Island Sound 1999–2009

By John R. Mullaney and Gregory E. Schwarz

Abstract

The total nitrogen load to Long Island Sound from Connecticut and contributing areas to the north was estimated for October 1998 to September 2009. Discrete measurements of total nitrogen concentrations and continuous flow data from 37 water-quality monitoring stations in the Long Island Sound watershed were used to compute total annual nitrogen yields and loads. Total annual computed yields and basin characteristics were used to develop a generalized-least squares regression model for use in estimating the total nitrogen yields from unmonitored areas in coastal and central Connecticut. Significant variables in the regression included the percentage of developed land, percentage of row crops, point-source nitrogen yields from wastewater-treatment facilities, and annual mean streamflow.

Computed annual median total nitrogen yields at individual monitoring stations ranged from less than 2,000 pounds per square mile in mostly forested basins (typically less than 10 percent developed land) to more than 13,000 pounds per square mile in urban basins (greater than 40 percent developed) with wastewater-treatment facilities and in one agricultural basin. Medians of computed total annual nitrogen yields for water years 1999–2009 at most stations were similar to those previously computed for water years 1988–98. However, computed medians of annual yields at several stations, including the Naugatuck River, Quinnipiac River, and Hockanum River, were lower than during 1988–98. Nitrogen yields estimated for 26 unmonitored areas downstream from monitoring stations ranged from less than 2,000 pounds per square mile to 34,000 pounds per square mile.

Computed annual total nitrogen loads at the farthest downstream monitoring stations were combined with the corresponding estimates for the downstream unmonitored areas for a combined estimate of the total nitrogen load from the entire study area. Resulting combined total nitrogen loads ranged from 38 to 68 million pounds per year during water years 1999–2009. Total annual loads from the monitored basins represent 63 to 74 percent of the total load. Computed annual nitrogen loads from four stations near the Massachusetts border with Connecticut represent 52 to 54 percent of the total nitrogen load during water years 2008–9, the only years with data for all the border sites.

During the latter part of the 1999–2009 study period, total nitrogen loads to Long Island Sound from the study area appeared to increase slightly. The apparent increase in loads may be due to higher than normal streamflows, which consequently increased nonpoint nitrogen loads during the study, offsetting major reductions of nitrogen from wastewater-treatment facilities. Nitrogen loads from wastewater treatment facilities declined as much as 2.3 million pounds per year in areas of Connecticut upstream from the monitoring stations and as much as 5.8 million pounds per year in unmonitored areas downstream in coastal and central Connecticut.

Introduction

The Long Island Sound Study (LISS) began in 1985 when Congress appropriated funds for the U.S. Environmental Protection Agency (USEPA) to carry out a program to research, monitor, and assess the water quality of Long Island Sound in concert with the States of Connecticut and New York, forming a bi-State partnership consisting of Federal and State agencies, user groups, concerned organizations, and individuals dedicated to restoring and protecting the Sound (New York Department of Environmental Conservation and Connecticut Department of Environmental Protection, 2000). In 1994, the LISS completed a comprehensive conservation and management plan (CCMP) that identified six problems that merit special attention, including low dissolved oxygen (hypoxia), toxic contamination, pathogen contamination, effects of habitat loss on the health of living resources, land use and development resulting in habitat loss, and degradation of water quality (Long Island Sound Study, 1994). In 2012, an effort to update the CCMP was begun.

Hypoxia is the issue identified as the highest priority water-quality problem for Long Island Sound. Hypoxia is defined by the LISS as concentrations of dissolved oxygen of 3 milligrams per liter (mg/L) or less in a water column of Long Island Sound (Long Island Sound Study, 1994). The problem occurs during the summer months in the bottom waters of western Long Island Sound.

Hypoxia is believed to be caused by overenrichment of nitrogen in Long Island Sound. Although nitrogen is essential to a productive ecosystem, too much nitrogen fuels the excessive growth of algae. When the algae die, they sink to the bottom, where they are consumed by bacteria. The microbial decay of algae and the respiration of oxygen-breathing organisms use up the available oxygen in the lower water column and in the bottom sediments, gradually reducing the dissolved oxygen concentration to unhealthy levels. If the water column remains stratified for an extended period and the amount of organic carbon (primarily from decaying algae) is high enough, oxygen may fall to hypoxic or even anoxic levels. Under these conditions, some organisms may suffocate and die, while others flee the hypoxic area. Dense algal blooms also can inhibit light penetration, preventing sufficient light from reaching the bottom in shallow areas to support the growth of submerged aquatic vegetation, an important habitat for shellfish and juvenile fish. Consequently, excessive nitrogen impairs the function and health of Long Island Sound.

The LISS estimated that the load of nitrogen delivered to Long Island Sound has more than doubled since precolonial times. Discharges from sewage-treatment plants, atmospheric deposition, and runoff are the primary sources of nitrogen enrichment to Long Island Sound (New York Department of Environmental Conservation and Connecticut Department of Environmental Protection, 2000).

In 2001, the States of New York and Connecticut implemented a total maximum daily load (TMDL) with the goal of reducing the nitrogen load to Long Island Sound by 58.5 percent by 2014 (New York Department of Environmental Conservation and Connecticut Department of Environmental Protection, 2000). The goals of the TMDL are to be achieved by reducing nitrogen loads from wastewater-treatment facilities (WWTFs) and nonpoint sources of nitrogen. In Connecticut, waste-load allocations of nitrogen have been assigned to 79 wastewater-treatment facilities (Connecticut Department of Environmental Protection, 2010). Facilities that are under their waste-load allocations can sell nitrogen credits through the nitrogen credit exchange in Connecticut to facilities that exceed their waste-load allocation. Regions of Connecticut have been assigned trading ratios on the basis of their proximity to western Long Island Sound. WWTFs near the western end of Long Island Sound have a trading ratio of 1, whereas a facility in the northeastern part of Connecticut is assigned a trading ratio of 0.14 on the basis of modeled delivery of nitrogen to the western region of Long Island Sound. For WWTFs with high trading ratios, economics often favor additional treatment through plant upgrades, while those with lower ratios may find the purchase of credits economically advantageous over treatment (Connecticut Department of Environmental Protection, 2010). Upgrades to WWTFs in Connecticut have caused significant reductions in daily nitrogen loads since 2001 (Long Island Sound Study, 2013).

The U.S. Geological Survey (USGS) has collected data on nitrogen in streams in Connecticut since the inception of the Clean Water Act of 1972 and has previously estimated nitrogen loads from rivers draining to Long Island Sound (Trench, 2000; Mullaney and others, 2002). In 2008, the USGS began an enhanced data collection program for the purpose of estimating nutrient loads from tributaries draining to Long Island Sound and to provide data to assist with an update of the nitrogen TMDL, which expires in 2014.

Purpose and Scope

The purpose of this report is to provide estimates of total nitrogen loads to Long Island Sound from Connecticut and contributing areas to the north from 1998 through 2009 in order to provide information to be used in a revised TMDL for nitrogen loading to Long Island Sound. This report includes load estimates (appendix 1) for total nitrogen at 37 stations in or near Connecticut in the Long Island Sound watershed for water years[1] 1999 to 2009 (October 1998 to September 2009). Samples were collected at 16 fall-line stations—the monitoring stations farthest downstream, yet above tidal influence—and at other upstream basins or basins with a dominant type of land use. These data were used to estimate nitrogen loads from unmonitored areas in coastal Connecticut. For several stations, data collection was begun in October 2008, and therefore, load estimates were computed only for available years. This report also contains information on total nitrogen yields to enable comparison of the export of nitrogen per unit area among monitoring stations and to be used in a statistical model to estimate nitrogen loads downstream from the fall-line stations. The computed total nitrogen loads for the fall-line stations were summed with the estimated loads from below the fall-line stations to create a combined estimate of the nitrogen loads to Long Island Sound from the study area.

Previous Studies

This report serves as an extension of the analyses that were done from 1988 through 1998 (Mullaney and others, 2002). The previous analysis was primarily designed to estimate the nonpoint source loads of nitrogen to Long Island Sound from the same study area as in this report, using nearly identical methods. Mullaney and others (2002) identified information and efforts that would be useful for improving nitrogen load estimates to Long Island Sound, including (1) adding additional monitoring stations representative of urban and agricultural land uses, (2) increasing sampling frequency for nitrogen at new or existing stations, (3) adding continuous streamgaging, where possible, to nitrogen monitoring stations to increase the pool of stations for use in

[1]A water year is the period from October 1 of the previous year through September 30 of the year designated; for example, water year 2009 covers October 1, 2008, through September 30, 2009.

load calculation, (4) developing methods for computing loads in tidal reaches, (5) analyzing newly available temporal data on nitrogen loads from WWTFs in Connecticut to improve regression models used to estimate nitrogen loads from unmonitored areas, (6) developing a water-diversion tracking system to understand the implications of using surrogate streamgages to estimate annual streamflows from unmonitored areas, and (7) applying field scale studies or models to determine instream losses of nitrogen.

A number of these information sources were addressed in this study. Several additional monitoring stations were added, although others were discontinued that had been used from 1988 through 1998. The sampling frequency was increased to 12 times per year at the fall-line stations and at newly established stations. Continuous streamflow measurement was added to the streamgages at Housatonic River near Ashley Falls, Massachusetts (site 30; figs. 1 and 2), and Shetucket River at Taftville, Connecticut (site 4; figs. 1, 2). Nitrogen loads computed for 12 monitoring stations from 2003 through 2005 from Deacon and others (2006) were included in this study (fig. 1).

Nitrogen load data from tidal reaches are currently unavailable; however, nitrogen sampling and discharge measurement are being conducted on the lower Connecticut River and likely will be available for future updates on nitrogen loads to Long Island Sound (Jonathan Morrison, U.S. Geological Survey, oral commun., 2013). Data on monthly loads of total nitrogen from WWTFs in Connecticut became available in 2002; the data were used to improve the regression model used to estimate nitrogen loads from unmonitored areas draining to Long Island Sound.

Two studies investigated the attenuation of nitrogen in the study area; one used the Spatially Referenced Regressions on Watershed Attributes (SPARROW) model (Moore and others, 2011), and the other used mass balance and in situ denitrification measurements on two reaches of the Connecticut River in New Hampshire and Massachusetts (Smith and others, 2008).

Description of the Study Area

The study area (fig. 1) consists of the watershed draining to Long Island Sound from Connecticut, Massachusetts, New Hampshire, Vermont, and small parts of New York (excluding Long Island) and Rhode Island, encompassing more than 16,000 square miles (mi^2). The major rivers draining the area are the Connecticut, Housatonic, and Thames Rivers. The study area contains about 12 percent urbanized land, 7.7 percent agricultural land, 71 percent forested land, and about 5 percent wetlands, based on analysis using the 2001 National Land Cover Database (NLCD; Homer and others, 2007). The most developed areas are in the southern part of the study area that encompasses parts of the Springfield, Mass., to Stamford, Conn., metropolitan areas, whereas much of the northern part of the study area is substantially forested, including the Green Mountains in Vermont and the White Mountains in New Hampshire.

Data Collection, Data Sources, and Methods of Data Analysis

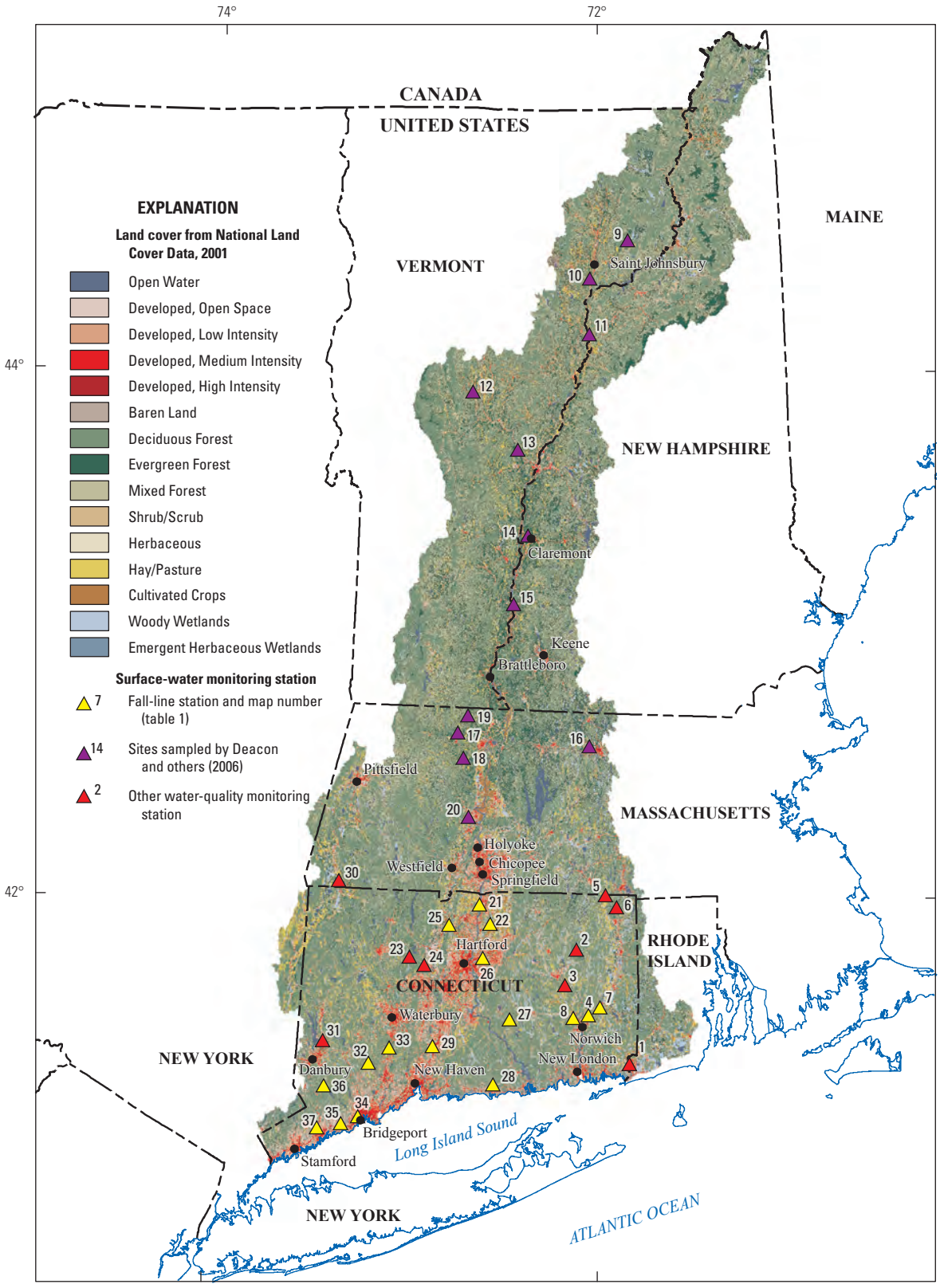
The computation of total nitrogen loads required retrieval of water-quality and streamflow data from USGS databases from October 1995 through September 2009 at water-quality monitoring and streamgage stations in the study area. Some available load estimates from the northern part of the watershed were used. Total nitrogen loads at each station were computed by using the LOADEST (load estimator) program (Runkel and others, 2004). Samples were collected as part of previously established water-quality networks and specifically for this investigation. Streamflow data for all stations used in the analyses were previously collected at streamgages at or near the water-quality monitoring stations.

Computed loads were used along with ancillary basin information in the creation of a generalized least squares (GLS) regression model to describe the variability in nitrogen yields on the basis of land use, streamflow, and wastewater discharge of nitrogen. This regression model was applied to unmonitored areas in coastal Connecticut in order to estimate loads from these regions.

Annual combined estimates of total nitrogen loads from the study area, were made by summing the loads computed using LOADEST at the fall-line stations with the estimates of total nitrogen loads from the unmonitored areas downstream from the fall-line stations.

Water-Quality Field Measurement and Sampling Procedures, and Streamflow Measurement

Water-quality sampling methods and equipment selection for samples collected for this study are described in U.S. Geological Survey (2006) and Lane and others (2003). Samples were collected using an equal width increment method by compositing samples from at least 10 equally spaced locations across the stream channel. Field measurements were made during each station visit, including specific conductance, temperature, pH, dissolved oxygen, and turbidity. The methods are described in Wilde (variously dated). Water-quality samples for nutrient analyses were preserved as needed and stored on ice before shipping within three days to the USGS National Water Quality Laboratory in Denver, Colorado. Streamflow measurements, streamgage operations, and discharge computations were done following the procedures described in Rantz (1982a,b).



Base from Connecticut Department of Environmental Protection, 2004, 1:24,000
Land use/land cover from U.S. Environmental Protection Agency, 2001

Figure 1. Long Island Sound watershed in the northeastern United States, with land cover and selected water-quality monitoring stations on rivers draining to Long Island Sound, northeastern United States.

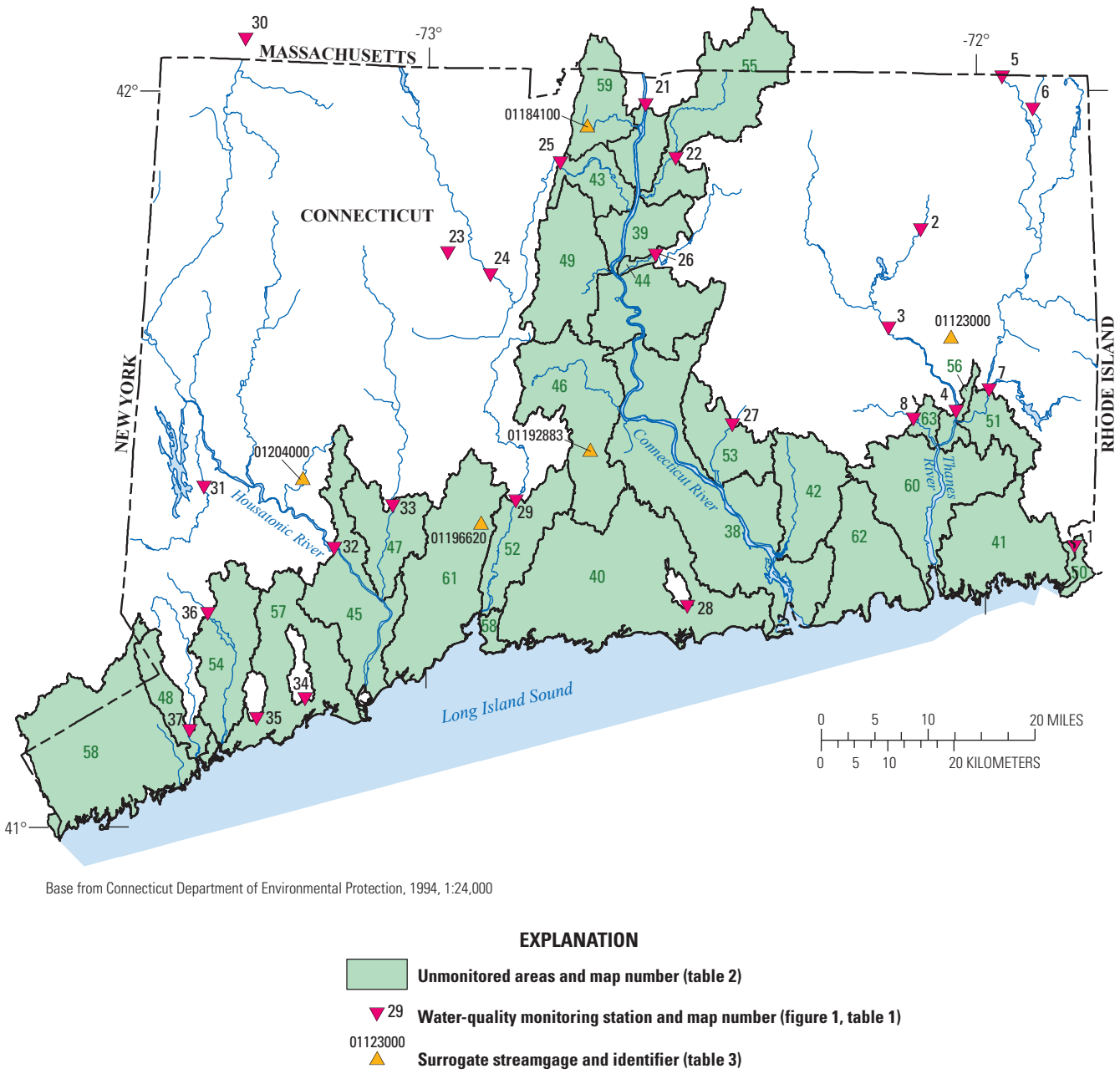


Figure 2. Unmonitored areas draining to Long Island Sound, water-quality monitoring stations, and surrogate streamgages in parts of Connecticut, Rhode Island, Massachusetts, and New York.

Laboratory Measurements

Total nitrogen was calculated as the sum of total ammonia plus organic nitrogen and nitrite plus nitrate nitrogen. Total ammonia plus organic nitrogen and nitrite plus nitrate nitrogen were analyzed using the methods detailed in Fishman (1993) and Patton and Truitt (2000). Analytical results were entered into the National Water Information System (NWIS) database by laboratory personnel. In the study area, total nitrogen concentrations contained varying proportions of nitrite plus nitrate nitrogen and total ammonia plus organic nitrogen. In samples from this study, nitrite plus nitrate nitrogen typically represented about 46 to 68 percent of the total nitrogen with median ratios in samples from some stations as low as low as 27 percent or as high as 90 percent. The percent of the total nitrogen from nitrite plus nitrate nitrogen typically increased with increasing urbanization in the watershed.

Quality Assurance and Quality Control Sampling and Analysis

Quality assurance and quality control (QA/QC) samples were collected and analyzed routinely for the constituents in total nitrogen, including total ammonia plus organic nitrogen and nitrite plus nitrate nitrogen. Field blanks were collected to determine whether the samples may have been contaminated with the analytes of interest as a result of the sampling, storage, and shipping procedures or the exposure of the sampling equipment to the environment. Split replicates were collected primarily to determine the reproducibility of the analytical data and the potential bias from preservatives, filtering, and shipping of the samples. Procedures for field blanks and split replicates are described in U.S. Geological Survey (2006).

Water samples for analysis for total nitrogen concentration were collected as part of several projects or programs during 1995 through 2009; therefore, all QA/QC data for total nitrogen associated with any of the stations in this study were evaluated. Field blanks were collected 95 times at 25 stations. Concentrations of total nitrogen in all field blanks were less than the reporting limit and ranged from less than 0.07 to less than 0.43 mg/L. In three field blank samples, concentrations of total ammonia plus organic nitrogen were greater than the reporting limit (0.10 mg/L), ranging from 0.21 to 0.41 mg/L. In one sample, the concentration of nitrite plus nitrate nitrogen, 0.3 mg/L, was greater than the maximum reporting limit (0.06 mg/L). The results of these analyses indicate low potential for bias associated with the equipment used, the environments around the sampling sites, and the sample processing.

Split replicates were collected 96 times at 25 sites. The relative percent difference in total nitrogen concentrations between the environmental samples and the split replicates ranged from a low of –20 percent to a high of +34.62 percent. The 25th percentile was –3.22 and the 75th percentile was +2.35 percent, indicating that most of the analytical results were reproducible. These relative percent differentials translate to a small absolute difference in analytical results. The minimum was –0.19 mg/L, the maximum was +0.11 mg/L, and the 25th and 75th percentiles were –0.01 and +0.02 mg/L, respectively, indicating little variability in the analytical results.

Load Estimation Data

Most of the data used in this study are from chemical analyses of water samples and from streamflow data collected at 25 streamgages (table 1) in the Long Island Sound watershed in Connecticut as part of the USGS Cooperative Water Program. Some of the water-quality data were obtained as part of the USGS National Water-Quality Assessment program. Data on discrete total nitrogen concentrations and mean daily streamflow were retrieved from NWIS in 2011. All available data from October 1995 through September 2009 (water years 1996–2009) were retrieved; total nitrogen represents the sum of total ammonia plus organic nitrogen and nitrate plus nitrite nitrogen concentrations stored in the NWIS database. Sample collection frequency at individual stations ranged from 4 samples per year to 22 samples per year for the available period of record, which ranged from 2 to 14 years.

Water-quality load analyses from an additional 12 stations (fig. 1; table 1) used in this study were made as part of a study of nitrogen loads in the northern part of the Connecticut River Basin (Deacon and others 2006). These data represent water years 2003–5.

Load Computation for Monitoring Stations

Total nitrogen loads were computed by using the LOADEST computer program (Runkel and others, 2004). Given a set of discrete water-quality measurements at each station and corresponding streamflow data, LOADEST develops a regression model for the estimation of constituent load. Explanatory variables in the regression model may include various functions of streamflow, time, seasonal terms, and additional user-specified data. The formulated regression model then is used to estimate loads over a user-specified time interval.

The LOADEST program uses adjusted maximum likelihood estimation (AMLE; Cohn, 1988; Cohn and others, 1992) because the dataset can contain censored data (below an analytical or reporting threshold). Retransformation bias (underestimation of true loads resulting from changing estimates made in log space back to actual numbers) is handled in the AMLE by equations specially designed for censored data. Load estimations using datasets with no censored data converge to the maximum likelihood estimation (MLE); either estimation method, used appropriately, results in a minimum-variance, unbiased estimate of constituent loads

Table 1. Water-quality monitoring stations used for nitrogen load analysis in basins draining to Long Island Sound.

[mi², square mile; R.I., Rhode Island; Conn., Connecticut; Vt., Vermont; N.H., New Hampshire; Mass., Massachusetts; NLCD, National Land Cover Database]

U.S. Geological Survey identifier	Station name	Map number (figures 1, 2)	Drainage area, in mi²	Developed land[1], in percent of basin area	Agricultural land[2], in percent of basin area	Forest and wetland[3], in percent of basin area	Impervious cover, in percent of basin area	Population density in 2000, people per mi²	Period of record used (water years)	Number of samples with total nitrogen analyses
01118500	Pawcatuck River at Westerly, R.I.	1	295	10.4	8.8	76.5	2.6	176	1996–2009	62
01120790	Natchaug River at Marcy Rd., near Chaplin, Conn.	2	66.5	6.1	5.9	84.7	0.6	64	2007–2009	36
01122610	Shetucket River at S. Windham, Conn.	3	408	10.0	7.6	78.7	1.8	256	1996–2009	140
011230695	Shetucket River at Taftville, Conn.	4	512	9.5	8.5	78.5	1.6	235	2008–2009	29
01124000	Quinebaug River at Quinebaug, Conn.	5	155	11.9	6.1	78.3	2.3	255	1996–2009	150
01125100	French River at N. Grosvenordale, Conn.	6	101	17.6	7.5	67.9	5.1	527	2003–2009	47
01127000	Quinebaug River at Jewett City, Conn.	7	713	11.4	10.1	74.4	2.6	254	1996–2009	140
01127500	Yantic River at Yantic, Conn.	8	89.3	7.8	16.6	70.9	1.3	135	2008–2009	29
01134500	Moose River at Victory, Vt.	9	75.2	0.8	0.1	95.3	0.1	4	2003–2005	42
01135500	Passumpsic River at Passumpsic, Vt.	10	436	5.8	8.8	82.6	1.2	47	2003–2005	43
01138500	Connecticut River at Wells River, Vt.	11	2,644	3.7	4.6	83.4	0.7	24	2003–2005	43
01142500	Ayers Brook at Randolph, Vt.	12	30.5	6.5	18.4	72.9	1.0	44	2003–2005	43
01144000	White River at West Hartford, Vt.	13	690	4.4	9.2	84.3	0.7	31	2003–2005	45
01152500	Sugar River at West Claremont, N.H.	14	269	7.0	5.8	81.6	1.6	101	2003–2005	43
01154500	Connecticut River at North Walpole, N.H.	15	5493	4.7	6.6	83.2	0.9	42	2003–2005	44
01163200	Otter River at Otter River, Mass.	16	34.1	23.0	5.6	65.9	9.1	645	2003–2005	42
01169000	North River at Shattuckville, Mass.	17	89	4.3	8.4	86.5	0.6	35	2003–2005	41
01169900	South River near Conway, Mass.	18	24.1	6.4	11.3	81.4	0.9	62	2003–2005	41
01170100	Green River near Colrain, Mass.	19	41.4	3.0	4.3	92.2	0.2	26	2003–2005	68
01171500	Mill River at Northhampton, Mass.	20	52.6	9.2	5.7	83.6	1.9	218	2003–2005	43
01184000	Connecticut River at Thompsonville, Conn.	21	9,660	6.9	6.8	81.5	1.6	117	1996–2009	170
01184490	Broad Brook at Broad Brook, Conn.	22	15.5	15.2	38.1	45.0	2.9	427	1997–2009	106
01188000	Bunnell (Burlington) Brook near Burlington, Conn.	23	4.1	10.2	17.9	69.9	1.9	221	1996–2009	74
01188090	Farmington River at Unionville, Conn.	24	378	7.2	3.7	84.3	1.1	124	1996–2009	54
01189995	Farmington River at Tariffville, Conn.	25	577	13.7	5.8	76.2	3.1	327	1996–2009	119
01192500	Hockanum River near East Hartford, Conn.	26	73.4	41.4	9.8	46.2	13.2	1,334	1996–2009	117
01193500	Salmon River near East Hampton, Conn.	27	100	11.3	8.3	77.1	1.8	263	1996–2009	74
01195100	Indian River near Clinton, Conn.	28	5.68	11.5	3.9	81.7	1.5	367	2008–2009	31
01196500	Quinnipiac River at Wallingford, Conn.	29	115	53.2	2.8	40.9	17.5	1,383	1996–2009	124

Table 1. Water-quality monitoring stations used for nitrogen load analysis in basins draining to Long Island Sound.—Continued

[mi², square mile; R.I., Rhode Island; Conn., Connecticut; Vt., Vermont; N.H., New Hampshire; Mass., Massachusetts; NLCD, National Land Cover Database]

U.S. Geological Survey identifier	Station name	Map number (figures 1, 2)	Drainage area, in mi²	Developed land[1], in percent of basin area	Agricultural land[2], in percent of basin area	Forest and wetland[3], in percent of basin area	Impervious cover, in percent of basin area	Population density in 2000, people per mi²	Period of record used (water years)	Number of samples with total nitrogen analyses
01198125	Housatonic River at Ashley Falls, Mass.	30	465	9.8	10.7	75.4	2.3	189	2008–2009	24
01201487	Still River at Route 7 at Brookfield Center, Conn.	31	62.3	40.9	4.5	51.2	14.5	1,472	2001–2009	77
01205500	Housatonic River at Stevenson, Conn.	32	1,544	10.4	13.4	71.6	2.3	228	1996–2009	77
01208500	Naugatuck River at Beacon Falls, Conn.	33	260	25.4	8.9	62.2	8.6	928	1996–2009	123
01208873	Rooster River at Fairfield, Conn.	34	10.6	92.6	0.0	6.5	35.7	5,006	2008–2009	28
01208950	Sasco Brook near Southport, Conn	35	7.38	37.8	1.8	58.6	5.5	540	2008–2009	28
01208990	Saugatuck River near Redding, Conn.	36	21	13.2	3.7	80.7	1.3	333	1996–2009	71
01209710	Norwalk River at Winnipauk, Conn.	37	33	27.6	2.7	67.7	6.8	722	1996–2009	173

[1]Sum of 2001 NLCD categories: 21 - developed, open space; 22 - developed, low intensity; 23 - developed, medium intensity; 24 - developed, high intensity.

[2]Sum of 2001 NLCD categories: 81 - pasture/hay; 82 - cultivated crops.

[3]Sum of 2001 NLCD categories: 41 - deciduous forest; 42 - evergreen forest; 43 - mixed forest; 90 - woody wetlands; 95 - emergent herbaceous wetland.

(Runkel and others, 2004). Data analyzed for total nitrogen in this study contained no censored data. Where either nitrite plus nitrate nitrogen or total ammonia plus organic were detected at greater than the reporting limit, no total nitrogen concentration was reported in NWIS.

Estimations using the AMLE or MLE require that model residuals are normally distributed. As part of the evaluation of models, plots of residuals were analyzed graphically to verify that residuals met or nearly met normality assumptions.

Load estimations were computed for water years 1999–2009. Input data sets for the LOADEST model contained concentrations of total nitrogen and continuous streamflow values for water years 1996–2009, if available, in order to improve the load estimations by including data prior to water year 1999. Load estimations using LOADEST are referred to as "computed loads" in this report.

Load Estimation for Unmonitored Areas

A multivariate regression model was developed to estimate annual nonpoint nitrogen yields for all 26 unmonitored areas that drain to Long Island Sound (fig. 2; table 2). These unmonitored areas are based on basin boundaries and include downstream parts of monitored basins and groups of coastal basins.

The regression model uses land use, streamflow, and point-source nitrogen data as independent variables to describe the variability of annual nitrogen yield (Mullaney and others, 2002). Computations of individual annual yields for water years 1999–2009 (based on LOADEST calculations described above) for each water-quality monitoring station were used in multivariate regression as the response variable.

Correlation among model residuals is present because (1) data for multiple years from the same monitoring station were used in the regression and (2) data for many of the explanatory variables were fixed and the same values were used for each year (land use and land cover, for example). To account for this correlation, a GLS model with a serially correlated error structure was applied. This regression method allows for calculation of unbiased coefficient estimates and confidence intervals around estimates of predicted yields. A detailed description of these methods is in Mullaney and others (2002, appendix 2). Estimates of total nitrogen loads from the unmonitored basins were combined with the computed loads from the fall-line monitoring stations to estimate the total nitrogen loads delivered to Long Island Sound from the study area for the period of interest.

Data sets used in describing the variability of nitrogen yields included land use and land cover from 2001, annual streamflows, and loads of nitrogen discharged from wastewater-treatment facilities. Multiple combinations of variables were tested in the regression. Variables were selected on the basis of physical plausibility, inspection of plots of residuals, and other statistical diagnostics. The goal was to describe the greatest amount of variability with the fewest number of variables.

Land Use and Land Cover

Selected land-use and land-cover data were summarized for basins analyzed in this study from interpreted Landsat images from the NLCD for 2001 (U.S. Environmental Protection Agency, 2001; Homer and others, 2007). The NLCD 2001 is a 16-class land-cover classification scheme that has been applied consistently across all 50 States and Puerto Rico at a spatial resolution of 30 meters. The NLCD 2001 is based primarily on the unsupervised classification of Landsat Enhanced Thematic Mapper+ satellite data from about 2001.

Streamflow and Water Yield

One of the most important factors in determining annual total nitrogen loads from a river is the annual variability of streamflow. Therefore, the annual streamflow for each streamgage, normalized to drainage area and resulting in water yields, was used as an explanatory variable to estimate the annual yields of total nitrogen. Annual mean streamflow data for each streamgage (with LOADEST computations) was converted to inches of runoff per year, for each year as done by Mullaney and others (2002).

In order to apply the annual runoff variable when making predictions for the unmonitored areas, streamflow data from streamgages (table 3) in or near each unmonitored area, called "surrogate streamgages," were used to estimate annual mean streamflow and runoff. Most surrogate streamgages were selected from basins with no major wastewater discharges. The use of this surrogate streamgage approach does not account for diversions of water that might be present in each unmonitored basin; therefore, estimates may be biased low or high if substantial amounts of water are imported from, or exported to, any unmonitored basin. During the period of the study (water years 1999–2009), runoff in Connecticut exceeded the median value of 27.1 inches for the 30-year period of water years 1980–2009 in 6 of the 11 years studied, primarily toward the end of the record (fig. 3; U.S. Geological Survey, 2012).

Wastewater Nitrogen

WWTF nitrogen load data were derived from two sources: (1) data on loads reported to the Connecticut Department of Energy and Environmental Protection (CTDEEP) by WWTFs in Connecticut and (2) output data from the USGS SPARROW model for facilities north of Connecticut (Moore and others, 2011). CTDEEP data include calendar year loads for all WWTFs in Connecticut for 1999 to 2002 and monthly loads reported by all Connecticut

Table 2. Unmonitored areas draining to Long Island Sound, Connecticut and Rhode Island.

[mi², square mile; CT, Connecticut; S., south; N., north; NLCD, National Land Cover Database]

Unmonitored basin/area name	Map number (figure 2)	Drainage area, in mi²	Developed land[1], in percent of basin area	Agricultural land[2], in percent of basin area	Forest and wetland[3], in percent of basin area	Impervious cover, in percent of basin area	Population density in 2000, people per mi²
CT mainstem S.	38	227.5	15.3	4.7	70.1	3.6	334
CT mainstem N.	39	139.5	49.8	9.7	34.1	18.2	1,436
Central	40	210.6	23.6	4.0	67.7	6.3	577
East of Thames	41	87.2	24.0	8.4	63.1	8.6	576
Eightmile	42	62.4	6.2	6.3	84.7	0.6	84
Farmington	43	30.6	38.8	13.8	42.1	12.8	636
Hockanum	44	3.5	71.2	2.2	23.4	32.7	3,522
Housatonic	45	94.3	43.0	5.0	46.8	13.5	1,165
Mattabesett	46	108.9	34.3	12.8	49.0	11.3	977
Naugatuck	47	51.9	26.1	6.3	64.1	8.6	897
Norwalk	48	29.6	42.0	1.6	54.1	12.5	1,690
Park	49	77.2	64.5	5.9	27.3	25.2	2,893
Pawcatuck	50	9.4	62.2	1.3	20.6	29.6	1,657
Quinebaug	51	28.8	6.9	19.0	72.0	1.2	128
Quinnipiac	52	54.7	54.7	7.0	34.5	17.7	1,404
Salmon	53	48.4	10.4	5.4	77.3	1.6	333
Saugatuck	54	68.8	22.6	3.4	70.1	3.6	516
Scantic	55	98.1	17.5	19.8	60.5	3.8	377
Shetucket	56	11.5	31.1	7.4	57.3	9.9	1,263
Southwest east	57	98.9	60.0	2.1	33.4	22.6	2,356
Southwest west	58	167.1	44.6	2.5	50.2	12.3	1,683
Stony Brook	59	44.6	19.1	29.5	46.2	6.0	335
Thames Mainstem	60	107.7	22.8	5.0	64.7	7.7	685
West Central	61	130.5	54.0	2.2	41.0	20.3	2,192
West of Thames	62	76.2	24.1	3.3	64.9	6.9	558
Yantic	63	8.6	43.2	6.4	47.8	12.9	956

[1]Sum of 2001 NLCD categories: 21 - developed, open space; 22 - developed, low intensity; 23 - developed, medium intensity; 24 - developed, high intensity.

[2]Sum of 2001 NLCD categories: 81 - pasture/hay; 82 - cultivated crops; 90 - woody wetlands; 95 - emergent herbaceous wetland.

[3]Sum of 2001 NLCD categories: 41 - deciduous forest; 42 - evergreen forest; 43 - mixed forest.

facilities for 2002 to 2009 as part of the CTDEEP Nitrogen Credit Exchange program (NCE; Connecticut Department of Environmental Protection, 2010). Monthly WWTF nitrogen loads were summed by water year to conform with the LOADEST outputs. Data for 1999 through 2002 were summarized by calendar year because monthly data were not available prior to the implementation of the NCE in 2001. Data on nitrogen loads from WWTFs in Connecticut are in appendix 3, and summed by station in appendix 1.

The loads of nitrogen from WWTFs in Connecticut have decreased steadily following the implementation of the NCE, both upstream from USGS monitoring stations and in the unmonitored coastal areas (shown in fig. 2). Loads from Connecticut WWTFs upstream from USGS fall-line monitoring stations declined from a high of 5.3 million pounds per year (Mlb/yr) in calendar year 1999 to a low of 3.4 Mlb/yr in water year 2008 (fig. 4). Loads of total nitrogen from WWTFs in the unmonitored coastal basins (downstream

Table 3. Surrogate streamgages selected to represent unmonitored basins that drain to Long Island Sound.

[USGS, U.S. Geological Survey; CT, Connecticut; S., south; N., north; Conn., Connecticut; R.I., Rhode Island]

Unmonitored area, or water-quality site (figures 1 and 2)	Unmonitored basin or part of basin	Streamgage used as surrogate	
		USGS station number	Station name
40	CT mainstem S.	01193500	Salmon River near East Hampton, Conn.
41	CT mainstem N.	01184490	Broad Brook at Broad Brook, Conn.
42	Eightmile	01193500	Salmon River near East Hampton, Conn.
43	Farmington	01184100	Stony Brook near West Suffield, Conn.
44	Hockanum	01192500	Hockanum River near East Hartford, Conn.
45	Housatonic	01204000	Pomperaug River at Southbury, Conn.
46	Mattabesett	01192883	Coginchaug River at Middlefield, Conn.
47	Scantic	01184490	Broad Brook at Broad Brook, Conn.
48	Stony Brook	01184100	Stony Brook near West Suffield, Conn.
49	Park	01184100	Stony Brook near West Suffield, Conn.
50	Salmon	01193500	Salmon River near East Hampton, Conn.
51	Yantic	01127500	Yantic River at Yantic, Conn.
52	Shetucket	01193500	Salmon River near East Hampton, Conn.
53	Quinebaug	01123000	Little River near Hanover, Conn.
54	Pawcatuck	01118500	Pawcatuck River at Westerly, R.I.
55	Thames Mainstem	01127500	Yantic River at Yantic, Conn.
56	East of Thames	01127500	Yantic River at Yantic, Conn.
57	West of Thames	01127500	Yantic River at Yantic, Conn.
58	Central	01195100	Indian River near Clinton, Conn.
59	Quinnipiac	01196500	Quinnipiac River at Wallingford, Conn.
60	West Central	01196620	Mill River near Hamden, Conn.
61	Naugatuck	01208500	Naugatuck River at Beacon Falls, Conn.
62	Saugatuck	01208990	Saugatuck River near Redding, Conn.
63	Norwalk	01209710	Norwalk River near Winnipauk, Conn.
64	Southwest_east	01208950	Sasco Brook near Southport, Conn.
65	Southwest_west	01208950	Sasco Brook near Southport, Conn.
4	011230695	01127500	Yantic River at Yantic, Conn.

from USGS monitoring stations) declined from a high of 13.1 Mlb/yr in calendar year 1999 to a low of 7.3 Mlb/yr in water year 2009 (fig. 4). Annual total nitrogen load data from WWTFs were summed by water-quality monitoring station or unmonitored area and normalized by dividing by the drainage area of each basin to calculate a yield, in pounds per square mile (lb/mi^2). Annual summaries of nitrogen load from WWTFs in Connecticut are listed in appendix 3.

Annual or monthly total nitrogen load data from WWTFs in basins outside Connecticut were generally unavailable. Therefore, nitrogen load estimates from WWTFs for those basins (table 4; Moore and others, 2011) were determined using the USGS SPARROW decision-support tool (http://cida.usgs.gov/sparrow/). Nitrogen load information used in the SPARROW model is based on 2002 estimates of nitrogen loads from a USEPA permitted wastewater-discharge dataset that was developed on the basis of the methods used by McMahon and others (2007) and described in Maupin and Ivahnenko (2011). Load estimates were assumed to be representative of the entire study period and were normalized by dividing the cumulative wastewater-discharge loads by the entire drainage basin for the monitoring station to calculate a yield, in pounds per square mile per year (lb/mi^2/yr).

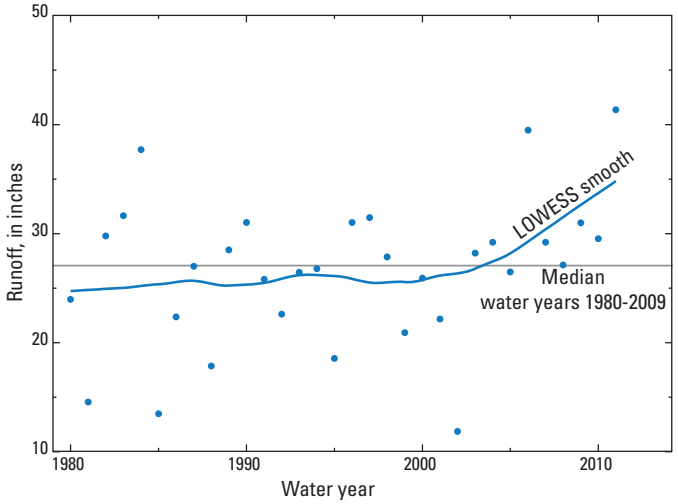


Figure 3. Runoff in Connecticut, water years 1980–2011, and median runoff, water years 1980–2009.

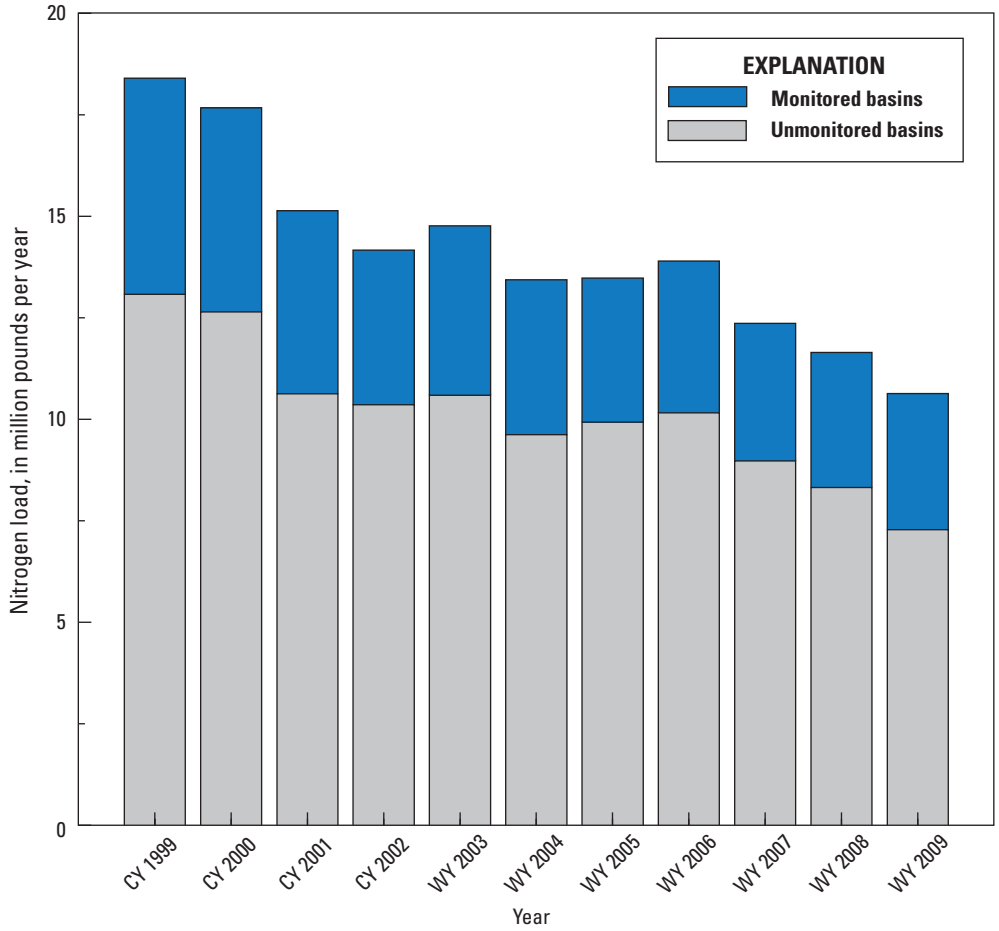


Figure 4. Loads of nitrogen discharged from Connecticut wastewater-treatment facilities in monitored and unmonitored basins draining to Long Island Sound, calendar years (CY) 1999–2002 and water years (WY) 2003–09.

Table 4. Estimated cumulative nitrogen loads from wastewater-treatment facilities outside Connecticut for stations in the drainage area to Long Island Sound.

[USGS, U.S. Geological Survey; kg/yr, kilograms per year; lb/yr, pounds per year; Vt., Vermont; N.H., New Hampshire; Mass., Massachusetts; Conn., Connecticut]

USGS station number	Station name	Map number (figure 1)	Nitrogen load (kg/yr)[1]	Nitrogen load (lb/yr)
01135500	Passumpsic River at Passumpsic, Vt.	10	19,000	41,900
01138500	Connecticut River at Wells River, Vt.	11	44,300	97,600
01152500	Sugar River at West Claremont, N.H.	14	19,900	43,800
01154500	Connecticut River at North Walpole, N.H.	15	194,000	428,000
01163200	Otter River at Otter River, Mass.	16	44,500	98,000
01184000	Connecticut River at Thompsonville, Conn.	21	1,790,000	3,950,000
01198125	Housatonic River near Ashley Falls, Mass.	30	85,300	188,000
01205500	Housatonic River at Stevenson, Conn.	32	85,300	188,000
01125100	French River at N. Grosvenordale, Conn.	6	42,900	94,500
01124000	Quinebaug River at Quinebaug, Conn.	5	61,200	135,000

[1]Data from USGS SPARROW model by Moore and others (2011).

Estimated Nitrogen Yields and Loads from Long Island Sound Tributaries

Total nitrogen loads computed for 37 monitoring stations by means of LOADEST (appendix 2) were used to develop a GLS regression model describing the relations among annual total nitrogen yields and ancillary variables. This regression model was used to estimate total nitrogen yields from the unmonitored areas (shown in fig. 2) and from the fall-line monitoring stations that did not have the complete 11 years of water-quality data. Loads for each unmonitored area were then calculated by multiplying by drainage area. Load computations and estimates for the monitored and unmonitored areas were summed by Long Island Sound nitrogen management zones.

Computed Nitrogen Yields and Loads at Monitoring Stations

Median total nitrogen yields from mostly forested basins were typically less than 2,000 lb/mi^2/yr, whereas median yields from urbanized basins with no WWTFs were as high as 5,600 lb/mi^2/yr and 13,100 lb/mi^2/yr for basins with large nitrogen contributions from WWTFs. The highest yields were from the Broad Brook Basin (station 01184490; table 1) with a median nitrogen yield of 14,600 lb/mi^2/yr for water years 1999–2009 (fig. 5; table 5; appendix 1). Broad Brook Basin has no WWTFs but contains the largest percentage of agricultural land of the basins that were sampled for this study (table 1; Mullaney, 2007). Basins with the highest yields do not necessarily represent a large amount of nitrogen load, if the basin areas are small. Nitrogen yield and load computations are given in appendix 2.

Total nitrogen yields at monitoring stations sampled in water years 1988–98 (Mullaney and others, 2002) and 1999–2009 were compared to determine whether there were any obvious changes resulting from management action in the Long Island Sound watershed to reduce total nitrogen loads (fig. 6). The median total nitrogen yields for most of the stations plot near the 1:1 line, indicating that median total nitrogen yields were generally similar for water years 1999–2009 and 1988–98. Median nitrogen yield values for some stations might not be comparable because of a short length of record during both periods (that is, 2 to 3 years).

Median total nitrogen yields were lower than during the 1988–98 period at several stations. Computed median total yields from the Naugatuck River at Beacon Falls (station 01208500) declined from 8,800 to 5,750 lb/mi^2/yr. The computed median total nitrogen yields at Hockanum River near East Hartford (station 01192500) also declined from 11,900 to 10,400 lb/mi^2/yr. Other declines included the Quinnipiac River at Wallingford (01196500) and Sasco Brook near Southport (01208950; appendix 2). Data from WWTFs in the Naugatuck River Basin above the monitoring station indicate a decline in total nitrogen load of about 1.3 Mlb/yr from calendar year 1999 to water year 2009 (appendix 1). Much of the improvement in the Naugatuck River is due to reconstruction of the City of Waterbury WWTF, which was completed in 2000 (Connecticut Department of Environmental Protection, 2001). Declines in total nitrogen yields at the Hockanum and Quinnipiac monitoring stations may be attributable to declines in nitrogen loads from WWTFs upstream from these sites (appendix 1).

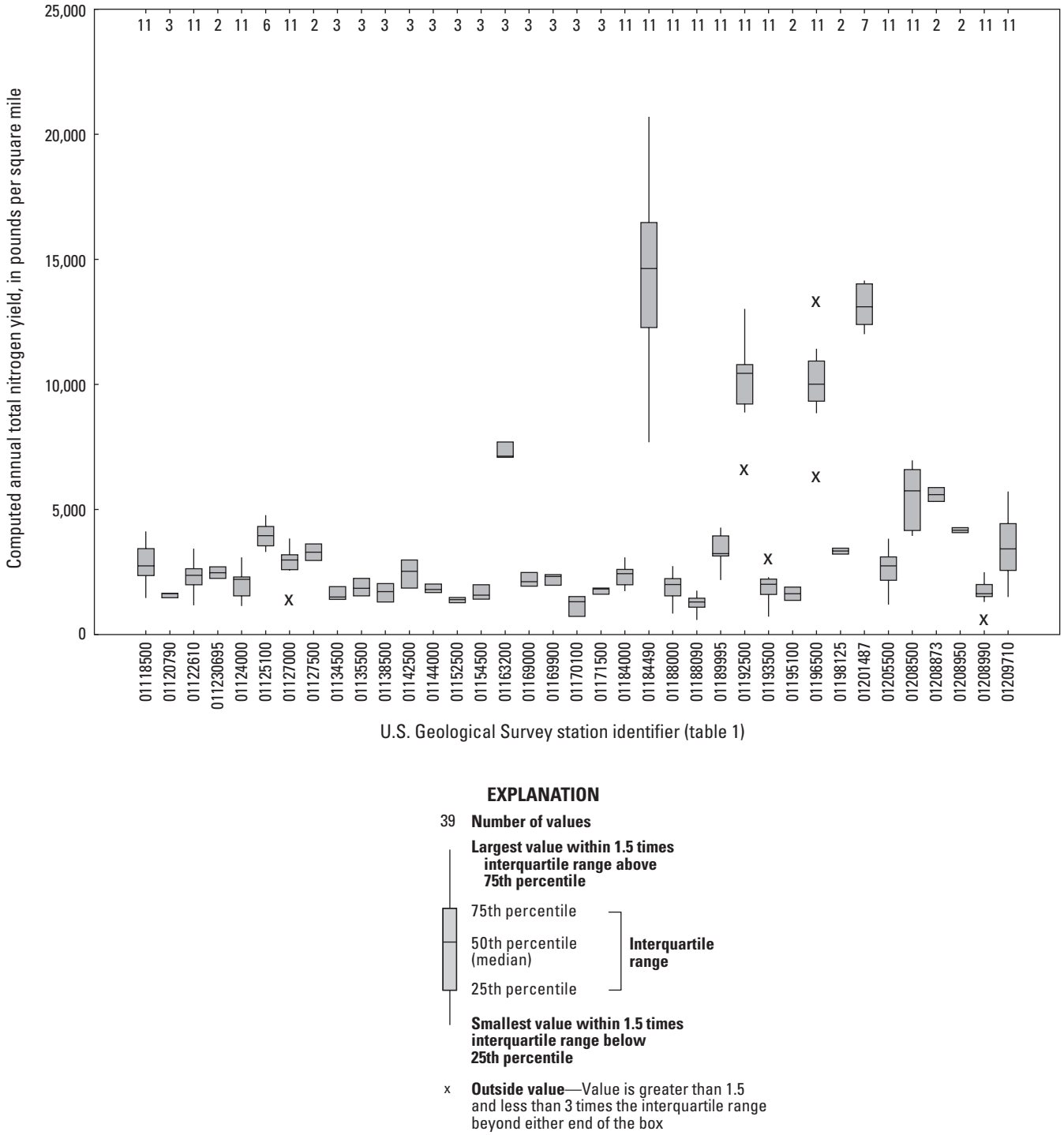


Figure 5. Boxplots showing the distribution of computed annual total nitrogen yields from selected water-quality monitoring stations in basins draining to Long Island Sound, water years 1999–2009.

Table 5. Summary statistics for total nitrogen loads and yields from selected water-quality stations draining to Long Island Sound.

[Loads in pounds per year, yields in pounds per square mile; R.I., Rhode Island; Conn., Connecticut; Vt., Vermont; N.H., New Hampshire; Mass., Massachusetts]

U.S. Geological Survey identifier	Station name	Map number (figure 1)	Variable	Number of years of record, water years 1999–2009	Mean	Minimum	Median	Maximum
01118500	Pawcatuck River at Westerly, R.I.	1	Load	11	834,000	432,000	811,000	1,220,000
01118500	Pawcatuck River at Westerly, R.I.	1	Yield	11	2,830	1,470	2,750	4,130
01120790	Natchaug River at Marcy Rd., near Chaplin, Conn.	2	Load	3	106,000	97,900	109,000	110,000
01120790	Natchaug River at Marcy Rd., near Chaplin, Conn.	2	Yield	3	1,590	1,470	1,640	1,650
01122610	Shetucket River at S. Windham, Conn.	3	Load	11	961,000	479,000	967,000	1,400,000
01122610	Shetucket River at S. Windham, Conn.	3	Yield	11	2,350	1,180	2,370	3,430
011230695	Shetucket River at Taftville, Conn.	4	Load	2	1,270,000	1,150,000	1,270,000	1,390,000
011230695	Shetucket River at Taftville, Conn.	4	Yield	2	2,480	2,250	2,480	2,710
01124000	Quinebaug River at Quinebaug, Conn.	5	Load	11	322,000	177,000	343,000	479,000
01124000	Quinebaug River at Quinebaug, Conn.	5	Yield	11	2,080	1,140	2,210	3,090
01125100	French River at N. Grosvenordale, Conn.	6	Load	6	402,000	334,000	399,000	482,000
01125100	French River at N. Grosvenordale, Conn.	6	Yield	6	3,980	3,300	3,950	4,770
01127000	Quinebaug River at Jewett City, Conn.	7	Load	11	2,060,000	1,130,000	2,130,000	2,740,000
01127000	Quinebaug River at Jewett City, Conn.	7	Yield	11	2,890	1,580	2,990	3,840
01127500	Yantic River at Yantic, Conn.	8	Load	2	294,000	265,000	294,000	323,000
01127500	Yantic River at Yantic, Conn.	8	Yield	2	3,290	2,970	3,290	3,620
01134500	Moose River at Victory, Vt.	9	Load	3	121,000	106,000	113,000	145,000
01134500	Moose River at Victory, Vt.	9	Yield	3	1,610	1,410	1,500	1,920
01135500	Passumpsic River at Passumpsic, Vt.	10	Load	3	822,000	677,000	808,000	981,000
01135500	Passumpsic River at Passumpsic, Vt.	10	Yield	3	1,880	1,550	1,850	2,250
01138500	Connecticut River at Wells River, Vt.	11	Load	3	4,470,000	3,400,000	4,600,000	5,400,000
01138500	Connecticut River at Wells River, Vt.	11	Yield	3	1,690	1,300	1,720	2,040
01142500	Ayers Brook at Randolph, Vt.	12	Load	3	74,900	56,600	77,200	90,800
01142500	Ayers Brook at Randolph, Vt.	12	Yield	3	2,460	1,860	2,530	2,980
01144000	White River at West Hartford, Vt.	13	Load	3	1,260,000	1,160,000	1,240,000	1,390,000
01144000	White River at West Hartford, Vt.	13	Yield	3	1,830	1,680	1,800	2,020
01152500	Sugar River at West Claremont, N.H.	14	Load	3	372,000	344,000	376,000	397,000
01152500	Sugar River at West Claremont, N.H.	14	Yield	3	1,390	1,280	1,400	1,480
01154500	Connecticut River at North Walpole, N.H.	15	Load	3	9,140,000	7,820,000	8,690,000	10,900,000

Table 5. Summary statistics for total nitrogen loads and yields from selected water-quality stations draining to Long Island Sound.—Continued

[Loads in pounds per year, yields in pounds per square mile; R.I., Rhode Island; Conn., Connecticut; Vt., Vermont; N.H., New Hampshire; Mass., Massachusetts]

U.S. Geological Survey identifier	Station name	Map number (figure 1)	Variable	Number of years of record, water years 1999–2009	Mean	Minimum	Median	Maximum
01154500	Connecticut River at North Walpole, N.H.	15	Yield	3	1,660	1,420	1,580	1,990
01163200	Otter River at Otter River, Mass.	16	Load	3	249,000	242,000	243,000	262,000
01163200	Otter River at Otter River, Mass.	16	Yield	3	7,310	7,090	7,130	7,700
01169000	North River at Shattuckville, Mass.	17	Load	3	194,000	173,000	189,000	221,000
01169000	North River at Shattuckville, Mass.	17	Yield	3	2,180	1,940	2,120	2,480
01169900	South River near Conway, Mass.	18	Load	3	53,700	47,400	55,800	57,800
01169900	South River near Conway, Mass.	18	Yield	3	2,230	1,970	2,320	2,400
01170100	Green River near Colrain, Mass.	19	Load	3	49,100	30,300	54,200	62,800
01170100	Green River near Colrain, Mass.	19	Yield	3	1,190	732	1,310	1,520
01171500	Mill River at Northhampton, Mass.	20	Load	3	95,400	87,600	98,500	100,000
01171500	Mill River at Northhampton, Mass.	20	Yield	3	1,770	1,620	1,820	1,860
01184000	Connecticut River at Thompsonville, Conn.	21	Load	11	22,600,000	16,800,000	23,500,000	29,800,000
01184000	Connecticut River at Thompsonville, Conn.	21	Yield	11	2,340	1,740	2,440	3,090
01184490	Broad Brook at Broad Brook, Conn.	22	Load	11	222,000	119,000	227,000	321,000
01184490	Broad Brook at Broad Brook, Conn.	22	Yield	11	14,300	7,690	14,600	20,700
01188000	Bunnell (Burlington) Brook near Burlington, Conn.	23	Load	11	7,870	3,450	8,220	11,200
01188000	Bunnell (Burlington) Brook near Burlington, Conn.	23	Yield	11	1,920	842	2,010	2,740
01188090	Farmington River at Unionville, Conn.	24	Load	11	485,000	224,000	491,000	664,000
01188090	Farmington River at Unionville, Conn.	24	Yield	11	1,280	592	1,300	1,760
01189995	Farmington River at Tariffville, Conn.	25	Load	11	1,960,000	1,260,000	1,870,000	2,470,000
01189995	Farmington River at Tariffville, Conn.	25	Yield	11	3,390	2,180	3,240	4,280
01192500	Hockanum River near East Hartford, Conn.	26	Load	11	739,000	499,000	766,000	955,000
01192500	Hockanum River near East Hartford, Conn.	26	Yield	11	10,100	6,800	10,400	13,000
01193500	Salmon River near East Hampton, Conn.	27	Load	11	194,000	71,500	201,000	324,000
01193500	Salmon River near East Hampton, Conn.	27	Yield	11	1,940	715	2,010	3,240
01195100	Indian River near Clinton, Conn.	28	Load	2	9,270	7,760	9,270	10,800
01195100	Indian River near Clinton, Conn.	28	Yield	2	1,630	1,370	1,630	1,900
01196500	Quinnipiac River at Wallingford, Conn.	29	Load	11	1,160,000	749,000	1,150,000	1,550,000
01196500	Quinnipiac River at Wallingford, Conn.	29	Yield	11	10,100	6,520	10,000	13,500

Table 5. Summary statistics for total nitrogen loads and yields from selected water-quality stations draining to Long Island Sound.—Continued

[Loads in pounds per year, yields in pounds per square mile; R.I., Rhode Island; Conn., Connecticut; Vt., Vermont; N.H., New Hampshire; Mass., Massachusetts]

U.S. Geological Survey identifier	Station name	Map number (figure 1)	Variable	Number of years of record, water years 1999–2009	Mean	Minimum	Median	Maximum
01198125	Housatonic River at Ashley Falls, Mass.	30	Load	2	1,550,000	1,500,000	1,550,000	1,610,000
01198125	Housatonic River at Ashley Falls, Mass.	30	Yield	2	3,340	3,220	3,340	3,460
01201487	Still River at Route 7 at Brookfield Center, Conn.	31	Load	7	824,000	748,000	816,000	882,000
01201487	Still River at Route 7 at Brookfield Center, Conn.	31	Yield	7	13,200	12,000	13,100	14,200
01205500	Housatonic River at Stevenson, Conn.	32	Load	11	4,130,000	1,860,000	4,250,000	5,920,000
01205500	Housatonic River at Stevenson, Conn.	32	Yield	11	2,670	1,200	2,750	3,830
01208500	Naugatuck River at Beacon Falls, Conn.	33	Load	11	1,410,000	1,030,000	1,490,000	1,810,000
01208500	Naugatuck River at Beacon Falls, Conn.	33	Yield	11	5,430	3,950	5,750	6,960
01208873	Rooster River at Fairfield, Conn.	34	Load	2	59,300	56,400	59,300	62,300
01208873	Rooster River at Fairfield, Conn.	34	Yield	2	5,600	5,320	5,600	5,880
01208950	Sasco Brook near Southport, Conn.	35	Load	2	30,800	30,100	30,800	31,500
01208950	Sasco Brook near Southport, Conn.	35	Yield	2	4,180	4,080	4,180	4,270
01208990	Saugatuck River near Redding, Conn.	36	Load	11	35,600	16,800	34,400	52,400
01208990	Saugatuck River near Redding, Conn.	36	Yield	11	1,700	800	1,640	2,500
01209710	Norwalk River at Winnipauk, Conn.	37	Load	11	116,000	49,600	113,000	189,000
01209710	Norwalk River at Winnipauk, Conn.	37	Yield	11	3,530	1,500	3,430	5,720

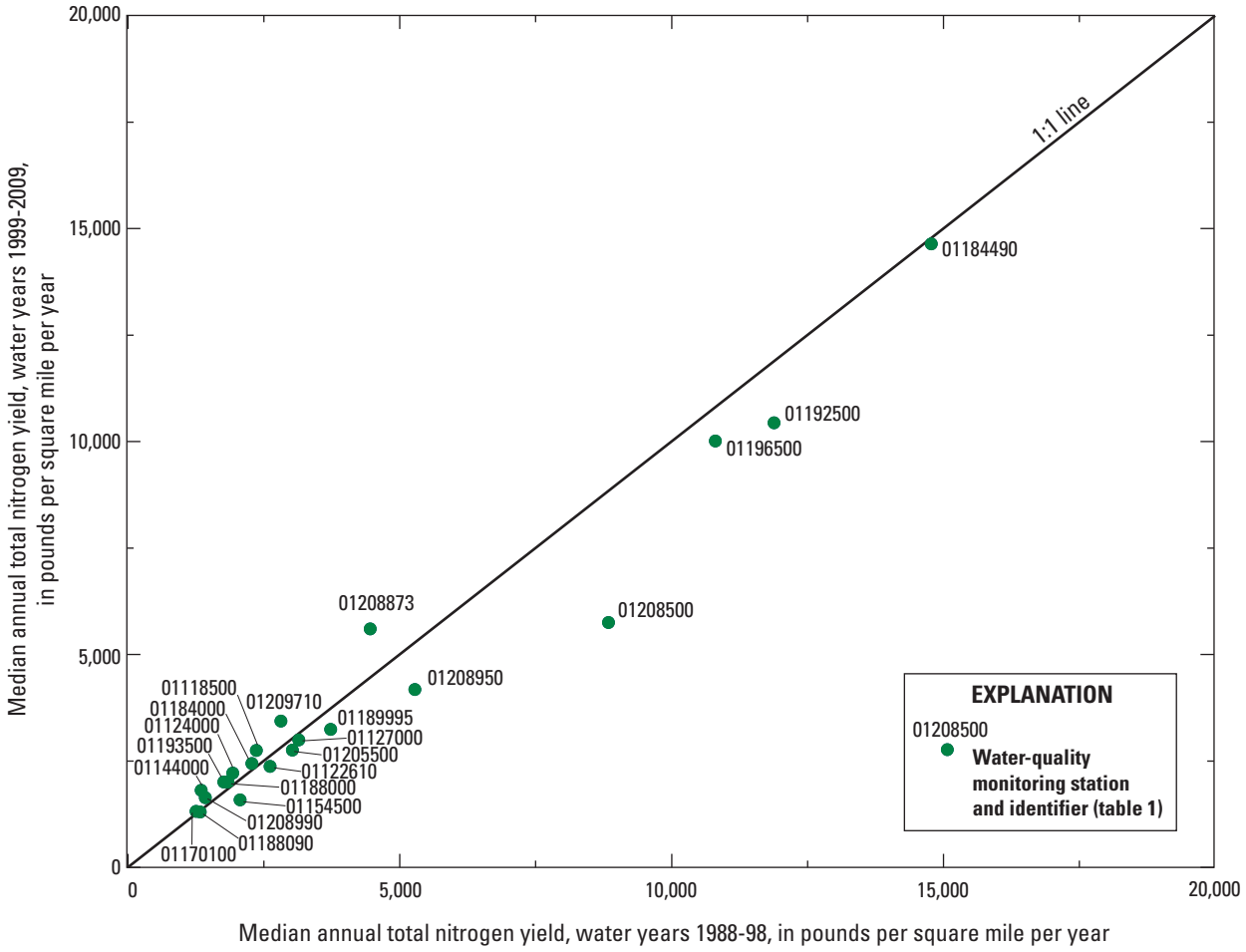


Figure 6. Median annual total nitrogen yields for water years 1988–98 in relation to those for water years 1999–2009 for basins draining to Long Island Sound.

Computed median total nitrogen yields at several stations increased, including the Norwalk River at Winnipauk (01209710) and the Rooster River near Fairfield (01208873) stations. The loads from WWTFs upstream from the Norwalk River monitoring station were small relative to those for other urbanized basins but increased by a factor of 1.5 from calendar year 1999 through water year 2009 (appendix 1). Even with declines in wastewater discharge of nitrogen from WWTFs, nitrogen yields at many stations for water years 1999–2009 were similar to those determined for water years 1988–98. One of the primary reasons for the similar yields, between the two time periods, may be attributable to increases in streamflow. Although there were substantial declines in point-source nitrogen discharge, streamflows were greater than the median (fig. 3) for 6 of the 11 years analyzed, contributing to a greater than normal nonpoint-source nitrogen load. Summary statistics for load and yield data are presented in table 5; detailed data are reported in appendix 1.

Estimated Total Nitrogen Yields and Loads from Unmonitored Areas

The response variable in the regression model developed in this part of the study was total nitrogen yield, determined by using LOADEST with computed total nitrogen load outputs from 37 stations. Regression parameters were estimated using the GLS method, which transforms the regression data so that the resulting errors are independent and identically distributed. The linear transformation consists of multiplying all regression variables by the square root of the inverse of the error covariance matrix, estimated from the residuals of a first-stage ordinary least squares (OLS) model (Mullaney and others, 2002). The effect of the transformation is to ensure the resulting model residuals from a second-stage OLS regression are independent and identically distributed. The estimated coefficients and standard errors of the second-stage regression are unbiased and efficient. Because the final

regression is based on transformed data, all plots of fit and of the distribution of model residuals also are plotted in the transformed space (figs. 7–9).

The transformation method employed in the derivation of the values plotted in figure 7 is a complex linear combination of the untransformed yields (see equation 8 in appendix 2 of Mullaney and others (2002) for a mathematical description of the transformation). The transformation results in values that adhere to desirable statistical properties, such as being approximately independent and having a common variance, but because negative coefficients are employed in the linear combination, negative values for the transformed yields may occur, and are likely if the untransformed yields are positive but small in value.

Explanatory variables were selected (table 6) by a trial and error process, by using variables that were similar to those used in the previous study (Mullaney and others, 2002), by evaluating plausibility, and by comparing significance and the distribution of residuals. The goal was to reduce the number of variables to as few as possible while minimizing bias in residuals. The land-use variables that were chosen (percentage of developed land use and percentage of cultivated crops) were fixed in time with data from the 2001 NLCD (U.S. Environmental Protection Agency, 2001). Two variables were used to represent the nitrogen loads from WWTFs: (1) nitrogen yields from WWTFs were calculated by summing the loads from the WWTFs upstream from the monitoring station and dividing by the drainage area and (2) the nitrogen yields from WWTFs outside Connecticut also were fixed by using outputs from the SPARROW model (Moore and others, 2011), which are based on an analysis of 2002 data. The annual mean runoff and the yields from WWTFs in Connecticut (CTpointyield) were variable from year to year and were the primary factors affecting annual variability in nitrogen yields. The coefficient of the CTpointyield variable was fixed at 1, based on information from the SPARROW

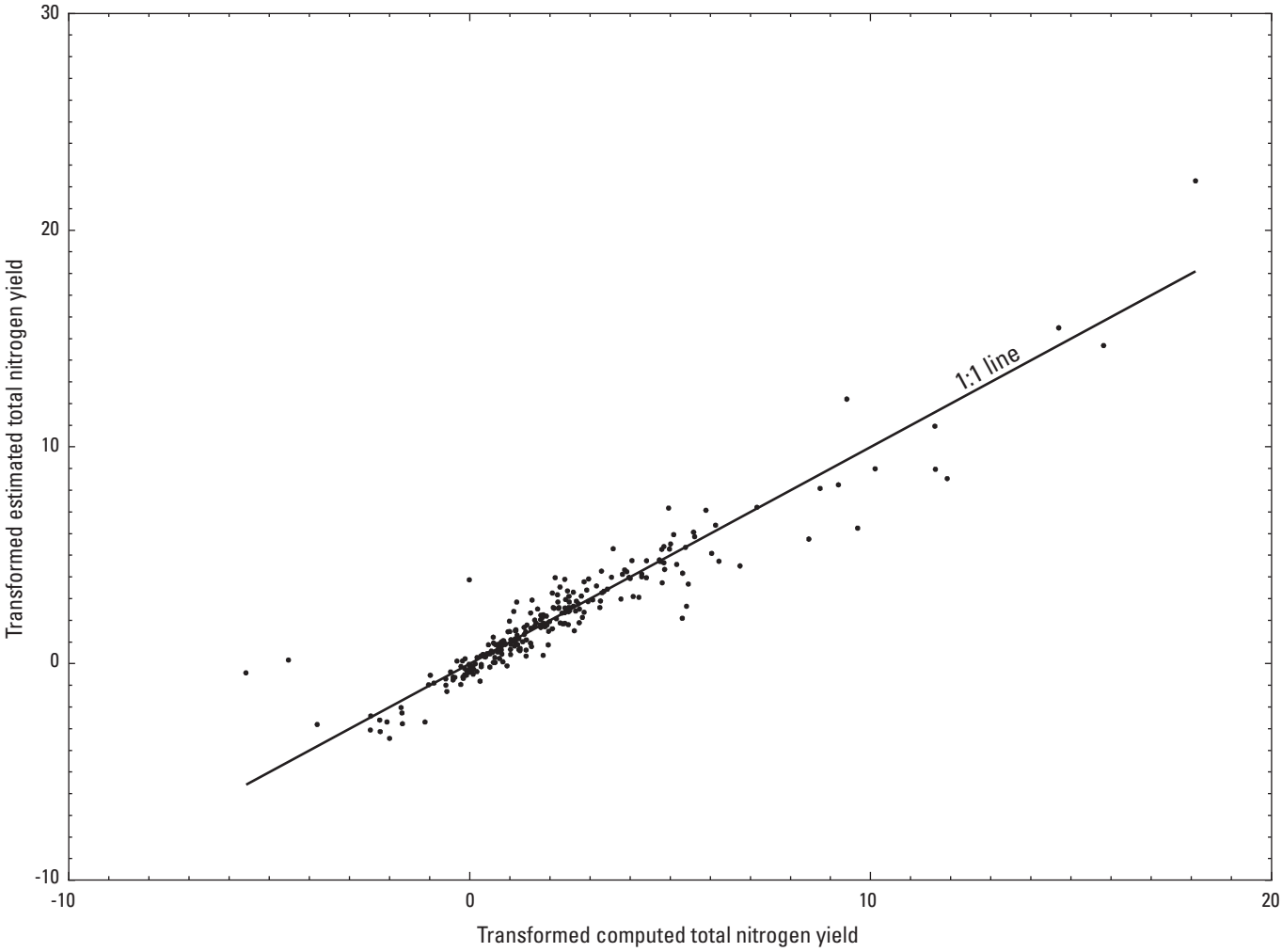


Figure 7. Transformed computed total nitrogen yield in relation to transformed estimated total nitrogen yield from monitored basins draining to Long Island Sound, water years 1999-2009.

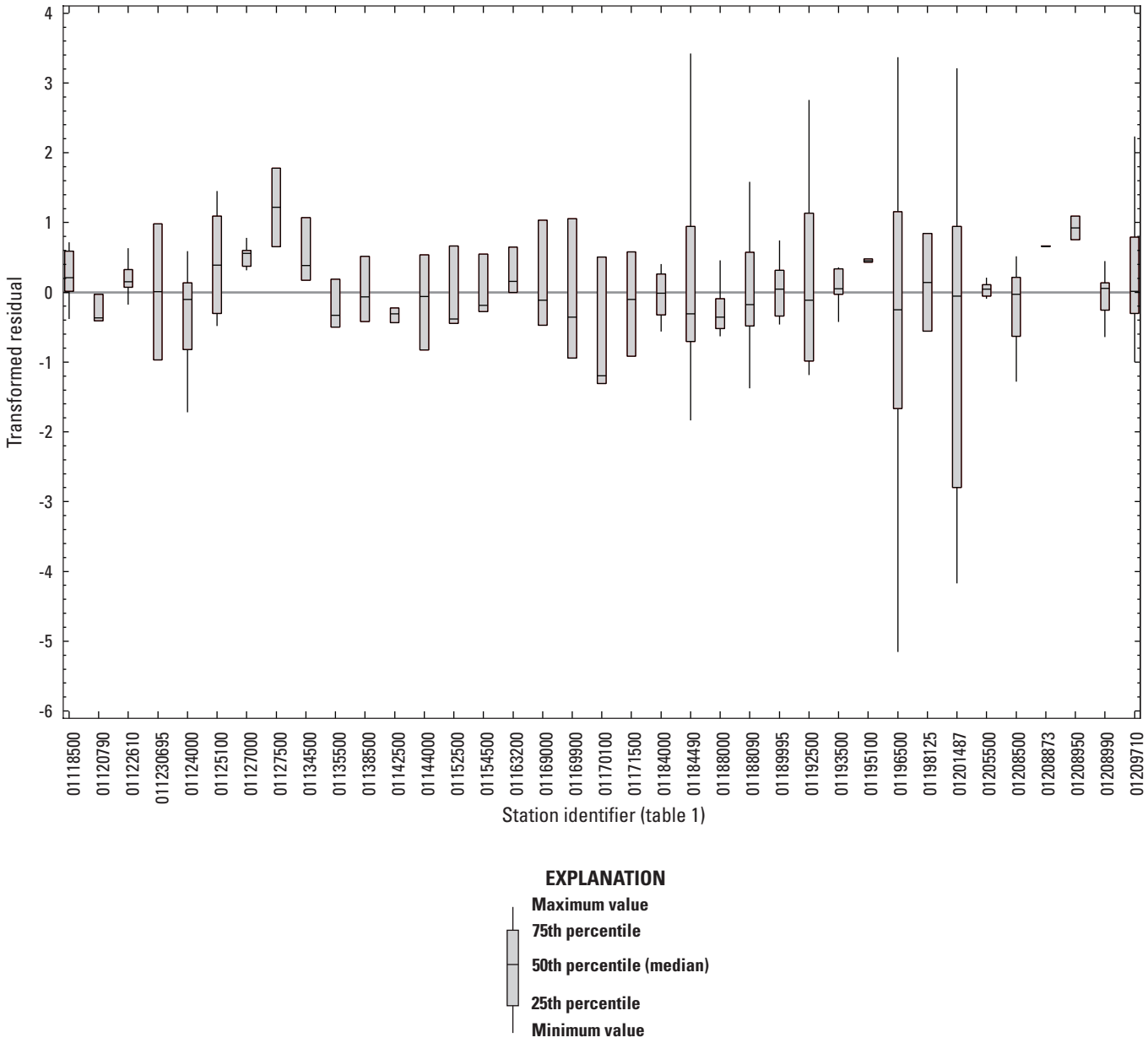


Figure 8. Transformed residuals, by station in basins draining to Long Island Sound, water years 1999-2009.

model (Moore and others, 2011) that indicated no attenuation of nitrogen was apparent in the analysis of data for the large rivers to which most wastewater-treatment facilities discharge. This fixed coefficient facilitated the calculation of total nitrogen yields in the unmonitored areas, many of which had discharges directly to Long Island Sound or to the estuaries of the major rivers. Therefore, the GLS regression coefficients were effectively calculated as if the CTpointyield was subtracted from the station yield.

Median annual total nitrogen yields estimated for the unmonitored areas (fig. 10; appendix 2) ranged from 1,630 lb/mi^2/yr at the Eightmile basin (fig. 2, site 42; table 2), to 34,000 lb/mi^2/yr for the lower reach of the Yantic basin (fig. 2, site 63; table 2). Yields for some basins are unusually high due to the location of WWTFs downstream from monitoring stations. For instance, the predicted yields for the Yantic basin represent only the most downstream part of the basin, a small drainage area downstream from the monitoring station, which contains a wastewater-treatment facility.

To account for uncertainties in the estimates caused by measurement error, a range of confidence intervals is provided, bounded by what are referred to as “inner” and

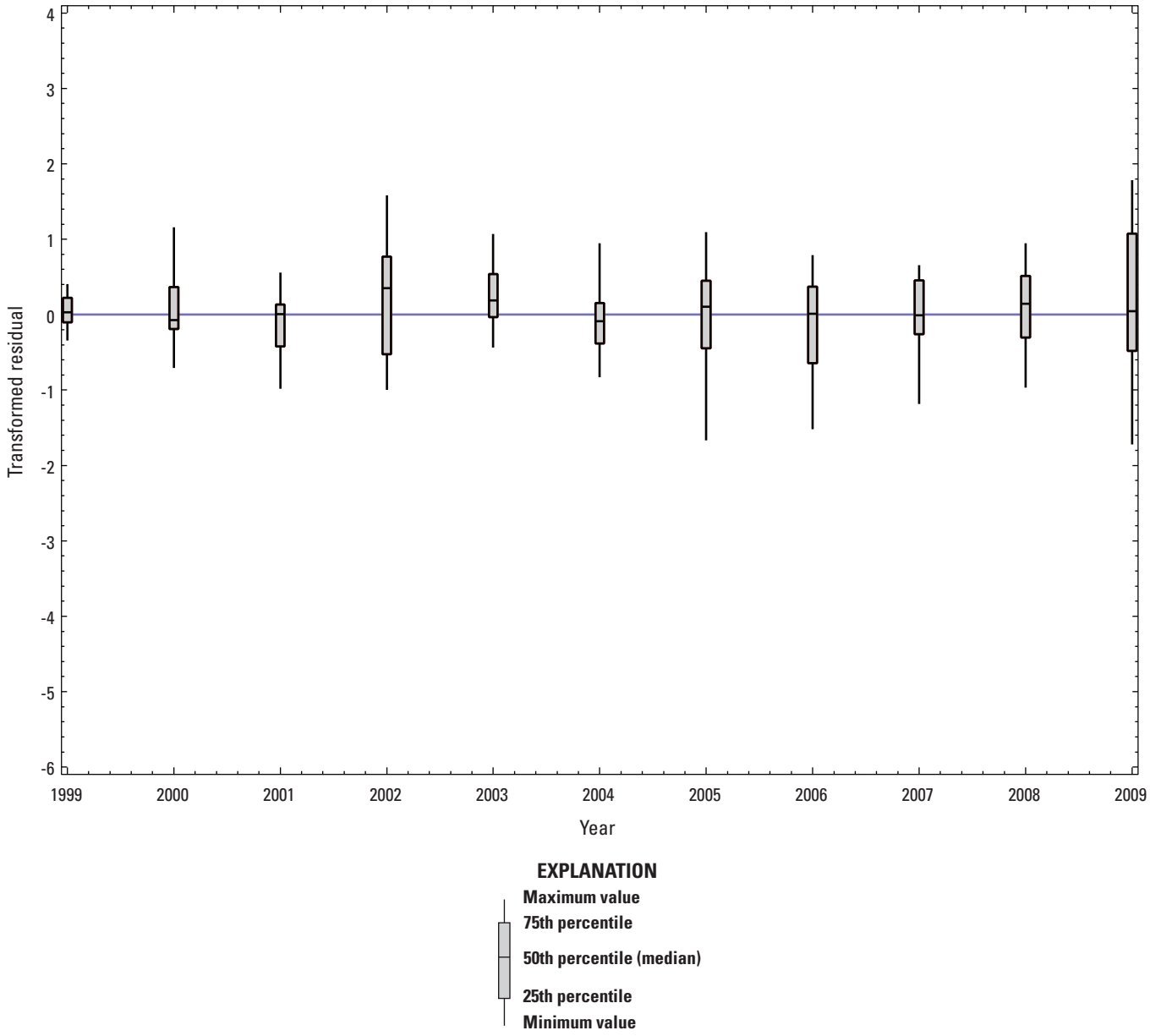


Figure 9. Transformed residuals, by water year, for monitored basins draining to Long Island Sound, water years 1999–2009.

"outer" confidence intervals (Mullaney and others, 2002, appendix 2). The average inner 90-percent confidence interval was ±19.5 percent and the average outer 90-percent confidence interval was ±27.5 percent. Estimates of nitrogen yield from the GLS model for water year 2009 demonstrate, as an example, the inner and outer confidence intervals graphically in figure 11. Additional error, unaccounted for by these confidence intervals, could be present in the estimates because of the increased uncertainty of streamflow estimated using surrogate streamflow stations in the regression model input. Output information from the GLS regression model is in appendix 2.

Combined Estimates of Total Nitrogen Loads From Tributaries to Long Island Sound

Nitrogen loads to Long Island Sound from tributaries were summed for each major basin represented by the Long Island Sound management zones (New York State Department of Environmental Conservation and Connecticut Department of Environmental Protection, 2000) shown in figure 12. The sum includes the loads from the farthest downstream monitoring stations calculated by using LOADEST, and the loads estimated by multiplying the estimated nitrogen yields from the unmonitored areas by the drainage area of each

Table 6. Generalized least squares (GLS) estimates of model coefficients and standard errors, with asymptotically valid t-statistics and *p*-values.

[<, less than; na, not applicable]

Transformed variable	Units	Parameter estimate	Standard error	t-statistic	*p*-value
Intercept	Dimensionless	-1,510	224	-6.75	<.0001
Developed land use	Percent	43.0	7.00	6.14	<.0001
Cultivated crops	Percent	205.0	63.8	3.22	0.0015
SPARROW (yield from wastewater-treatment facilities outside of Connecticut)	Pounds per square mile per year	1.51	0.18	8.23	<.0001
Ctpointyield (yield from wastewater-treatment facilities in Connecticut)	Pounds per square mile per year	1.00	0.00	na	<.0001
Annual mean runoff	Inches	99.9	5.04	19.8	<.0001
Indicator for station 01184490	Dimensionless	8,940	1,370	6.51	<.0001

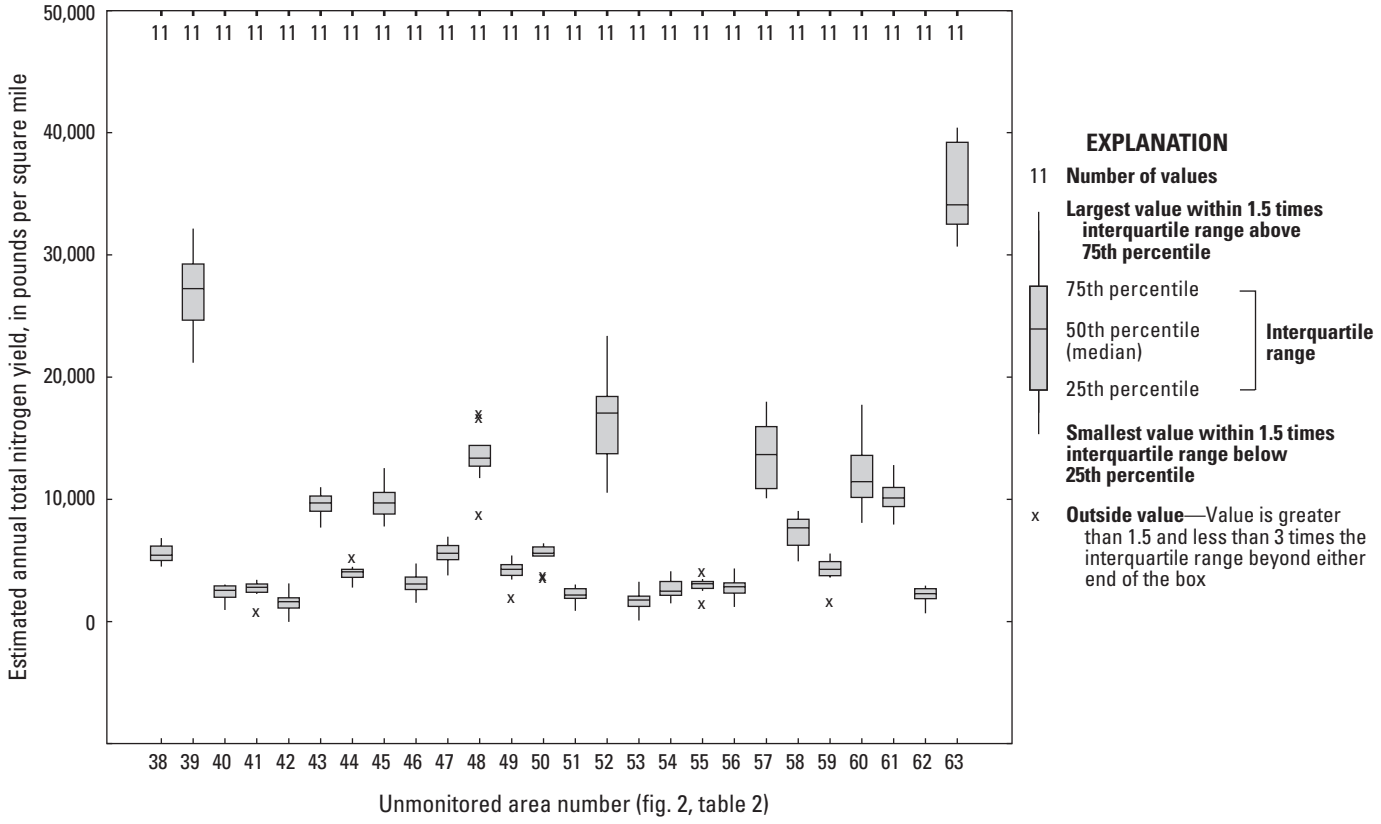


Figure 10. Boxplots showing distribution of estimated annual total nitrogen yield for unmonitored basins draining to Long Island Sound.

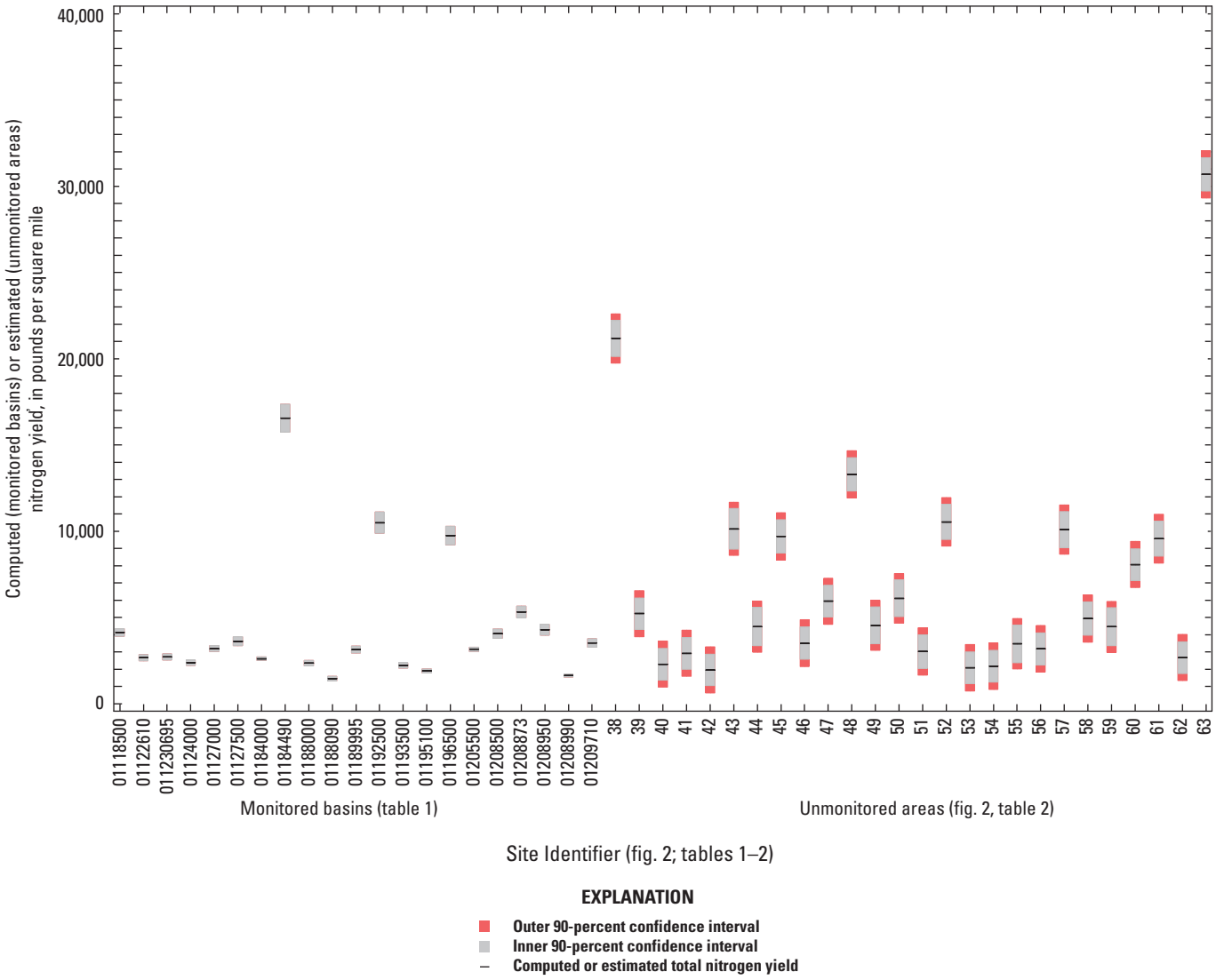


Figure 11. Computed or estimated nitrogen yields and confidence intervals for monitored and unmonitored basins draining to Long Island Sound, water year 2009.

unmonitored area. The estimated total nitrogen load from the study area (excluding the Pawcatuck River Basin, which does not drain to Long Island Sound) ranged from a low of 37 million pounds (Mlb) in water year 2002 (a dry year) to 67 Mlb (fig. 13; sum of zones in table 7) in water year 2006 (a wet year). Nitrogen loads from the monitored area above the fall-line stations ranged from 64 to 75 percent of the total nitrogen load from the study area. The nitrogen load from the monitored areas was dominated by the Connecticut River at Thompsonville, Conn. (station 01184000), near the border with Massachusetts, which represented 58 to 69 percent of the computed load from the monitored areas and 37 to 50 percent of the estimated nitrogen load from the study area.

Loads appear to have increased slightly during the study period (fig. 13), even though there were substantial decreases in nitrogen loads from WWTFs. As noted earlier in this report, this apparent increase is likely due to higher than normal streamflows and runoff during most of the study period (fig. 3).

Nitrogen loads were calculated for several basins at or near the border between Massachusetts and Connecticut (table 8), including the Housatonic River near Ashley Falls, Mass. (01198125); the Connecticut River at Thompsonville, Conn. (01184000); the Quinebaug River at Quinebaug, Conn. (01124000); and the French River at N. Grosvenordale, Conn. (01125100). Data from these stations for the available water years provide computed total nitrogen loads entering Connecticut from Massachusetts, with the exception of the Farmington River Basin where there is no monitoring station at the border. Computed nitrogen loads from these four stations ranged from 27.3 to 29.4 Mlb for water years 2008 and 2009 (the only years with data for all sites; table 8), representing 52 to 54 percent of the estimated load to Long Island Sound from the study area.

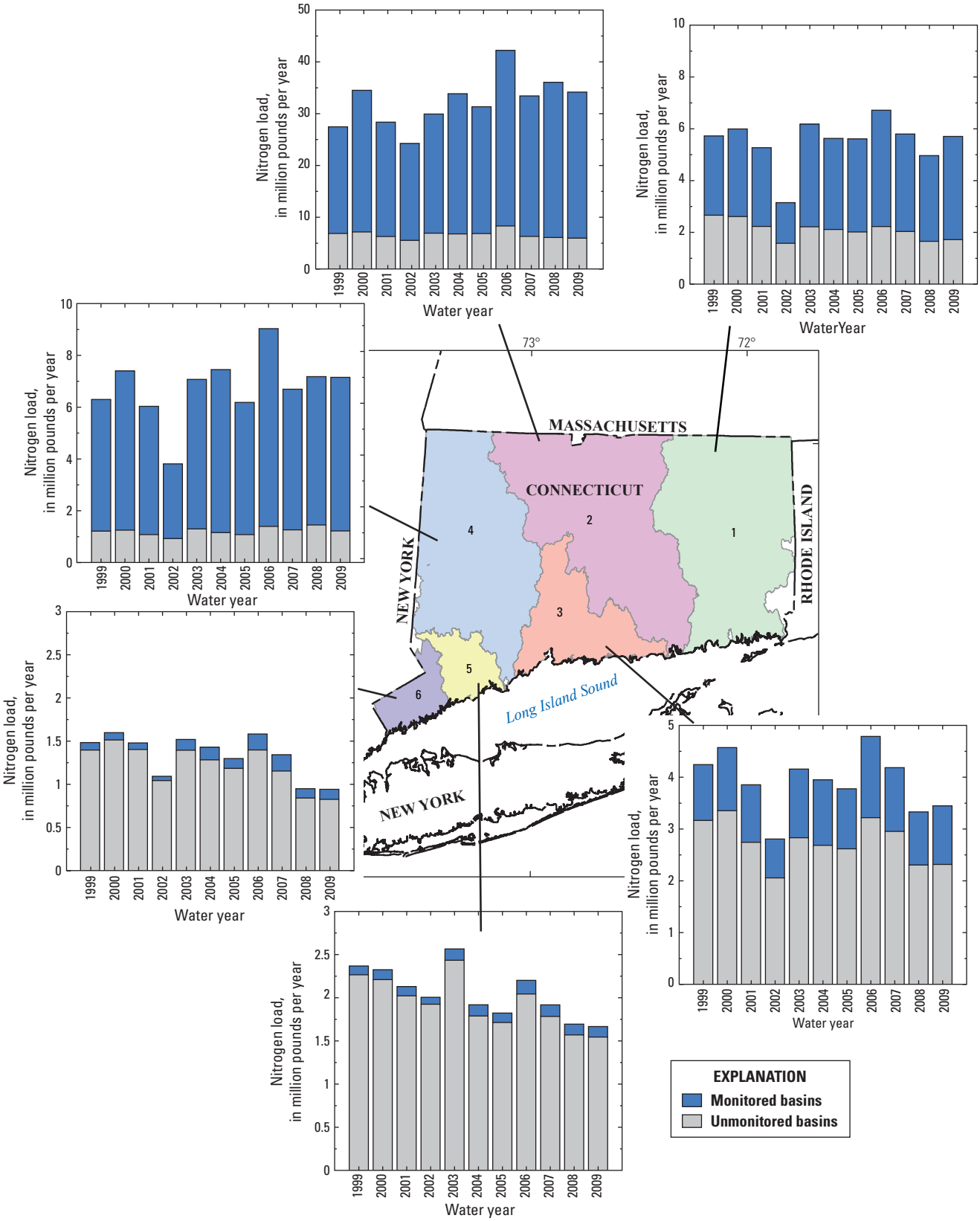


Figure 12. Long Island Sound management zones for nitrogen and estimated loads from monitored and unmonitored areas draining to Long Island Sound, water years 1999–2009. (Management zones in this report include the loads from upstream areas north of Connecticut.)

Table 7. Estimated total nitrogen loads from monitored basins and unmonitored areas in Long Island Sound nitrogen management zones, water years 1999–2009.

[Management zones in this report include the loads from upstream areas north of Connecticut; all values in pounds per year]

Water year	Zone 1		Zone 2		Zone 3		Zone 4		Zone 5		Zone 6	
	Monitored	Unmonitored	Monitored	Unmonitored	Monitored	Unmonitored	Monitored	Unmonitored	Monitored	Unmonitored	Monitored	Unmonitored
1999	3,060,000	2,660,000	20,600,000	6,870,000	1,080,000	3,160,000	5,080,000	1,220,000	102,000	2,260,000	86,700	1,400,000
2000	3,380,000	2,610,000	27,300,000	7,170,000	1,220,000	3,340,000	6,150,000	1,250,000	114,000	2,210,000	84,700	1,510,000
2001	3,040,000	2,220,000	22,100,000	6,280,000	1,110,000	2,740,000	4,950,000	1,080,000	107,000	2,020,000	77,100	1,400,000
2002	1,570,000	1,570,000	18,700,000	5,540,000	751,000	2,050,000	2,880,000	929,000	80,400	1,920,000	49,600	1,040,000
2003	3,960,000	2,210,000	23,000,000	6,910,000	1,330,000	2,820,000	5,770,000	1,300,000	132,000	2,430,000	125,000	1,390,000
2004	3,510,000	2,100,000	27,100,000	6,780,000	1,270,000	2,680,000	6,290,000	1,160,000	130,000	1,790,000	146,000	1,280,000
2005	3,590,000	2,010,000	24,500,000	6,850,000	1,160,000	2,610,000	5,100,000	1,080,000	109,000	1,710,000	113,000	1,180,000
2006	4,490,000	2,220,000	33,900,000	8,320,000	1,570,000	3,210,000	7,630,000	1,400,000	158,000	2,040,000	185,000	1,400,000
2007	3,760,000	2,030,000	27,100,000	6,300,000	1,230,000	2,940,000	5,430,000	1,260,000	134,000	1,780,000	189,000	1,150,000
2008	3,310,000	1,650,000	30,000,000	6,090,000	1,030,000	2,300,000	5,730,000	1,450,000	126,000	1,570,000	108,000	840,000
2009	3,980,000	1,710,000	28,200,000	5,960,000	1,130,000	2,310,000	5,930,000	1,220,000	122,000	1,540,000	116,000	824,000

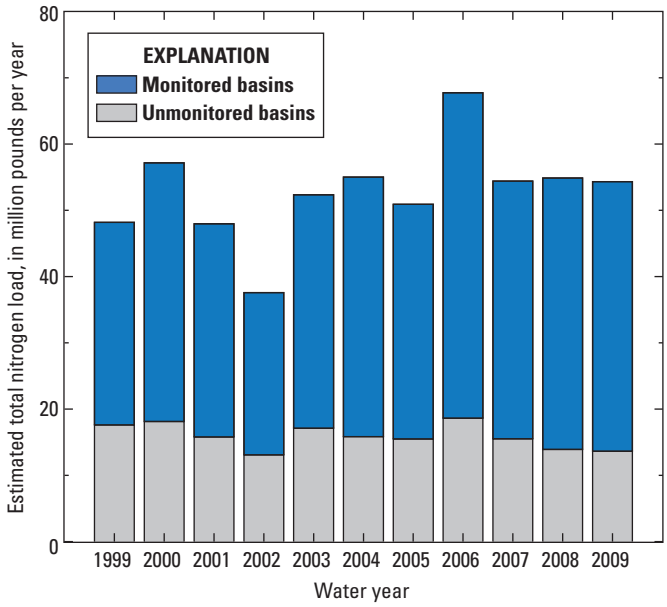


Figure 13. Estimated total nitrogen loads for monitored and unmonitored areas draining to Long Island Sound, water years 1999–2009.

Table 8. Computed nitrogen loads for state-border monitoring stations and percent of nitrogen load contributed to the Long Island Sound management zones, water years 1999–2009.

[Percent is the portion of the nitrogen load from the management zone. --, no data]

Water year	Zone 1			Zone 2		Zone 4	
	Quinebaug River (loads in pounds per year)	French River (loads in pounds per year)	Percent	Connecticut River (loads in pounds per year)	Percent	Housatonic River (loads in pounds per year)	Percent
1999	218,000	--	3.8	17,700,000	64.5	--	--
2000	315,000	--	5.3	23,900,000	69.1	--	--
2001	241,000	--	4.6	19,200,000	67.8	--	--
2002	177,000	--	5.6	16,800,000	69.1	--	--
2003	355,000	--	5.7	19,600,000	65.7	--	--
2004	343,000	424,000	13.7	23,500,000	69.5	--	--
2005	348,000	437,000	14.0	21,300,000	68.0	--	--
2006	479,000	482,000	14.3	29,800,000	70.7	--	--
2007	342,000	359,000	12.1	24,100,000	72.2	--	--
2008	357,000	334,000	13.9	27,100,000	75.1	1,610,000	25.5
2009	369,000	374,000	13.0	25,100,000	73.6	1,500,000	20.2

Summary

An assessment of total nitrogen loads from Connecticut to Long Island Sound for water years 1999–2009 was conducted. Data were analyzed to evaluate changes in nitrogen loads relative to nitrogen management efforts that have been ongoing in Connecticut and New York with a goal to reduce nitrogen loads by 58.5 percent by 2014. As a result of management of point sources of nitrogen in Connecticut, annual nitrogen loads from municipal wastewater-treatment facilities declined by as much as 2 million pounds per year (Mlb/yr) in basins upstream from U.S. Geological Survey (USGS) monitoring stations and by as much as 5.8 Mlb/yr in basins downstream from USGS monitoring stations.

This assessment was based on an analysis of total nitrogen concentrations and continuous streamflow data from 37 water-quality monitoring stations in or near the Long Island Sound watershed. Data were collected from 4 to 22 times per year and for periods of 2 to 14 years. Nitrogen loads at monitoring stations were computed by using the computer program LOADEST, a regression model that incorporates the relation of constituent concentration to streamflow, time, and season.

Nitrogen yields at monitoring stations in the study were typically less than 2,000 pounds per square mile per year (lb/mi^2/yr) in basins that were dominated by forested land. Median nitrogen yields from urbanized basins with no major wastewater-treatment facilities were as high as 5,600 lb/mi^2/yr, whereas median nitrogen yields from urbanized basins with major wastewater-treatment facilities were as high as 13,100 lb/mi^2/yr. The highest yields were from the Broad Brook Basin, in north central Conn. with a median nitrogen yield of 14,600 lb/mi^2/yr.

Median nitrogen yields for water years 1999–2009 were compared with nitrogen yields for water years 1988–98 to determine whether there were any substantial changes. Nitrogen yields generally were similar for the two periods for most stations. Stations with the most obvious improvements include the Naugatuck River at Beacon Falls, Conn.; Quinnipiac River at Wallingford, Conn.; and Hockanum River near East Hartford, Conn. With major declines in nitrogen loads from wastewater-treatment facilities in Connecticut, more apparent changes were expected. Streamflow was higher than normal, however, during much of the study period, and consequently, nitrogen loads from nonpoint sources were greater, potentially masking improvements.

Total nitrogen loads from 26 unmonitored coastal areas during 1999 through 2009 were estimated using a generalized least squares (GLS) multiple-linear regression model coupled with an analysis of error components. The regression model related computed annual yield of nitrogen from monitored basins to basin characteristics. The model also was used to estimate nitrogen loads for missing years from fall-line stations with fewer than 11 years of data. Explanatory variables that were statistically significant in the GLS model include percentage of developed land, percentage of row crops, point-source yield of nitrogen from Connecticut wastewater facilities, annual mean runoff, and point-source nitrogen yield estimated for parts of the watershed north of the Connecticut border with Massachusetts. Estimated nitrogen yields from the unmonitored areas ranged from 1,630 lb/mi^2/yr to 35,400 lb/mi^2/yr. The average inner and outer 90-percent confidence intervals of the yield predictions were ±19.5 and ±27.5 percent, respectively.

Load calculations using data from the farthest downstream monitoring stations were summed with estimates for the unmonitored areas for a combined estimate of the total nitrogen load from the study area for water years 1999–2009. The estimated total nitrogen load from the study area ranged from 38 Mlb/yr (water year 2002) to 68 Mlb/yr (water year 2006). Loads increased slightly during the study period, but any increases are likely due to higher than normal streamflows during most of the study period. The loads calculated or estimated for the monitored areas upstream from the fall-line stations represented 63 to 74 percent of the estimated load of total nitrogen from the study area, with the estimates from the unmonitored areas representing the remainder. Nitrogen loads at stations on the major tributaries (excluding the Farmington River) that cross the Connecticut border with Massachusetts represented 52 to 54 percent of the estimated nitrogen load from the study area to Long Island Sound.

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Appendix 1

Appendix 2

Appendix 3

Table 1–1. Load estimates and regression model input data.

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS Station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (figure 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut (table 6), in lb/mi²/yr	Annual mean runoff, in inches	Mean daily total nitrogen flux, in lb/d	Variance in total nitrogen flux, in lb/d	Lower limit of the 95-percent confidence interval, in lb/d	Upper limit of the 95-percent confidence interval, in lb/d	Total nitrogen load, in lb/yr	Total nitrogen yield in lb/mi²/yr
A. Load estimates and regression model input data—Continued															
01118500	1999	295.0	0	10.4	1.2	0	0	0	21.2	1,552	2,265	1,456	1,652	566,347	1,920
01118500	2000	295.0	0	10.4	1.2	0	0	0	26.6	2,020	3,055	1,909	2,137	739,496	2,507
01118500	2001	295.0	0	10.4	1.2	0	0	0	30.1	2,222	3,538	2,101	2,349	811,148	2,750
01118500	2002	295.0	0	10.4	1.2	0	0	0	13.7	1,185	1,099	1,118	1,255	432,492	1,466
01118500	2003	295.0	0	10.4	1.2	0	0	0	32.3	2,495	3,302	2,377	2,618	910,675	3,087
01118500	2004	295.0	0	10.4	1.2	0	0	0	26.1	2,091	1,819	2,001	2,185	765,467	2,595
01118500	2005	295.0	0	10.4	1.2	0	0	0	30.4	2,376	2,786	2,266	2,490	867,387	2,940
01118500	2006	295.0	0	10.4	1.2	0	0	0	40.2	3,166	8,147	2,984	3,355	1,155,420	3,917
01118500	2007	295.0	0	10.4	1.2	0	0	0	35.1	2,774	5,423	2,624	2,930	1,012,342	3,432
01118500	2008	295.0	0	10.4	1.2	0	0	0	21.8	1,906	2,455	1,805	2,012	697,647	2,365
01118500	2009	295.0	0	10.4	1.2	0	0	0	39.6	3,335	11,566	3,122	3,559	1,217,297	4,126
01120790	2007	66.5	1	6.1	0.3	0	0	0	31.6	299	395	261	341	109,143	1,641
01120790	2008	66.5	1	6.1	0.3	0	0	0	28.2	268	284	235	304	97,922	1,473
01120790	2009	66.5	1	6.1	0.3	0	0	0	30.7	301	239	270	334	109,715	1,650
01122610	1999	408.0	1	10.0	0.8	244,315	599	0	20.7	2,228	6,243	2,055	2,412	813,383	1,994
01122610	2000	408.0	1	10.0	0.8	230,946	566	0	24.3	2,557	5,614	2,392	2,730	935,681	2,293
01122610	2001	408.0	1	10.0	0.8	146,000	358	0	20.6	2,200	4,520	2,045	2,364	803,089	1,968
01122610	2002	408.0	1	10.0	0.8	175,129	429	0	11.8	1,314	784	1,242	1,388	479,431	1,175
01122610	2003	408.0	1	10.0	0.8	174,968	429	0	28.0	2,857	6,479	2,677	3,046	1,042,905	2,556
01122610	2004	408.0	1	10.0	0.8	167,681	411	0	29.1	2,940	7,782	2,744	3,146	1,076,101	2,638
01122610	2005	408.0	1	10.0	0.8	140,570	345	0	28.3	2,838	8,294	2,639	3,047	1,035,713	2,539
01122610	2006	408.0	1	10.0	0.8	122,532	300	0	38.9	3,839	26,887	3,502	4,201	1,401,389	3,435
01122610	2007	408.0	1	10.0	0.8	144,494	354	0	26.8	2,650	9,299	2,445	2,868	967,386	2,371

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS Station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (figure 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut (table 6), in lb/mi²/yr	Annual mean runoff, in inches	Mean daily total nitrogen flux, in lb/d	Variance in total nitrogen flux, in lb/d	Lower limit of the 95-percent confidence interval, in lb/d	Upper limit of the 95-percent confidence interval, in lb/d	Total nitrogen load, in lb/yr	Total nitrogen yield in lb/mi²/yr
A. Load estimates and regression model input data—Continued															
01122610	2008	408.0	1	10.0	0.8	177,858	436	0	25.8	2,540	10,336	2,327	2,768	929,777	2,279
01122610	2009	408.0	1	10.0	0.8	187,150	459	0	30.8	2,971	15,122	2,720	3,238	1,084,355	2,658
011230695	2008	512.0	1	9.5	0.8	183,077	358	0	29.0	3,142	24,658	2,837	3,472	1,150,039	2,246
011230695	2009	512.0	1	9.5	0.8	194,531	380	0	26.1	3,797	23,281	3,497	4,116	1,385,901	2,707
01124000	1999	155.0	1	11.9	0.6	0	0	870	16.9	597	298	560	635	217,805	1,405
01124000	2000	155.0	1	11.9	0.6	0	0	870	23.7	862	502	814	911	315,314	2,034
01124000	2001	155.0	1	11.9	0.6	0	0	870	17.6	659	294	622	698	240,672	1,553
01124000	2002	155.0	1	11.9	0.6	0	0	870	11.5	484	145	458	512	176,728	1,140
01124000	2003	155.0	1	11.9	0.6	0	0	870	26.0	972	727	916	1,030	354,697	2,288
01124000	2004	155.0	1	11.9	0.6	0	0	870	24.8	937	630	884	992	343,028	2,213
01124000	2005	155.0	1	11.9	0.6	0	0	870	26.6	955	643	901	1,011	348,456	2,248
01124000	2006	155.0	1	11.9	0.6	0	0	870	38.9	1,313	2,219	1,217	1,413	479,119	3,091
01124000	2007	155.0	1	11.9	0.6	0	0	870	27.7	937	622	884	992	341,926	2,206
01124000	2008	155.0	1	11.9	0.6	0	0	870	30.2	975	1,016	910	1,044	356,862	2,302
01124000	2009	155.0	1	11.9	0.6	0	0	870	30.9	1,010	1,578	931	1,093	368,542	2,378
01125100	2004	101.0	1	17.6	1.1	0	0	936	24.2	1,159	6,008	1,011	1,322	424,127	4,199
01125100	2005	101.0	1	17.6	1.1	0	0	936	29.4	1,197	4,555	1,066	1,340	436,938	4,326
01125100	2006	101.0	1	17.6	1.1	0	0	936	38.2	1,321	5,474	1,177	1,477	482,089	4,773
01125100	2007	101.0	1	17.6	1.1	0	0	936	26.7	983	1,954	895	1,078	358,744	3,552
01125100	2008	101.0	1	17.6	1.1	0	0	936	27.8	911	2,717	810	1,022	333,565	3,303
01125100	2009	101.0	1	17.6	1.1	0	0	936	31.4	1,026	4,800	894	1,171	374,365	3,707
01127000	1999	713.0	1	11.4	1.1	178,955	251	0	21.1	5,070	18,798	4,776	5,376	1,850,381	2,595
01127000	2000	713.0	1	11.4	1.1	190,658	267	0	24.5	5,953	18,264	5,662	6,255	2,178,904	3,056

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS Station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (figure 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut (table 6), in lb/mi²/yr	Annual mean runoff, in inches	Mean daily total nitrogen flux, in lb/d	Variance in total nitrogen flux, in lb/d	Lower limit of the 95-percent confidence interval, in lb/d	Upper limit of the 95-percent confidence interval, in lb/d	Total nitrogen load, in lb/yr	Total nitrogen yield in lb/mi²/yr
A. Load estimates and regression model input data—Continued															
01127000	2001	713.0	1	11.4	1.1	151,475	212	0	21.8	5,025	13,887	4,764	5,297	1,834,184	2,572
01127000	2002	713.0	1	11.4	1.1	171,204	240	0	12.5	3,092	2,566	2,968	3,221	1,128,682	1,583
01127000	2003	713.0	1	11.4	1.1	199,744	280	0	28.1	6,342	19,364	6,038	6,656	2,314,763	3,247
01127000	2004	713.0	1	11.4	1.1	183,568	257	0	26.1	5,811	15,540	5,536	6,096	2,126,732	2,983
01127000	2005	713.0	1	11.4	1.1	197,252	277	0	27.5	5,966	20,984	5,654	6,290	2,177,579	3,054
01127000	2006	713.0	1	11.4	1.1	210,561	295	0	36.5	7,505	51,762	7,038	7,995	2,739,455	3,842
01127000	2007	713.0	1	11.4	1.1	201,329	282	0	28.2	5,837	28,788	5,483	6,207	2,130,334	2,988
01127000	2008	713.0	1	11.4	1.1	210,509	295	0	25.4	5,180	25,113	4,850	5,525	1,895,709	2,659
01127000	2009	713.0	1	11.4	1.1	173,449	243	0	30.2	6,228	38,221	5,831	6,645	2,273,197	3,188
01127500	2008	89.3	1	7.8	2.5	0	0	0	25.3	723	977	659	792	264,780	2,965
01127500	2009	89.3	1	7.8	2.5	0	0	0	31.0	886	1,401	809	967	323,292	3,620
01134500	2003	75.2	2	0.8	0.0	0	0	0	21.7	334				106,000	1,410
01134500	2004	75.2	2	0.8	0.0	0	0	0	31.4	443				145,000	1,920
01134500	2005	75.2	2	0.8	0.0	0	0	0	27.2	356				113,000	1,500
01135500	2003	436.0	2	5.8	4.2	0	0	96	19.5	2,008				677,000	1,550
01135500	2004	436.0	2	5.8	4.2	0	0	96	28.9	2,978				981,000	2,250
01135500	2005	436.0	2	5.8	4.2	0	0	96	23.1	2,411				808,000	1,850
01138500	2003	2644.0	2	3.7	2.5	0	0	37	19.6	9,890				3,400,000	1,300
01138500	2004	2644.0	2	3.7	2.5	0	0	37	30.7	15,519				5,400,000	2,040
01138500	2005	2644.0	2	3.7	2.5	0	0	37	25.5	13,096				4,600,000	1,720
01142500	2003	30.5	2	6.5	7.9	0	0	0	18.4	170				56,600	1,860
01142500	2004	30.5	2	6.5	7.9	0	0	0	28.3	271				90,800	2,980
01142500	2005	30.5	2	6.5	7.9	0	0	0	23.4	235				77,200	2,530

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS Station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (figure 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut (table 6), in lb/mi²/yr	Annual mean runoff, in inches	Mean daily total nitrogen flux, in lb/d	Variance in total nitrogen flux, in lb/d	Lower limit of the 95-percent confidence interval, in lb/d	Upper limit of the 95-percent confidence interval, in lb/d	Total nitrogen load, in lb/yr	Total nitrogen yield in lb/mi²/yr
A. Load estimates and regression model input data—Continued															
01144000	2003	690.0	2	4.4	3.4	0	0	0	22.7	3,425				1,160,000	1,680
01144000	2004	690.0	2	4.4	3.4	0	0	0	30.8	4,044				1,390,000	2,020
01144000	2005	690.0	2	4.4	3.4	0	0	0	24.6	3,699				1,240,000	1,800
01152500	2003	269.0	2	7.0	0.9	0	0	163	19.9	1,052				344,000	1,280
01152500	2004	269.0	2	7.0	0.9	0	0	163	26.5	1,189				397,000	1,480
01152500	2005	269.0	2	7.0	0.9	0	0	163	24.8	1,148				376,000	1,400
01154500	2003	5493.0	2	4.7	2.5	0	0	78	19.6	22,932				7,820,000	1,420
01154500	2004	5493.0	2	4.7	2.5	0	0	78	28.9	31,967				10,920,000	1,990
01154500	2005	5493.0	2	4.7	2.5	0	0	78	23.9	25,589				8,690,000	1,580
01163200	2003	34.1	2	23.0	0.9	0	0	2,875	28.0	715				242,000	7,090
01163200	2004	34.1	2	23.0	0.9	0	0	2,875	27.5	719				243,000	7,130
01163200	2005	34.1	2	23.0	0.9	0	0	2875	32.4	781				262,000	7,700
01169000	2003	89.0	2	4.3	0.3	0	0	0	30.5	605				189,000	2,120
01169000	2004	89.0	2	4.3	0.3	0	0	0	40.0	705				221,000	2,480
01169000	2005	89.0	2	4.3	0.3	0	0	0	35.2	567				173,000	1,940
01169900	2003	24.1	2	6.4	0.5	0	0	0	33.4	169				55,800	2,320
01169900	2004	24.1	2	6.4	0.5	0	0	0	41.2	175				57,800	2,400
01169900	2005	24.1	2	6.4	0.5	0	0	0	37.3	147				47,400	1,970
01170100	2003	41.4	2	3.0	0.2	0	0	0	31.7	184				54,200	1,310
01170100	2004	41.4	2	3.0	0.2	0	0	0	40.3	221				62,800	1,520
01170100	2005	41.4	2	3.0	0.2	0	0	0	29.4	103				30,300	732
01171500	2003	52.6	2	9.2	0.5	0	0	0	29.2	296				100,000	1,860
01171500	2004	52.6	2	9.2	0.5	0	0	0	32.8	287				98,500	1,820

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS Station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (figure 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut (table 6), in lb/mi²/yr	Annual mean runoff, in inches	Mean daily total nitrogen flux, in lb/d	Variance in total nitrogen flux, in lb/d	Lower limit of the 95-percent confidence interval, in lb/d	Upper limit of the 95-percent confidence interval, in lb/d	Total nitrogen load, in lb/yr	Total nitrogen yield in lb/mi²/yr
A. Load estimates and regression model input data—Continued															
01171500	2005	52.6	2	9.2	0.5	0	0	0	32.4	261				87,600	1,620
01184000	1999	9660.0	2	6.9	2.0	0	0	409	19.7	48,555	1,020,923	46,120	51,084	17,722,745	1,835
01184000	2000	9660.0	2	6.9	2.0	0	0	409	28.2	65,184	2,005,673	61,939	68,554	23,857,379	2,470
01184000	2001	9660.0	2	6.9	2.0	0	0	409	22.4	52,631	1,262,916	49,888	55,483	19,210,137	1,989
01184000	2002	9660.0	2	6.9	2.0	0	0	409	19.0	45,962	961,407	43,639	48,376	16,776,161	1,737
01184000	2003	9660.0	2	6.9	2.0	0	0	409	22.6	53,822	1,175,835	51,228	56,511	19,644,903	2,034
01184000	2004	9660.0	2	6.9	2.0	0	0	409	27.9	64,306	2,303,710	60,870	67,883	23,536,028	2,436
01184000	2005	9660.0	2	6.9	2.0	0	0	409	24.9	58,358	1,582,330	55,392	61,440	21,300,631	2,205
01184000	2006	9660.0	2	6.9	2.0	0	0	409	37.2	81,761	5,308,114	76,821	86,932	29,842,800	3,089
01184000	2007	9660.0	2	6.9	2.0	0	0	409	28.9	66,133	2,501,222	62,537	69,880	24,138,463	2,499
01184000	2008	9660.0	2	6.9	2.0	0	0	409	32.9	73,943	3,337,315	69,874	78,184	27,063,036	2,802
01184000	2009	9660.0	2	6.9	2.0	0	0	409	30.0	68,879	2,414,752	65,376	72,518	25,140,723	2,603
01184490	1999	15.5	2	15.2	18.7	0	0	0	18.3	476	99	456	497	173,763	11,210
01184490	2000	15.5	2	15.2	18.7	0	0	0	24.3	620	130	596	644	226,834	14,634
01184490	2001	15.5	2	15.2	18.7	0	0	0	20.4	521	93	501	542	190,200	12,271
01184490	2002	15.5	2	15.2	18.7	0	0	0	11.6	326	37	314	339	119,167	7,688
01184490	2003	15.5	2	15.2	18.7	0	0	0	23.7	625	148	600	651	228,207	14,723
01184490	2004	15.5	2	15.2	18.7	0	0	0	26.0	697	199	669	727	255,232	16,467
01184490	2005	15.5	2	15.2	18.7	0	0	0	24.1	651	146	627	677	237,741	15,338
01184490	2006	15.5	2	15.2	18.7	0	0	0	37.8	879	916	820	941	320,760	20,694
01184490	2007	15.5	2	15.2	18.7	0	0	0	21.9	583	102	562	604	212,787	13,728
01184490	2008	15.5	2	15.2	18.7	0	0	0	24.2	608	220	578	639	222,511	14,356
01184490	2009	15.5	2	15.2	18.7	0	0	0	27.9	703	440	662	746	256,663	16,559

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS Station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (figure 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut (table 6), in lb/mi²/yr	Annual mean runoff, in inches	Mean daily total nitrogen flux, in lb/d	Variance in total nitrogen flux, in lb/d	Lower limit of the 95-percent confidence interval, in lb/d	Upper limit of the 95-percent confidence interval, in lb/d	Total nitrogen load, in lb/yr	Total nitrogen yield in lb/mi²/yr
A. Load estimates and regression model input data—Continued															
01188000	1999	4.1	2	10.2	1.9	0	0	0	25.7	16	1	14	18	5,830	1,422
01188000	2000	4.1	2	10.2	1.9	0	0	0	30.0	20	1	18	22	7,277	1,775
01188000	2001	4.1	2	10.2	1.9	0	0	0	26.3	17	1	16	19	6,353	1,550
01188000	2002	4.1	2	10.2	1.9	0	0	0	12.8	9	0	9	10	3,452	842
01188000	2003	4.1	2	10.2	1.9	0	0	0	33.9	24	1	22	26	8,586	2,094
01188000	2004	4.1	2	10.2	1.9	0	0	0	34.2	24	1	22	26	8,811	2,149
01188000	2005	4.1	2	10.2	1.9	0	0	0	30.0	22	1	20	23	7,963	1,942
01188000	2006	4.1	2	10.2	1.9	0	0	0	44.4	31	2	28	34	11,233	2,740
01188000	2007	4.1	2	10.2	1.9	0	0	0	30.5	23	1	21	25	8,224	2,006
01188000	2008	4.1	2	10.2	1.9	0	0	0	32.9	25	1	23	27	9,174	2,237
01188000	2009	4.1	2	10.2	1.9	0	0	0	33.3	26	1	24	29	9,633	2,350
01188090	1999	378.0	2	7.2	0.4	107,006	283	0	18.9	1,107	2,064	1,016	1,204	404,162	1,069
01188090	2000	378.0	2	7.2	0.4	101,748	269	0	25.7	1,435	3,069	1,324	1,552	525,037	1,389
01188090	2001	378.0	2	7.2	0.4	98,185	260	0	20.5	1,134	1,536	1,054	1,219	414,000	1,095
01188090	2002	378.0	2	7.2	0.4	116,831	309	0	10.3	613	558	566	663	223,745	592
01188090	2003	378.0	2	7.2	0.4	100,505	266	0	24.5	1,314	1,882	1,225	1,407	479,606	1,269
01188090	2004	378.0	2	7.2	0.4	110,387	292	0	30.7	1,633	4,802	1,495	1,779	597,622	1,581
01188090	2005	378.0	2	7.2	0.4	114,455	303	0	25.4	1,346	2,736	1,241	1,458	491,466	1,300
01188090	2006	378.0	2	7.2	0.4	119,527	316	0	36.5	1,819	9,256	1,631	2,022	663,867	1,756
01188090	2007	378.0	2	7.2	0.4	96,449	255	0	26.7	1,326	4,038	1,199	1,462	483,965	1,280
01188090	2008	378.0	2	7.2	0.4	64,090	170	0	28.2	1,383	5,217	1,242	1,535	506,203	1,339
01188090	2009	378.0	2	7.2	0.4	60,944	161	0	30.7	1,507	7,653	1,339	1,690	549,997	1,455
01189995	1999	577.0	2	13.7	0.9	1,121,554	1,944	0	20.7	4,968	18,009	4,689	5,259	1,813,188	3,142

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS Station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (figure 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut (table 6), in lb/mi²/yr	Annual mean runoff, in inches	Mean daily total nitrogen flux, in lb/d	Variance in total nitrogen flux, in lb/d	Lower limit of the 95-percent confidence interval, in lb/d	Upper limit of the 95-percent confidence interval, in lb/d	Total nitrogen load, in lb/yr	Total nitrogen yield in lb/mi²/yr
A. Load estimates and regression model input data—Continued															
01189995	2000	577.0	2	13.7	0.9	1,100,928	1,908	0	28.1	6,280	29,446	5,929	6,647	2,298,645	3,984
01189995	2001	577.0	2	13.7	0.9	1,085,875	1,882	0	21.7	5,118	19,963	4,825	5,425	1,868,212	3,238
01189995	2002	577.0	2	13.7	0.9	848,411	1,470	0	11.8	3,448	10,443	3,240	3,665	1,258,422	2,181
01189995	2003	577.0	2	13.7	0.9	881,316	1,527	0	26.8	5,837	29,025	5,490	6,200	2,130,603	3,693
01189995	2004	577.0	2	13.7	0.9	848,210	1,470	0	30.8	6,225	35,947	5,841	6,627	2,278,260	3,948
01189995	2005	577.0	2	13.7	0.9	730,345	1,266	0	26.2	5,393	21,448	5,090	5,709	1,968,380	3,411
01189995	2006	577.0	2	13.7	0.9	734,998	1,274	0	39.6	6,765	50,177	6,314	7,240	2,469,187	4,279
01189995	2007	577.0	2	13.7	0.9	626,367	1,086	0	28.1	5,044	19,222	4,755	5,346	1,841,207	3,191
01189995	2008	577.0	2	13.7	0.9	532,707	923	0	29.1	4,917	22,756	4,610	5,239	1,799,671	3,119
01189995	2009	577.0	2	13.7	0.9	442,092	766	0	31.5	4,964	36,668	4,587	5,364	1,812,028	3,140
01192500	1999	73.4	2	41.4	2.8	475,775	6,482	0	20.2	1,984	2,777	1,873	2,099	724,054	9,864
01192500	2000	73.4	2	41.4	2.8	477,630	6,507	0	24.0	2,165	2,587	2,057	2,277	792,294	10,794
01192500	2001	73.4	2	41.4	2.8	527,060	7,181	0	18.5	1,786	1,598	1,700	1,876	651,950	8,882
01192500	2002	73.4	2	41.4	2.8	476,158	6,487	0	11.9	1,368	1,349	1,292	1,447	499,374	6,803
01192500	2003	73.4	2	41.4	2.8	493,723	6,726	0	26.8	2,190	2,161	2,089	2,295	799,498	10,892
01192500	2004	73.4	2	41.4	2.8	504,556	6,874	0	26.5	2,155	2,247	2,053	2,261	788,690	10,745
01192500	2005	73.4	2	41.4	2.8	455,407	6,204	0	25.9	2,100	2,591	1,992	2,212	766,438	10,442
01192500	2006	73.4	2	41.4	2.8	495,593	6,752	0	39.8	2,617	7,150	2,446	2,797	955,232	13,014
01192500	2007	73.4	2	41.4	2.8	469,048	6,390	0	24.7	1,937	3,015	1,823	2,055	706,841	9,630
01192500	2008	73.4	2	41.4	2.8	385,871	5,257	0	23.8	1,848	3,328	1,730	1,971	676,306	9,214
01192500	2009	73.4	2	41.4	2.8	441,264	6,012	0	28.9	2,110	5,633	1,960	2,268	769,983	10,490
01193500	1999	100.0	2	11.3	0.7	0	0	0	22.5	440	351	400	483	160,635	1,606
01193500	2000	100.0	2	11.3	0.7	0	0	0	24.3	457	283	421	495	167,166	1,672

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS Station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (figure 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut (table 6), in lb/mi²/yr	Annual mean runoff, in inches	Mean daily total nitrogen flux, in lb/d	Variance in total nitrogen flux, in lb/d	Lower limit of the 95-percent confidence interval, in lb/d	Upper limit of the 95-percent confidence interval, in lb/d	Total nitrogen load, in lb/yr	Total nitrogen yield in lb/mi²/yr
A. Load estimates and regression model input data—Continued															
01193500	2001	100.0	2	11.3	0.7	0	0	0	21.2	411	293	373	452	150,107	1,501
01193500	2002	100.0	2	11.3	0.7	0	0	0	11.1	196	35	182	211	71,545	715
01193500	2003	100.0	2	11.3	0.7	0	0	0	28.4	553	534	505	604	201,823	2,018
01193500	2004	100.0	2	11.3	0.7	0	0	0	30.0	591	686	536	651	216,404	2,164
01193500	2005	100.0	2	11.3	0.7	0	0	0	27.8	550	598	498	606	200,782	2,008
01193500	2006	100.0	2	11.3	0.7	0	0	0	42.7	887	2,161	792	990	323,643	3,236
01193500	2007	100.0	2	11.3	0.7	0	0	0	30.9	629	954	563	700	229,427	2,294
01193500	2008	100.0	2	11.3	0.7	0	0	0	26.5	532	649	477	592	194,840	1,948
01193500	2009	100.0	2	11.3	0.7	0	0	0	31.0	609	693	552	671	222,399	2,224
01195100	2008	5.7	3	11.5	0.2	0	0	0	19.2	21	1	19	23	7,764	1,367
01195100	2009	5.7	3	11.5	0.2	0	0	0	25.5	30	1	27	32	10,771	1,896
01196500	1999	115.0	3	53.2	0.3	730,720	6,354	0	23.9	2,940	5,042	2,793	3,092	1,073,073	9,331
01196500	2000	115.0	3	53.2	0.3	849,852	7,390	0	27.3	3,308	4,475	3,169	3,452	1,210,710	10,528
01196500	2001	115.0	3	53.2	0.3	958,125	8,332	0	24.9	3,016	4,344	2,879	3,158	1,100,830	9,572
01196500	2002	115.0	3	53.2	0.3	784,053	6,818	0	12.5	2,053	2,432	1,953	2,157	749,469	6,517
01196500	2003	115.0	3	53.2	0.3	830,308	7,220	0	32.8	3,600	6,853	3,430	3,775	1,313,845	11,425
01196500	2004	115.0	3	53.2	0.3	803,819	6,990	0	31.0	3,435	6,108	3,274	3,602	1,257,118	10,931
01196500	2005	115.0	3	53.2	0.3	724,256	6,298	0	27.8	3,153	4,149	3,018	3,292	1,150,715	10,006
01196500	2006	115.0	3	53.2	0.3	692,376	6,021	0	47.0	4,260	23,901	3,956	4,581	1,554,942	13,521
01196500	2007	115.0	3	53.2	0.3	636,613	5,536	0	33.8	3,340	8,660	3,152	3,535	1,219,005	10,600
01196500	2008	115.0	3	53.2	0.3	703,527	6,118	0	26.8	2,781	6,380	2,621	2,949	1,017,959	8,852
01196500	2009	115.0	3	53.2	0.3	723,716	6,293	0	31.5	3,072	10,944	2,866	3,288	1,121,099	9,749
01198125	2008	465.0	4	9.8	1.8	0	0	404	33.9	4,393	41,670	3,999	4,815	1,607,766	3,458

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS Station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (figure 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut (table 6), in lb/mi²/yr	Annual mean runoff, in inches	Mean daily total nitrogen flux, in lb/d	Variance in total nitrogen flux, in lb/d	Lower limit of the 95-percent confidence interval, in lb/d	Upper limit of the 95-percent confidence interval, in lb/d	Total nitrogen load, in lb/yr	Total nitrogen yield in lb/mi²/yr
A. Load estimates and regression model input data—Continued															
01198125	2009	465.0	4	9.8	1.8	0	0	404	37.1	4,098	32,811	3,748	4,472	1,495,808	3,217
01201487	2003	62.3	4	40.9	0.4	714,003	11,461	0	32.2	2,392	7,667	2,219	2,574	873,038	14,013
01201487	2004	62.3	4	40.9	0.4	679,919	10,914	0	33.2	2,364	5,089	2,221	2,515	865,379	13,891
01201487	2005	62.3	4	40.9	0.4	630,606	10,122	0	27.2	2,236	2,751	2,126	2,350	816,098	13,099
01201487	2006	62.3	4	40.9	0.4	763,342	12,253	0	38.9	2,416	3,771	2,289	2,548	881,769	14,154
01201487	2007	62.3	4	40.9	0.4	655,985	10,529	0	29.8	2,222	3,037	2,106	2,342	810,917	13,016
01201487	2008	62.3	4	40.9	0.4	665,858	10,688	0	26.7	2,110	3,637	1,987	2,238	772,178	12,395
01201487	2009	62.3	4	40.9	0.4	733,630	11,776	0	26.7	2,050	5,153	1,908	2,200	748,340	12,012
01205500	1999	1544.0	4	10.4	1.7	751,737	487	121.8	20.8	9,034	42,767	8,578	9,507	3,297,344	2,136
01205500	2000	1544.0	4	10.4	1.7	798,146	517	121.8	28.0	11,857	70,471	11,296	12,439	4,339,805	2,811
01205500	2001	1544.0	4	10.4	1.7	775,260	502	121.8	21.4	9,190	45,269	8,726	9,671	3,354,193	2,172
01205500	2002	1544.0	4	10.4	1.7	765,034	495	121.8	12.0	5,087	13,268	4,835	5,348	1,856,607	1,202
01205500	2003	1544.0	4	10.4	1.7	794,168	514	121.8	26.6	11,417	64,936	10,869	11,985	4,167,128	2,699
01205500	2004	1544.0	4	10.4	1.7	749,838	486	121.8	30.0	13,105	100,811	12,434	13,801	4,796,293	3,106
01205500	2005	1544.0	4	10.4	1.7	706,056	457	121.8	24.5	10,740	63,579	10,192	11,309	3,920,063	2,539
01205500	2006	1544.0	4	10.4	1.7	856,096	554	121.8	37.4	16,215	194,530	15,294	17,176	5,918,347	3,833
01205500	2007	1544.0	4	10.4	1.7	746,799	484	121.8	27.0	11,639	78,751	11,023	12,280	4,248,239	2,751
01205500	2008	1544.0	4	10.4	1.7	750,594	486	121.8	29.5	12,697	100,915	12,019	13,403	4,646,963	3,010
01205500	2009	1544.0	4	10.4	1.7	832,286	539	121.8	31.1	13,356	98,902	12,690	14,047	4,874,764	3,157
01208500	1999	260.0	4	25.4	0.9	1,804,992	6,942	0	24.3	4,894	35,470	4,506	5,308	1,786,474	6,871
01208500	2000	260.0	4	25.4	0.9	1,375,428	5,290	0	27.8	4,945	23,647	4,623	5,284	1,809,898	6,961
01208500	2001	260.0	4	25.4	0.9	861,765	3,314	0	25.5	4,371	22,399	4,055	4,705	1,595,477	6,136
01208500	2002	260.0	4	25.4	0.9	574,933	2,211	0	14.2	2,813	4,183	2,666	2,965	1,026,746	3,949

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS Station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (figure 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut (table 6), in lb/mi²/yr	Annual mean runoff, in inches	Mean daily total nitrogen flux, in lb/d	Variance in total nitrogen flux, in lb/d	Lower limit of the 95-percent confidence interval, in lb/d	Upper limit of the 95-percent confidence interval, in lb/d	Total nitrogen load, in lb/yr	Total nitrogen yield in lb/mi²/yr
A. Load estimates and regression model input data—Continued															
01208500	2003	260.0	4	25.4	0.9	787,389	3,028	0	32.0	4,403	17,982	4,118	4,703	1,607,239	6,182
01208500	2004	260.0	4	25.4	0.9	546,838	2,103	0	31.6	4,084	16,996	3,808	4,374	1,494,671	5,749
01208500	2005	260.0	4	25.4	0.9	579,014	2,227	0	25.3	3,245	8,442	3,045	3,454	1,184,390	4,555
01208500	2006	260.0	4	25.4	0.9	607,739	2,337	0	45.2	4,701	69,520	4,186	5,262	1,715,958	6,600
01208500	2007	260.0	4	25.4	0.9	548,262	2,109	0	30.6	3,238	20,621	2,945	3,551	1,181,704	4,545
01208500	2008	260.0	4	25.4	0.9	547,240	2,105	0	30.5	2,955	14,057	2,714	3,212	1,081,638	4,160
01208500	2009	260.0	4	25.4	0.9	537,342	2,067	0	32.7	2,892	14,082	2,652	3,147	1,055,467	4,059
01208873	2008	10.6	5	92.6	0.0	0	0	0	19.8	170	50	156	186	62,328	5,880
01208873	2009	10.6	5	92.6	0.0	0	0	0	17.8	154	35	142	167	56,371	5,318
01208950	2008	7.4	5	37.8	0.0	0	0	0	21.0	82	19	73	92	30,096	4,078
01208950	2009	7.4	5	37.8	0.0	0	0	0	23.8	86	15	79	95	31,548	4,275
01208990	1999	21.0	5	13.2	0.2	0	0	0	24.9	95	14	87	104	34,783	1,656
01208990	2000	21.0	5	13.2	0.2	0	0	0	23.4	88	7	82	94	32,041	1,526
01208990	2001	21.0	5	13.2	0.2	0	0	0	19.8	75	7	69	81	27,353	1,303
01208990	2002	21.0	5	13.2	0.2	0	0	0	12.4	46	2	43	49	16,790	800
01208990	2003	21.0	5	13.2	0.2	0	0	0	29.8	113	16	105	122	41,247	1,964
01208990	2004	21.0	5	13.2	0.2	0	0	0	31.1	118	19	109	128	43,237	2,059
01208990	2005	21.0	5	13.2	0.2	0	0	0	24.9	94	11	87	102	34,406	1,638
01208990	2006	21.0	5	13.2	0.2	0	0	0	37.4	144	32	132	156	52,397	2,495
01208990	2007	21.0	5	13.2	0.2	0	0	0	29.8	115	25	104	128	42,115	2,005
01208990	2008	21.0	5	13.2	0.2	0	0	0	23.9	90	10	83	98	33,081	1,575
01208990	2009	21.0	5	13.2	0.2	0	0	0	25.0	94	10	88	101	34,400	1,638
01209710	1999	33.0	5	27.6	0.2	8,948	271	0	21.1	238	80	216	261	86,723	2,628

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS Station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (figure 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut (table 6), in lb/mi²/yr	Annual mean runoff, in inches	Mean daily total nitrogen flux, in lb/d	Variance in total nitrogen flux, in lb/d	Lower limit of the 95-percent confidence interval, in lb/d	Upper limit of the 95-percent confidence interval, in lb/d	Total nitrogen load, in lb/yr	Total nitrogen yield in lb/mi²/yr
A. Load estimates and regression model input data—Continued															
01209710	2000	33.0	5	27.6	0.2	8,052	244	0	21.5	231	44	216	247	84,704	2,567
01209710	2001	33.0	5	27.6	0.2	6,935	210	0	18.9	211	37	196	228	77,087	2,336
01209710	2002	33.0	5	27.6	0.2	8,257	250	0	12.5	136	9	127	145	49,576	1,502
01209710	2003	33.0	5	27.6	0.2	8,741	265	0	29.7	343	94	320	367	125,157	3,793
01209710	2004	33.0	5	27.6	0.2	10,416	316	0	33.7	400	160	370	431	146,231	4,431
01209710	2005	33.0	5	27.6	0.2	10,859	329	0	26.5	310	86	288	333	113,189	3,430
01209710	2006	33.0	5	27.6	0.2	12,474	378	0	41.2	506	356	464	551	184,728	5,598
01209710	2007	33.0	5	27.6	0.2	10,619	322	0	40.6	517	511	463	576	188,636	5,716
01209710	2008	33.0	5	27.6	0.2	12,579	381	0	24.6	295	131	269	322	107,804	3,267
01209710	2009	33.0	5	27.6	0.2	13,658	414	0	26.5	319	181	290	350	116,308	3,524

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (fig. 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut, in lb/mi²/yr	Annual mean runoff, in inches
B. Input data below for unmonitored sites/basins where predictions are necessary—Continued									
01127500	1999	89.3	1	7.8	2.5	0	0	0	22.7
01127500	2000	89.3	1	7.8	2.5	0	0	0	22.9
01127500	2001	89.3	1	7.8	2.5	0	0	0	24.3
01127500	2002	89.3	1	7.8	2.5	0	0	0	11.0
01127500	2003	89.3	1	7.8	2.5	0	0	0	31.2
01127500	2004	89.3	1	7.8	2.5	0	0	0	27.0
01127500	2005	89.3	1	7.8	2.5	0	0	0	27.9
01127500	2006	89.3	1	7.8	2.5	0	0	0	33.7
01127500	2007	89.3	1	7.8	2.5	0	0	0	31.3
011230695	1999	512.0	1	9.5	0.8	252,345	493	0	22.7
011230695	2000	512.0	1	9.5	0.8	232,410	454	0	22.9
011230695	2001	512.0	1	9.5	0.8	150,745	294	0	24.3
011230695	2002	512.0	1	9.5	0.8	180,645	353	0	11.0
011230695	2003	512.0	1	9.5	0.8	177,581	347	0	31.2
011230695	2004	512.0	1	9.5	0.8	170,820	334	0	27.0
011230695	2005	512.0	1	9.5	0.8	145,169	284	0	27.9
011230695	2006	512.0	1	9.5	0.8	130,153	254	0	33.7
011230695	2007	512.0	1	9.5	0.8	150,390	294	0	31.3
01195100	1999	5.7	3	11.5	0.2	0	0	0	15.8
01195100	2000	5.7	3	11.5	0.2	0	0	0	21.6
01195100	2001	5.7	3	11.5	0.2	0	0	0	24.7
01195100	2002	5.7	3	11.5	0.2	0	0	0	11.1
01195100	2003	5.7	3	11.5	0.2	0	0	0	28.5
01195100	2004	5.7	3	11.5	0.2	0	0	0	23.2
01195100	2005	5.7	3	11.5	0.2	0	0	0	22.2
01195100	2006	5.7	3	11.5	0.2	0	0	0	30.9
01195100	2007	5.7	3	11.5	0.2	0	0	0	28.7
01208873	1999	10.6	5	92.6	0.0	0	0	0	13.9
01208873	2000	10.6	5	92.6	0.0	0	0	0	21.3
01208873	2001	10.6	5	92.6	0.0	0	0	0	20.4
01208873	2002	10.6	5	92.6	0.0	0	0	0	12.5
01208873	2003	10.6	5	92.6	0.0	0	0	0	24.0
01208873	2004	10.6	5	92.6	0.0	0	0	0	21.9
01208873	2005	10.6	5	92.6	0.0	0	0	0	17.3

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (fig. 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut, in lb/mi²/yr	Annual mean runoff, in inches
B. Input data below for unmonitored sites/basins where predictions are necessary—Continued									
01208873	2006	10.6	5	92.6	0.0	0	0	0	32.1
01208873	2007	10.6	5	92.6	0.0	0	0	0	25.1
01208950	1999	7.4	5	37.8	0.0	0	0	0	15.3
01208950	2000	7.4	5	37.8	0.0	0	0	0	24.8
01208950	2001	7.4	5	37.8	0.0	0	0	0	23.3
01208950	2002	7.4	5	37.8	0.0	0	0	0	12.6
01208950	2003	7.4	5	37.8	0.0	0	0	0	32.3
01208950	2004	7.4	5	37.8	0.0	0	0	0	30.0
01208950	2005	7.4	5	37.8	0.0	0	0	0	21.3
01208950	2006	7.4	5	37.8	0.0	0	0	0	41.1
01208950	2007	7.4	5	37.8	0.0	0	0	0	33.2
CT mainstem S.	1999	227.5	2	15.3	0.5	1,211,427	5,326	0	22.5
CT mainstem S.	2000	227.5	2	15.3	0.5	1,021,506	4,491	0	24.3
CT mainstem S.	2001	227.5	2	15.3	0.5	1,049,740	4,615	0	21.2
CT mainstem S.	2002	227.5	2	15.3	0.5	955,953	4,202	0	11.1
CT mainstem S.	2003	227.5	2	15.3	0.5	876,494	3,853	0	28.4
CT mainstem S.	2004	227.5	2	15.3	0.5	720,465	3,167	0	30.0
CT mainstem S.	2005	227.5	2	15.3	0.5	728,197	3,201	0	27.8
CT mainstem S.	2006	227.5	2	15.3	0.5	700,973	3,082	0	42.7
CT mainstem S.	2007	227.5	2	15.3	0.5	601,859	2,646	0	30.9
CT mainstem S.	2008	227.5	2	15.3	0.5	590,925	2,598	0	26.5
CT mainstem S.	2009	227.5	2	15.3	0.5	650,609	2,860	0	31.0
CT mainstem N.	1999	139.5	2	49.8	3.8	3,529,473	25,308	0	18.3
CT mainstem N.	2000	139.5	2	49.8	3.8	3,589,728	25,740	0	24.3
CT mainstem N.	2001	139.5	2	49.8	3.8	2,956,135	21,197	0	20.4
CT mainstem N.	2002	139.5	2	49.8	3.8	3,277,862	23,503	0	11.6
CT mainstem N.	2003	139.5	2	49.8	3.8	3,271,542	23,458	0	23.7
CT mainstem N.	2004	139.5	2	49.8	3.8	3,294,500	23,623	0	26.0
CT mainstem N.	2005	139.5	2	49.8	3.8	3,548,473	25,444	0	24.1
CT mainstem N.	2006	139.5	2	49.8	3.8	3,761,075	26,968	0	37.8
CT mainstem N.	2007	139.5	2	49.8	3.8	2,966,652	21,272	0	21.9
CT mainstem N.	2008	139.5	2	49.8	3.8	2,782,560	19,952	0	24.2
CT mainstem N.	2009	139.5	2	49.8	3.8	2,366,128	16,966	0	27.9
Eightmile	1999	62.4	2	6.2	0.5	0	0	0	22.5

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (fig. 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut, in lb/mi²/yr	Annual mean runoff, in inches
B. Input data below for unmonitored sites/basins where predictions are necessary—Continued									
Eightmile	2000	62.4	2	6.2	0.5	0	0	0	24.3
Eightmile	2001	62.4	2	6.2	0.5	0	0	0	21.2
Eightmile	2002	62.4	2	6.2	0.5	0	0	0	11.1
Eightmile	2003	62.4	2	6.2	0.5	0	0	0	28.4
Eightmile	2004	62.4	2	6.2	0.5	0	0	0	30.0
Eightmile	2005	62.4	2	6.2	0.5	0	0	0	27.8
Eightmile	2006	62.4	2	6.2	0.5	0	0	0	42.7
Eightmile	2007	62.4	2	6.2	0.5	0	0	0	30.9
Eightmile	2008	62.4	2	6.2	0.5	0	0	0	26.5
Eightmile	2009	62.4	2	6.2	0.5	0	0	0	31.0
Farmington	1999	30.6	2	38.8	7.5	163,629	5,339	0	19.8
Farmington	2000	30.6	2	38.8	7.5	171,288	5,589	0	29.7
Farmington	2001	30.6	2	38.8	7.5	112,785	3,680	0	28.1
Farmington	2002	30.6	2	38.8	7.5	155,898	5,087	0	8.9
Farmington	2003	30.6	2	38.8	7.5	154,649	5,046	0	32.0
Farmington	2004	30.6	2	38.8	7.5	161,876	5,282	0	27.0
Farmington	2005	30.6	2	38.8	7.5	167,140	5,454	0	23.3
Farmington	2006	30.6	2	38.8	7.5	163,202	5,325	0	39.6
Farmington	2007	30.6	2	38.8	7.5	155,282	5,067	0	26.2
Farmington	2008	30.6	2	38.8	7.5	161,083	5,256	0	35.3
Farmington	2009	30.6	2	38.8	7.5	163,483	5,335	0	31.0
Hockanum	1999	3.5	2	71.2	0.2	0	0	0	20.2
Hockanum	2000	3.5	2	71.2	0.2	0	0	0	24.0
Hockanum	2001	3.5	2	71.2	0.2	0	0	0	18.5
Hockanum	2002	3.5	2	71.2	0.2	0	0	0	11.9
Hockanum	2003	3.5	2	71.2	0.2	0	0	0	26.8
Hockanum	2004	3.5	2	71.2	0.2	0	0	0	26.5
Hockanum	2005	3.5	2	71.2	0.2	0	0	0	25.9
Hockanum	2006	3.5	2	71.2	0.2	0	0	0	39.8
Hockanum	2007	3.5	2	71.2	0.2	0	0	0	24.7
Hockanum	2008	3.5	2	71.2	0.2	0	0	0	23.8
Hockanum	2009	3.5	2	71.2	0.2	0	0	0	28.9
Housatonic	1999	94.3	4	43.0	0.3	642,036	6,812	0	21.7
Housatonic	2000	94.3	4	43.0	0.3	659,532	6,998	0	24.7
Housatonic	2001	94.3	4	43.0	0.3	595,315	6,316	0	20.9

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (fig. 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut, in lb/mi²/yr	Annual mean runoff, in inches
B. Input data below for unmonitored sites/basins where predictions are necessary—Continued									
Housatonic	2002	94.3	4	43.0	0.3	588,035	6,239	0	11.5
Housatonic	2003	94.3	4	43.0	0.3	707,013	7,501	0	26.7
Housatonic	2004	94.3	4	43.0	0.3	576,344	6,115	0	27.6
Housatonic	2005	94.3	4	43.0	0.3	582,092	6,176	0	21.1
Housatonic	2006	94.3	4	43.0	0.3	667,356	7,081	0	35.6
Housatonic	2007	94.3	4	43.0	0.3	691,890	7,341	0	26.1
Housatonic	2008	94.3	4	43.0	0.3	884,494	9,385	0	27.7
Housatonic	2009	94.3	4	43.0	0.3	601,585	6,383	0	29.3
Mattabesett	1999	108.9	2	34.3	1.0	0	0	0	19.7
Mattabesett	2000	108.9	2	34.3	1.0	0	0	0	25.6
Mattabesett	2001	108.9	2	34.3	1.0	0	0	0	24.6
Mattabesett	2002	108.9	2	34.3	1.0	0	0	0	13.6
Mattabesett	2003	108.9	2	34.3	1.0	0	0	0	35.0
Mattabesett	2004	108.9	2	34.3	1.0	0	0	0	31.2
Mattabesett	2005	108.9	2	34.3	1.0	0	0	0	29.2
Mattabesett	2006	108.9	2	34.3	1.0	0	0	0	45.9
Mattabesett	2007	108.9	2	34.3	1.0	0	0	0	34.8
Mattabesett	2008	108.9	2	34.3	1.0	0	0	0	28.8
Mattabesett	2009	108.9	2	34.3	1.0	0	0	0	33.5
Scantic	1999	98.1	2	17.5	7.0	0	0	0	18.3
Scantic	2000	98.1	2	17.5	7.0	0	0	0	24.3
Scantic	2001	98.1	2	17.5	7.0	0	0	0	20.4
Scantic	2002	98.1	2	17.5	7.0	0	0	0	11.6
Scantic	2003	98.1	2	17.5	7.0	0	0	0	23.7
Scantic	2004	98.1	2	17.5	7.0	0	0	0	26.0
Scantic	2005	98.1	2	17.5	7.0	0	0	0	24.1
Scantic	2006	98.1	2	17.5	7.0	0	0	0	37.8
Scantic	2007	98.1	2	17.5	7.0	0	0	0	21.9
Scantic	2008	98.1	2	17.5	7.0	0	0	0	24.2
Scantic	2009	98.1	2	17.5	7.0	0	0	0	27.9
Stony Brook	1999	44.6	2	19.1	7.1	52,190	1,171	0	19.8
Stony Brook	2000	44.6	2	19.1	7.1	49,776	1,117	0	29.7
Stony Brook	2001	44.6	2	19.1	7.1	59,130	1,327	0	28.1
Stony Brook	2002	44.6	2	19.1	7.1	12,282	276	0	8.9
Stony Brook	2003	44.6	2	19.1	7.1	12,743	286	0	32.0

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (fig. 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut, in lb/mi²/yr	Annual mean runoff, in inches
B. Input data below for unmonitored sites/basins where predictions are necessary—Continued									
Stony Brook	2004	44.6	2	19.1	7.1	11,958	268	0	27.0
Stony Brook	2005	44.6	2	19.1	7.1	21,490	482	0	23.3
Stony Brook	2006	44.6	2	19.1	7.1	37,026	831	0	39.6
Stony Brook	2007	44.6	2	19.1	7.1	24,023	539	0	26.2
Stony Brook	2008	44.6	2	19.1	7.1	29,329	658	0	35.3
Stony Brook	2009	44.6	2	19.1	7.1	26,210	588	0	31.0
Park	1999	77.2	2	64.5	0.9	0	0	0	19.8
Park	2000	77.2	2	64.5	0.9	0	0	0	29.7
Park	2001	77.2	2	64.5	0.9	0	0	0	28.1
Park	2002	77.2	2	64.5	0.9	0	0	0	8.9
Park	2003	77.2	2	64.5	0.9	0	0	0	32.0
Park	2004	77.2	2	64.5	0.9	0	0	0	27.0
Park	2005	77.2	2	64.5	0.9	0	0	0	23.3
Park	2006	77.2	2	64.5	0.9	0	0	0	39.6
Park	2007	77.2	2	64.5	0.9	0	0	0	26.2
Park	2008	77.2	2	64.5	0.9	0	0	0	35.3
Park	2009	77.2	2	64.5	0.9	0	0	0	31.0
Salmon	1999	48.4	2	10.4	0.2	0	0	0	22.5
Salmon	2000	48.4	2	10.4	0.2	0	0	0	24.3
Salmon	2001	48.4	2	10.4	0.2	0	0	0	21.2
Salmon	2002	48.4	2	10.4	0.2	0	0	0	11.1
Salmon	2003	48.4	2	10.4	0.2	0	0	0	28.4
Salmon	2004	48.4	2	10.4	0.2	0	0	0	30.0
Salmon	2005	48.4	2	10.4	0.2	0	0	0	27.8
Salmon	2006	48.4	2	10.4	0.2	0	0	0	42.7
Salmon	2007	48.4	2	10.4	0.2	0	0	0	30.9
Salmon	2008	48.4	2	10.4	0.2	0	0	0	26.5
Salmon	2009	48.4	2	10.4	0.2	0	0	0	31.0
Yantic	1999	8.6	1	43.2	0.3	304,947	35,394	0	22.7
Yantic	2000	8.6	1	43.2	0.3	270,474	31,393	0	22.9
Yantic	2001	8.6	1	43.2	0.3	267,910	31,095	0	24.3
Yantic	2002	8.6	1	43.2	0.3	276,042	32,039	0	11.0
Yantic	2003	8.6	1	43.2	0.3	317,709	36,875	0	31.2
Yantic	2004	8.6	1	43.2	0.3	318,827	37,005	0	27.0
Yantic	2005	8.6	1	43.2	0.3	276,573	32,101	0	27.9

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (fig. 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut, in lb/mi²/yr	Annual mean runoff, in inches
B. Input data below for unmonitored sites/basins where predictions are necessary—Continued									
Yantic	2006	8.6	1	43.2	0.3	305,286	35,434	0	33.7
Yantic	2007	8.6	1	43.2	0.3	249,528	28,962	0	31.3
Yantic	2008	8.6	1	43.2	0.3	247,613	28,740	0	25.3
Yantic	2009	8.6	1	43.2	0.3	234,070	27,168	0	31.0
Shetucket	1999	11.5	1	31.1	1.2	0	0	0	22.5
Shetucket	2000	11.5	1	31.1	1.2	0	0	0	24.3
Shetucket	2001	11.5	1	31.1	1.2	0	0	0	21.2
Shetucket	2002	11.5	1	31.1	1.2	0	0	0	11.1
Shetucket	2003	11.5	1	31.1	1.2	0	0	0	28.4
Shetucket	2004	11.5	1	31.1	1.2	0	0	0	30.0
Shetucket	2005	11.5	1	31.1	1.2	0	0	0	27.8
Shetucket	2006	11.5	1	31.1	1.2	0	0	0	42.7
Shetucket	2007	11.5	1	31.1	1.2	0	0	0	30.9
Shetucket	2008	11.5	1	31.1	1.2	0	0	0	26.5
Shetucket	2009	11.5	1	31.1	1.2	0	0	0	31.0
Quinebaug	1999	28.8	1	6.9	4.8	0	0	0	21.2
Quinebaug	2000	28.8	1	6.9	4.8	0	0	0	22.3
Quinebaug	2001	28.8	1	6.9	4.8	0	0	0	19.9
Quinebaug	2002	28.8	1	6.9	4.8	0	0	0	11.0
Quinebaug	2003	28.8	1	6.9	4.8	0	0	0	29.9
Quinebaug	2004	28.8	1	6.9	4.8	0	0	0	23.9
Quinebaug	2005	28.8	1	6.9	4.8	0	0	0	24.2
Quinebaug	2006	28.8	1	6.9	4.8	0	0	0	29.2
Quinebaug	2007	28.8	1	6.9	4.8	0	0	0	26.6
Quinebaug	2008	28.8	1	6.9	4.8	0	0	0	22.7
Quinebaug	2009	28.8	1	6.9	4.8	0	0	0	32.6
Pawcatuck	1999	9.4	0	62.2	0.1	19,310	2,052	0	21.2
Pawcatuck	2000	9.4	0	62.2	0.1	19,398	2,061	0	26.6
Pawcatuck	2001	9.4	0	62.2	0.1	20,805	2,211	0	30.1
Pawcatuck	2002	9.4	0	62.2	0.1	14,847	1,577	0	13.7
Pawcatuck	2003	9.4	0	62.2	0.1	12,710	1,350	0	32.3
Pawcatuck	2004	9.4	0	62.2	0.1	16,860	1,791	0	26.1
Pawcatuck	2005	9.4	0	62.2	0.1	11,403	1,212	0	30.4
Pawcatuck	2006	9.4	0	62.2	0.1	8,998	956	0	40.2
Pawcatuck	2007	9.4	0	62.2	0.1	8,119	863	0	35.1

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (fig. 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut, in lb/mi²/yr	Annual mean runoff, in inches
B. Input data below for unmonitored sites/basins where predictions are necessary—Continued									
Pawcatuck	2008	9.4	0	62.2	0.1	5,176	550	0	21.8
Pawcatuck	2009	9.4	0	62.2	0.1	9,170	974	0	39.6
Thames Main-stem	1999	107.7	1	22.8	0.4	1,715,474	15,928	0	22.7
Thames Main-stem	2000	107.7	1	22.8	0.4	1,618,820	15,031	0	22.9
Thames Main-stem	2001	107.7	1	22.8	0.4	1,251,883	11,624	0	24.3
Thames Main-stem	2002	107.7	1	22.8	0.4	1,022,262	9,492	0	11.0
Thames Main-stem	2003	107.7	1	22.8	0.4	980,178	9,101	0	31.2
Thames Main-stem	2004	107.7	1	22.8	0.4	1,008,110	9,360	0	27.0
Thames Main-stem	2005	107.7	1	22.8	0.4	934,362	8,676	0	27.9
Thames Main-stem	2006	107.7	1	22.8	0.4	919,015	8,533	0	33.7
Thames Main-stem	2007	107.7	1	22.8	0.4	883,786	8,206	0	31.3
Thames Main-stem	2008	107.7	1	22.8	0.4	690,457	6,411	0	25.3
Thames Main-stem	2009	107.7	1	22.8	0.4	584,017	5,423	0	31.0
East of Thames	1999	87.2	1	24.0	0.6	29,934	343	0	22.7
East of Thames	2000	87.2	1	24.0	0.6	99,844	1,145	0	22.9
East of Thames	2001	87.2	1	24.0	0.6	55,115	632	0	24.3
East of Thames	2002	87.2	1	24.0	0.6	33,664	386	0	11.0
East of Thames	2003	87.2	1	24.0	0.6	35,575	408	0	31.2
East of Thames	2004	87.2	1	24.0	0.6	34,974	401	0	27.0
East of Thames	2005	87.2	1	24.0	0.6	32,327	371	0	27.9
East of Thames	2006	87.2	1	24.0	0.6	34,227	392	0	33.7
East of Thames	2007	87.2	1	24.0	0.6	21,430	246	0	31.3
East of Thames	2008	87.2	1	24.0	0.6	18,893	217	0	25.3
East of Thames	2009	87.2	1	24.0	0.6	14,806	170	0	31.0
West of Thames	1999	76.2	1	24.1	0.2	0	0	0	22.7

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (fig. 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut, in lb/mi²/yr	Annual mean runoff, in inches
B. Input data below for unmonitored sites/basins where predictions are necessary—Continued									
West of Thames	2000	76.2	1	24.1	0.2	0	0	0	22.9
West of Thames	2001	76.2	1	24.1	0.2	0	0	0	24.3
West of Thames	2002	76.2	1	24.1	0.2	0	0	0	11.0
West of Thames	2003	76.2	1	24.1	0.2	0	0	0	31.2
West of Thames	2004	76.2	1	24.1	0.2	0	0	0	27.0
West of Thames	2005	76.2	1	24.1	0.2	0	0	0	27.9
West of Thames	2006	76.2	1	24.1	0.2	0	0	0	33.7
West of Thames	2007	76.2	1	24.1	0.2	0	0	0	31.3
West of Thames	2008	76.2	1	24.1	0.2	0	0	0	25.3
West of Thames	2009	76.2	1	24.1	0.2	0	0	0	31.0
Central	1999	210.6	3	23.6	0.4	370,849	1,761	0	15.8
Central	2000	210.6	3	23.6	0.4	269,376	1,279	0	21.6
Central	2001	210.6	3	23.6	0.4	199,655	948	0	24.7
Central	2002	210.6	3	23.6	0.4	51,881	246	0	11.1
Central	2003	210.6	3	23.6	0.4	29,623	141	0	28.5
Central	2004	210.6	3	23.6	0.4	47,994	228	0	23.2
Central	2005	210.6	3	23.6	0.4	40,563	193	0	22.2
Central	2006	210.6	3	23.6	0.4	46,696	222	0	30.9
Central	2007	210.6	3	23.6	0.4	41,237	196	0	28.7
Central	2008	210.6	3	23.6	0.4	35,329	168	0	19.2
Central	2009	210.6	3	23.6	0.4	34,785	165	0	25.5
Quinnipiac	1999	54.7	3	54.7	1.3	1,031,863	18,868	0	23.9
Quinnipiac	2000	54.7	3	54.7	1.3	1,068,575	19,539	0	27.3
Quinnipiac	2001	54.7	3	54.7	1.3	810,413	14,819	0	24.9
Quinnipiac	2002	54.7	3	54.7	1.3	685,392	12,533	0	12.5
Quinnipiac	2003	54.7	3	54.7	1.3	686,256	12,548	0	32.8
Quinnipiac	2004	54.7	3	54.7	1.3	762,028	13,934	0	31.0
Quinnipiac	2005	54.7	3	54.7	1.3	750,163	13,717	0	27.8
Quinnipiac	2006	54.7	3	54.7	1.3	615,095	11,247	0	47.0
Quinnipiac	2007	54.7	3	54.7	1.3	505,355	9,241	0	33.8
Quinnipiac	2008	54.7	3	54.7	1.3	408,424	7,468	0	26.8
Quinnipiac	2009	54.7	3	54.7	1.3	343,400	6,279	0	31.5
West Central	1999	130.5	3	54.0	0.1	924,714	7,084	0	22.0
West Central	2000	130.5	3	54.0	0.1	936,594	7,175	0	29.6

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (fig. 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut, in lb/mi²/yr	Annual mean runoff, in inches
B. Input data below for unmonitored sites/basins where predictions are necessary—Continued									
West Central	2001	130.5	3	54.0	0.1	661,015	5,064	0	25.2
West Central	2002	130.5	3	54.0	0.1	801,487	6,140	0	9.6
West Central	2003	130.5	3	54.0	0.1	844,672	6,471	0	31.0
West Central	2004	130.5	3	54.0	0.1	731,371	5,603	0	30.4
West Central	2005	130.5	3	54.0	0.1	773,550	5,926	0	26.5
West Central	2006	130.5	3	54.0	0.1	952,990	7,301	0	46.6
West Central	2007	130.5	3	54.0	0.1	1,109,546	8,500	0	32.2
West Central	2008	130.5	3	54.0	0.1	885,219	6,781	0	25.8
West Central	2009	130.5	3	54.0	0.1	769,759	5,897	0	28.3
Naugatuck	1999	51.9	4	26.1	0.7	218,267	4,206	0	24.3
Naugatuck	2000	51.9	4	26.1	0.7	190,320	3,667	0	27.8
Naugatuck	2001	51.9	4	26.1	0.7	133,590	2,574	0	25.5
Naugatuck	2002	51.9	4	26.1	0.7	134,622	2,594	0	14.2
Naugatuck	2003	51.9	4	26.1	0.7	150,757	2,905	0	32.0
Naugatuck	2004	51.9	4	26.1	0.7	136,628	2,633	0	31.6
Naugatuck	2005	51.9	4	26.1	0.7	143,969	2,774	0	25.3
Naugatuck	2006	51.9	4	26.1	0.7	137,508	2,650	0	45.2
Naugatuck	2007	51.9	4	26.1	0.7	143,992	2,775	0	30.6
Naugatuck	2008	51.9	4	26.1	0.7	124,043	2,390	0	30.5
Naugatuck	2009	51.9	4	26.1	0.7	151,355	2,916	0	32.7
Saugatuck	1999	68.8	5	22.6	0.1	35,470	516	0	24.9
Saugatuck	2000	68.8	5	22.6	0.1	40,260	585	0	23.4
Saugatuck	2001	68.8	5	22.6	0.1	43,800	637	0	19.8
Saugatuck	2002	68.8	5	22.6	0.1	51,162	744	0	12.4
Saugatuck	2003	68.8	5	22.6	0.1	54,675	795	0	29.8
Saugatuck	2004	68.8	5	22.6	0.1	53,735	781	0	31.1
Saugatuck	2005	68.8	5	22.6	0.1	50,508	734	0	24.9
Saugatuck	2006	68.8	5	22.6	0.1	60,759	883	0	37.4
Saugatuck	2007	68.8	5	22.6	0.1	30,587	445	0	29.8
Saugatuck	2008	68.8	5	22.6	0.1	17,717	258	0	23.9
Saugatuck	2009	68.8	5	22.6	0.1	12,474	181	0	25.0
Norwalk	1999	29.6	5	42.0	0.1	441,056	14,916	0	21.1

Table 1–1. Load estimates and regression model input data.—Continued

[[Numbers are unrounded model inputs. Numbers in red are from Joseph Salata, U.S. Environmental Protection Agency, written commun., 2012. USGS, U.S. Geological Survey; ID, identification; lb/d, pounds per day; lb/yr, pounds per year; lb/mi²/year, pounds per square mile per year; mi², square mile; S., south; N., north]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Drainage area (mi²)	Long Island Sound management zone (fig. 12)	Percentage of developed land	Percentage of cultivated crops	Total nitrogen load from wastewater-treatment facilities in Connecticut, in lb/yr	Total nitrogen yield from wastewater-treatment facilities in Connecticut, in lb/mi²/yr	Total nitrogen yield from wastewater-treatment facilities outside Connecticut, in lb/mi²/yr	Annual mean runoff, in inches
B. Input data below for unmonitored sites/basins where predictions are necessary—Continued									
Norwalk	2000	29.6	5	42.0	0.1	343,674	11,622	0	21.5
Norwalk	2001	29.6	5	42.0	0.1	281,780	9,529	0	18.9
Norwalk	2002	29.6	5	42.0	0.1	221,341	7,485	0	12.5
Norwalk	2003	29.6	5	42.0	0.1	328,529	11,110	0	29.7
Norwalk	2004	29.6	5	42.0	0.1	286,103	9,675	0	33.7
Norwalk	2005	29.6	5	42.0	0.1	295,255	9,985	0	26.5
Norwalk	2006	29.6	5	42.0	0.1	273,429	9,247	0	41.2
Norwalk	2007	29.6	5	42.0	0.1	375,194	12,688	0	40.6
Norwalk	2008	29.6	5	42.0	0.1	293,756	9,934	0	24.6
Norwalk	2009	29.6	5	42.0	0.1	305,270	10,324	0	26.5
Southwest east	1999	98.9	5	60.0	0.2	1,318,231	13,327	0	15.3
Southwest east	2000	98.9	5	60.0	0.2	1,269,288	12,832	0	24.8
Southwest east	2001	98.9	5	60.0	0.2	1,186,250	11,993	0	23.3
Southwest east	2002	98.9	5	60.0	0.2	1,317,763	13,322	0	12.6
Southwest east	2003	98.9	5	60.0	0.2	1,351,340	13,662	0	32.3
Southwest east	2004	98.9	5	60.0	0.2	752,064	7,603	0	30.0
Southwest east	2005	98.9	5	60.0	0.2	820,486	8,295	0	21.3
Southwest east	2006	98.9	5	60.0	0.2	837,010	8,462	0	41.1
Southwest east	2007	98.9	5	60.0	0.2	637,832	6,448	0	33.2
Southwest east	2008	98.9	5	60.0	0.2	726,274	7,342	0	21.0
Southwest east	2009	98.9	5	60.0	0.2	654,479	6,617	0	23.8
Southwest west	1999	167.1	6	44.6	0.1	1,069,654	6,403	0	15.3
Southwest west	2000	167.1	6	44.6	0.1	1,026,630	6,145	0	24.8
Southwest west	2001	167.1	6	44.6	0.1	940,605	5,631	0	23.3
Southwest west	2002	167.1	6	44.6	0.1	759,744	4,548	0	12.6
Southwest west	2003	167.1	6	44.6	0.1	782,554	4,684	0	32.3
Southwest west	2004	167.1	6	44.6	0.1	710,015	4,250	0	30.0
Southwest west	2005	167.1	6	44.6	0.1	757,259	4,533	0	21.3
Southwest west	2006	167.1	6	44.6	0.1	639,492	3,828	0	41.1
Southwest west	2007	167.1	6	44.6	0.1	527,700	3,159	0	33.2
Southwest west	2008	167.1	6	44.6	0.1	417,994	2,502	0	21.0
Southwest west	2009	167.1	6	44.6	0.1	356,695	2,135	0	23.8

Table 2–1. Regression model yield estimates for unmonitored areas draining to Long Island Sound.

[Numbers are unrounded model output. Zero values indicate prediction estimate less than zero (negative number). USGS, U.S. Geological Survey; CT, Connecticut; ID, identifier; lbs/mi²/year, pounds per square mile per year; lbs/yr, pounds per year; N., north; S., south]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Estimated total nitrogen yield, in lb/mi²/year	Lower boundary of the outer 90-percent confidence interval, in lb/mi²/year	Lower boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the outer 90-percent confidence interval, in lb/mi²/year	Estimated total nitrogen load, in lb/yr
01127500	1999	2,202	1,018	1,404	2,999	3,385	196,600
01127500	2000	2,223	1,039	1,425	3,020	3,406	198,492
01127500	2001	2,365	1,182	1,568	3,162	3,548	211,200
01127500	2002	1,042	0	235	1,850	2,232	93,087
01127500	2003	3,053	1,869	2,255	3,851	4,236	272,601
01127500	2004	2,633	1,450	1,836	3,430	3,816	235,130
01127500	2005	2,724	1,541	1,927	3,521	3,907	243,259
01127500	2006	3,305	2,121	2,506	4,104	4,490	295,147
01127500	2007	3,070	1,887	2,272	3,869	4,254	274,195
01195100	1999	798	0	0	1,699	1,874	4,533
01195100	2000	1,380	308	484	2,277	2,452	7,839
01195100	2001	1,687	615	791	2,582	2,758	9,580
01195100	2002	333	0	03	1,239	1,413	1,889
01195100	2003	2,064	993	1,169	2,958	3,134	11,721
01195100	2004	1,540	469	645	2,436	2,612	8,750
01195100	2005	1,436	364	540	2,332	2,508	8,155
01195100	2006	2,308	1,237	1,413	3,203	3,379	13,110
01195100	2007	2,084	1,014	1,190	2,979	3,155	11,839
01208873	1999	4,513	1,042	1,648	7,378	7,984	47,839
01208873	2000	5,255	1,785	2,391	8,118	8,725	55,702
01208873	2001	5,169	1,699	2,305	8,033	8,639	54,791
01208873	2002	4,376	904	1,510	7,241	7,847	46,383
01208873	2003	5,530	2,060	2,667	8,393	8,999	58,618
01208873	2004	5,312	1,842	2,448	8,175	8,781	56,303
01208873	2005	4,852	1,381	1,987	7,716	8,322	51,426
01208873	2006	6,332	2,862	3,468	9,196	9,802	67,119
01208873	2007	5,639	2,170	2,776	8,502	9,109	59,776
01208950	1999	2,600	0	0	5,364	5,937	19,185
01208950	2000	3,554	218	791	6,317	6,890	26,228
01208950	2001	3,404	69	642	6,167	6,740	25,125
01208950	2002	2,336	0	0	5,101	5,673	17,237
01208950	2003	4,304	968	1,541	7,067	7,639	31,762
01208950	2004	4,069	734	1,307	6,832	7,405	30,032
01208950	2005	3,200	0	437	5,963	6,536	23,618
01208950	2006	5,179	1,842	2,414	7,944	8,516	38,220
01208950	2007	4,388	1,053	1,625	7,151	7,724	32,386
011230695	1999	1,976	842	1,147	2,806	3,111	1,011,936
011230695	2000	1,959	824	1,129	2,788	3,093	1,002,849

Table 2–1. Regression model yield estimates for unmonitored areas draining to Long Island Sound.—Continued

[Numbers are unrounded model output. Zero values indicate prediction estimate less than zero (negative number). USGS, U.S. Geological Survey; CT, Connecticut; ID, identifier; lbs/mi²/year, pounds per square mile per year; lbs/yr, pounds per year; N., north; S., south]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Estimated total nitrogen yield, in lb/mi²/year	Lower boundary of the outer 90-percent confidence interval, in lb/mi²/year	Lower boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the outer 90-percent confidence interval, in lb/mi²/year	Estimated total nitrogen load, in lb/yr
011230695	2001	1,941	807	1,112	2,771	3,076	994,044
011230695	2002	677	0	0	1,518	1,819	346,747
011230695	2003	2,681	1,547	1,852	3,511	3,815	1,372,921
011230695	2004	2,249	1,115	1,420	3,077	3,382	1,151,323
011230695	2005	2,290	1,156	1,461	3,118	3,423	1,172,281
011230695	2006	2,841	1,707	2,011	3,671	3,976	1,454,761
011230695	2007	2,646	1,512	1,817	3,475	3,780	1,354,872
Central	1999	2,913	1,570	1,989	3,837	4,255	613,564
Central	2000	3,013	1,674	2,093	3,933	4,353	634,704
Central	2001	2,989	1,650	2,070	3,908	4,328	629,527
Central	2002	933	0	4	1,862	2,279	196,530
Central	2003	2,558	1,220	1,640	3,477	3,897	538,911
Central	2004	2,122	783	1,203	3,042	3,462	447,076
Central	2005	1,982	643	1,063	2,902	3,322	417,587
Central	2006	2,884	1,545	1,965	3,803	4,223	607,487
Central	2007	2,634	1,296	1,716	3,553	3,973	554,894
Central	2008	1,660	320	739	2,582	3,001	349,764
Central	2009	2,291	953	1,372	3,210	3,630	482,644
CT mainstem N.	1999	28,553	27,120	27,502	29,604	29,986	3,982,073
CT mainstem N.	2000	29,582	28,150	28,532	30,632	31,014	4,125,618
CT mainstem N.	2001	24,652	23,220	23,602	25,703	26,084	3,438,060
CT mainstem N.	2002	26,081	24,645	25,026	27,136	27,517	3,637,359
CT mainstem N.	2003	27,240	25,808	26,190	28,290	28,672	3,799,020
CT mainstem N.	2004	27,633	26,201	26,583	28,683	29,065	3,853,794
CT mainstem N.	2005	29,267	27,835	28,217	30,317	30,699	4,081,662
CT mainstem N.	2006	32,164	30,727	31,108	33,220	33,600	4,485,675
CT mainstem N.	2007	24,882	23,450	23,832	25,932	26,314	3,470,131
CT mainstem N.	2008	23,790	22,358	22,740	24,840	25,222	3,317,862
CT mainstem N.	2009	21,176	19,743	20,125	22,226	22,608	2,953,238
CT mainstem S.	1999	6,833	5,498	5,920	7,746	8,168	1,554,366
CT mainstem S.	2000	6,179	4,844	5,266	7,091	7,513	1,405,482
CT mainstem S.	2001	5,992	4,657	5,078	6,906	7,328	1,363,073
CT mainstem S.	2002	4,571	3,230	3,649	5,494	5,913	1,039,883
CT mainstem S.	2003	5,945	4,611	5,033	6,857	7,279	1,352,307
CT mainstem S.	2004	5,421	4,087	4,509	6,334	6,756	1,233,208
CT mainstem S.	2005	5,234	3,900	4,322	6,147	6,569	1,190,708
CT mainstem S.	2006	6,605	5,266	5,685	7,526	7,945	1,502,558
CT mainstem S.	2007	4,991	3,657	4,079	5,903	6,325	1,135,328

Table 2–1. Regression model yield estimates for unmonitored areas draining to Long Island Sound.—Continued

[Numbers are unrounded model output. Zero values indicate prediction estimate less than zero (negative number). USGS, U.S. Geological Survey; CT, Connecticut; ID, identifier; lbs/mi²/year, pounds per square mile per year; lbs/yr, pounds per year; N., north; S., south]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Estimated total nitrogen yield, in lb/mi²/year	Lower boundary of the outer 90-percent confidence interval, in lb/mi²/year	Lower boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the outer 90-percent confidence interval, in lb/mi²/year	Estimated total nitrogen load, in lb/yr
CT mainstem S.	2008	4,501	3,167	3,589	5,413	5,835	1,023,865
CT mainstem S.	2009	5,220	3,886	4,308	6,133	6,554	1,187,433
East of Thames	1999	2,256	918	1,338	3,174	3,594	196,751
East of Thames	2000	3,079	1,741	2,161	3,997	4,417	268,509
East of Thames	2001	2,708	1,370	1,791	3,626	4,046	236,191
East of Thames	2002	1,140	0	212	2,067	2,484	99,389
East of Thames	2003	3,172	1,834	2,254	4,089	4,510	276,616
East of Thames	2004	2,745	1,408	1,828	3,662	4,083	239,421
East of Thames	2005	2,806	1,468	1,889	3,723	4,144	244,713
East of Thames	2006	3,409	2,070	2,490	4,327	4,747	297,287
East of Thames	2007	3,027	1,689	2,110	3,945	4,365	264,028
East of Thames	2008	2,397	1,059	1,480	3,314	3,735	209,054
East of Thames	2009	2,916	1,578	1,999	3,834	4,254	254,341
Eightmile	1999	1,103	0	183	2,023	2,442	68,817
Eightmile	2000	1,283	0	364	2,203	2,622	80,074
Eightmile	2001	973	0	52	1,893	2,313	60,696
Eightmile	2002	0	0	0	894	1,310	-2,228
Eightmile	2003	1,687	348	768	2,606	3,026	105,265
Eightmile	2004	1,849	511	931	2,768	3,188	115,394
Eightmile	2005	1,629	290	710	2,547	2,967	101,616
Eightmile	2006	3,119	1,775	2,193	4,046	4,463	194,623
Eightmile	2007	1,941	602	1,022	2,859	3,279	121,080
Eightmile	2008	1,499	160	580	2,417	2,837	93,505
Eightmile	2009	1,955	616	1,036	2,874	3,294	122,000
Farmington	1999	9,023	7,492	7,841	10,204	10,554	276,508
Farmington	2000	10,261	8,728	9,078	11,444	11,793	314,449
Farmington	2001	8,199	6,667	7,016	9,381	9,730	251,247
Farmington	2002	7,687	6,153	6,501	8,873	9,221	235,570
Farmington	2003	9,956	8,422	8,771	11,140	11,489	305,092
Farmington	2004	9,692	8,160	8,510	10,874	11,224	297,017
Farmington	2005	9,492	7,961	8,311	10,674	11,023	290,897
Farmington	2006	10,993	9,455	9,802	12,184	12,531	336,881
Farmington	2007	9,393	7,861	8,211	10,575	10,924	287,842
Farmington	2008	10,490	8,954	9,303	11,676	12,025	321,458
Farmington	2009	10,136	8,603	8,952	11,319	11,668	310,608
Hockanum	1999	3,604	2,122	2,486	4,722	5,087	12,459
Hockanum	2000	3,977	2,495	2,860	5,094	5,459	13,748
Hockanum	2001	3,431	1,948	2,312	4,550	4,914	11,860

Table 2–1. Regression model yield estimates for unmonitored areas draining to Long Island Sound.—Continued

[Numbers are unrounded model output. Zero values indicate prediction estimate less than zero (negative number). USGS, U.S. Geological Survey; CT, Connecticut; ID, identifier; lbs/mi²/year, pounds per square mile per year; lbs/yr, pounds per year; N., north; S., south]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Estimated total nitrogen yield, in lb/mi²/year	Lower boundary of the outer 90-percent confidence interval, in lb/mi²/year	Lower boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the outer 90-percent confidence interval, in lb/mi²/year	Estimated total nitrogen load, in lb/yr
Hockanum	2002	2,774	1,287	1,651	3,897	4,261	9,589
Hockanum	2003	4,256	2,775	3,140	5,373	5,738	14,713
Hockanum	2004	4,232	2,750	3,115	5,349	5,713	14,629
Hockanum	2005	4,174	2,693	3,058	5,291	5,656	14,430
Hockanum	2006	5,557	4,072	4,435	6,679	7,042	19,210
Hockanum	2007	4,054	2,572	2,937	5,171	5,535	14,013
Hockanum	2008	3,957	2,475	2,840	5,074	5,439	13,679
Hockanum	2009	4,470	2,989	3,353	5,587	5,952	15,453
Housatonic	1999	9,376	8,002	8,407	10,345	10,750	883,683
Housatonic	2000	9,860	8,487	8,892	10,828	11,233	929,322
Housatonic	2001	8,792	7,418	7,823	9,761	10,166	828,656
Housatonic	2002	7,777	6,398	6,801	8,754	9,156	733,011
Housatonic	2003	10,562	9,189	9,594	11,530	11,935	995,494
Housatonic	2004	9,262	7,889	8,295	10,230	10,635	872,976
Housatonic	2005	8,673	7,299	7,703	9,642	10,046	817,388
Housatonic	2006	11,027	9,653	10,057	11,997	12,402	1,039,320
Housatonic	2007	10,342	8,969	9,374	11,310	11,715	974,740
Housatonic	2008	12,541	11,168	11,573	13,509	13,914	1,181,976
Housatonic	2009	9,705	8,332	8,737	10,673	11,078	914,716
Mattabesett	1999	2,131	778	1,191	3,070	3,484	232,080
Mattabesett	2000	2,719	1,367	1,781	3,656	4,070	296,089
Mattabesett	2001	2,624	1,272	1,687	3,562	3,976	285,805
Mattabesett	2002	1,522	166	578	2,467	2,879	165,807
Mattabesett	2003	3,662	2,309	2,722	4,602	5,015	398,853
Mattabesett	2004	3,282	1,930	2,344	4,220	4,634	357,402
Mattabesett	2005	3,078	1,727	2,141	4,016	4,430	335,255
Mattabesett	2006	4,745	3,384	3,795	5,695	6,106	516,780
Mattabesett	2007	3,644	2,291	2,704	4,583	4,997	396,833
Mattabesett	2008	3,042	1,691	2,105	3,980	4,394	331,350
Mattabesett	2009	3,506	2,153	2,567	4,445	4,858	381,806
Naugatuck	1999	6,393	5,054	5,474	7,313	7,733	331,805
Naugatuck	2000	6,204	4,865	5,285	7,124	7,543	321,980
Naugatuck	2001	4,883	3,544	3,963	5,803	6,222	253,422
Naugatuck	2002	3,773	2,429	2,847	4,699	5,117	195,825
Naugatuck	2003	5,863	4,524	4,943	6,784	7,203	304,291
Naugatuck	2004	5,551	4,211	4,631	6,471	6,890	288,066
Naugatuck	2005	5,064	3,725	4,144	5,984	6,403	262,812
Naugatuck	2006	6,929	5,581	5,997	7,860	8,276	359,578

Table 2–1. Regression model yield estimates for unmonitored areas draining to Long Island Sound.—Continued

[Numbers are unrounded model output. Zero values indicate prediction estimate less than zero (negative number). USGS, U.S. Geological Survey; CT, Connecticut; ID, identifier; lbs/mi²/year, pounds per square mile per year; lbs/yr, pounds per year; N., north; S., south]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Estimated total nitrogen yield, in lb/mi²/year	Lower boundary of the outer 90-percent confidence interval, in lb/mi²/year	Lower boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the outer 90-percent confidence interval, in lb/mi²/year	Estimated total nitrogen load, in lb/yr
Naugatuck	2007	5,589	4,249	4,669	6,509	6,928	290,051
Naugatuck	2008	5,198	3,859	4,278	6,118	6,538	269,769
Naugatuck	2009	5,940	4,600	5,020	6,861	7,280	308,282
Norwalk	1999	17,340	15,968	16,373	18,307	18,712	512,745
Norwalk	2000	14,085	12,713	13,119	15,052	15,458	416,509
Norwalk	2001	11,734	10,361	10,766	12,702	13,107	346,969
Norwalk	2002	9,057	7,680	8,084	10,031	10,434	267,825
Norwalk	2003	14,397	13,026	13,432	15,363	15,769	425,734
Norwalk	2004	13,365	11,993	12,399	14,332	14,738	395,220
Norwalk	2005	12,948	11,577	11,982	13,913	14,319	382,869
Norwalk	2006	13,679	12,303	12,707	14,651	15,055	404,487
Norwalk	2007	17,063	15,688	16,092	18,034	18,438	504,559
Norwalk	2008	12,708	11,337	11,742	13,674	14,080	375,786
Norwalk	2009	13,294	11,923	12,329	14,260	14,666	393,114
Park	1999	3,424	1,972	2,346	4,501	4,876	264,370
Park	2000	4,412	2,960	3,336	5,488	5,863	340,668
Park	2001	4,259	2,807	3,182	5,335	5,710	328,830
Park	2002	2,340	882	1,255	3,426	3,798	180,697
Park	2003	4,649	3,198	3,572	5,726	6,101	359,017
Park	2004	4,150	2,699	3,074	5,226	5,601	320,462
Park	2005	3,779	2,327	2,702	4,855	5,230	291,778
Park	2006	5,408	3,952	4,326	6,489	6,863	417,565
Park	2007	4,066	2,615	2,990	5,142	5,517	313,958
Park	2008	4,974	3,521	3,895	6,052	6,427	384,042
Park	2009	4,541	3,090	3,465	5,618	5,993	350,658
Pawcatuck	1999	5,354	3,912	4,291	6,416	6,795	50,387
Pawcatuck	2000	5,900	4,460	4,839	6,962	7,341	55,530
Pawcatuck	2001	6,402	4,962	5,340	7,464	7,843	60,256
Pawcatuck	2002	4,126	2,681	3,059	5,193	5,571	38,832
Pawcatuck	2003	5,755	4,314	4,692	6,817	7,196	54,162
Pawcatuck	2004	5,583	4,142	4,521	6,645	7,023	52,545
Pawcatuck	2005	5,431	3,990	4,369	6,493	6,872	51,115
Pawcatuck	2006	6,149	4,705	5,082	7,216	7,594	57,874
Pawcatuck	2007	5,546	4,104	4,482	6,609	6,988	52,197
Pawcatuck	2008	3,912	2,471	2,850	4,974	5,353	36,819
Pawcatuck	2009	6,108	4,664	5,042	7,175	7,552	57,488
Quinebaug	1999	1,886	508	910	2,863	3,265	54,402

Table 2–1. Regression model yield estimates for unmonitored areas draining to Long Island Sound.—Continued

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USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Estimated total nitrogen yield, in lb/mi²/year	Lower boundary of the outer 90-percent confidence interval, in lb/mi²/year	Lower boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the outer 90-percent confidence interval, in lb/mi²/year	Estimated total nitrogen load, in lb/yr
Quinebaug	2000	1,996	617	1,020	2,971	3,374	57,549
Quinebaug	2001	1,762	383	785	2,738	3,141	50,800
Quinebaug	2002	864	0	0	1,846	2,247	24,912
Quinebaug	2003	2,756	1,376	1,779	3,732	4,135	79,463
Quinebaug	2004	2,157	778	1,181	3,132	3,535	62,192
Quinebaug	2005	2,188	809	1,212	3,163	3,566	63,089
Quinebaug	2006	2,688	1,309	1,712	3,665	4,067	77,524
Quinebaug	2007	2,427	1,048	1,451	3,403	3,805	69,985
Quinebaug	2008	2,036	658	1,060	3,012	3,415	58,720
Quinebaug	2009	3,023	1,643	2,046	4,001	4,404	87,191
Quinnipiac	1999	22,366	20,953	21,343	23,389	23,778	1,223,159
Quinnipiac	2000	23,377	21,965	22,354	24,400	24,789	1,278,455
Quinnipiac	2001	18,419	17,007	17,396	19,442	19,831	1,007,321
Quinnipiac	2002	14,891	13,475	13,862	15,921	16,308	814,394
Quinnipiac	2003	16,937	15,524	15,913	17,961	18,350	926,251
Quinnipiac	2004	18,145	16,732	17,121	19,168	19,557	992,315
Quinnipiac	2005	17,606	16,194	16,583	18,629	19,018	962,864
Quinnipiac	2006	17,056	15,633	16,019	18,093	18,479	932,776
Quinnipiac	2007	13,727	12,313	12,702	14,752	15,140	750,708
Quinnipiac	2008	11,258	9,846	10,235	12,280	12,670	615,670
Quinnipiac	2009	10,541	9,128	9,517	11,564	11,953	576,456
Salmon	1999	1,228	0	309	2,147	2,567	59,415
Salmon	2000	1,408	70	490	2,327	2,747	68,146
Salmon	2001	1,098	0	178	2,017	2,437	53,117
Salmon	2002	89	0	0	1,018	1,435	4,314
Salmon	2003	1,812	474	894	2,730	3,150	87,683
Salmon	2004	1,974	636	1,056	2,892	3,312	95,539
Salmon	2005	1,753	415	836	2,671	3,092	84,853
Salmon	2006	3,244	1,901	2,319	4,169	4,587	156,987
Salmon	2007	2,065	727	1,147	2,983	3,404	99,948
Salmon	2008	1,623	285	705	2,541	2,962	78,562
Salmon	2009	2,080	742	1,162	2,998	3,418	100,662
Saugatuck	1999	2,489	1,150	1,569	3,410	3,829	171,283
Saugatuck	2000	2,416	1,075	1,495	3,336	3,756	166,196
Saugatuck	2001	2,107	765	1,184	3,029	3,448	144,950
Saugatuck	2002	1,474	128	545	2,403	2,820	101,427
Saugatuck	2003	3,261	1,922	2,342	4,181	4,601	224,401
Saugatuck	2004	3,376	2,037	2,456	4,297	4,716	232,308

Table 2–1. Regression model yield estimates for unmonitored areas draining to Long Island Sound.—Continued

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USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Estimated total nitrogen yield, in lb/mi²/year	Lower boundary of the outer 90-percent confidence interval, in lb/mi²/year	Lower boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the outer 90-percent confidence interval, in lb/mi²/year	Estimated total nitrogen load, in lb/yr
Saugatuck	2005	2,708	1,368	1,787	3,628	4,047	186,289
Saugatuck	2006	4,113	2,772	3,190	5,036	5,455	283,010
Saugatuck	2007	2,916	1,576	1,996	3,836	4,255	200,607
Saugatuck	2008	2,131	792	1,211	3,052	3,471	146,652
Saugatuck	2009	2,170	830	1,250	3,090	3,510	149,299
Scantic	1999	2,506	1,045	1,417	3,596	3,968	245,890
Scantic	2000	3,104	1,643	2,015	4,193	4,565	304,479
Scantic	2001	2,717	1,256	1,628	3,806	4,178	266,518
Scantic	2002	1,839	375	746	2,931	3,302	180,398
Scantic	2003	3,043	1,582	1,954	4,132	4,504	298,562
Scantic	2004	3,271	1,810	2,182	4,361	4,733	320,942
Scantic	2005	3,084	1,623	1,995	4,173	4,545	302,579
Scantic	2006	4,457	2,990	3,360	5,553	5,923	437,225
Scantic	2007	2,871	1,410	1,782	3,960	4,332	281,681
Scantic	2008	3,099	1,639	2,010	4,189	4,560	304,065
Scantic	2009	3,471	2,009	2,381	4,561	4,932	340,510
Shetucket	1999	2,325	978	1,395	3,255	3,671	26,672
Shetucket	2000	2,505	1,159	1,576	3,435	3,851	28,742
Shetucket	2001	2,195	848	1,264	3,125	3,541	25,179
Shetucket	2002	1,186	-166	248	2,125	2,538	13,608
Shetucket	2003	2,909	1,563	1,979	3,838	4,255	33,374
Shetucket	2004	3,071	1,725	2,142	4,001	4,417	35,237
Shetucket	2005	2,850	1,504	1,921	3,780	4,196	32,703
Shetucket	2006	4,341	2,989	3,403	5,279	5,693	49,805
Shetucket	2007	3,162	1,816	2,232	4,092	4,509	36,282
Shetucket	2008	2,720	1,374	1,791	3,650	4,066	31,212
Shetucket	2009	3,177	1,831	2,247	4,107	4,523	36,451
Southwest east	1999	15,957	14,522	14,903	17,010	17,391	1,578,323
Southwest east	2000	16,416	14,985	15,367	17,465	17,847	1,623,786
Southwest east	2001	15,427	13,996	14,378	16,476	16,858	1,525,961
Southwest east	2002	15,688	14,252	14,632	16,743	17,124	1,551,748
Southwest east	2003	17,996	16,564	16,946	19,045	19,427	1,780,007
Southwest east	2004	11,702	10,271	10,654	12,751	13,134	1,157,539
Southwest east	2005	11,525	10,093	10,475	12,575	12,957	1,139,998
Southwest east	2006	13,671	12,235	12,616	14,726	15,106	1,352,235
Southwest east	2007	10,867	9,435	9,817	11,916	12,298	1,074,858
Southwest east	2008	10,545	9,113	9,495	11,595	11,977	1,043,057
Southwest east	2009	10,093	8,662	9,044	11,142	11,524	998,343

Table 2–1. Regression model yield estimates for unmonitored areas draining to Long Island Sound.—Continued

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USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Estimated total nitrogen yield, in lb/mi²/year	Lower boundary of the outer 90-percent confidence interval, in lb/mi²/year	Lower boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the outer 90-percent confidence interval, in lb/mi²/year	Estimated total nitrogen load, in lb/yr
Southwest west	1999	8,355	6,973	7,374	9,335	9,737	1,395,736
Southwest west	2000	9,052	7,674	8,076	10,027	10,430	1,512,154
Southwest west	2001	8,387	7,009	7,412	9,363	9,766	1,401,156
Southwest west	2002	6,236	4,852	5,253	7,219	7,620	1,041,735
Southwest west	2003	8,341	6,962	7,365	9,317	9,719	1,393,342
Southwest west	2004	7,672	6,294	6,697	8,647	9,050	1,281,633
Southwest west	2005	7,086	5,707	6,109	8,062	8,465	1,183,696
Southwest west	2006	8,359	6,977	7,378	9,341	9,742	1,396,466
Southwest west	2007	6,900	5,521	5,923	7,876	8,278	1,152,606
Southwest west	2008	5,027	3,648	4,050	6,004	6,406	839,822
Southwest west	2009	4,934	3,556	3,958	5,910	6,313	824,259
Stony Brook	1999	3,921	2,452	2,822	5,020	5,390	174,774
Stony Brook	2000	4,855	3,385	3,754	5,956	6,325	216,404
Stony Brook	2001	4,912	3,442	3,811	6,012	6,381	218,924
Stony Brook	2002	1,942	470	837	3,047	3,415	86,566
Stony Brook	2003	4,262	2,791	3,160	5,364	5,732	189,963
Stony Brook	2004	3,745	2,276	2,645	4,845	5,214	166,922
Stony Brook	2005	3,587	2,119	2,488	4,686	5,056	159,896
Stony Brook	2006	5,565	4,089	4,456	6,673	7,040	248,042
Stony Brook	2007	3,931	2,463	2,832	5,031	5,400	175,232
Stony Brook	2008	4,958	3,486	3,854	6,062	6,430	220,994
Stony Brook	2009	4,456	2,985	3,354	5,557	5,926	198,604
Thames Mainstem	1999	17,738	16,399	16,819	18,656	19,076	1,910,351
Thames Mainstem	2000	16,861	15,523	15,943	17,780	18,200	1,815,979
Thames Mainstem	2001	13,597	12,258	12,678	14,515	14,935	1,464,368
Thames Mainstem	2002	10,142	8,797	9,214	11,070	11,487	1,092,297
Thames Mainstem	2003	11,761	10,423	10,843	12,680	13,100	1,266,715
Thames Mainstem	2004	11,601	10,263	10,683	12,519	12,939	1,249,456
Thames Mainstem	2005	11,008	9,669	10,090	11,925	12,346	1,185,512
Thames Mainstem	2006	11,446	10,107	10,527	12,365	12,785	1,232,744
Thames Mainstem	2007	10,884	9,546	9,966	11,803	12,223	1,172,246
Thames Mainstem	2008	8,488	7,150	7,570	9,406	9,826	914,161
Thames Mainstem	2009	8,066	6,728	7,148	8,984	9,404	868,695
West Central	1999	10,116	8,707	9,098	11,133	11,524	1,320,428
West Central	2000	10,964	9,556	9,947	11,981	12,372	1,431,165
West Central	2001	8,416	7,008	7,399	9,433	9,824	1,098,545
West Central	2002	7,934	6,518	6,906	8,961	9,349	1,035,610
West Central	2003	10,400	8,992	9,383	11,418	11,809	1,357,610

Table 2–1. Regression model yield estimates for unmonitored areas draining to Long Island Sound.—Continued

[Numbers are unrounded model output. Zero values indicate prediction estimate less than zero (negative number). USGS, U.S. Geological Survey; CT, Connecticut; ID, identifier; lbs/mi²/year, pounds per square mile per year; lbs/yr, pounds per year; N., north; S., south]

USGS station ID or name of unmonitored area (figs. 1–2, tables 1, 2)	Water year	Estimated total nitrogen yield, in lb/mi²/year	Lower boundary of the outer 90-percent confidence interval, in lb/mi²/year	Lower boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the inner 90-percent confidence interval, in lb/mi²/year	Upper boundary of the outer 90-percent confidence interval, in lb/mi²/year	Estimated total nitrogen load, in lb/yr
West Central	2004	9,477	8,069	8,459	10,494	10,885	1,237,039
West Central	2005	9,407	7,999	8,390	10,424	10,815	1,227,959
West Central	2006	12,793	11,376	11,764	13,822	14,210	1,669,930
West Central	2007	12,556	11,148	11,538	13,574	13,965	1,639,025
West Central	2008	10,198	8,790	9,181	11,215	11,606	1,331,226
West Central	2009	9,564	8,156	8,547	10,581	10,972	1,248,482
West of Thames	1999	1,838	497	917	2,760	3,179	140,037
West of Thames	2000	1,859	519	938	2,781	3,200	141,652
West of Thames	2001	2,002	661	1,081	2,923	3,342	152,493
West of Thames	2002	679	-668	-252	1,610	2,026	51,727
West of Thames	2003	2,689	1,349	1,768	3,610	4,029	204,876
West of Thames	2004	2,270	930	1,349	3,190	3,610	172,909
West of Thames	2005	2,361	1,021	1,440	3,281	3,701	179,844
West of Thames	2006	2,942	1,601	2,020	3,863	4,282	224,111
West of Thames	2007	2,707	1,367	1,786	3,628	4,047	206,237
West of Thames	2008	2,106	766	1,185	3,027	3,446	160,429
West of Thames	2009	2,672	1,332	1,751	3,593	4,012	203,561
Yantic	1999	38,075	36,701	37,106	39,044	39,448	328,041
Yantic	2000	34,095	32,721	33,126	35,064	35,468	293,751
Yantic	2001	33,939	32,566	32,971	34,908	35,313	292,413
Yantic	2002	33,561	32,181	32,583	34,538	34,940	289,149
Yantic	2003	40,407	39,034	39,438	41,376	41,780	348,136
Yantic	2004	40,117	38,744	39,149	41,085	41,490	345,639
Yantic	2005	35,304	33,931	34,336	36,272	36,677	304,169
Yantic	2006	39,218	37,843	38,248	40,187	40,592	337,888
Yantic	2007	32,511	31,138	31,543	33,480	33,885	280,109
Yantic	2008	31,688	30,315	30,719	32,656	33,061	273,013
Yantic	2009	30,682	29,309	29,713	31,651	32,055	264,348

Table 3–1. Annual total nitrogen loads from wastewater-treatment facilities in Connecticut, 1999–2009.

[Data summarized from values in rounded pounds per year. CY; calendar year; ID, identification; lb/yr, pounds per year; WY, water year]

Index (fig. 3–1)	Publicly owned wastewater-treatment facility	National pollutant discharge elimination system ID	CY99	CY00	CY01	CY02	WY03	WY04	WY05	WY06	WY07	WY08	WY09
			Annual total nitrogen load, in lb/yr										
1	Groton City	CT0101184	115,000	61,900	62,400	76,200	60,300	64,400	50,200	46,500	43,100	42,900	42,000
2	Groton Town	CT0100242	187,000	194,000	214,000	207,000	185,000	153,000	157,000	173,000	152,000	171,000	138,000
3	Jewett City	CT0100269	24,800	12,800	11,300	13,300	15,900	14,500	5,570	4,470	3,620	3,930	4,190
4	Killingly	CT0101257	37,000	72,500	61,700	59,200	58,100	54,100	63,600	60,800	55,900	68,700	49,100
5	Ledyard	CT0101681	3,220	2,560	2,190	1,730	1,280	1,490	1,620	2,370	2,130	1,980	2,100
6	Montville	CT0100935	174,000	126,000	89,100	67,700	64,700	75,600	43,500	32,300	30,200	27,400	35,000
7	New London	CT0100382	273,000	278,000	291,000	164,000	141,000	126,000	154,000	132,000	183,000	129,000	144,000
8	Norwich	CT0100412	305,000	270,000	268,000	276,000	318,000	319,000	277,000	305,000	250,000	248,000	234,000
9	Plainfield North	CT0100447	30,300	30,000	27,700	19,100	30,200	29,300	31,700	41,200	40,600	38,700	32,600
10	Plainfield Village	CT0100439	11,600	12,100	10,600	11,900	17,000	14,200	17,600	19,800	15,600	14,600	15,800
11	Putnam	CT0100960	65,000	53,100	34,300	59,800	66,000	60,100	67,200	73,600	77,000	75,200	65,600
12	Sprague	CT0100978	8,030	1,460	4,750	5,520	2,610	3,140	4,600	7,620	5,900	5,220	7,380
13	Stafford Springs	CT0101214	69,500	69,200	50,700	49,500	47,900	44,700	47,000	42,100	42,800	56,600	56,900
14	Stonington Borough	CT0101281	2,920	72,800	36,100	20,200	20,100	16,700	16,800	14,400	8,770	7,840	5,020
15	Stonington Mystic	CT0100544	27,000	27,000	19,000	13,400	15,500	18,300	15,500	19,800	12,700	11,100	9,790
16	Stonington Pawcatuck	CT0101290	19,300	19,400	20,800	14,800	12,700	16,900	11,400	9,000	8,120	5,180	9,170
17	Thompson	CT0100706	10,200	10,200	5,840	7,990	12,600	11,300	11,600	10,700	8,680	9,370	6,200
18	Uconn	CT0101320	22,500	25,300	22,300	28,600	28,300	32,400	31,000	25,800	30,200	34,300	32,200
19	Windham	CT0101001	152,000	137,000	73,000	97,000	98,700	90,600	62,600	54,600	71,500	87,000	98,100
20	Bristol	CT0100374	490,000	497,000	512,000	347,000	402,000	335,000	208,000	210,000	215,000	172,000	166,000
21	Canton	CT0100072	20,200	26,700	23,000	25,600	29,300	36,000	38,700	41,800	36,000	33,900	35,800
22	East Hampton	CT0024694	86,800	63,000	64,600	31,100	39,800	35,100	33,400	49,800	39,300	46,600	43,700
23	East Hartford	CT0100170	313,000	314,000	333,000	275,000	283,000	275,000	293,000	370,000	152,000	146,000	160,000
24	East Windsor	CT0100196	21,700	16,800	12,400	7,310	11,300	11,200	14,300	13,600	12,600	9,350	9,100
25	Enfield	CT0100200	494,000	326,000	331,000	334,000	358,000	106,000	197,000	120,000	94,400	89,800	103,000
26	Farmington	CT0100218	232,000	197,000	202,000	141,000	127,000	145,000	149,000	160,000	153,000	125,000	103,000
27	Glastonbury	CT0100226	111,000	111,000	107,000	95,900	102,000	133,000	80,400	98,700	106,000	130,000	102,000
28	Hartford	CT0100251	2,100,000	2,310,000	1,740,000	2,180,000	2,080,000	2,350,000	2,470,000	2,700,000	2,210,000	2,070,000	1,640,000

Table 3–1. Annual total nitrogen loads from wastewater-treatment facilities in Connecticut, 1999–2009.—Continued

[Data summarized from values in rounded pounds per year. CY; calendar year; ID, identification; lb/yr, pounds per year; WY, water year]

Index (fig. 3–1)	Publicly owned wastewater-treatment facility	National pollutant discharge elimination system ID	CY99	CY00	CY01	CY02	WY03	WY04	WY05	WY06	WY07	WY08	WY09
			Annual total nitrogen load, in lb/yr										
29	Manchester	CT0100293	305,000	315,000	349,000	300,000	285,000	271,000	278,000	293,000	277,000	237,000	299,000
30	Mattabassett	CT0100307	941,000	774,000	805,000	774,000	684,000	527,000	513,000	462,000	404,000	389,000	411,000
31	Middletown	CT0100323	138,000	146,000	155,000	142,000	143,000	146,000	171,000	175,000	148,000	145,000	183,000
32	Plainville	CT0100455	109,000	91,900	108,000	92,000	108,000	114,000	102,000	117,000	102,000	118,000	49,800
33	Plymouth	CT0100463	36,800	35,900	28,100	26,500	25,900	26,200	27,000	26,900	26,400	31,100	31,900
34	Portland	CT0101150	45,800	38,100	25,200	8,670	9,890	12,700	10,900	14,200	10,200	10,500	12,400
35	Rocky Hill	CT0100480	273,000	256,000	245,000	230,000	281,000	270,000	331,000	304,000	238,000	182,000	194,000
36	Simsbury	CT0100919	146,000	178,000	137,000	125,000	118,000	117,000	129,000	102,000	33,200	22,400	30,800
37	South Windsor	CT0100510	132,000	160,000	119,000	109,000	115,000	116,000	120,000	112,000	119,000	117,000	117,000
38	Suffield	CT0100552	52,200	49,800	59,100	12,300	12,700	12,000	21,500	37,000	24,000	29,300	26,200
39	Vernon	CT0100609	171,000	163,000	178,000	176,000	209,000	234,000	178,000	202,000	192,000	149,000	142,000
40	Windsor Locks	CT0101591	80,600	92,200	74,500	47,500	44,100	36,800	44,500	42,200	35,300	36,700	43,300
41	Windsor Poquonock	CT0100994	164,000	171,000	113,000	156,000	155,000	162,000	167,000	163,000	155,000	161,000	163,000
42	Winsted	CT0101222	86,800	75,000	75,200	91,200	71,200	74,400	75,800	77,700	60,500	30,200	25,200
43	Branford	CT0100048	371,000	269,000	200,000	51,900	29,600	48,000	40,600	46,700	41,200	35,300	34,800
44	Cheshire	CT0100081	195,000	206,000	202,000	171,000	178,000	193,000	176,000	104,000	26,500	27,200	24,000
45	Meriden	CT0100315	270,000	383,000	479,000	314,000	359,000	327,000	277,000	311,000	299,000	355,000	383,000
46	New Haven East	CT0100366	708,000	608,000	433,000	511,000	597,000	531,000	581,000	725,000	938,000	609,000	553,000
47	North Haven	CT0100404	178,000	183,000	151,000	194,000	190,000	179,000	179,000	83,100	84,500	80,200	80,900
48	Southington	CT0100536	266,000	261,000	278,000	299,000	294,000	284,000	272,000	278,000	311,000	322,000	317,000
49	Wallingford	CT0100617	235,000	262,000	259,000	200,000	199,000	233,000	240,000	215,000	132,000	129,000	141,000
50	West Haven	CT0101079	217,000	329,000	228,000	291,000	248,000	200,000	192,000	228,000	171,000	276,000	217,000
51	Ansonia	CT0100013	175,000	142,000	100,000	99,700	115,000	99,100	103,000	99,900	101,000	84,100	105,000
52	Beacon Falls	CT0101061	19,000	21,200	17,200	15,000	17,100	14,500	14,800	14,900	18,300	20,000	21,500
53	Danbury	CT0100145	652,000	708,000	673,000	681,000	714,000	680,000	631,000	763,000	656,000	666,000	734,000
54	Derby	CT0100161	55,500	30,400	22,600	19,500	22,700	23,100	20,100	24,300	24,900	20,100	24,900
55	Litchfield	CT0100803	27,700	23,400	30,300	24,300	19,700	15,700	15,700	15,700	13,700	15,400	16,200
56	Milford Beaver Brook	CT0100749	43,300	46,800	47,500	47,500	66,300	46,900	42,400	49,400	52,800	39,900	46,700

Table 3–1. Annual total nitrogen loads from wastewater-treatment facilities in Connecticut, 1999–2009.—Continued

[Data summarized from values in rounded pounds per year. CY; calendar year; ID, identification; lb/yr, pounds per year; WY, water year]

Index (fig. 3–1)	Publicly owned wastewater-treatment facility	National pollutant discharge elimination system ID	CY99	CY00	CY01	CY02	WY03	WY04	WY05	WY06	WY07	WY08	WY09
			Annual total nitrogen load, in lb/yr										
57	Milford Housatonic	CT0101656	180,000	196,000	212,000	160,000	169,000	148,000	163,000	205,000	237,000	305,000	115,000
58	Naugatuck Treatment	CT0100641	143,000	152,000	167,000	175,000	173,000	108,000	103,000	99,600	90,000	103,000	134,000
59	New Milford	CT0100391	19,500	28,900	44,900	27,700	20,300	19,500	28,000	33,200	31,800	33,600	43,100
60	Newtown	CT0101788	9,350	5,860	8,030	12,300	17,900	12,300	9,840	11,200	13,200	5,690	7,100
61	Norfolk	CT0101231	16,100	5,490	3,650	3,190	4,170	5,190	4,980	11,000	11,300	11,000	10,600
62	North Canaan	CT0100064	10,600	13,100	6,570	6,730	8,460	8,010	8,240	10,100	9,830	7,940	9,330
63	Salisbury	CT0100498	16,800	13,200	8,760	9,980	9,600	9,240	8,660	11,600	10,900	11,100	12,300
64	Seymour	CT0100501	24,400	26,700	16,400	19,900	18,900	23,000	26,100	22,700	25,100	19,900	24,400
65	Shelton	CT0100714	183,000	160,000	94,200	165,000	188,000	197,000	175,000	177,000	183,000	84,400	77,200
66	Southbury Tr. School	CT0100528	15,000	10,600	5,110	6,050	6,040	6,560	5,130	3,830	2,820	3,040	1,830
67	Stratford	CT0101036	180,000	226,000	219,000	196,000	260,000	161,000	181,000	211,000	193,000	435,000	338,000
68	Thomaston	CT0100781	63,700	46,800	18,600	12,800	16,800	16,400	17,600	16,300	12,700	15,300	14,000
69	Torrington Wcpf	CT0100579	154,000	116,000	131,000	103,000	115,000	104,000	88,100	102,000	89,000	99,100	89,000
70	Waterbury	CT0100625	1,400,000	1,000,000	545,000	284,000	483,000	318,000	371,000	389,000	357,000	330,000	301,000
71	Bridgeport East	CT0101010	340,000	290,000	207,000	208,000	248,000	167,000	174,000	173,000	103,000	86,400	112,000
72	Bridgeport West	CT0100056	613,000	680,000	685,000	842,000	931,000	422,000	522,000	461,000	384,000	472,000	364,000
73	Fairfield	CT0101044	366,000	299,000	294,000	268,000	172,000	163,000	124,000	203,000	151,000	168,000	178,000
74	Westport	CT0100684	35,500	40,300	43,800	51,200	54,700	53,700	50,500	60,800	30,600	17,700	12,500
75	Greenwich	CT0100234	270,000	192,000	165,000	150,000	173,000	154,000	194,000	207,000	239,000	196,000	158,000
76	New Canaan	CT0101273	16,100	12,400	9,490	7,590	9,150	7,510	10,000	10,400	14,300	11,200	9,660
77	Norwalk	CT0101249	441,000	344,000	282,000	221,000	329,000	286,000	295,000	273,000	375,000	294,000	305,000
78	Ridgefield South St.	CT0100854	8,950	8,050	6,940	8,260	8,740	10,400	10,900	12,500	10,600	12,600	13,700
79	Stamford	CT0101087	783,000	822,000	766,000	603,000	601,000	548,000	554,000	422,000	274,000	211,000	189,000
80	Watertown Fire District	CT0100633	47,100	58,200	0	0	0	0	0	0	0	0	0
81	Cytec	CT0000086	618,000	624,000	400,000	291,000	297,000	350,000	331,000	317,000	288,000	199,000	121,000
82	Pfizer	CT0000957	967,000	959,000	596,000	508,000	528,000	589,000	529,000	535,000	476,000	320,000	226,000

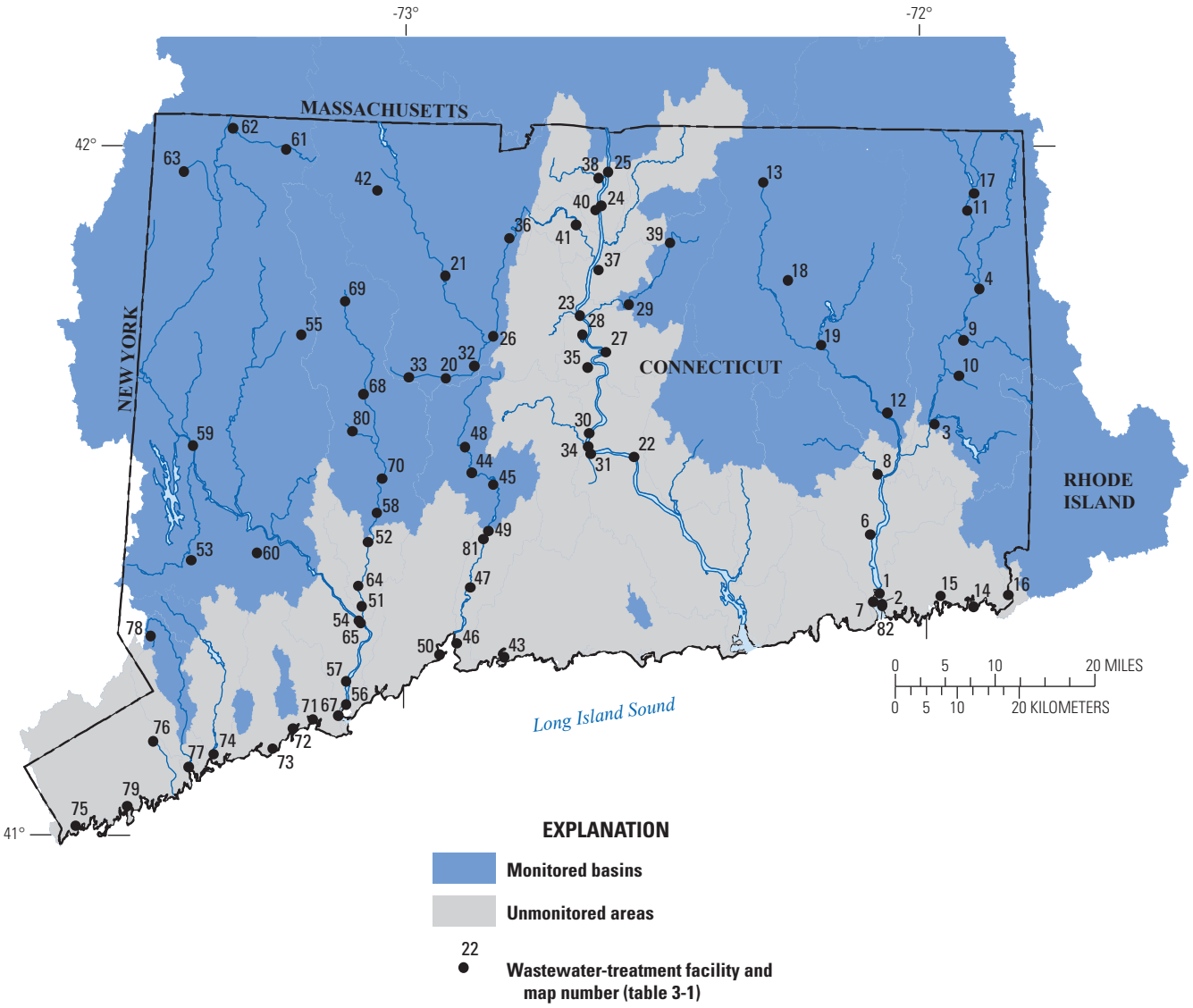

Figure 3–1. Map showing location of wastewater-treatment facilities in Connecticut.

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