Water Quality Assessment of the Monocacy River

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Executive Summary

In the last several years, there has been considerable discussion of water quality of the Monocacy River, largely in reference to development of a Frederick and Carroll County Monocacy River Plan. In repeated discussions of the plan, there has been substantial speculation and conjecture on the water quality of the river with little focus on available data the state has collected since 1986. Through a generous gift from the Robert C. and Jane E. Ladner Charitable Fund, the state's data from 4 stations in the river as well as a major tributary, Big Pipe Creek, have been evaluated to identify specific river reaches that may be responsible for elevated nutrient concentrations as the river passes through Frederick County.

River and tributary concentrations of a suite of nitrogen and phosphorus compounds (the 2 main nutrients that support growth of rooted, attached, and floating plants), total suspended solids, and chlorophyll-*a*, the primary photosynthetic pigment of all plants and some cyanobacteria (aka, blue-green algae), were evaluated through time.

For the 33-year data set from the Pennsylvania border to the Potomac, river nitrogen and phosphorus compounds and concentrations were primarily controlled by contributions from agriculture. For nitrogen, average total nitrogen concentrations just south of the PA-MD border (2.01 mg/L) increased to 2.84 mg/L in mid-County, likely due to high nitrogen contributions (3.72 mg/L) from Big Pipe Creek. Further south to the Potomac, total nitrogen concentrations continued to increase (a range of 3.23-3.32 mg/L for the 2 stations) likely due to inputs from the city of Frederick and lands immediately north and south of the city. Over the 33-year period, nitrogen concentrations significantly declined at each station by 0.02-0.04 mg/L/yr. Phosphorus, on the other hand, appeared to be most elevated in the river at the PA-MD border station (0.115 mg/L), slightly declining in the upper river (0.102 mg/L) from dilution from low phosphorus inputs of Big Pipe Creek (0.069 mg/L), and then increasing again in the southern region of the county (a range of 0.129-0.147 mg/L for the southern 2 stations) mostly from the area in and around the city. As with the nitrogen constituents, significant decreases in phosphorus concentrations at each station were noted over the 33 years, but at far lower rates (0.001-0.003 mg/L/yr) than noted for nitrogen. There were few differences in suspended solids or chlorophyll-*a* concentrations across the 5 stations.

In contrast to this long-term trend, an abrupt reduction in nutrients, particularly phosphorus, was noted in the station just below the city of Frederick in the 2003-2005 period. This dramatic decline may be the result of the city's installation of biological nutrient removal (BNR) in its wastewater treatment plant in November, 2002. In less than 3 years after this upgrade, total nitrogen and phosphorus concentrations south of the city were reduced on average approximately 19% and 59%, respectively. For nitrogen, significant concentration increases were noted further south in the lower river, whereas phosphorus did not change as the river passed towards the Potomac at the County's southern boundary.

The discharge of TN and TP from WWTPs in the Monocacy River watershed indicate that nutrient input from the three largest plants, Frederick City, Ft. Detrick Area C, and Ballenger-McKinney, may have had substantial impacts on river concentrations over the past decade or more solely due to the volumes of treated sewerage discharge each day. Those inputs have been dramatically reduced to very low levels in the last several years. Additionally, several smaller facilities discharge small volumes of very high concentrations of both TN (>7-8 mg/L) and TP (>1.5 mg/L) in the past and currently; whether these small volumes can dramatically increase historical concentrations of river pools of these two nutrients remains undetermined due to possible dilution by ambient stream or creek flows prior to their merging with the larger river. However, recent output from the Chesapeake Bay Program on 2018 progress in

nutrient reduction suggests that overall, wastewater forms less than 9% and 17% of total loads entering the Monocacy's creeks, streams, and main river.

Rigorous statistical analyses using non-linear smoothing techniques were undertaken on the 33-year data and two important results were found: 1) repeated strong seasonal signals (repeated up-and-down variations in concentrations) were noted for each station every year and 2) these patterns were strongly influenced by aperiodic high and low flow events. This second observation is particularly valuable as it suggests that the river's future water quality may be significantly affected by the projected extreme rain events and extended droughts of our new regional climate.

The compiled results suggest that a Phase II portion of the project should be initiated to spatially resolve baseflow nutrient concentrations and land uses in Little Pipe Creek, tributary watersheds surrounding the city of Frederick (Israel and Glade Creeks to the north and Linganore Creek to the south), as well as those in the rapidly developing southern portion of the County (Ballenger, Bennett, and Bush Creeks) and the Monocacy Direct Southwest area. Those results, in turn, should guide County, City, public, and private discussions on best management practices effective in the region's future climate that could be implemented to reduce these elevated contaminants.

Introduction

In the last 3 years, individuals from Frederick and Carroll County have deliberated on development of a Monocacy River Plan to revise and update the 1990 plan established in response to Maryland's Scenic River program. After substantial and often contentious discussion, the two counties have produced separate river plans due to differences in priorities for what should guide future river management. Lost in much of the effort has been the actual water quality of the river, the factor which allows the river to tell those interested in its condition. Important water quality parameters that are excellent condition indicators include pools of nitrogen (N as total nitrogen, dissolved inorganic nitrogen, nitrate, nitrite, and ammonium) and phosphorus (P as total phosphorus and dissolved inorganic P as ortho-phosphate phosphorus), the 2 primary macronutrients that control plant (submersed grasses, algae, and cyanobacteria) growth and bottom oxygen levels locally and in the bay. Two other parameters are also important indicators, a) total suspended solids (TSS) that determine water clarity and light availability for the 'plant' groups above, as well as bound phosphorus carried in from the land during major storms and river resuspension events and b) chlorophyll-*a*, a measure of that plant biomass (specifically floating microscopic organisms). This report summarizes analyses of these parameters from 1986-2018 and indicates river reaches with elevated levels of these constituents thereby enabling more spatially explicit identification of likely land uses responsible for the contaminated river segments.

The Monocacy River and its tributaries cover portions of Adams County in South-central Pennsylvania and Carroll and Frederick Counties in Maryland. Principal land use in the 744 square mile watershed is agriculture as row crops and animal husbandry. Nutrient and sediment input from urban or suburban areas are also potential sources: the city of Frederick, the second largest city in Maryland, as well as the town of Walkersville, are located at the southern end of the main river approximately 15 miles from the river's confluence with the Potomac River. There are 5 incorporated municipalities and 6 small growth areas in the watershed of Frederick County with 11 wastewater treatment plants (WWTP) that discharge to Monocacy River tributaries and two WWTPs (Frederick City and Frederick County) have direct flows to the river. These developed areas with substantial impervious surfaces, septic fields, and WWTPs and could be additional sources of nutrients or sediments to our waterways.

Data

As part of the seven jurisdiction Chesapeake Bay Program partnership, staff from Maryland's Department of Natural Resources (MDDNR) have monitored water quality in the Monocacy River every month since 1986 at 4 stations along the main channel of the river and at 1 station on Big Pipe Creek (BPC), a tributary that enters the Monocacy between station MON0528 below the MD-PA border and the next main channel station MON0269 (Fig. 1). The goal of the state's program was to determine nutrient concentrations in the river that could contribute to local water quality and river health issues. Additionally, this monitoring was employed to estimate contributions of nutrients, sediments, and plant biomass (as chlorophyll-*a*) that are transported into the Potomac River and potentially the Chesapeake Bay, thereby playing a role in productivity of the estuary and extent of deep channel low oxygen levels (hypoxia/anoxia of bay bottom waters) that threaten bay living resources. The spatial and temporal expanse of that zone has led to EPA's 2010 Bay-wide implementation of the TMDL (Total Maximum Daily Load) regulations for all bay watershed jurisdictions including the Monocacy River and all of Maryland waters discharging at greater than 100 cubic feet per second.

On a local level, the monthly river data allow the community to assess the roles of both Frederick and Carroll Counties in managing local river conditions along the main channel of the river and from those patterns, specific river reaches that may have substantial nutrient or sediment increases (or reductions) and the algae and cyanobacteria those parameters control. Those results, in turn, will enable more

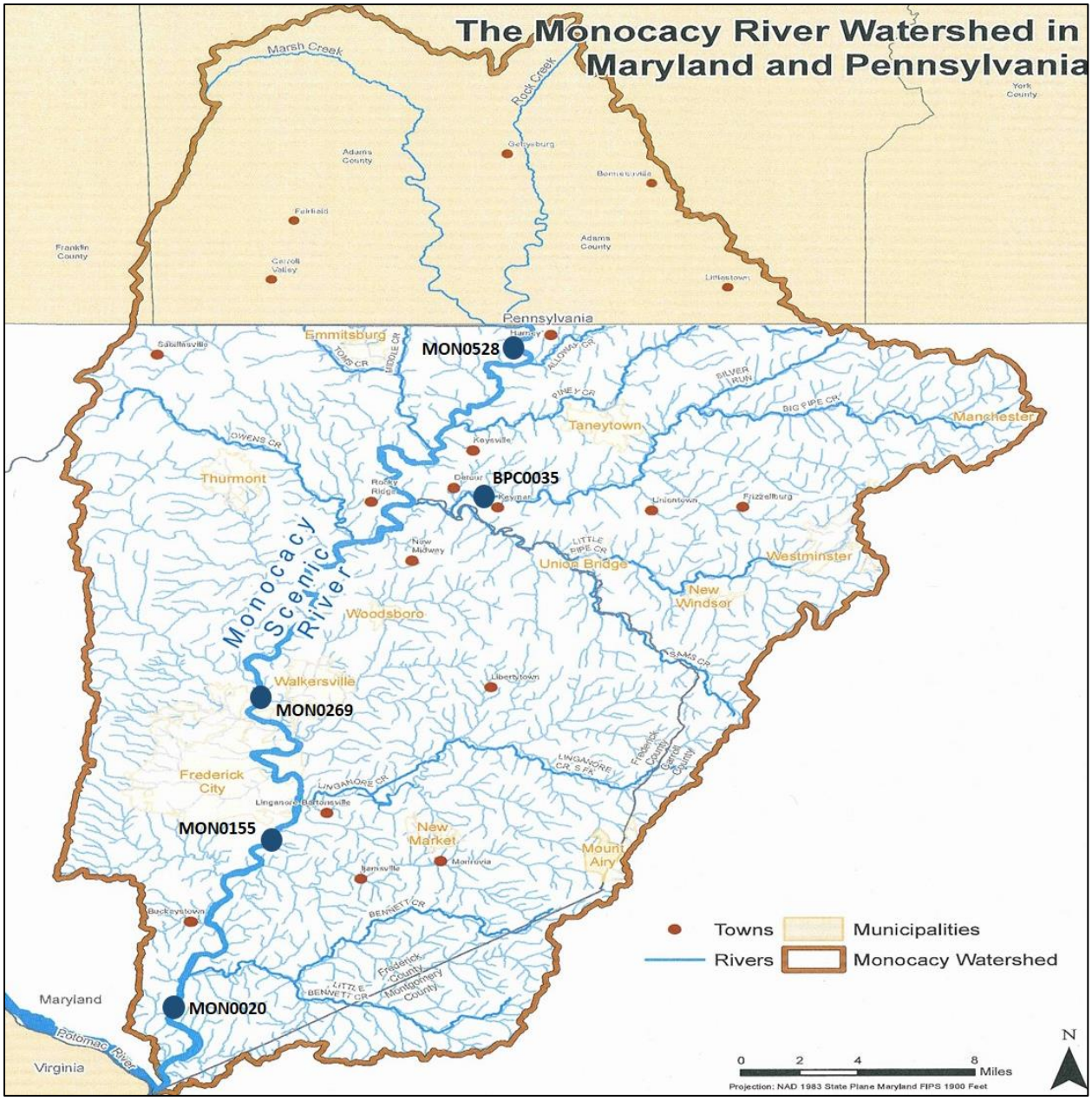

Figure 1. Monocacy River watershed. The blue dots and station names represent the 5 stations in the watershed sampled each month by the Maryland Department of Natural Resources (MD DNR) from 1986-2018 (courtesy of Frederick County Division of Planning and Permitting).

spatially explicit monitoring in a Phase II project to determine what land uses or small watersheds within a problematic river reach might be responsible for any enriched conditions, thereby guiding possible public-private discussions on land use changes that might be implemented to reduce the input of contaminants.

Besides determining whether the County's land use decisions over the past 3 decades have added to or reduced nutrient concentrations from our northern neighbors, concentration thresholds of several parameters have been derived and used locally to indicate good to poor river conditions (Table 1).

Additionally, EPA (1986) has established a total phosphorus concentration of 0.1 mg/L as a threshold for prevention of excessive algal growth, eutrophic conditions, and poor water quality. The reader can use these to assist in understanding and interpreting information provided below.

Table 1. Nitrogen and phosphorus concentrations (mg/L) as indicators of low-high water quality conditions (Southerland et al. 2005 in Versar 2012).

Parameter	Low	Medium	High
Total Nitrogen	<1.5	1.5-7.0	>7.0
Nitrate-Nitrogen	<1.0	1.0-5.0	>5.0
Nitrite-Nitrogen	<0.0025	0.0025-0.01	>0.01
Ammonium-Nitrogen	<0.03	0.03-0.07	>0.07
Total Phosphorus	<0.025	0.025-0.07	>0.07
Ortho-phosphate Phosphorus	<0.008	0.008-0.03	>0.03

Methods

Water quality data from the Monocacy River and Big Pipe Creek stations (Table 2) were obtained from Dr. E. Perry, a consultant contracted by the state for statistical analysis of the compiled data. These are identical to publically available data through the Chesapeake Information Management System (CIMS) which is the database for all bay watershed data. The water quality parameters examined are those most responsible for aquatic system productivity and ecosystem health and as such, serve as indicators of the Monocacy's ecological condition over the past 33 years. The data analyzed included nitrogen pools as Total Nitrogen (TN), Nitrite+Nitrate Nitrogen (NO23), Ammonium Nitrogen (NH4), and Dissolved Inorganic Nitrogen (DIN, the sum of the latter 2 pools). Phosphorus, the other essential macronutrient for the growth of all plants and cyanobacteria, was found as Total Phosphorus (TP) and ortho-phosphate Phosphorus (PO4). Two other constituents were also explored, Total Suspended Solids (TSS, responsible for most phosphorus entering water bodies attached to sediment particles) and Chlorophyll-*a* (CHLa), the green pigment found in all plants and cyanobacteria.

Two types of comparative analyses were undertaken. The simplest approach was to determine the average concentration and its standard error (a measure of variability in a station's month-to-month data) over 33 years, after removing missing observations (Appendix B); the standard error allows statistical comparisons of mean concentrations down the river and against the levels noted in the primary incoming tributary, Double Pipe Creek with its station on Big Pipe Creek several miles from the Monocacy. A simple one-way analysis of variance (ANOVA) was used to detect whether concentrations at these stations were different (significantly different indicates that the two averages were distinct from each other at a probability of 95 out of 100, commonly indicated as $p<0.05$). If there were no detectable differences, this would imply that the specific water quality parameter was not affected by surrounding or upstream land uses or within stream processes. On the other hand, statistically different station concentrations would suggest that some land use or in-stream process might be altering the levels of the parameter as the river water moves downstream through the county.

The second approach was undertaken to assess whether season or river flow significantly altered observed patterns in the data through time. Why correct for these two variables? First, seasons (or time of year) have obvious differences in a number of conditions including water temperature, precipitation,

Table 2. Stations on the Monocacy River and Big Pipe Creek sampled each month from 1986-2018.

STATION	WATER BODY	LATITUDE	LONGITUDE	STATION DESCRIPTION
MON0528	MONOCACY RIVER - UPPER	39.67917	-77.234886	MONOCACY RIVER AT BRIDGEPORT, MD
BPC0035	BIG PIPE CREEK	39.61218	-77.238205	BIG PIPE CREEK AT BRUCEVILLE, MD
MON0269	MONOCACY RIVER - UPPER	39.480274	-77.38939	MONOCACY RIVER BRIDGE ON BIGGS FORD ROAD, W. OF WALKERSVILLE
MON0155	MONOCACY RIVER - LOWER	39.387783	-77.381096	MONOCACY RIVER, BOAT RAMP AT PINCE CLIFF PARK, FREDERICK, MD
MON0020	MONOCACY RIVER - LOWER (CHK L/L)	39.27171	-77.441574	MONOCACY RIVER BRIDGE ON MARYLAND ROUTE 28 NEAR FREDERICK, MD

fertilizer applications, and water demands to name a few. Flow also varies as a function of storms and droughts, with storms potentially flushing in particles from the land and impervious surfaces or alternatively diluting substances in the receiving body. Removing or correcting for these environmental drivers therefore yields concentrations that would be present independent of those changing conditions.

An example may help better understanding of the need for these 'corrections'. Suppose a pond has 10 mg/L of a substance. During a major storm, the pond's volume increases by 25%. That increase in volume would result in dilution of that initial concentration, i.e., yielding 10 mg per 1.25 L and an apparent reduction to 8 mg/L. Hence, concentrations must be corrected for or remove as much of the environmental controls so that station-to-station comparisons exclude meteorological and hydrological variability.

The second set of analyses was addressed with the following techniques. The seasonal cycle was represented by a smoothed function of the day of the year (1:366). Flow effects for each station were estimated by non-linear function of flow from the nearest USGS river gage (see Table C1, Appendix C) and the degree to which flow causes departures from seasonal means. All data were natural log-transformed to obtain a normal distribution of the data. Thereafter, General Additive Models (GAMs) were constructed by determining weighted functions of season and flow to best mimic/predict the observed pattern for the water quality parameter over the 33-year period; those weighted functions were then compared to the observed patterns and if the modeled pattern predicted the observations using three statistical techniques (see Appendix C1 to C-2), the season or season + flow model was deemed significant in defining the parameter's distribution in the river. Changes in water quality over time were then estimated by comparing the seasonally adjusted and flow adjusted mean and standard errors of the initial 2 years vs. the last 2 years of data.

The latter approach also allowed detection of long-term trends in river nutrients, suspended solids, and chlorophyll-*a*, that is, whether these parameters were changing through the 33-year sampling period. The Bay-wide TMDL requires dramatic reductions in nutrients and sediments with each state assigning amounts of each pollutant that a specific river could introduce to the bay. The reductions would be accomplished through implementation of best management practices (BMPs) for pollutants entering from point sources (pipes, industries, WWTPs, Concentrated Animal Feeding Operations) as well as non-point sources (e.g., land runoff, atmospheric deposition, stormwater, etc.). Presumably, BMP implementation should result in lower concentrations in all state receiving waters, including the Monocacy.

Results

All data are provided in attached appendices. Appendix A provides all data employed in the analyses, 1986-2018. Appendix B is a series of graphs portraying concentrations of each water quality parameter through time at the 4 main river stations in Frederick County and in Big Pipe Creek flowing in from Carroll County. Data from the latter station and station MON0269 are plotted in the same graph to show the similarities between the concentrations of the creek with levels noted in the Monocacy River immediately downstream of BPC's merge with the river. Appendix C has results from the GAMs analyses indicating presence/absence of season or season+flow in governing river concentrations of the measured parameters as well as whether there are long-term trends in the data that indicate significantly lower or higher concentrations through time. Appendix D is a summary of land uses in the watersheds of each river segment that are responsible for delivery of nitrogen and phosphorus to the river or its tributary creeks and streams. Finally, Appendix E contains graphs of long-term nutrient discharges from the 13 WWTPs in Frederick and Carroll Counties that drain directly or indirectly into the Monocacy River.

Nitrogen Species

Total Nitrogen (TN) is comprised of particles and dissolved compounds, some organic (i.e., N chemically bound to carbon, including those alive or once so) and other inorganic constituents that are available for uptake by river plants, algae, and cyanobacteria.

For the 33-year period, concentrations of TN, DIN, and NO23 in the Monocacy River increased from south of the PA-MD border to the mouth of the Potomac River. The general down-river pattern for TN is depicted in Figure 2; the same pattern is observed for DIN and NO23 (see Figs. B-3 and B-4 in Appendix B). The largest increases in the TN pools along the river are between those noted at the Pennsylvania border (2.01 mg/L at MON0528) and Station MON0269 (2.84 mg/L), due to input from Big Pipe Creek

(3.72 mg/L) in the northern county (Table 3). As part of the TN pool, average DIN and NO23 concentrations doubled as the river passes through the county: DIN increases from 1.36±0.05 to 2.76±0.04 mg/L and NO23 from 1.31±0.05 to 2.71±0.04 mg/L (Table 3).

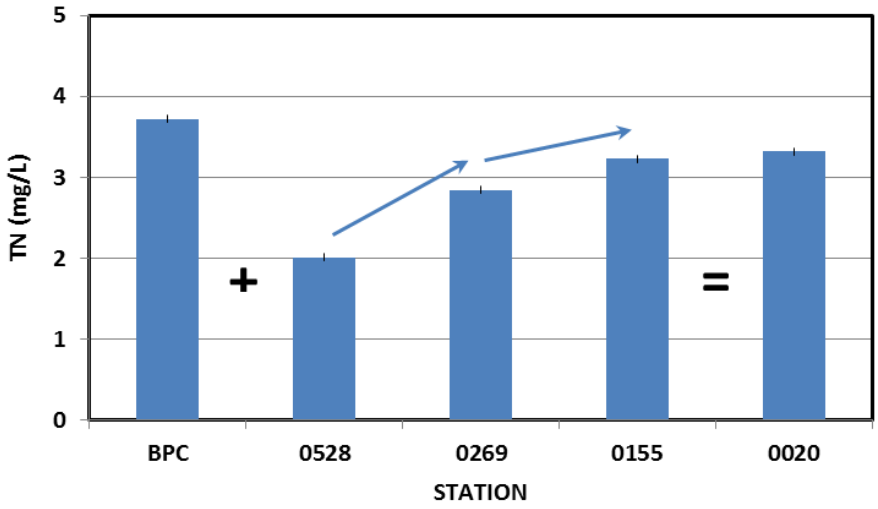

Figure 2. North-to-south average concentrations (±standard error) of total nitrogen (TN) along the main channel of the Monocacy River (Stations 0528-0020) and the main tributary into the river in northern Frederick County, Big Pipe Creek (BPC0035). The + indicates mixing, blue arrows imply significant increases in TN, and = indicates similar average concentrations.

Table 3. Average concentrations (±se) of TN from 1986-2018 for the Monocacy River and Big Pipe Creek stations.

STATION	TN (mg/L)
MON0528	2.01±0.06[a]
BPC0035	3.72±0.04[b]
MON0269	2.84±0.04[c]
MON0155	3.23±0.04[d]
MON0020	3.32±0.04[d]

[a-d]Superscripts indicate significant concentration differences from levels noted in stations immediately downriver.

As noted above, TN is a mixture of all particulate and dissolved nitrogen compounds. In both the river and creek, TN is dominated by soluble nitrogen constituents with NO23 the principal constituent of DIN and TN (Table 4). Ammonium nitrogen (NH4) was only a small fraction of the total pool, contributing <3.2% to the total TN pool but reached or exceeded the 0.07 mg/L high threshold noted in Table 1.

Temperature, day length, and river flow vary throughout a year and hence suspended particles (N and P containing particulates in the TN and TP pools, TSS, CHLa) and dissolved materials (DIN, NO23, NH4, PO4) in the river may vary as these conditions change. For TN, distinct seasonal patterns are obvious within each year (e.g., see colored lines in Figs. 3 and 4), a pattern found across all of the constituents analyzed in this project (see plots, Appendix C).

Table 4. Average concentrations (±se) for 4 nitrogen pools in the 4 Monocacy stations and Big Pipe Creek. % refers to contribution of that pool to TN.

STATION	TN (mg/L)	DIN (mg/L)	NO23 (mg/L) & % of TN	NH4 (mg/L) & % of TN
MON0528	2.01±0.06	1.36±0.05	1.31±0.05, 56%	0.07±0.01, 3.2%
BPC0035	3.72±0.04	3.22±0.04	3.19±0.04, 85%	0.05±0.00, 1.0%
MON0269	2.84±0.04	2.29±0.04	2.26±0.04, 78%	0.04±0.00, 1.5%
MON0155	3.23±0.04	2.64±0.04	2.57±0.04, 79%	0.08±0.01, 2.5%
MON0020	3.32±0.04	2.76±0.04	2.71±0.04, 81%	0.05±0.00, 1.5%

In the upper river and BPC, TN concentrations were highest in winter and lowest in summer (Fig. 3a) when river flows are minimal. However, at stations south of Frederick City, i.e., MON0155 and MON0020, the seasonal pattern shifts to lowest concentrations alternating between spring and summer (Fig. 3b). These patterns are driven by patterns of the largest TN pool, that is, NO23 concentrations (Fig. 4a,b).

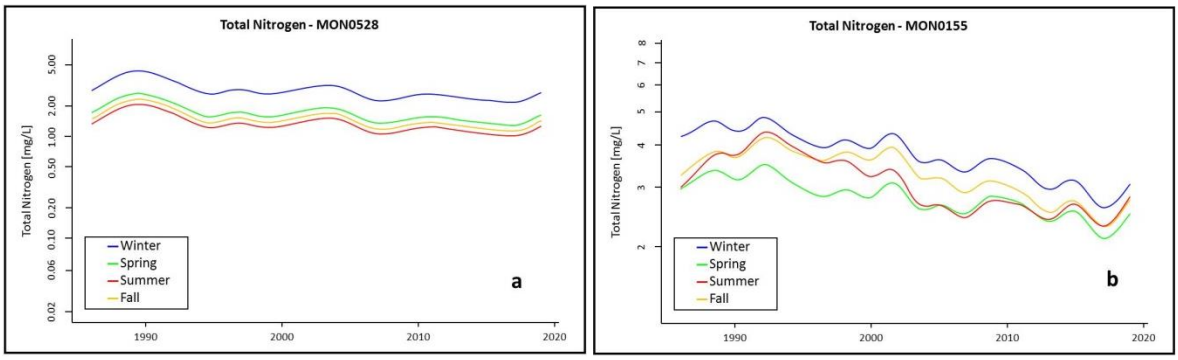

Figure 3. TN through time, corrected for season, at a) MON0528 and b) MON0155. The highest concentrations are found in winter (blue line) and lowest concentrations in either summer (red line) or spring (green line). Note the change in the Y axis scales between the 2 stations. Full size detailed graphs are available at Appendix C-3 and C-9.

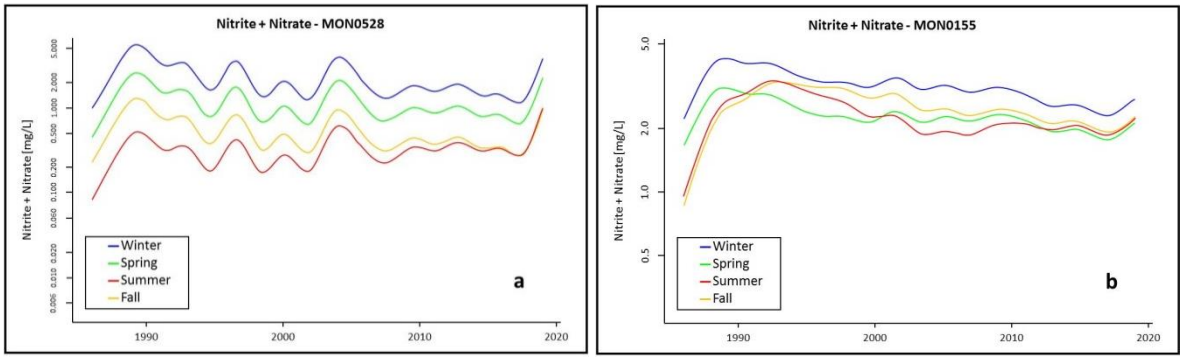

Figure 4. NO23 through time, corrected for season, at a) MON0528 and b) MON0155. The highest concentrations are in winter (blue line) and lowest concentrations in either summer (red line) or spring (green line). Note the change in the Y axes between the 2 stations. Full size detailed graphs are available at Appendix C-23 and C-29.

The variation in TN within a year is also further influenced by extremes in flow. In Figure 5, note the large swings in concentrations (dotted fuschia line), extremes associated with either higher or lower than average river flows (the small blue or green bars at the top of the graph) for the 33-year period.

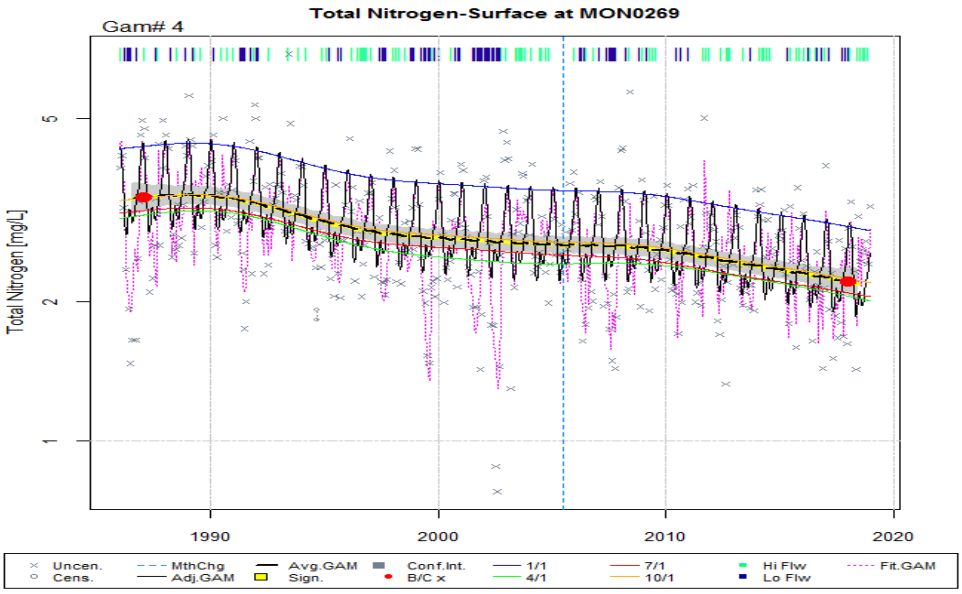

Figure 5. TN concentrations (mg/L) at MON0269 for the 1986-2018 period. Note the extremes in concentrations in the dotted fuschia line that can be traced to higher or lower flow events (green or blue bars, top of the graph), relative to the average flow over the 33-year period. Full size graphs are available at Appendix C-8.

This high variability was dampened below Frederick City (MON0155 and MON0020 graphs at Appendix C-10 and C-12).

Even though nitrogen concentrations increased as the river passed through the county, significant decreases ($p<0.05$) in most nitrogen pools were noted at each station over the 33 years of observation, i.e., amounts of each station's nitrogen were declining from 1986 to 2018 (Table 5). For NO23, concentrations appeared to increase from 1986 to the 1989-1992 period in all 5 stations and then declined (e.g., Fig. 4b and Appendix C-23 to C-32). Much greater declines were noted once the field data were corrected for season+flow (last column on right, 0.71-1.3 mg/L/33 years) or approximate decreases of 0.02-0.04 mg/L, on average, each year.

Phosphorus Species

TP and PO4 have different patterns than noted for the nitrogen-containing constituents; both are equal to or greater than the 'high' thresholds found in Table 1. The average TP (±se) concentration at MON0528 is 0.115±0.004 mg/L with the concentration (0.102±0.005 mg/L) significantly lower in the next station downriver, MON0269 (Table 6, Fig. 6). The TP concentration at BPC0035 was even less at 0.069±0.006 mg/L, likely diluting the TP moving downriver from the PA-MD border as the creek merges with the main river. TP levels increase again following passage through Frederick City, reaching 0.147±0.007 and 0.129±0.005 mg/L, respectively at MON0155 and MON0020, the latter station nearest the confluence with the Potomac River.

Table 5. Trends in season and season+flow corrected TN concentrations through time at each station on the Monocacy River and Big Pipe Creek from 1986-2018.

STATION	Initial Season Adjusted Average Concentration (mg/L)	Final Season Adjusted Average Concentration (mg/L)	TREND (corrected for Season) (mg/L over 33 yrs)	Initial Season+Flow Adjusted Average Concentration (mg/L)	Final Season+Flow Adjusted Average Concentration (mg/L)	TREND (corrected for Season+Flow) (mg/L over 33 yrs)
MON0528	2.04	1.46	-0.58	2.39	1.16	-1.23
BPC0035	3.70	3.29	-0.41	3.98	3.27	-0.71
MON0269	2.88	2.33	-0.55	3.36	2.21	-1.15
MON0155	3.45	2.45	-1.00	3.58	2.39	-1.19
MON0020	3.52	2.59	-0.93	3.77	2.47	-1.30

Table 6. Average (±se) concentrations of TP and PO4 at the 4 stations on the Monocacy River and Big Pipe Creek, 1986-2018.

STATION	TP (mg/L)	PO4 (mg/L)	PO4/TP (%)
MON0528	0.115±0.004[a]	0.081±0.003[a]	70.4%
BPC0035	0.069±0.006[b]	0.037±0.003[b]	53.6%
MON0269	0.102±0.005[c]	0.066±0.003[c]	64.7%
MON0155	0.147±0.007[d]	0.105±0.005[d]	71.4%
MON0020	0.129±0.005[e]	0.091±0.004[e]	70.5%

[a-e]Superscripts indicate significant concentration differences from levels noted in stations immediately downriver.

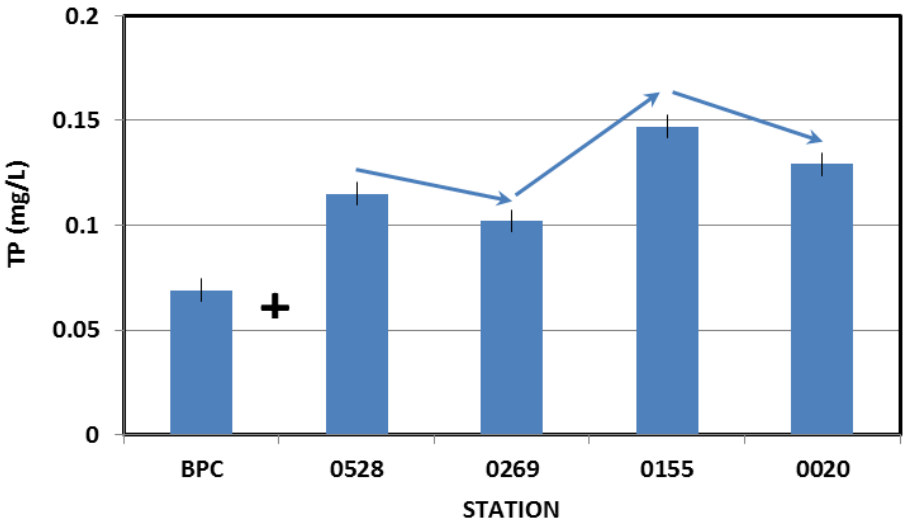

Figure 6. North-to-south 1986-2018 average concentrations of total phosphorus (TP) along the main channel of the Monocacy River (Stations 0528-0020) and the main tributary into the river in northern Frederick County, Big Pipe Creek (BPC0035). The + indicates mixing and blue arrows imply significant changes in TP concentrations.

Dissolved phosphorous, as PO4, contributed 53.6%-71.4% of TP pools across the 5 stations (Table 6). As with TP, inflow of BPC appeared to dilute the dissolved phosphorus coming in at the PA border, resulting

in lower concentrations at MON0269. Concentrations significantly increased after passing through the city of Frederick (Station MON0155) then declined slightly at MON0020 north of the Potomac River. This pattern is also indicated by the percentage of the dissolved phosphorus to TP, that is, PO4 makes up >70% of the TP at the PA border but after mixing with inflow from BPC with its lower amounts of PO4 to TP, PO4/TP at MON0269 is <65%. The dissolved pool resumes its larger contribution to TP south of Frederick City.

As in TN and the other nitrogen pools, there were distinct seasonal patterns in TP levels in the river and BPC, i.e., the repeated up-and-down cycle within each year (see Appendix C-43 to C-52) while aperiodic flow events dramatically altered concentrations in the two upriver stations and BPC, mostly associated with high flows. But contrary to the highest nitrogen levels in winter in upper river stations, highest TP (Fig. 7) and PO4 (Fig. 8) concentrations were found in summer-fall with lowest levels in winter and spring. The role of aperiodic high and low flows in phosphorus levels is also very obvious (fuschia lines in Figs. 9), implying substantial flow control for the phosphorus nutrient pools; this influence is most obvious in Big Pipe Creek with very high flow-induced variability throughout the study period.

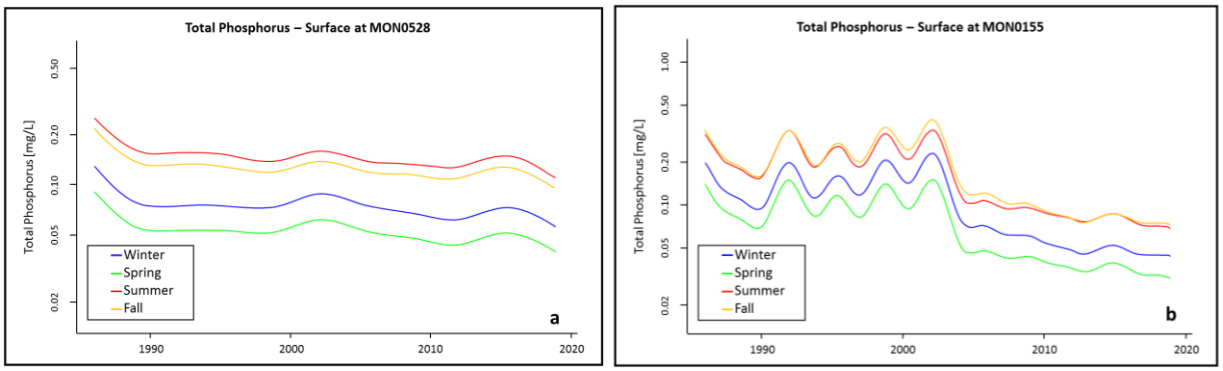

Figure 7. TP through time, corrected for season, at a) MON0528 and b) MON0155. The highest concentrations are found in either summer (red line) or fall (yellow line) and lowest concentrations in spring (green line). Note the change in the Y axes between the 2 stations. Detailed graphs can be found at Appendix C-43 and C-49.

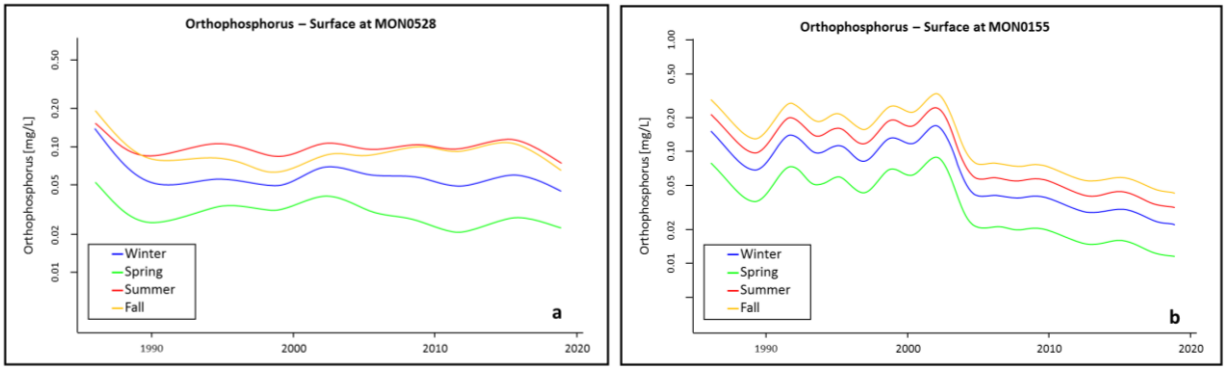

Figure 8. Ortho-phosphate phosphorus through time, corrected for season, at a) MON0528 and b) MON0155. The highest concentrations are found in either summer (red line) or fall (yellow line) and lowest concentrations in spring (green line). Note the change in the Y axes between the 2 stations. Detailed graphs can be found at Appendix C-53 and C-59.

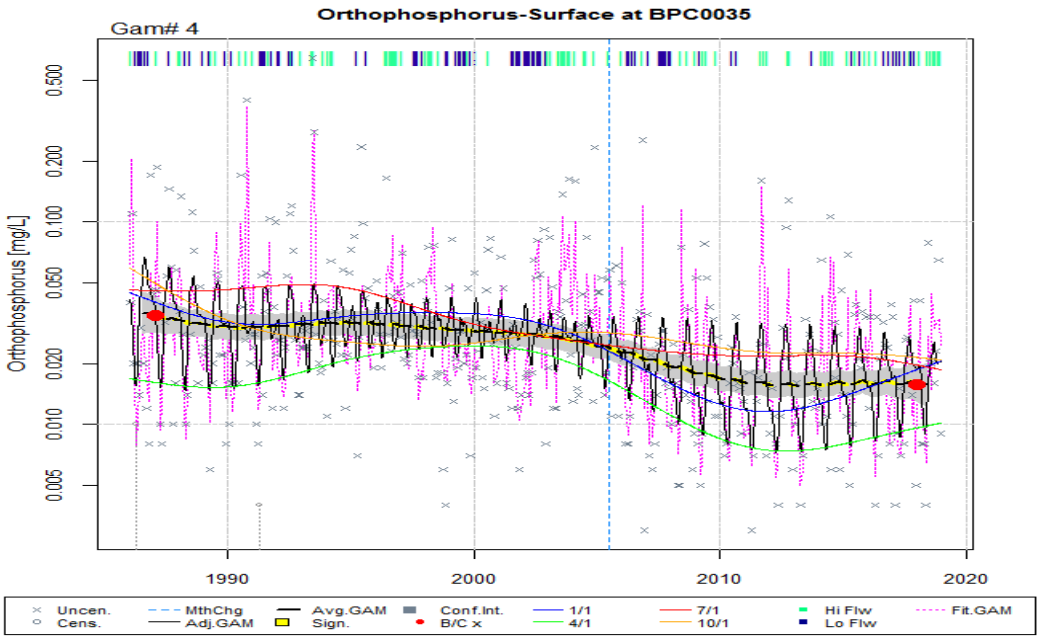

Figure 9. Extreme flow-controlled variability (dotted fuschia line) in ortho-phosphate phosphorus concentration at BPC0035 from 1986-2018.

Declining trends in TP (and PO4) from 1986-2018 are found for all stations (Table 7) with smallest declines in BPC and the largest at MON0155 just below Frederick City. These changes result in average annual reductions from 0.001-0.003 mg/L for the 33-year period, 13-20 fold lower than noted for TN.

Table 7. Significant reductions (trends) in season and season+flow corrected TP concentrations through time at each station on the Monocacy River and Big Pipe Creek from 1986-2018.

STATION	Initial Season Adjusted Average Concentration (mg/L)	Final Season Adjusted Average Concentration (mg/L)	TREND (corrected for Season) (mg/L over 33 yrs)	Initial Season+Flow Adjusted Average Concentration (mg/L)	Final Season+Flow Adjusted Average Concentration (mg/L)	TREND (corrected for Season+Flow) (mg/L over 33 yrs)
MON0528	0.134	0.049	-0.085	0.144	0.066	-0.078
BPC0035	0.063	0.032	-0.031	0.065	0.030	-0.035
MON0269	0.105	0.053	-0.052	0.115	0.049	-0.066
MON0155	0.171	0.052	-0.119	0.160	0.049	-0.111
MON0020	0.137	0.050	-0.087	0.134	0.049	-0.085

Interestingly, trends in PO4 concentrations through time indicate a dramatic reduction at Station MON0155 between 2003 and 2004 to about 0.05 mg/L (Fig. 10), not observed at river or BPC stations further north. The reductions in average TP (from about 0.22 to 0.09 mg/L) and ortho-P (from approximately 0.18 to 0.04 mg/L) approximated 0.05 mg/L/yr for each pool in the 2003-2005 period. Thereafter through 2018, TP and ortho-P slowly declined at rates approximating 0.002 mg/L/yr. The change can be attributed to implementation of biological nutrient removal (BNR) at the city's WWTP.

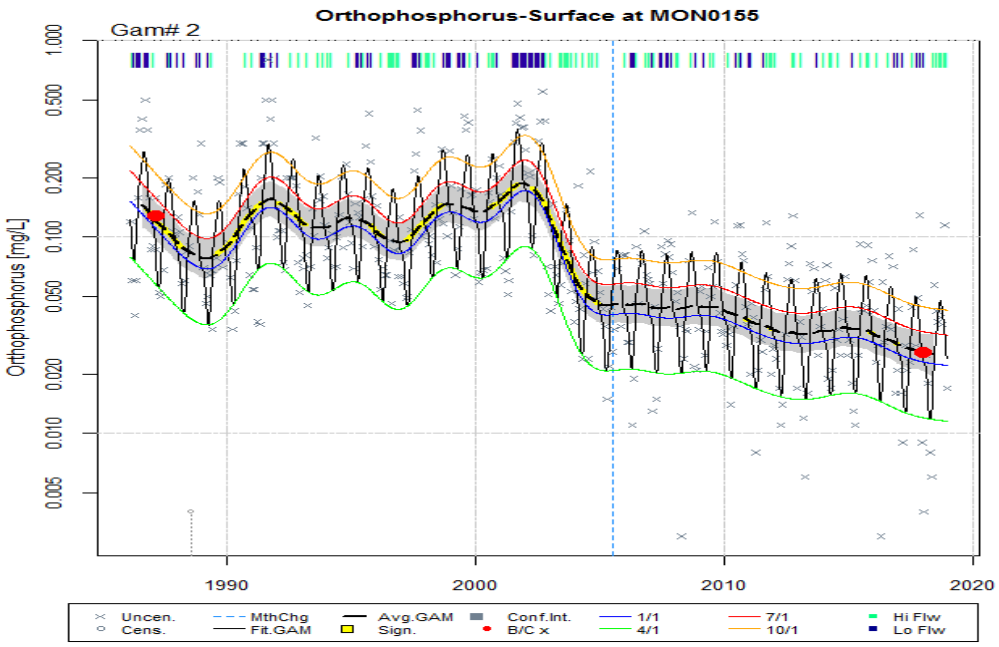

Figure 10. Season-adjusted PO4 concentrations at MON0155. Note the large PO4 decline between 2003 and 2004 at this station just below the city of Frederick.

This rapid decline in the phosphorus compounds after the 2002 BNR WWTP upgrades indicated that the overall trends over 33 years needed to be re-examined for patterns following installation of the advanced treatment. Hence, data from 2005-2018 were analyzed to identify whether the patterns seen for 33 years continued or alternatively, did the advanced treatment alter the river response. For both nitrogen and phosphorus, average concentrations at each station were lower than noted over the 33-year period (compare Fig. 11(a) to Fig. 2 and Fig. 11(b) to Fig. 6). Second, in the post-BNR period, TN concentrations are increasing below the city of Frederick vs. similar concentrations, on average, for the 33-year period. And third, the previously identified increase in TP seen for the river reach from north of the city to south (Fig. 6) is no longer present and in fact, has declined and remains low and similar all the way to just north of the Potomac River (Fig. 11(b)).

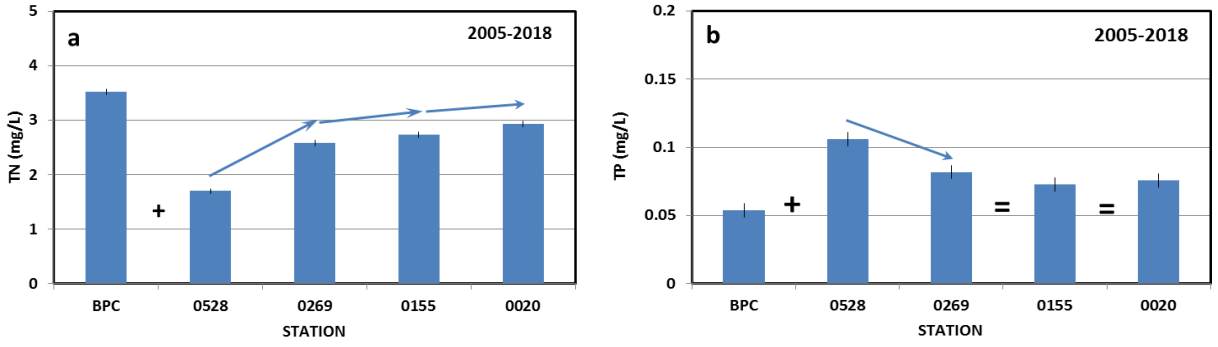

Figure 11. Trends in (a) TN and (b) TP for the period 2005-2018, after BNR implementation at the city of Frederick's WWTP. The + indicates mixing, = indicates similar average concentrations, and blue arrows imply significant changes in nutrient concentrations.

Total Suspended Solids

This commonly monitored material represents the weight of all particles suspended in the water and includes sediments and living and dead (organic) matter. In contrast to the inorganic nutrients (N, P) described above, there was only one significant change in TSS over the 33 years, an increase from the PA-MD border to the river station further south, i.e., MON0528 vs. MON0269 (Table 8).

Table 8. Average (±se) TSS concentrations for the Monocacy River and Big Pipe Creek stations for the 1986-2018 period.

STATION	TSS (mg/L)
MON0528	12.3±0.8[a]
BPC0035	17.7±2.2[b]
MON0269	17.0±2.2[b]
MON0155	16.9±1.4[b]
MON0020	18.1±2.2[b]

[a-b]Superscripts indicate significant concentration differences from levels noted in stations immediately downriver.

There were season and season+flow impacts on average concentrations at each station noted initially and at the end of the 33-year period (Table 9). The effect of season was only noted for the northern Monocacy River station, MON0528, with a total reduction approximating 4 mg/L over 33 years, or 0.12 mg/yr. The combined effects of season and flow did result in a few more significant reductions, south of the PA-MD border (-5.2 mg/L/33 yrs or -0.16 mg/L/yr) and the stations above (-4.9 mg/L/33 yrs or -0.15 mg/L/yr) and immediately below the city of Frederick (-5.9 mg/L/33 yrs or 0.18 mg/L/yr).

Table 9. Reductions (trends) in season and season+flow corrected TSS concentrations at each station on the Monocacy River and Big Pipe Creek from 1986-2018. NS indicates the initial and final concentrations were not significantly different (p>0.05).

STATION	Initial Season Adjusted Average Concentration (mg/L)	Final Season Adjusted Average Concentration (mg/L)	TREND (corrected for Season) (mg/L over 33 yrs)	Initial Season+Flow Adjusted Average Concentration (mg/L)	Final Season+Flow Adjusted Average Concentration (mg/L)	TREND (corrected for Season+Flow) (mg/L over 33 yrs)
MON0528	10.0	5.9	-4.0	10.0	4.8	-5.2
BPC0035	7.6	8.7	NS	10.2	7.1	NS
MON0269	8.3	7.5	NS	10.3	5.4	-4.9
MON0155	9.8	8.3	NS	12.5	6.6	-5.9
MON0020	6.3	9.1	NS	9.6	7.0	NS

Chlorophyll-*a*

Suspended algae and cyanobacteria were estimated through their common photosynthetic pigment, chlorophyll-*a* (CHLa). Concentrations of these groups were quite low at all stations (Table 10), <5.3 µg/L. Lowest pigment levels and hence algae and cyanobacteria were noted in Big Pipe Creek (2.69 µg/L) and as in nutrients and TSS, it appears that the mixing of BPC (BPC0035) and PA-MD border (MON0528) water and its suspended or dissolved constituents results in a river concentration down river somewhere between the levels noted for the two upriver stations.

Table 10. Average (±se) CHLa concentrations for the 4 Monocacy River and 1 Big Pipe Creek stations for the 1986-2018 period.

STATION	CHLa (µg/L)
MON0528	5.22±0.50[a]
BPC0035	2.69±0.19[b]
MON0269	4.24±0.57[c]
MON0155	5.24±0.62[c]
MON0020	5.30±0.82[c]

[a-c]Superscripts indicate significant concentration differences from levels noted in stations immediately downriver.

CHLa concentrations were largely independent of season and season+flow effects at each station over the 33-year period (Table 11). The only significant change in the average CHLa concentration over the 33 yr period was noted just south of the PA-MD border, with season and season+flow yielding similar declines of 1.67-1.73 µg/L/33 years or a trivial 0.05 µg/L each year.

Table 11. Significant reductions (trends) in season and season+flow corrected CHLa concentrations through time at each station on the Monocacy River and Big Pipe Creek from 1986-2018. NS indicates the initial and final concentrations were not significantly different (p>0.05).

STATION	Initial Season Adjusted Average Concentration (µg/L)	Final Season Adjusted Average Concentration (µg/L)	TREND (corrected for Season) (µg/L/33 yrs)	Initial Season+Flow Adjusted Average Concentration (µg/L)	Final Season+Flow Adjusted Average Concentration (µg/L)	TREND (corrected for Season+Flow) (µg/L/33 yrs)
MON0528	3.64	1.97	-1.73	3.68	2.01	-1.67
BPC0035	1.84	1.94	NS	2.00	1.70	NS
MON0269	1.67	1.95	NS	1.88	1.55	NS
MON0155	3.21	2.48	NS	3.33	2.29	NS
MON0020	1.54	1.78	NS	2.12	1.83	NS

Discussion

The Monocacy River is experiencing substantial inputs of nitrogen and phosphorus as it transits Frederick County, consistent with previous state assessments of surface water quality in its watershed (MDE 2018). Water quality conditions have been sufficiently poor for TP, TSS, *E. coli* (an indicator of fecal contaminant input from animals), PCBs, mercury, pH, and temperature to result in state listings of impairments and some cases state TMDLs (Total Maximum Daily Loads). Unfortunately, the results presented above indicate that while nitrogen and phosphorus are declining somewhat in the river over the last 33 years, problems remain.

Water quality of the Monocacy River is strongly influenced by input from Carroll County's Big Pipe Creek, the primary tributary entering the larger river in northern Frederick County. For nitrogen, high BPC concentrations mix with lower nitrogen-containing river water from the PA-MD border resulting in river concentrations increasing 41%, 68%, and 73% for TN, DIN, and NO23, respectively, at the station below the confluence of the two systems. In contrast, low BPC phosphorus concentrations mix with higher concentrations noted at the PA-MD border, effectively diluting the TP and PO4 border concentrations by 11% and 19%, respectively, below the confluence of BPC and the river.

Sources of nitrogen in the BPC are likely non-point, i.e., diffuse and not conducted to the waterway through pipes or culverts. The nitrogen concentrations reflect land use further east in the Big Pipe Creek watershed, a basin dominated by agricultural crop production and animal husbandry. Nitrogen, primarily as soluble NO23, is a common by-product of these practices, i.e., through the use of fertilizers applied to the land and animals defecating in or near pasture streams. Riparian buffers and stream fencing could alleviate some of these nitrogen loads, potentially reducing BPC concentrations and receiving waters of the Monocacy River. However, the Lehigh Cement Corporation in Union Bridge, MD may also add nitrogen as cement operations typically discharge substantial levels of this macronutrient to the air and receiving waters (e.g., see Ipeaiyeda and Obaje 2017); discharge data are being sought.

It should be noted that Big Pipe Creek and Little Pipe Creek (LPC, also known as Sam's Creek), a tributary with multiple smaller creeks originating in Frederick County, merge before discharging into the Monocacy River. LPC has TMDLs in place for *E. coli*, sediment, and phosphorus with relatively few water quality data. The most recent summary (Versar 2017) for LPC finds average TN and TP levels for the period 2013-2016 at 4.47 and 0.039 mg/L, respectively, indicating likely contributions to BPC before the merged system, Double Pipe Creek, enters the Monocacy. LPC nitrogen concentrations of 4.47 mg/L would increase those noted in BPC; the LPC phosphorus concentration of 0.039 mg/L is similar to that found in the BPC. In order to document which of the tributaries to the LPC are responsible for the elevated TN concentrations, future sampling will be needed west of the confluence of the two creeks and in the small feeder streams (e.g., Beaver Dam Creek, Haines Branch, Clemson Branch plus about 10 others, Fig. 12) that enter the LPC in its westward flow in Frederick County. This type of watershed and sub-watershed sampling to identify potential drainage areas and land uses contributing to elevated creek or river nutrient levels is common across the region's coastal plain and Piedmont.

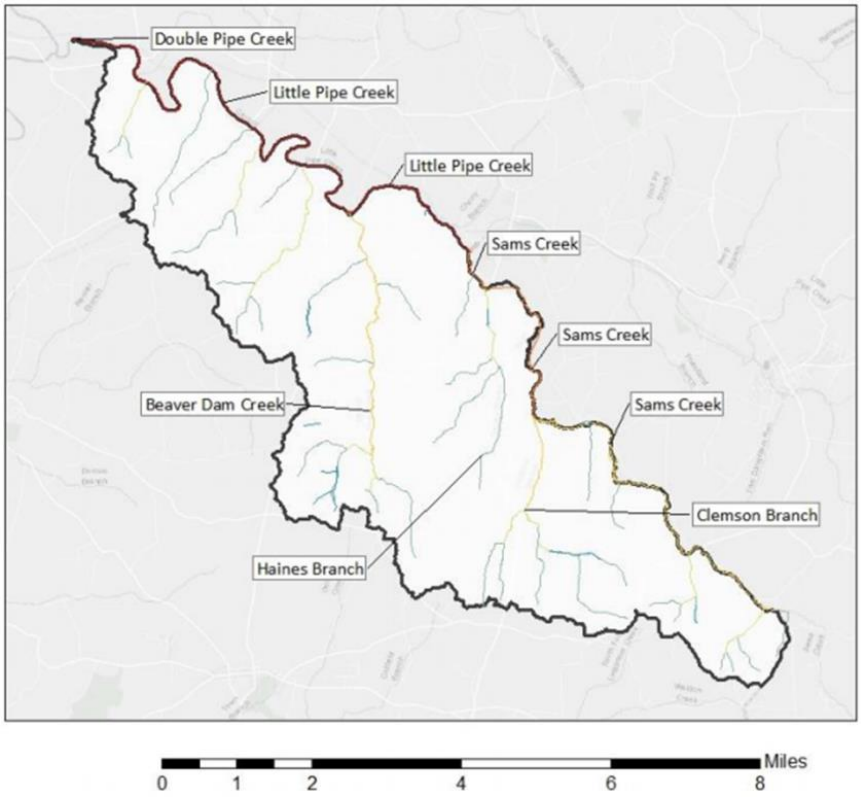

Figure 12. LPC and its tributaries in Frederick County (adapted from AKRF 2019).

In an inspection of digitized County maps, specifically forest surrounding creeks and streams along LPC in northern Frederick County, substantial areas of forest were not digitized in the GIS forest layer thereby underestimating likely nutrient reduction capacity in this part of the County. It is recommended that finer spatial scale resolution (re-digitizing) of forest buffer acreage be undertaken in the near future, particularly when possible increases in County funds for agriculture preservation have been discussed where these funds might be prioritized for preserving agricultural lands that include riparian buffer tracts for water quality improvement. Versar (2017) has estimated that about 30% of the watershed's potentially buffered area remains without trees or shrubs (see Round 2 graph, p. B-17 of their report); perhaps this acreage is smaller.

Other areas of the upper river's watershed are also dominated by agriculture and hence non-point sources of nitrogen and phosphorus. Recent output of nitrogen and phosphorus loads for the entire river watershed from the MON0528 at the PA border to MON0269 indicate that agriculture yields 2,840,391 and 72507 lbs N and P per year, respectively (Appendix D) to the creeks, streams, and river of this segment. The agriculture load represents 69% and 47%, respectively, of the total input of the two nutrients, far exceeding any other sector's contributions to river nutrient levels.

Over the entire 33-year period as well as the more recent post-BNR installation period, as the Monocacy flows south, nitrogen concentrations increase from MON0269 north of Frederick to just north of the Potomac River. This pattern indicates that land use from mid-County to the Potomac is responsible for higher nitrogen levels in the Monocacy and again, agriculture remains the dominant anthropogenic source of nutrients (Appendix D). Agriculture dominates land use from MON0269 to the city and several tributaries have substantial nitrogen concentrations. TN concentrations in Glade Creek, entering just below MON0269, are very high at 7.64-7.98 mg/L (EA 2017, Versar 2017), some of the highest nitrogen levels found in the analyses for the 33-year period and far above concentrations deemed excessively high for freshwaters (see Table 1). The average TN concentrations (approx. 2.82-2.9 mg/L; Versar 2017, CCWS 2018) for Carroll Creek in the 2013-2016 period and 2018 are similar to the average level noted for MON0269 indicating this small tributary might also be part of the contributions to the higher nitrogen levels noted south of the city at MON0155. Linganore Creek is under huge development pressure with permits in place for more than 5000 additional homes in the watershed (T. Goodfellow, Frederick County Department of Planning and Permitting). In contrast, nitrogen levels in Tuscarora and Fishing Creeks, two of the other creeks entering the river south of MON0269, were low to moderate (EA 2017), perhaps indicating land use in these tributaries might not explain the observed increase in this portion of the Monocacy. Below MON0155, the small but significant increases in nitrogen since 2005 are likely attributable to inputs from agriculture along the western side of the Monocacy north of the Potomac (Monocacy Direct Southwest area, 5.92 mg/L) and high development pressure in the watersheds of Linganore Creek (3.83-4.49 mg/L), Ballenger Creek (3.32 mg/L), Bennett Creek (3.03 mg/L), and Bush Creek (3.65 mg/L) (Versar 2017).

In contrast, since 2005, phosphorus declines in the river following passage through the city and remains low to the Potomac. Reasons for this difference in recent patterns likely reflect two processes. First, BNR treatment at the city WWTP has been very effective at removal of phosphorus and the large decline after 2005. Second, because phosphorus enters the river bound to sediment particles, perhaps much of the sediment load settles out or is captured in effective placement of best management practices along the main river and in the watersheds of the small tributaries entering the river, thereby limiting new inputs. Versar (2017) tabulated TP concentrations south of the city for the period 2013-2016 and reported a range of 0.013-0.060 mg/L for the primary tributaries, lower than noted for the 2005-2018 period (Stations MON0155 and MON0020 in Fig. 11b). It is not certain whether this decreasing trend

would remain if state collections were immediately after major storms as the Monocacy becomes an extremely turbid system with even modest rainfall, resuspending phosphorus-rich bottom sediments and eroding surface and bank sediments and their bound phosphorus.

The importance of Frederick's WWTP in river nutrient concentrations exemplified by the dramatic decline in river TP below MON0269 after BNR implementation suggests the nutrient loads from the other WWTPs might also be influence river levels across the watershed. However, recent Chesapeake Bay Program model results (Appendix D) for 2018 indicate that wastewater nutrient discharges currently make up less than 9% and 17% of the total nitrogen and phosphorus entering the river and its creeks and streams. In the upper river between the PA border and MON0269, there are 6 plants, Emmitsburg, Mount St. Mary's, Thurmont, Lewistown, Crestview, and from Carroll County, Taneytown Appendix E). Two of these facilities, Emmitsburg and Taneytown, discharge >3 mg TN/L which could be part of the reason for elevated nitrogen levels in this part of the northern river. Similarly, these two plants have substantial TP loadings prior to 2015 with discharge concentrations >1.5 mg TP/L. Recall that concentrations exceeding 0.07 mg/L (Table 1) surpass the thresholds for eutrophy in ambient waters and to be discussed below, this portion of northern Frederick County (Fig. 13) and western Carroll County (Piney Creek, https://geodata.md.gov/ streamhealth/) region is characterized by Poor stream health, potentially reflecting the elevated phosphorus and eutrophic conditions that these high nutrient concentration would support.

For the mid-river segment between MON0269 and MON0155, there are four WWTPs with substantial loads. These are Woodsboro, White Rock, Ft. Detrick, and the City of Frederick (Appendix E). TN levels from the largest discharger, City of Frederick, exceeded 20 mg TN/L until late 2002. From then until late 2018, TN levels leaving the plant approximated 7-8 mg/L with mid-2018 concentrations dropping to ~3 mg/L. Until 2011, Fort Detrick discharge approximated 7-8 mg TN/L, declining to ~2 mg/L from 2011 on. Woodsboro, discharging only 0.077 MGD, has few data but levels approximate 10 mg TN/L. For TP, Frederick City's discharge declined from approximately 3 mg/L before late 2002 to <1 mg/L thereafter while levels from Ft. Detrick changes dramatically over the 1985-2018 period. Levels from 1991-1995 were >4 mg TP/L declining to ~1 mg/L by 2011. From then to 2018, although data are not verified, concentrations <0.2 mg/L are reported. Woodsboro discharge approximated 4 mg TP/L for the period 2009-2018. Woodsboro discharges into Israel Creek, another system with Poor stream health (Fig. 13), and its impact from both TN and TP appears to be reflected in this health indicator.

For the lower Monocacy segment, MON0155 to MON0020, there are 3 WWTPs, Ballenger-McKinney, Mill Bottom, and Pleasant Brach. The largest WWTP at Ballenger-McKinney, discharges about 7.3 MGD and its historical pattern is similar to Ft. Detrick, i.e., ~15 mg TN/L discharged in the 1991-1995 period and until 2014, releasing ~6 mg TN/L. Upgrades in late 2014 have resulted in discharges approximating 1-2 mg TN/L. The Mill Bottom WWTP releases about 8-15 mg TN/L into Bush Creek and Pleasant Branch 8-10 mg/L into a tributary of Bennett Creek; stream health of both sub-systems is fair to poor (Fig. 13, https://geodata.md.gov/streamhealth/), suggesting possible local impacts from WWTP discharges. For TP, discharge from Ballenger-McKinney is very low after 1995, <0.1 mg/L in 2018. Pleasant Branch levels are ~4 mg TP/L from 2009 to 2018.

The point source loads reported above suggest that at least for the major WWTPs in the basin, i.e., City of Frederick, Ft. Detrick, and Ballenger-McKinney, current treatment infrastructure appears to be partially responsible for declining phosphorus in the river for the river reach from Frederick City to the Potomac. The smaller WWTPs have appreciable loadings of the both TN and TP but because their daily discharge volumes are low, the dilution of their discharge concentrations are likely substantially diluted

prior to entering the Monocacy so actual impacts to alter nutrient concentrations in the main river will be small. Only through use of the more complex Chesapeake Bay Program watershed model could the WWTP discharge effects on river nutrient concentrations be estimated.

The results indicating substantial effects of season and season+flow on nutrient concentrations in the river and BPC were not surprising. In winter, cold temperatures and low sunlight (hours and altitude) reduce the uptake of inorganic nitrogen and the nitrogen pools remain high. In contrast, warmer temperatures and more sunlight allows for nitrogen uptake over 12-14 h per day, yielding lower summer concentrations. For phosphorus, lowest concentrations are noted in spring due to dilution in high flows while summer maxima are associated with low river flows. However, for both nutrients, concentration dependence on aperiodic flow events is apparent (see GAM# 4 graphs in Appendix C) and indicate installation and maintenance of best management practices to reduce flow impacts is a practical approach to reducing this dependence.

This latter point is important when considering our changing climate. Besides the warmer temperatures now common to the region and expected for the century, precipitation patterns are projected as boom-bust for the area, that is, aperiodic major, intense storms followed by substantial drought periods as just experienced in 2018 and 2019. Major precipitation events (10 to 1000 year floods, e.g., Frederick and Ellicott City, respectively) deliver huge amounts of rain in short periods that will rapidly erode soils from farms as well as transport particulates and associated nutrients from roads, roofs, parking lots, and other impervious surfaces through county suburbs and municipalities. Stormwater runoff will overwhelm either missing or older community storage capacities, leading to flashy flows and particle loading of our receiving waters. Hence, implementing best management practices effective at very high flows is critical and should be a consideration in future land use decisions (planning, permitting, and construction) as well as WWTP storage and treatment capacities.

Long-term reductions in station nitrogen and phosphorus concentrations were generally noted, implying gradual river improvement over the 33-year study period. Annual reductions in nitrogen approximated 0.02-0.04 mg/L, thereby maintaining low production of excess plant material in the Monocacy as well as export to the Potomac and Chesapeake Bay where N inputs exacerbate bottom hypoxia and anoxia, loss of fish and shellfish habitat, increases in fish disease, and algal blooms. However, that concentrations of nitrogen roughly double in passing through the County over both the 1986-2018 and 2005-2018 periods suggests even with improvement, substantial load reduction must occur throughout the Monocacy watershed to alleviate the enrichment from land uses common to Frederick and Carroll Counties. Phosphorus reductions at each station were more modest over the 33-year period, at 0.001-0.003 mg/L/yr across the 5 stations, but at least declines and not increases were noted. Further, the addition of BNR to the city WWTP in late 2002 resulted in an immediate 59% decline in TP that maintained lower levels below the city to the Potomac River through the study period.

Although not analyzed in the present study, there are other water quality constituents that should be examined in the river and across its watershed, including a focus on potential threats in streams and to stream health (Fig. 13). Fair to Poor stream health of feeder creeks and streams may suggest poor water quality that then enters the larger river. Note the large numbers of Poor to Very Poor sub-watersheds of the Monocacy that surround the city of Frederick (north, east, and west), the river reach area typified by dramatic increases in nutrients. Other foci should be herbicides and pesticides used in agriculture and turf maintenance as these continue to be serious concerns across the Chesapeake watershed. For example, USGS researchers (Blazer 2019, Walsh 2019) have identified multiple compounds that may be responsible for 70-100% frequencies of intersex (male and female sex tissue in the same fish) in

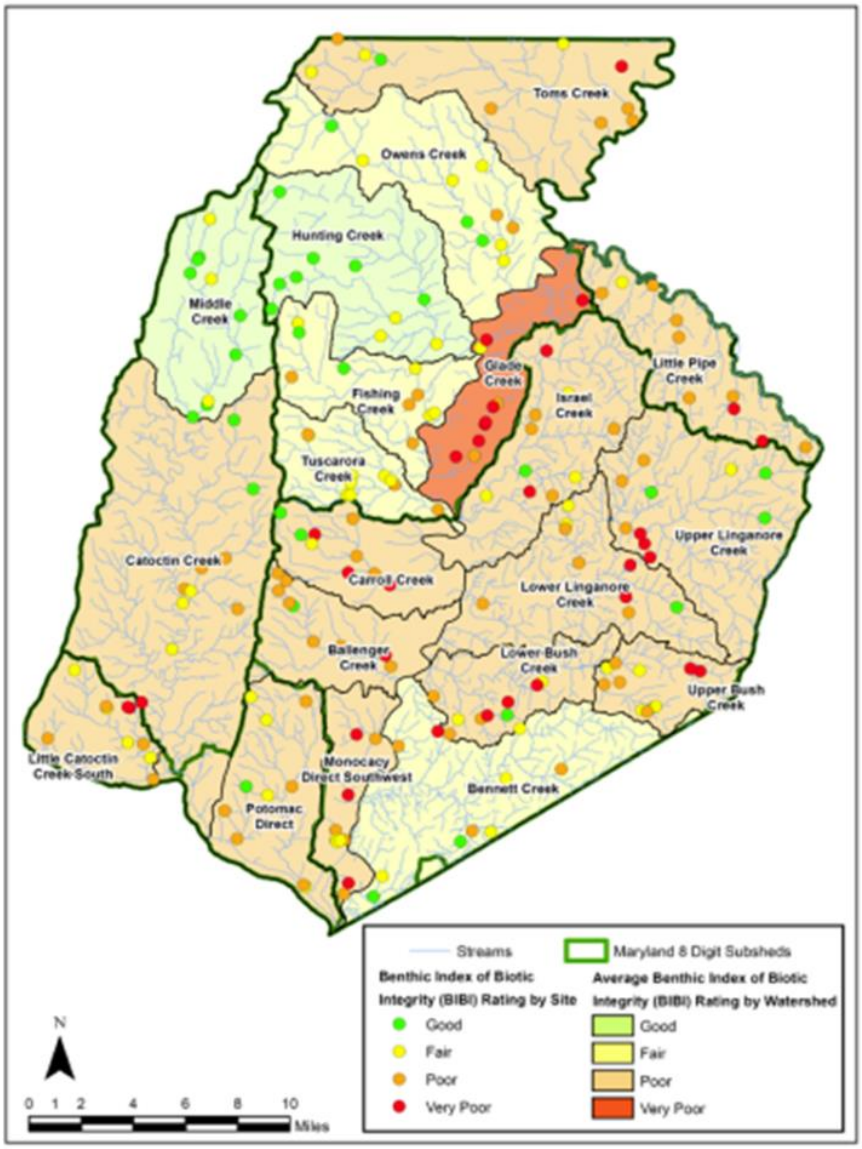

Figure 13. Stream health indicated through the Benthic IBI for Frederick County-monitored streams (from Versar 2017). Note: Middle Creek, Catoctin Creek, and Little Catoctin Creek are not sub-watersheds of the Monocacy River.

Monocacy River smallmouth bass populations and potential reductions in fecundity and ability to resist disease (reduced immune response). PCBs and mercury have been found in fish tissue (MDE 2018). Halogenated organic compounds, threats to human health, are also found in the river, attributable to drinking water utility treatments with chlorine or other halogens (Wiles 2014); some monitoring of these compounds is done but a time series analysis could document trends through time. The same concern holds for naturally produced organic compounds that are toxic to humans, wildlife, and domestic animals. These materials are produced by abundant cyanobacteria (aka, blue-green algae) and toxicities of chlorinated by-products of these compounds from utility treatments is a growing focus nationally, with at least one long-term project underway to identify and determine toxicities of these materials. There are suites of compounds that have been tested and analyzed at Ft. Detrick for decades and may also pose some risk if released from stored containers, present in groundwaters or local sediments, or have long half-lives in natural systems; the current installation focus is on tetrachloroethene (PCE) and

trichloroethene (TCE) with on-going remediation underway but the list of potential contaminants is expansive. Hence, many unknown or non-monitored compounds may pose risks beyond the nutrients and suspended solids analyzed in the present assessment.

Recommendations

Based on Assessment results, the following recommendations are provided.

- Two additional phases of this study should be undertaken: 1) Phase II, to further localize pollutant sources and 2) Phase III, to engage stakeholders in a dialog re. nutrient reduction options based on the findings of this and subsequent reports.
- The second assessment (Phase II) of river and tributary nitrogen concentrations should be initiated in nutrient-enriched river segments to identify sub-watershed or other sources of the contamination. Collections should be made in Little Pipe Creek upstream of the confluence with Big Pipe Creek, mouths of small Frederick tributaries entering the Little Pipe Creek, and in the Monocacy River just north and south of the confluence with Double Pipe Creek (the creek formed from BPC and LPC). The mouth of Piney Creek might also be sampled due to the slightly rising TN load from the Taneytown WWTP. In the river reach between MON0269 and MON0155, collections should be made at the mouths of small creeks and streams (e.g., Israel, Glade, Carroll, Linganore) entering the Monocacy and in stations immediately above and below Frederick City boundaries. South of MON0155, samples for nitrogen should be collected, at a minimum, at the mouths of Ballenger Creek, Bennett Creek, and Bush Creek and adjacent to Monocacy Direct Southwest. These results will inform future dialog with land owners, utilities, installations, or industries potentially increasing river pollutants (Phase III) on BMPs to be considered for implementation and fiscal support.
- County staff should be trained in the routine use of the Chesapeake Bay Program's CAST (Chesapeake Assessment Scenario Tool) to generate cumulative nutrient loadings from land use initiatives that the County implements in its on-going MS4 and other nutrient and sediment reduction projects. The model could be used as an exploratory tool to identify likely point (pipe discharges) and non-point (diffuse) nutrient sources responsible for river nutrient enrichment (Fig. 14).
- County GIS staff should re-digitize forest resource areas in the Monocacy's watershed, including its multiple sub-watersheds, and determine stream areas with and without forest cover. The latter information will identify areas that could be reforested in public, private, or public/private partnerships to reduce nutrient and sediment inputs.
- In the past, County staff and collaborators have compiled excellent land use considerations for some rapidly developing and agricultural-dominated areas. These recommendations, as in *The Lake Linganore Source Water Protection Plan* (EFC 2004) and *Action Plan for the Linganore Source Water Protection Plan* (2006), should be re-examined for application throughout the County and particularly sub-watersheds identified as nutrient or sediment sources that continue to degrade the Monocacy River.
- Considering the strong dependence of river nutrient concentrations on flow events, County and City officials should identify appropriate best management practices effective in addressing high runoff that will accompany major precipitation events and persist in drought periods in between these major storms.
- Finally, considering the breadth of potential contaminants that could jeopardize river water quality, habitats, wildlife health, and public safety, efforts should be made to assemble or monitor these compounds in the river for future pollutant remediation across the basin.

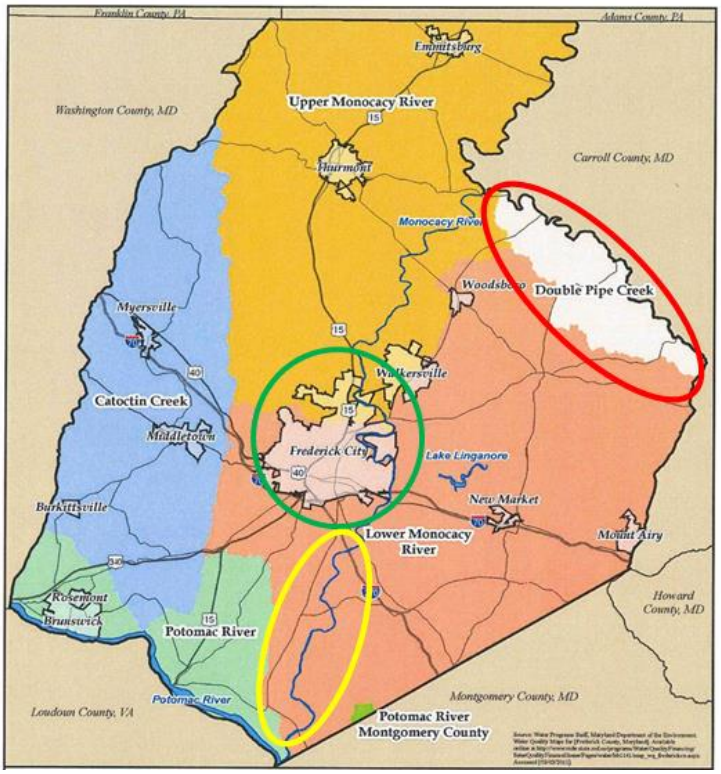

Figure 14. Recommended areas for Phase II sampling and modeling to identify sources of elevated nitrogen in the Monocacy River watershed. Sample collections and nutrient analyses should be initiated in the red ellipse area that covers the Frederick County portion of the Little Pipe Creek watershed that with Big Pipe Creek forms the Double Pipe Creek drainage area. The green ellipse is the area surrounding the city of Frederick including Glade Creek to the north and Linganore Creek to the south. The yellow ellipse includes the mouths of creeks (Ballenger, Bennett, Bush, and Monocacy Direct Southwest) entering the lower Monocacy (map courtesy of Frederick County Division of Planning and Permitting).

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Appendix A

Monthly state-collected water quality data from 1986-2018 (data are also available at http://data.chesapeakebay.net/WaterQuality). Station locations can be found in Table 1. Negative numbers (<25) were changed to zero. Symbols are:

- TN = Total Nitrogen (all particulate and dissolved Nitrogen)
- DIN = Dissolved Inorganic Nitrogen (sum of NO23+NH4)
- NO23 = Nitrate + Nitrite Nitrogen
- NH4 = Ammonium Nitrogen
- TP = Total Phosphorus (all particulate and dissolved Phosphorus)
- PO4 = dissolved orthophosphate Phosphorus
- TSS = Total Suspended Solids
- CHLa = Chlorophyll-*a* (green pigment in all plants, algae, cyanobacteria)
- NA = Not Analyzed.

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
BPC0035	1/27/1986	4.15	3.21	2.95	0.26	0.173	0.04	51	7.48
BPC0035	2/19/1986	4.95	3.49	3.2	0.29	0.278	0.11	127	8.37
BPC0035	3/19/1986	4.35	3.92	3.9	0.02	0.052	0.02	41	1.5
BPC0035	4/15/1986	3.6	3.23	3.2	0.03	0.031	0.005	7	1.42
BPC0035	5/5/1986	3.65	3.03	3	0.03	0.031	0.02	5	1.2
BPC0035	6/4/1986	2.75	2.412	2.4	0.012	0.038	0.014	12	1.35
BPC0035	7/1/1986	2.4	1.928	1.9	0.028	0.059	0.03	10	1.2
BPC0035	8/5/1986	2.1	1.532	1.5	0.032	NA	0.02	5	3.49
BPC0035	9/22/1986	2.1	1.766	1.75	0.016	0.03	0.012	2	2.69
BPC0035	10/21/1986	3.18	2.708	2.7	0.008	0.012	0.008	0.5	0.67
BPC0035	11/19/1986	4.9	3.34	3.2	0.14	0.358	0.17	95	3.59
BPC0035	12/15/1986	5.15	4.536	4.5	0.036	0.051	0.046	1	0.37
BPC0035	1/12/1987	5.75	5.056	5	0.056	0.062	0.044	2	0.9
BPC0035	2/9/1987	5.4	4.924	4.9	0.024	0.053	0.046	5	1.59
BPC0035	3/2/1987	4.7	3.77	3.6	0.17	0.205	0.186	99	5.98
BPC0035	4/14/1987	3.7	3.316	3.3	0.016	0.045	0.01	0.5	2.29
BPC0035	5/12/1987	3	2.516	2.5	0.016	0.018	0.008	3	2.24
BPC0035	6/23/1987	3.2	2.632	2.6	0.032	0.071	0.032	32	2.49
BPC0035	7/29/1987	3	2.124	2.1	0.024	0.053	0.054	8	2.39
BPC0035	8/25/1987	6.2	2.58	2.5	0.08	0.196	0.146	20	2.09
BPC0035	9/22/1987	3.65	3.124	3.1	0.024	0.071	0.06	11	0.6
BPC0035	10/21/1987	3.35	2.904	2.9	0.004	0.027	0.01	4	1.72
BPC0035	11/24/1987	4.3	3.812	3.8	0.012	0.062	0.016	0.5	0.75
BPC0035	12/8/1987	5.15	4.628	4.6	0.028	0.053	0.058	0.5	0.36
BPC0035	1/18/1988	5.13	NA	4.5	NA	0.049	0.036	0.5	1
BPC0035	2/16/1988	5.1	3.82	3.6	0.22	0.238	0.134	26	2.69
BPC0035	3/7/1988	4.9	4.428	4.4	0.028	0.057	0.028	10	1.35
BPC0035	4/20/1988	3.65	3.112	3.1	0.012	0.038	0.01	4	2.09
BPC0035	5/16/1988	3.2	2.716	2.7	0.016	0.037	0.014	17	2.69
BPC0035	6/27/1988	3.2	2.736	2.7	0.036	0.053	0.028	2	2.32
BPC0035	7/25/1988	3.15	2.296	2.2	0.096	0.15	0.112	49	2.69
BPC0035	8/29/1988	3.1	2.136	2.1	0.036	0.097	0.072	27	3.59
BPC0035	9/26/1988	3.15	2.72	2.7	0.02	0.065	NA	4	2.24
BPC0035	10/24/1988	3.25	NA	2.5	NA	0.104	0.016	5	1.35
BPC0035	11/29/1988	3.55	2.868	2.8	0.068	0.086	0.048	9	1.99
BPC0035	1/23/1989	5.4	4.908	4.9	0.008	0.036	0.022	0.5	1.2
BPC0035	2/21/1989	4.95	4.324	4.3	0.024	0.027	0.024	10	2.65

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
BPC0035	3/27/1989	4.7	4.016	4	0.016	0.009	0.026	21	3.2
BPC0035	4/25/1989	4	3.22	3.2	0.02	0.089	0.006	2	2.69
BPC0035	5/22/1989	4.15	3.636	3.6	0.036	0.045	0.016	8	1.94
BPC0035	6/6/1989	4.3	3.624	3.6	0.024	NA	0.02	11	4.19
BPC0035	7/31/1989	NA	3.748	3.7	0.048	NA	0.056	18	3.59
BPC0035	8/21/1989	3.6	2.748	2.7	0.048	0.116	0.052	20	2.39
BPC0035	9/18/1989	3.85	3.316	3.3	0.016	0.071	0.022	8	3.89
BPC0035	10/30/1989	4.25	3.504	3.5	0.004	0.036	0.022	4	0.7
BPC0035	11/27/1989	4.9	NA	4.4	NA	0.045	NA	2	1.05
BPC0035	12/18/1989	5.15	5.008	5	0.008	0.009	0.008	5	0.7
BPC0035	1/22/1990	4.7	4.224	4.2	0.024	0.033	0.01	13	3.74
BPC0035	2/20/1990	5.55	4.612	4.6	0.012	0.028	0.016	5	0.97
BPC0035	3/28/1990	3.6	3.204	3.2	0.004	0.02	0.016	5	2.62
BPC0035	4/24/1990	NA	NA	NA	NA	0.036	NA	4	2.99
BPC0035	5/21/1990	NA	NA	NA	0.036	0.068	0.03	24	1.5
BPC0035	6/18/1990	3.95	3.708	3.7	0.008	0.037	0.016	6	3.59
BPC0035	7/23/1990	4.8	3.36	3.3	0.06	0.39	0.17	170	2.49
BPC0035	8/20/1990	3.6	3.028	3	0.028	0.072	0.038	20	2.09
BPC0035	9/17/1990	3.45	3.02	3	0.02	0.062	0.026	10	1.5
BPC0035	10/23/1990	4.75	3.816	3.7	0.116	0.338	0.4	182	4.49
BPC0035	11/26/1990	4.25	3.904	3.9	0.004	NA	0.028	2	1.4
BPC0035	12/17/1990	4.35	3.716	3.7	0.016	NA	0.02	7	3.2
BPC0035	1/21/1991	5.45	4.836	4.8	0.036	0.034	0.024	2	1.05
BPC0035	2/6/1991	5.5	4.92	4.9	0.02	0.044	0.028	5	1.35
BPC0035	3/6/1991	4.4	4.012	4	0.012	0.031	0.01	1	2.62
BPC0035	4/3/1991	4.45	3.908	3.9	0.008	0.046	0.008	5	1.79
BPC0035	5/1/1991	4.05	3.42	3.4	0.02	NA	0.002	15	3.49
BPC0035	5/29/1991	3.6	3.172	3.1	0.072	0.098	0.054	16	2.49
BPC0035	6/12/1991	3.45	2.944	2.9	0.044	0.069	0.014	15	1.3
BPC0035	7/2/1991	2.95	2.244	2.2	0.044	0.05	0.036	33	1.62
BPC0035	7/31/1991	2.65	2.064	2	0.064	0.089	0.056	4	1.35
BPC0035	8/28/1991	2.7	2.528	2.5	0.028	0.066	0.046	8	0.9
BPC0035	9/25/1991	4.25	3.048	3	0.048	0.274	0.104	156	NA
BPC0035	10/30/1991	2.45	2.108	2.1	0.008	0.03	0.012	1	0.82
BPC0035	11/26/1991	3.7	3.116	3.1	0.016	0.058	0.038	7	0.45
BPC0035	12/11/1991	4.8	3.768	3.7	0.068	0.154	0.1	11	NA
BPC0035	1/2/1992	4.9	4.528	4.5	0.028	0.048	0.022	19	2.09
BPC0035	2/5/1992	4.6	4.112	4.1	0.012	0.055	0.026	3	1.3
BPC0035	3/4/1992	4.6	4.112	4.1	0.012	0.055	0.026	3	1.5

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
BPC0035	4/8/1992	NA	3.816	3.8	0.016	NA	0.012	7	1.1
BPC0035	5/6/1992	3.65	3.112	3.1	0.012	0.064	0.024	7	1.3
BPC0035	6/3/1992	3.95	3.436	3.4	0.036	0.074	0.054	13	1.35
BPC0035	7/15/1992	2.85	2.26	2.2	0.06	0.091	0.11	33	0.6
BPC0035	8/5/1992	3.85	3.088	3	0.088	0.167	0.12	24	1.5
BPC0035	9/2/1992	2.4	2.224	2.2	0.024	0.078	0.072	4	0.4
BPC0035	10/13/1992	3.75	3.036	3	0.036	0.08	0.026	4	0.3
BPC0035	11/12/1992	4.2	3.812	3.8	0.012	0.051	0.014	2	0.4
BPC0035	12/2/1992	NA	4.312	4.3	0.012	NA	0.014	3	NA
BPC0035	1/12/1993	4.55	4.336	4.3	0.036	NA	0.024	11	1.35
BPC0035	2/3/1993	5.5	5.014	5	0.014	0.034	0.024	5	1.2
BPC0035	3/3/1993	4.55	4.129	4.1	0.029	0.034	0.029	2	5.38
BPC0035	4/7/1993	4.35	3.917	3.9	0.017	0.047	0.024	14	1.2
BPC0035	5/5/1993	4.03	3.625	3.6	0.025	0.029	0.031	12	4.34
BPC0035	6/9/1993	5.1	3.446	3.1	0.346	1.1	0.646	530	7.48
BPC0035	7/7/1993	7.51	3.033	2.84	0.193	1.5	0.278	42	7.48
BPC0035	8/4/1993	3.88	3.316	3.25	0.066	0.031	0.028	12	1.1
BPC0035	9/22/1993	3.957	3.479	3.467	0.012	0.03	0.02	4	0.9
BPC0035	10/6/1993	3.635	3.264	3.255	0.009	0.057	0.018	29	0.52
BPC0035	11/9/1993	4.222	3.815	3.8	0.015	0.13	0.019	4	0.24
BPC0035	12/1/1993	5.244	4.527	4.5	0.027	0.005	0.041	15	0.75
BPC0035	1/11/1994	5.408	5.216	5.2	0.016	0.027	0.011	6	0.6
BPC0035	2/2/1994	4.791	4.541	4.5	0.041	0.056	0.026	5	0.4
BPC0035	3/17/1994	3.636	3.269	3.2	0.069	0.082	0.064	12	0.85
BPC0035	4/13/1994	3.767	3.354	3.327	0.027	0.035	0.026	6	3.36
BPC0035	5/18/1994	NA	NA	NA	0.068	0.018	0.036	6	1.5
BPC0035	6/8/1994	3.909	3.499	3.473	0.026	0.044	0.025	15	4.34
BPC0035	7/6/1994	3.128	2.77	2.728	0.042	0.045	0.033	10	3.29
BPC0035	8/10/1994	3.177	2.772	2.737	0.035	0.051	0.022	18	2.87
BPC0035	9/7/1994	3.573	3.497	3.487	0.01	0.101	0.058	11	1.5
BPC0035	10/18/1994	NA	NA	NA	0.013	0.013	0.012	4	0.8
BPC0035	11/9/1994	3.207	2.912	2.9	0.012	0.044	0.022	3	0.75
BPC0035	12/7/1994	3.451	2.931	2.908	0.023	0.109	0.056	36	2.54
BPC0035	1/4/1995	4.536	4.174	4.161	0.013	0.083	0.073	10	0.9
BPC0035	2/1/1995	4.677	4.593	4.576	0.017	0.026	0.033	9	NA
BPC0035	3/1/1995	3.778	3.315	3.197	0.118	0.104	0.085	35	3.59
BPC0035	4/5/1995	4.005	3.735	3.731	0.004	0.017	0.007	9	1.74
BPC0035	5/3/1995	3.486	3.032	2.948	0.084	0.07	0.027	20	2.49
BPC0035	6/13/1995	2.937	2.47	2.433	0.037	0.079	0.235	26	1.79

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
BPC0035	7/5/1995	3.399	2.892	2.853	0.039	0.132	0.098	32	1.79
BPC0035	8/2/1995	2.692	2.273	2.246	0.027	0.047	0.042	2	1.27
BPC0035	9/13/1995	2.944	2.503	2.485	0.018	0.074	0.047	20	0.45
BPC0035	10/11/1995	3.225	2.719	2.715	0.004	0.044	0.032	4	0.67
BPC0035	11/8/1995	2.536	2.21	2.206	0.004	0.026	0.025	1	1.3
BPC0035	12/6/1995	4.558	4.284	4.276	0.008	0.035	0.019	3	1.2
BPC0035	1/18/1996	NA	NA	NA	0.04	0.044	0.051	8	1.35
BPC0035	2/7/1996	5.525	5.327	5.296	0.031	0.035	0.037	3	NA
BPC0035	3/6/1996	4.715	4.281	4.254	0.027	0.022	0.028	4	3.49
BPC0035	4/3/1996	3.992	3.56	3.539	0.021	0.047	0.019	10	2.84
BPC0035	5/8/1996	3.777	3.272	3.25	0.022	0.039	0.025	15	8.17
BPC0035	6/5/1996	5.539	4.072	3.789	0.283	0.338	0.165	150	8.22
BPC0035	7/17/1996	4.343	3.819	3.801	0.018	0.065	0.028	9	2.39
BPC0035	8/21/1996	3.323	2.837	2.82	0.017	0.057	0.023	10	1.79
BPC0035	9/18/1996	3.244	2.634	2.588	0.046	0.127	0.043	31	3.29
BPC0035	10/2/1996	3.981	3.656	3.648	0.008	0.041	0.03	4	1.57
BPC0035	11/13/1996	4.492	4.395	4.384	0.011	0.018	0.032	10	0.75
BPC0035	12/4/1996	4.255	3.826	3.802	0.024	0.071	0.045	15	1.64
BPC0035	1/8/1997	5.132	4.751	4.737	0.014	0.04	0.027	7	1.27
BPC0035	2/5/1997	4.851	3.904	3.777	0.127	0.217	0.07	82	13.46
BPC0035	3/12/1997	3.852	3.735	3.725	0.01	0.021	0.021	3	4.19
BPC0035	4/9/1997	NA	3.671	3.66	0.011	0.022	0.02	7	4.78
BPC0035	5/7/1997	NA	3.27	3.239	0.031	0.038	0.022	8	2.84
BPC0035	6/4/1997	5.049	4.404	4.194	0.21	0.111	0.049	28	5.38
BPC0035	7/9/1997	3.103	2.619	2.593	0.026	0.086	0.029	18	3.19
BPC0035	8/6/1997	2.997	2.252	2.227	0.025	0.065	0.03	15	4.19
BPC0035	9/3/1997	2.547	2.209	2.177	0.032	0.068	0.028	15	NA
BPC0035	10/8/1997	3.08	2.609	2.6	0.009	0.046	0.017	4	NA
BPC0035	11/12/1997	4.817	4.246	4.177	0.069	0.062	0.051	6	0.8
BPC0035	12/3/1997	4.398	4.021	4.018	0.003	0.031	0.017	4	0.6
BPC0035	1/21/1998	5.2	4.939	4.92	0.019	0.043	0.041	5	0.6
BPC0035	2/4/1998	4.76	4.544	4.52	0.024	0.042	0.036	5	0.87
BPC0035	3/4/1998	3.553	3.013	2.933	0.08	0.108	0.075	20	2.09
BPC0035	4/1/1998	4.203	3.568	3.563	0.005	0.041	0.032	4	12.76
BPC0035	5/13/1998	3.241	2.34	2.201	0.139	0.168	0.077	58	6.98
BPC0035	6/11/1998	4.562	4.152	4.122	0.03	0.056	0.017	8	2.39
BPC0035	7/15/1998	3.781	3.38	3.371	0.009	0.023	0.018	4	1.79
BPC0035	8/12/1998	3.142	2.156	2.082	0.074	0.175	0.035	35	4.49
BPC0035	9/9/1998	3.948	3.368	3.348	0.02	0.08	0.018	8	1.05

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
BPC0035	10/7/1998	3.746	3.471	3.466	0.005	0.031	0.006	2	1
BPC0035	11/12/1998	4.07	3.795	3.77	0.025	0.015	0.004	3.5	1.59
BPC0035	12/9/1998	3.474	3.225	3.214	0.011	0.02	0.016	4	1.87
BPC0035	1/6/1999	4.989	4.276	4.089	0.187	0.079	0.047	2.5	0.46
BPC0035	2/3/1999	4.416	3.427	3.256	0.171	0.164	0.082	35	1.2
BPC0035	3/11/1999	4.027	3.625	3.617	0.008	0.029	0.013	1.5	2.39
BPC0035	4/7/1999	3.288	2.871	2.858	0.013	0.035	0.021	3	3.89
BPC0035	5/5/1999	3.519	2.856	2.769	0.087	0.038	0.019	2	1.79
BPC0035	6/2/1999	2.727	2.018	1.977	0.041	0.061	0.029	6.5	2.19
BPC0035	7/14/1999	1.974	1.299	1.264	0.035	0.057	0.029	10	1.25
BPC0035	8/11/1999	2.007	1.547	1.497	0.05	0.052	0.02	10	0.75
BPC0035	9/15/1999	2.332	1.937	1.912	0.025	0.063	0.022	5.5	1.3
BPC0035	10/13/1999	3.01	2.428	2.42	0.008	0.067	0.047	6	0.75
BPC0035	11/9/1999	3.28	3.021	3.02	0.001	0.019	0.007	1	1.06
BPC0035	12/1/1999	3.55	3.171	3.17	0.001	0.018	0.017	2	0.5
BPC0035	1/12/2000	4.071	3.511	3.441	0.07	0.069	0.056	12	5.08
BPC0035	2/9/2000	4.835	4.602	4.565	0.037	0.031	0.019	5	0.5
BPC0035	3/8/2000	4.16	3.835	3.83	0.005	0.044	0.023	4	1.4
BPC0035	4/5/2000	3.16	2.794	2.78	0.014	0.045	0.032	4	3.44
BPC0035	5/3/2000	3.609	3.121	3.089	0.032	0.036	0.017	8	1.99
BPC0035	6/7/2000	3.747	3.261	3.217	0.044	0.061	0.015	16	1.94
BPC0035	7/6/2000	3.45	3.004	2.97	0.034	0.067	0.046	18	1.2
BPC0035	8/2/2000	3.304	2.54	2.504	0.036	0.116	0.073	29	1.12
BPC0035	9/6/2000	3.631	2.691	2.651	0.04	0.115	0.083	13	0.3
BPC0035	10/4/2000	3.902	3.448	3.442	0.006	0.035	0.025	3	0.8
BPC0035	11/1/2000	3.442	3.117	3.112	0.005	0.031	0.011	1	1.72
BPC0035	12/6/2000	4.338	4.041	4.038	0.003	0.019	0.016	4	0.52
BPC0035	1/3/2001	5.028	4.901	4.878	0.023	0.035	0.026	1	0.4
BPC0035	2/7/2001	4.881	4.348	4.241	0.107	0.09	0.067	7	0.9
BPC0035	3/14/2001	3.831	3.197	3.181	0.016	0.065	0.047	10	6.88
BPC0035	4/11/2001	3.493	3.016	3.003	0.013	0.041	0.028	8	6.58
BPC0035	5/2/2001	3.471	3.045	3.031	0.014	0.035	0.016	7	4.49
BPC0035	6/6/2001	3.38	3.055	3.04	0.015	0.042	0.015	10	2.24
BPC0035	7/18/2001	3.03	2.573	2.56	0.013	0.036	0.012	2	1.2
BPC0035	8/8/2001	2.87	2.288	2.25	0.038	0.05	0.031	7	1.64
BPC0035	9/5/2001	2.36	1.983	1.96	0.023	0.036	0.024	2	2.47
BPC0035	10/10/2001	2.86	2.457	2.45	0.007	0.013	0.012	1	0.65
BPC0035	11/7/2001	2.24	1.972	1.97	0.002	0.005	0.006	1	0.9
BPC0035	12/5/2001	2.84	2.553	2.55	0.003	0.02	0.014	2	0.82

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
BPC0035	2/6/2002	3.75	3.48	3.46	0.02	0.017	0.017	1	0.75
BPC0035	3/6/2002	3.65	3.334	3.32	0.014	0.08	0.018	2	0.9
BPC0035	4/3/2002	2.82	2.546	2.54	0.006	0.019	0.014	3	1.3
BPC0035	5/1/2002	2.59	2.018	2	0.018	0.052	0.018	8	2.84
BPC0035	6/12/2002	2.21	1.624	1.56	0.064	0.092	0.065	13	0.9
BPC0035	7/10/2002	1.083	0.541	0.473	0.068	0.084	0.053	6	0.93
BPC0035	8/7/2002	1.034	0.365	0.304	0.061	0.11	0.081	8	1.35
BPC0035	9/11/2002	1.62	1.052	1.01	0.042	0.071	0.055	5	0.7
BPC0035	10/9/2002	1.94	1.376	1.35	0.026	0.05	0.03	3	0.7
BPC0035	11/6/2002	5.293	4.811	4.783	0.028	0.118	0.092	8	2.24
BPC0035	12/4/2002	4.82	4.485	4.48	0.005	0.019	0.008	2	NA
BPC0035	1/8/2003	5.355	4.879	4.865	0.014	0.043	0.019	6	0.9
BPC0035	2/5/2003	4.9	4.148	4.01	0.138	0.073	0.084	23	3.29
BPC0035	3/5/2003	4.23	3.9	3.65	0.25	0.062	0.048	9	1.2
BPC0035	4/2/2003	2.32	1.872	1.86	0.012	0.024	0.012	2	3.14
BPC0035	5/1/2003	3.1	2.865	2.83	0.035	0.027	0.012	2	4.78
BPC0035	6/11/2003	4.44	3.695	3.66	0.035	0.06	0.036	22	0.9
BPC0035	7/2/2003	3.63	3.242	3.23	0.012	0.06	0.034	8	6.66
BPC0035	8/13/2003	3.43	2.334	2.28	0.054	0.263	0.137	73	3.59
BPC0035	9/10/2003	4.375	4.019	4.005	0.014	0.048	0.027	6	0.67
BPC0035	10/1/2003	4.53	4.018	3.99	0.028	0.054	0.041	4	1.17
BPC0035	11/12/2003	4.615	3.696	3.615	0.081	0.251	0.163	64	11.96
BPC0035	12/10/2003	3.767	3.445	3.417	0.028	0.026	0.022	4	0.82
BPC0035	1/7/2004	4.605	4.353	4.335	0.018	0.017	0.013	3	1.4
BPC0035	2/11/2004	3.931	2.927	2.497	0.43	0.241	0.159	70	2.39
BPC0035	3/10/2004	3.773	3.399	3.383	0.016	0.017	0.015	4	4.59
BPC0035	4/7/2004	3.875	3.602	3.59	0.012	0.022	0.014	4	4.34
BPC0035	5/5/2004	3.745	3.293	3.266	0.027	0.042	0.031	9	1.99
BPC0035	6/2/2004	3.55	3.1	3.073	0.027	0.058	0.044	20	2.39
BPC0035	7/14/2004	3.637	3.264	3.216	0.048	0.053	0.031	25	NA
BPC0035	8/4/2004	2.768	2.201	2.132	0.069	0.126	0.084	36	1.99
BPC0035	9/15/2004	3.583	3.233	3.212	0.021	0.07	0.036	12	1.05
BPC0035	10/6/2004	4.011	3.87	3.861	0.009	0.035	0.026	4	0.6
BPC0035	11/3/2004	3.377	2.836	2.826	0.01	0.026	0.013	1	1.79
BPC0035	12/1/2004	3.729	2.755	2.663	0.092	0.278	0.234	64	50.2
BPC0035	1/5/2005	3.936	3.695	3.657	0.038	0.059	0.045	7	0.75
BPC0035	2/9/2005	3.983	3.607	3.556	0.051	0.065	0.045	20	0.9
BPC0035	3/9/2005	3.781	3.345	3.32	0.025	0.053	0.053	20	7.48
BPC0035	4/13/2005	4.121	3.917	3.889	0.028	0.024	0.014	6	2.16

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
BPC0035	5/4/2005	3.994	3.827	3.813	0.014	0.013	0.018	5	3.19
BPC0035	6/8/2005	3.518	2.984	2.892	0.092	0.086	0.052	18	1.94
BPC0035	7/6/2005	3.905	2.756	2.662	0.094	0.196	0.058	121	8.97
BPC0035	8/3/2005	3.537	3.012	2.974	0.038	0.031	0.011	2	2.99
BPC0035	9/7/2005	3.608	3.312	3.277	0.035	0.045	0.023	4	0.9
BPC0035	10/12/2005	3.697	3.424	3.41	0.014	0.056	0.061	9	NA
BPC0035	11/9/2005	3.399	3.356	3.356	0	0.025	0.011	1	1.94
BPC0035	12/8/2005	4.595	4.274	4.266	0.008	0.025	0.024	2	0.45
BPC0035	1/4/2006	4.026	3.671	3.626	0.045	0.076	0.05	16	2.56
BPC0035	2/1/2006	3.956	3.91	3.91	0	0.04	0.021	5	1.99
BPC0035	3/1/2006	4.682	4.621	4.614	0.007	0.016	0.008	2	1.64
BPC0035	4/12/2006	3.563	3.215	3.203	0.012	0.021	0.008	7	3.63
BPC0035	5/3/2006	3.292	3.1	3.054	0.046	0.024	0.011	4	1.5
BPC0035	6/14/2006	3.048	2.795	2.754	0.041	0.032	0.019	10	1.2
BPC0035	7/5/2006	3.552	3.186	3.173	0.013	0.043	0.023	15	1.87
BPC0035	8/9/2006	2.742	2.385	2.329	0.056	0.039	0.033	6	1.28
BPC0035	9/13/2006	3.176	2.62	2.591	0.029	0.051	0.036	7	1.05
BPC0035	10/11/2006	3.016	2.731	2.722	0.009	0.039	0.029	2	0.87
BPC0035	11/8/2006	4.453	2.885	2.804	0.081	0.538	0.254	225	17.19
BPC0035	12/6/2006	4.216	4.026	4.013	0.013	0.013	0.003	3	0.75
BPC0035	1/3/2007	4.117	3.621	3.591	0.03	0.045	0.035	6	NA
BPC0035	2/7/2007	5.833	5.397	5.397	0	0.01	0.007	2	0.96
BPC0035	3/7/2007	3.993	3.774	3.739	0.035	0.038	0.022	8	NA
BPC0035	4/4/2007	3.427	3.148	3.132	0.016	0.013	0.006	2	8.52
BPC0035	5/2/2007	3.388	2.722	2.708	0.014	0.022	0.008	5	4.34
BPC0035	6/13/2007	3.362	2.866	2.849	0.017	0.026	0.014	3	1.79
BPC0035	7/18/2007	2.427	2.11	2.052	0.058	0.031	0.025	11	1.79
BPC0035	8/15/2007	2.234	1.976	1.947	0.029	0.051	0.029	12	1.28
BPC0035	9/12/2007	2.615	1.941	1.893	0.048	0.329	0.029	9	1.68
BPC0035	10/10/2007	1.818	1.455	1.435	0.02	0.032	0.016	4	2.09
BPC0035	11/1/2007	2.915	2.328	2.317	0.011	0.034	0.019	4	0.45
BPC0035	12/5/2007	4.012	3.07	3.043	0.027	0.052	0.015	8	2.09
BPC0035	1/9/2008	4.324	4.193	4.187	0.006	0.046	0.01	5	3.29
BPC0035	2/6/2008	4.671	4.232	4.215	0.017	0.043	0.025	6	1.71
BPC0035	3/12/2008	4.1	3.975	3.97	0.005	0.04	0.016	12	1.92
BPC0035	4/9/2008	3.761	3.291	3.282	0.009	0.017	0.005	3	5.38
BPC0035	5/7/2008	3.449	2.911	2.894	0.017	0.006	0.005	5	2.35
BPC0035	6/4/2008	4.109	2.105	1.91	0.195	0.336	0.075	392	11.96
BPC0035	7/2/2008	3.618	3.217	3.181	0.036	0.037	0.022	5	1.2

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
BPC0035	8/6/2008	3.207	2.812	2.788	0.024	0.087	0.014	6	1.2
BPC0035	9/10/2008	3.306	2.881	2.862	0.019	0.043	0.037	NA	0.6
BPC0035	10/15/2008	3.815	3.677	3.666	0.011	0.028	0.013	2	1.79
BPC0035	11/12/2008	3.011	2.8	2.798	0.002	0.004	0.006	0.7	1.5
BPC0035	12/10/2008	4.232	4.049	4.042	0.007	0.008	0.009	2	1.35
BPC0035	1/7/2009	4.762	3.905	3.841	0.064	0.117	0.053	90	NA
BPC0035	2/4/2009	4.241	3.743	3.739	0.004	0.045	0.008	3	1.71
BPC0035	3/11/2009	4.01	3.643	3.636	0.007	0.015	0.005	2	5.77
BPC0035	4/8/2009	3.386	3.149	3.142	0.007	0.026	0.009	3	2.02
BPC0035	5/6/2009	3.425	2.656	2.53	0.126	0.144	0.078	41	4.27
BPC0035	6/10/2009	5.418	3.914	3.64	0.274	0.142	0.053	47	4.81
BPC0035	7/8/2009	3.588	3.043	3.015	0.028	0.028	0.013	5	1.17
BPC0035	8/5/2009	2.845	2.419	2.383	0.036	0.06	0.038	12	1.92
BPC0035	9/9/2009	3.73	3.162	3.154	0.008	0.038	0.033	4	1.28
BPC0035	10/14/2009	3.089	2.872	2.861	0.011	0.015	0.011	2	0.57
BPC0035	11/12/2009	3.477	3.186	3.172	0.014	0.049	0.027	7	2.59
BPC0035	12/2/2009	4.177	3.976	3.974	0.002	0.02	0.011	2	1.28
BPC0035	1/6/2010	5.069	4.716	4.707	0.009	0.02	0.013	3	0.4
BPC0035	2/3/2010	4.671	4.204	4.203	0.001	0.014	0.009	3	1.17
BPC0035	3/10/2010	3.651	3.344	3.343	0.001	0.041	0.007	11	14.74
BPC0035	4/7/2010	3.619	3.271	3.255	0.016	0.023	0.008	8	6.84
BPC0035	5/5/2010	3.672	3.08	3.001	0.079	0.035	0.016	12	3.74
BPC0035	6/16/2010	3.363	2.78	2.73	0.05	0.048	0.024	26	2.49
BPC0035	7/7/2010	2.743	2.136	2.096	0.04	0.03	0.02	5	2.78
BPC0035	8/18/2010	3.064	2.737	2.704	0.033	0.043	0.034	11	1.22
BPC0035	9/15/2010	2.685	2.311	2.286	0.025	0.026	0.016	4	0.96
BPC0035	10/13/2010	3.718	3.336	3.322	0.014	0.022	0.015	1	0.96
BPC0035	11/9/2010	3.75	3.196	3.189	0.007	0.013	0.009	1	0.5
BPC0035	12/8/2010	4.344	4.328	4.32	0.008	0.026	0.013	1	0.64
BPC0035	3/2/2011	4.06	3.507	3.496	0.011	0.032	0.018	6	3.81
BPC0035	4/6/2011	3.14	2.866	2.862	0.004	0.017	0.003	5	7.63
BPC0035	5/11/2011	3.399	3.248	3.24	0.008	0.015	0.007	5	4.91
BPC0035	6/15/2011	3.431	3.448	3.431	0.017	0.022	0.013	5	1.92
BPC0035	7/6/2011	3.222	2.842	2.824	0.018	0.03	0.017	5	2.46
BPC0035	8/10/2011	3.047	2.732	2.71	0.022	0.042	0.025	13	2.4
BPC0035	9/7/2011	2.877	1.755	1.713	0.042	0.289	0.16	106	6.94
BPC0035	10/5/2011	3.763	3.355	3.349	0.006	0.03	0.025	5	0.96
BPC0035	11/9/2011	4.074	3.706	3.703	0.003	0.015	0.007	1	2.06
BPC0035	12/7/2011	3.895	3.801	3.79	0.011	0.026	0.016	19	1.28

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
BPC0035	1/4/2012	4.451	4.204	4.199	0.005	0.013	0.009	3	1.54
BPC0035	2/1/2012	4.452	4.021	4.014	0.007	0.026	0.015	2	3.84
BPC0035	3/7/2012	4.114	3.834	3.829	0.005	0.023	0.011	3	1.28
BPC0035	4/4/2012	3.673	3.212	3.201	0.011	0.023	0.008	3	2.14
BPC0035	5/2/2012	3.386	2.993	2.986	0.007	0.013	0.004	3	4.12
BPC0035	6/13/2012	3.673	3.18	3.138	0.042	0.076	0.011	43	24.56
BPC0035	7/11/2012	2.865	2.421	2.395	0.026	0.047	0.03	7	2.29
BPC0035	8/8/2012	2.766	2.339	2.317	0.022	0.037	0.021	6	2.14
BPC0035	9/5/2012	2.562	1.983	1.94	0.043	0.132	0.094	15	1.87
BPC0035	10/3/2012	2.879	1.628	1.593	0.035	0.293	0.128	78	7.48
BPC0035	11/7/2012	4.283	4.038	4.032	0.006	0.03	0.022	3	NA
BPC0035	12/5/2012	3.999	3.71	3.704	0.006	0.015	0.006	1	3.35
BPC0035	1/9/2013	4.263	3.479	3.473	0.006	0.014	0.01	2	0.93
BPC0035	2/6/2013	4.335	4.07	4.061	0.009	0.024	0.016	5	0.85
BPC0035	3/7/2013	3.591	2.984	2.974	0.01	0.03	0.012	6	4.06
BPC0035	4/3/2013	3.904	3.497	3.494	0.003	0.007	0.004	2	2.14
BPC0035	5/1/2013	3.366	3.004	2.974	0.03	0.016	0.007	5	2.78
BPC0035	6/12/2013	3.116	2.571	2.541	0.03	0.059	0.033	14	1.78
BPC0035	7/10/2013	2.746	2.404	2.381	0.023	0.042	0.023	6.5	1.33
BPC0035	8/7/2013	3.053	2.768	2.743	0.025	0.044	0.028	12	1.07
BPC0035	9/4/2013	2.333	1.972	1.954	0.018	0.029	0.023	3	0.85
BPC0035	10/2/2013	3.05	2.702	2.702	0	0.023	0.013	1.8	0.57
BPC0035	11/6/2013	3.085	2.823	2.818	0.005	0.021	0.012	1.8	1.07
BPC0035	12/4/2013	4.544	3.733	3.727	0.006	0.023	0.015	1.8	0.53
BPC0035	1/8/2014	4.127	3.936	3.926	0.01	0.037	0.023	4.2	1.22
BPC0035	2/6/2014	3.447	2.363	2.288	0.075	0.17	0.065	99	3.74
BPC0035	3/5/2014	4.85	4.069	4.067	0.002	0.023	0.01	4.5	1.22
BPC0035	4/2/2014	3.396	3.022	3.02	0.002	0.062	0.013	32	4.27
BPC0035	5/7/2014	3.297	3.088	3.078	0.01	0.022	0.011	8.3	2.99
BPC0035	6/11/2014	4.488	3.042	2.941	0.101	0.324	0.106	168	9.61
BPC0035	7/2/2014	3.434	3.326	3.319	0.007	0.019	0.006	5.5	5.49
BPC0035	8/13/2014	3.566	2.866	2.838	0.028	0.078	0.032	30	4.27
BPC0035	9/3/2014	3.612	3.097	3.08	0.017	0.029	0.017	5.2	1.5
BPC0035	10/1/2014	3.364	2.931	2.924	0.007	0.043	0.028	6	1.28
BPC0035	11/12/2014	3.368	3.117	3.113	0.004	0.009	0.006	2.2	0.92
BPC0035	12/3/2014	3.404	2.954	2.945	0.009	0.064	0.046	8.5	5.55
BPC0035	1/7/2015	3.975	3.532	3.524	0.008	0.025	0.014	2	1.83
BPC0035	2/4/2015	3.728	3.269	3.269	0	0.024	0.011	4.3	1.92
BPC0035	3/12/2015	2.234	1.2	1.032	0.168	0.261	0.069	92	4.81

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
BPC0035	4/1/2015	3.41	3.15	3.143	0.007	0.019	0.005	4	1.92
BPC0035	5/13/2015	2.722	2.113	2.055	0.058	0.027	0.01	5.8	2.14
BPC0035	6/10/2015	3.388	2.791	2.751	0.04	0.07	0.035	22	2.59
BPC0035	7/1/2015	3.417	2.938	2.915	0.023	0.116	0.039	38	2.14
BPC0035	8/12/2015	2.95	2.75	2.714	0.036	0.043	0.021	20	1.74
BPC0035	9/9/2015	2.378	2.052	2.027	0.025	0.029	0.019	6.7	0.85
BPC0035	10/7/2015	3.834	3.472	3.462	0.01	0.044	0.036	5.3	0.47
BPC0035	11/4/2015	3.429	3.331	3.322	0.009	0.025	0.021	2.2	0.5
BPC0035	12/2/2015	2.864	2.388	2.369	0.019	0.07	0.034	14	7.21
BPC0035	1/6/2016	4.072	4.025	4.016	0.009	0.018	0.012	4.2	0.62
BPC0035	2/3/2016	3.112	2.677	2.651	0.026	0.056	0.034	17	2
BPC0035	3/2/2016	3.545	3.355	3.345	0.01	0.027	0.016	7	0.85
BPC0035	4/6/2016	3.401	2.991	2.984	0.007	0.016	0.004	3.7	2.59
BPC0035	5/4/2016	2.853	2.386	2.29	0.096	0.081	0.034	35	4.27
BPC0035	6/1/2016	2.891	2.61	2.588	0.022	0.024	0.007	4.2	4.67
BPC0035	7/6/2016	3.029	2.718	2.692	0.026	0.042	0.021	10	1.53
BPC0035	8/3/2016	2.946	2.712	2.686	0.026	0.053	0.032	9.8	1.78
BPC0035	9/7/2016	2.732	2.445	2.424	0.021	0.033	0.025	5	0.96
BPC0035	10/5/2016	2.601	2.447	2.432	0.015	0.034	0.024	6.2	0.64
BPC0035	11/9/2016	2.554	2.351	2.348	0.003	0.014	0.008	1.5	1.28
BPC0035	12/7/2016	3.283	2.964	2.923	0.041	0.07	0.039	11	5.13
BPC0035	1/4/2017	3.341	2.989	2.962	0.027	0.089	0.034	24	15.66
BPC0035	2/1/2017	4.116	3.658	3.653	0.005	0.012	0.004	2.3	1.37
BPC0035	3/1/2017	2.995	2.824	2.818	0.006	0.024	0.009	4	5.77
BPC0035	4/5/2017	3.131	2.869	2.85	0.019	0.038	0.015	10	2.78
BPC0035	5/3/2017	2.72	2.387	2.376	0.011	0.028	0.007	9.3	5.19
BPC0035	6/7/2017	3.152	2.687	2.678	0.009	0.028	0.008	9.5	5.49
BPC0035	7/5/2017	2.38	2.154	2.118	0.036	0.039	0.026	6.3	0.64
BPC0035	8/2/2017	2.877	2.62	2.595	0.025	0.048	0.027	8	1.07
BPC0035	9/6/2017	2.525	2.311	2.276	0.035	0.042	0.022	20	1.96
BPC0035	10/4/2017	2.386	2.328	2.314	0.014	0.021	0.014	3.8	0.62
BPC0035	11/1/2017	2.684	2.329	2.306	0.023	0.062	0.041	5.5	0.64
BPC0035	12/6/2017	3.499	3.245	3.244	0.001	0.011	0.005	2.7	2.35
BPC0035	2/8/2018	3.774	2.831	2.718	0.113	0.248	0.041	235	8.54
BPC0035	3/6/2018	4.072	3.6	3.599	0.001	0.016	0.008	4	1.78
BPC0035	4/4/2018	2.977	2.438	2.425	0.013	0.038	0.008	12	10.41
BPC0035	5/2/2018	2.893	2.485	2.471	0.014	0.023	0.004	3.8	5.98
BPC0035	6/6/2018	3.828	2.922	2.862	0.06	0.143	0.079	50	2.85
BPC0035	7/11/2018	3.565	3.228	3.196	0.032	0.039	0.02	5.7	0.71

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
BPC0035	8/1/2018	3.689	3.31	3.287	0.023	0.039	0.021	13	0.64
BPC0035	9/5/2018	3.513	3.188	3.161	0.027	0.025	0.016	3.3	1.22
BPC0035	10/3/2018	3.999	3.661	3.646	0.015	0.04	0.023	8.3	0.64
BPC0035	11/7/2018	3.209	2.64	2.612	0.028	0.119	0.065	35	2.14
BPC0035	12/10/2018	4.546	4.349	4.341	0.008	0.012	0.009	1.7	0.64
MON0020	1/7/1986	3.83	3.38	3.15	0.23	0.132	0.1	0.5	0.07
MON0020	2/3/1986	3.68	3.25	3.05	0.2	0.113	0.08	3	2.02
MON0020	3/4/1986	4.14	3.68	3.5	0.18	0.057	0.06	6	0.82
MON0020	4/2/1986	3.2	2.36	2.3	0.06	0.1	0.07	1	6.14
MON0020	5/13/1986	3	2.25	2.2	0.05	0.13	0.09	9	4.04
MON0020	6/17/1986	2.55	1.46	1.4	0.06	0.301	0.176	10	6.18
MON0020	7/15/1986	2	1.544	1.5	0.044	NA	0.2	10	2.54
MON0020	8/11/1986	2.25	1.64	1.6	0.04	0.241	0.2	10	1.03
MON0020	9/9/1986	NA	NA	NA	0.028	0.149	0.134	7	0.5
MON0020	10/15/1986	3.55	2.836	2.8	0.036	0.127	0.134	0.5	0.67
MON0020	11/18/1986	3.45	2.92	2.7	0.22	0.142	0.14	3	0.25
MON0020	12/9/1986	5.2	4.608	4.3	0.308	0.128	0.12	9	1.2
MON0020	1/6/1987	4.63	4.26	4	0.26	0.089	0.084	7	0.6
MON0020	2/24/1987	2.25	1.812	1.6	0.212	0.125	0.07	0.5	2.79
MON0020	3/10/1987	3.93	3.432	3.4	0.032	0.071	0.01	12	1.79
MON0020	4/7/1987	3.45	2.548	2.4	0.148	0.196	0.106	60	6.98
MON0020	5/5/1987	3.2	2.168	2	0.168	0.214	0.08	49	13.16
MON0020	6/2/1987	3.75	3.156	3.1	0.056	0.151	0.132	11	4.09
MON0020	7/7/1987	4.2	3.372	3.3	0.072	0.223	0.118	54	5.08
MON0020	8/4/1987	6.45	5.132	5.1	0.032	0.125	0.088	12	7.08
MON0020	9/2/1987	4.25	2.892	2.8	0.092	0.232	0.3	20	1.35
MON0020	10/6/1987	3.45	2.884	2.7	0.184	0.116	0.124	8	0.8
MON0020	11/17/1987	3.95	3.352	3.2	0.152	0.107	0.168	11	1.87
MON0020	12/15/1987	4.9	4.348	4.2	0.148	0.089	0.09	6	0.46
MON0020	1/11/1988	4.95	NA	4.3	NA	0.11	0.122	0.5	0.1
MON0020	2/23/1988	4.5	3.92	3.8	0.12	0.078	0.07	6	1.35
MON0020	3/14/1988	3.9	3.48	3.4	0.08	0.102	0.062	10	6.73
MON0020	4/12/1988	3	2.276	2.2	0.076	0.094	0.08	20	8.27
MON0020	5/10/1988	3.1	2.384	2.3	0.084	NA	0.088	7	5.08
MON0020	6/7/1988	3.6	3.028	3	0.028	0.072	0.048	2	2.47
MON0020	7/6/1988	4.1	3.336	3.3	0.036	0.133	0.16	11	7.18
MON0020	8/9/1988	4.05	3.248	3.2	0.048	0.214	0.3	22	1.69
MON0020	9/7/1988	3.7	2.9	2.8	0.1	NA	0.2	11	1.1
MON0020	10/4/1988	4.1	3.452	3.4	0.052	0.186	0.3	0.5	0.82

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0020	11/15/1988	3.65	3.044	3	0.044	0.138	0.186	2	1.5
MON0020	12/6/1988	4.45	3.904	3.9	0.004	0.149	0.16	3	0.82
MON0020	1/18/1989	4.85	4.192	4.1	0.092	0.071	0.09	15	4.19
MON0020	2/14/1989	4.7	4.024	4	0.024	0.098	0.09	2	1.5
MON0020	3/8/1989	4.5	3.748	3.5	0.248	0.143	0.164	33	6.48
MON0020	4/4/1989	NA	NA	NA	0.036	NA	0.062	22	3.89
MON0020	5/1/1989	3.2	2.652	2.6	0.052	0.089	0.072	9	6.13
MON0020	6/13/1989	4.6	3.456	3.4	0.056	0.143	0.124	24	4.19
MON0020	7/11/1989	4	3.328	3.3	0.028	0.134	0.114	20	4.64
MON0020	8/15/1989	4.05	3.644	3.6	0.044	0.062	0.154	13	2.84
MON0020	9/12/1989	5.05	4.432	4.4	0.032	0.214	0.2	13	1
MON0020	10/11/1989	4.05	3.608	3.6	0.008	0.116	0.118	1	0.6
MON0020	11/14/1989	3.7	2.912	2.9	0.012	0.16	0.122	5	1.79
MON0020	12/12/1989	4.25	4.048	4	0.048	0.089	0.108	0.5	1.27
MON0020	1/9/1990	4.85	4.256	4	0.256	0.117	0.096	20	2.84
MON0020	2/6/1990	4.1	3.692	3.6	0.092	0.114	0.084	14	3.29
MON0020	3/6/1990	4.65	4.008	4	0.008	0.092	0.044	4	2.89
MON0020	4/3/1990	5.3	2.452	2.3	0.152	0.797	0.3	760	59.81
MON0020	5/15/1990	4.3	2.812	2.7	0.112	0.236	0.128	2	7.85
MON0020	6/12/1990	3.8	3.232	3.2	0.032	0.167	0.12	24	4.49
MON0020	7/17/1990	5.3	3.904	3.8	0.104	0.391	0.158	37	5.68
MON0020	8/14/1990	3.6	2.512	2.5	0.012	0.204	0.11	44	65.79
MON0020	9/11/1990	4	3.52	3.5	0.02	0.246	0.2	13	0.9
MON0020	10/16/1990	2.6	2.26	2.2	0.06	0.125	0.138	31	1.2
MON0020	11/14/1990	4.15	3.66	3.6	0.06	0.156	0.1	16	1.35
MON0020	12/11/1990	NA	NA	NA	0.056	NA	0.04	7	1.1
MON0020	1/8/1991	4.25	3.608	3.4	0.208	0.153	0.09	17	2.69
MON0020	2/6/1991	4.9	4.248	4.2	0.048	0.095	0.072	7	2.29
MON0020	3/6/1991	3.45	2.484	2.4	0.084	0.175	0.088	27	13.76
MON0020	4/3/1991	NA	3.024	3	0.024	0.134	0.046	7	3.09
MON0020	5/1/1991	3.4	2.832	2.8	0.032	NA	0.066	9	3.89
MON0020	5/29/1991	3.6	3.068	3	0.068	0.22	0.2	11	1.3
MON0020	6/12/1991	3.55	2.84	2.8	0.04	0.203	0.17	18	0.45
MON0020	7/2/1991	3.34	2.652	2.6	0.052	0.248	0.2	21	1.05
MON0020	7/31/1991	4.4	3.46	3.4	0.06	0.457	0.4	3	3.44
MON0020	8/28/1991	4.1	3.564	3.5	0.064	0.41	0.4	18	1.64
MON0020	9/25/1991	5.35	4.348	4.3	0.048	0.339	0.4	18	NA
MON0020	10/30/1991	NA	3.208	3.2	0.008	0.267	0.4	1	0.75
MON0020	11/26/1991	3.4	2.616	2.5	0.116	0.223	0.3	16	1.3

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0020	12/11/1991	5.05	4.3	4	0.3	0.212	0.2	60	3.99
MON0020	1/2/1992	4.85	4.16	4.1	0.06	0.156	0.132	9	1.79
MON0020	2/5/1992	4.25	3.736	3.7	0.036	0.118	0.092	6	2.17
MON0020	3/4/1992	4.25	3.736	3.7	0.036	0.118	0.092	6	1.94
MON0020	4/8/1992	NA	3.312	3.3	0.012	NA	0.072	11	1.2
MON0020	5/6/1992	3.1	2.516	2.5	0.016	0.134	0.096	7	2.59
MON0020	6/3/1992	4.3	3.22	3.1	0.12	0.249	0.2	16	2.24
MON0020	7/15/1992	3.7	3.128	3.1	0.028	0.223	0.2	35	0.8
MON0020	8/5/1992	3.6	2.42	2.3	0.12	0.5	0.2	60	5.48
MON0020	9/2/1992	4.05	3.324	3.3	0.024	0.273	0.2	5	1.5
MON0020	10/14/1992	3.35	2.74	2.7	0.04	0.117	0.2	21	0.9
MON0020	11/12/1992	3.85	3.616	3.6	0.016	0.128	0.09	4	0.3
MON0020	12/2/1992	NA	3.528	3.5	0.028	NA	0.066	2	NA
MON0020	1/12/1993	4	3.644	3.6	0.044	NA	0.066	12	0.6
MON0020	2/3/1993	4.6	4.022	4	0.022	0.081	0.075	4	NA
MON0020	3/3/1993	4	3.624	3.6	0.024	0.074	0.056	0.5	11.36
MON0020	4/7/1993	3.75	3.133	3.1	0.033	0.099	0.045	13	1.2
MON0020	5/5/1993	3.29	2.913	2.9	0.013	0.056	0.044	14	10.37
MON0020	6/9/1993	4.9	4.083	4	0.083	0.248	0.156	42	5.23
MON0020	7/7/1993	4.43	2.774	2.77	0.004	0.313	0.01	44	58.91
MON0020	8/4/1993	4.34	3.946	3.88	0.066	0.224	0.215	6	1.35
MON0020	9/22/1993	4.246	3.523	3.496	0.027	0.279	0.227	29	0.6
MON0020	10/6/1993	4.321	3.778	3.761	0.017	0.262	0.202	38	0.6
MON0020	11/9/1993	3.681	3.204	3.2	0.004	0.108	0.127	3	0.15
MON0020	12/1/1993	NA	NA	NA	0.043	0.096	0.1	27	1.79
MON0020	1/11/1994	4.882	4.633	4.6	0.033	0.099	0.091	3	0.45
MON0020	2/2/1994	3.86	3.415	3.3	0.115	0.119	0.083	6	1.07
MON0020	3/17/1994	2.877	2.419	2.2	0.219	0.138	0.109	48	1.2
MON0020	4/13/1994	2.898	2.49	2.445	0.045	0.101	0.059	25	4.78
MON0020	5/18/1994	1.977	1.711	1.671	0.04	0.11	0.092	6	1.89
MON0020	6/8/1994	3.82	2.817	2.797	0.02	0.182	0.086	29	62.5
MON0020	7/6/1994	3.454	1.778	1.754	0.024	0.296	0.098	64	219.79
MON0020	8/10/1994	3.66	2.38	2.36	0.02	0.228	0.09	29	13.16
MON0020	9/7/1994	3.677	2.142	2.138	0.004	0.246	0.032	80	159.99
MON0020	10/18/1994	3.586	3.19	3.17	0.02	0.203	0.172	4	3.69
MON0020	11/9/1994	2.787	2.218	2.2	0.018	0.239	0.197	3	2.02
MON0020	12/7/1994	3.057	2.073	1.994	0.079	0.315	0.168	98	4.86
MON0020	1/4/1995	3.003	2.604	2.502	0.102	0.139	0.11	14	1.35
MON0020	2/1/1995	3.907	3.736	3.7	0.036	0.09	0.073	6	NA

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0020	3/1/1995	3.794	2.887	2.644	0.243	0.275	0.164	86	13.46
MON0020	4/5/1995	3.174	2.912	2.894	0.018	0.105	0.081	8	2.99
MON0020	5/3/1995	3.436	2.832	2.764	0.068	0.193	0.12	27	5.98
MON0020	6/13/1995	3.128	2.544	2.439	0.105	0.263	0.132	37	21.83
MON0020	7/5/1995	3.657	2.908	2.875	0.033	0.275	0.191	46	5.98
MON0020	8/2/1995	2.915	1.837	1.818	0.019	0.278	0.172	27	43.06
MON0020	9/13/1995	4.398	3.473	3.438	0.035	0.3	0.234	25	2.69
MON0020	10/11/1995	3.271	2.54	2.514	0.026	0.243	0.204	14	1.3
MON0020	11/8/1995	3.314	2.808	2.804	0.004	0.183	0.148	2	0.6
MON0020	12/6/1995	3.972	3.514	3.504	0.01	0.086	0.073	2	0.82
MON0020	2/7/1996	5.022	4.762	4.652	0.11	0.105	0.093	13	0.3
MON0020	3/6/1996	3.786	3.498	3.466	0.032	0.065	0.057	2	1.21
MON0020	4/3/1996	3.509	2.512	2.28	0.232	0.248	0.088	96	4.98
MON0020	5/8/1996	2.861	1.898	1.816	0.082	0.125	0.083	11	7.48
MON0020	6/5/1996	3.995	3.063	3.001	0.062	0.239	0.107	120	6.73
MON0020	7/17/1996	3.255	2.803	2.787	0.016	0.172	0.094	37	3.18
MON0020	8/21/1996	2.746	2.287	2.275	0.012	0.103	0.036	8	2.39
MON0020	9/18/1996	2.468	1.532	1.46	0.072	0.283	0.085	100	4.49
MON0020	10/2/1996	1.11	1.053	1.042	0.011	0.105	0.09	14	2.03
MON0020	11/13/1996	3.316	2.939	2.925	0.014	0.08	0.059	11	1.37
MON0020	12/4/1996	3.247	2.655	2.481	0.174	0.178	0.124	28	3.59
MON0020	1/8/1997	3.986	3.7	3.688	0.012	0.091	0.059	8	0.92
MON0020	2/5/1997	4.135	3.473	3.406	0.067	0.072	0.039	9	6.58
MON0020	3/12/1997	2.489	2.325	2.306	0.019	0.055	0.04	6	4.91
MON0020	4/9/1997	NA	2.251	2.23	0.021	0.058	0.039	7	6.73
MON0020	5/7/1997	NA	2.605	2.586	0.019	0.098	0.054	4	5.23
MON0020	6/4/1997	3.427	2.738	2.529	0.209	0.203	0.126	20	9.14
MON0020	7/9/1997	3.951	3.109	3.081	0.028	0.244	0.132	6	5.38
MON0020	8/6/1997	3.631	2.183	2.171	0.012	0.356	0.208	32	NA
MON0020	9/3/1997	3.391	2.864	2.831	0.033	0.291	0.23	13	NA
MON0020	10/8/1997	3.23	2.717	2.7	0.017	0.303	0.272	4	NA
MON0020	11/12/1997	4.441	3.795	3.721	0.074	0.134	0.074	10	0.9
MON0020	12/3/1997	4.005	3.582	3.575	0.007	0.103	0.084	4	0.75
MON0020	1/21/1998	3.961	3.579	3.531	0.048	0.077	0.074	6	0.75
MON0020	2/4/1998	3.79	3.438	3.38	0.058	0.081	0.066	7	0.9
MON0020	3/4/1998	3.166	2.521	2.456	0.065	0.149	0.074	39	3.89
MON0020	4/1/1998	3.051	2.506	2.501	0.005	0.059	0.039	3	22.58
MON0020	5/13/1998	2.436	1.453	1.256	0.197	0.315	0.161	85	4.98
MON0020	6/10/1998	3.456	3.314	3.306	0.008	0.092	0.061	6	3.29

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0020	7/15/1998	3.692	3.109	3.102	0.007	0.123	0.08	8	3.99
MON0020	8/12/1998	4.16	2.905	2.64	0.265	0.422	0.202	41	5.55
MON0020	9/9/1998	4.552	3.998	3.972	0.026	0.288	0.057	16	1.57
MON0020	10/7/1998	4.304	3.851	3.834	0.017	0.268	0.167	7	1.05
MON0020	11/12/1998	4.15	3.726	3.72	0.006	0.191	0.07	3	1.08
MON0020	12/9/1998	3.629	3.169	3.099	0.07	0.162	0.163	7	1.64
MON0020	1/6/1999	4.164	3.152	2.854	0.298	0.406	0.236	11	2.39
MON0020	2/3/1999	4.676	3.88	3.746	0.134	0.177	0.12	30	1.94
MON0020	3/10/1999	3.46	2.92	2.91	0.01	0.074	0.057	3	2.19
MON0020	4/7/1999	2.794	2.057	2.004	0.053	0.125	0.085	17	9.27
MON0020	5/5/1999	2.623	2.126	2.093	0.033	0.109	0.073	3.5	2.84
MON0020	6/2/1999	NA	2.397	2.338	0.059	0.197	0.166	5	0.27
MON0020	7/14/1999	3.634	2.978	2.944	0.034	0.309	0.281	12	1.5
MON0020	8/11/1999	0.957	0.391	0.307	0.084	0.309	0.22	5	0.85
MON0020	9/15/1999	3.264	2.739	2.664	0.075	0.235	0.103	15	1.35
MON0020	10/13/1999	3.245	2.359	2.165	0.194	0.231	0.176	16	2.24
MON0020	11/9/1999	2.748	2.398	2.388	0.01	0.116	0.104	2	0.79
MON0020	12/1/1999	3.08	2.66	2.66	0	0.096	0.083	1	1.3
MON0020	1/12/2000	3.629	2.725	2.609	0.116	0.17	0.145	23	4.19
MON0020	2/9/2000	4.374	4.054	3.974	0.08	0.11	0.085	5	0.8
MON0020	3/8/2000	3.525	3.045	2.995	0.05	0.063	0.051	10	1.35
MON0020	4/5/2000	2.367	2.249	2.227	0.022	0.053	0.035	5	4.49
MON0020	5/3/2000	2.988	2.532	2.518	0.014	0.091	0.058	9	2.14
MON0020	6/7/2000	3.024	2.39	2.344	0.046	0.157	0.041	19	1.64
MON0020	7/6/2000	3.15	2.521	2.48	0.041	0.189	0.152	18	NA
MON0020	8/2/2000	3.207	2.197	2.087	0.11	0.306	0.232	60	2.99
MON0020	9/6/2000	3.764	2.757	2.684	0.073	0.287	0.247	19	1.5
MON0020	10/4/2000	3.942	3.361	3.342	0.019	0.156	0.106	17	0.75
MON0020	11/1/2000	3.17	2.596	2.59	0.006	0.156	0.133	1	0.8
MON0020	12/6/2000	3.661	3.066	3.051	0.015	0.215	0.166	2	1.05
MON0020	1/3/2001	4.366	3.942	3.886	0.056	0.117	0.102	1	NA
MON0020	2/7/2001	4.202	3.732	3.682	0.05	0.102	0.061	7	1.2
MON0020	3/14/2001	2.75	2.166	2.15	0.016	0.092	0.036	26	27.91
MON0020	4/11/2001	3.196	2.28	2.186	0.094	0.174	0.07	33	21.23
MON0020	5/2/2001	3.034	2.578	2.564	0.014	0.086	0.042	7	5.28
MON0020	6/6/2001	3.38	2.588	2.57	0.018	0.147	0.076	18	23.92
MON0020	7/18/2001	3.16	2.541	2.51	0.031	0.181	0.103	18	16.75
MON0020	8/8/2001	3.14	1.925	1.92	0.005	0.232	0.105	32	78.95
MON0020	9/5/2001	3.75	3.04	3	0.04	0.254	0.238	15	12.15

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0020	10/10/2001	4.28	3.809	3.8	0.009	0.193	0.169	4	0.93
MON0020	11/7/2001	3.11	2.56	2.56	0	0.249	0.202	2	0.9
MON0020	12/5/2001	3.24	2.845	2.81	0.035	0.212	0.202	3	0.5
MON0020	1/2/2002	4.24	3.67	3.59	0.08	0.16	0.151	3	0.45
MON0020	2/6/2002	4.49	3.993	3.8	0.193	0.164	0.152	1	2.56
MON0020	3/6/2002	3.08	2.507	2.43	0.077	0.148	0.108	4	5.68
MON0020	5/1/2002	2.1	1.462	1.38	0.082	0.106	0.083	6	1.11
MON0020	6/12/2002	2.11	1.524	1.48	0.044	0.212	0.186	10	1.5
MON0020	7/10/2002	1.94	1.411	1.36	0.051	0.214	0.176	6	1.64
MON0020	8/19/2002	1.554	0.923	0.874	0.049	0.27	0.258	4	4.34
MON0020	9/11/2002	2.94	2.185	2.14	0.045	0.278	0.251	9	0.96
MON0020	10/9/2002	3.7	3.073	3.05	0.023	0.267	0.243	6	0.6
MON0020	11/6/2002	4.342	3.876	3.862	0.014	0.093	0.063	8	0.6
MON0020	12/4/2002	4.065	3.691	3.675	0.016	0.068	0.044	1	0.4
MON0020	1/8/2003	4.201	3.789	3.691	0.098	0.085	0.05	10	0.9
MON0020	2/5/2003	4.31	3.808	3.72	0.088	0.071	0.048	14	2.69
MON0020	3/5/2003	3.62	2.808	2.58	0.228	0.132	0.057	13	1.83
MON0020	4/2/2003	3.01	2.59	2.57	0.02	0.062	0.038	6	3.22
MON0020	5/1/2003	2.65	2.39	2.38	0.01	0.051	0.02	7	8.82
MON0020	6/11/2003	3.29	2.659	2.63	0.029	0.099	0.057	25	1.87
MON0020	7/2/2003	3.35	2.858	2.84	0.018	0.07	0.024	11	7.18
MON0020	8/13/2003	2.92	1.874	1.81	0.064	0.266	0.151	65	5.61
MON0020	9/10/2003	3.704	3.188	3.164	0.024	0.112	0.068	12	2.99
MON0020	10/1/2003	3.746	3.123	3.076	0.047	0.122	0.087	11	0.75
MON0020	11/12/2003	3.642	3.229	3.222	0.007	0.048	0.027	2	1.35
MON0020	12/10/2003	3.498	3.085	3.048	0.037	0.052	0.03	2	1.14
MON0020	1/7/2004	3.006	2.65	2.586	0.064	0.073	0.052	10	1.79
MON0020	2/11/2004	3.282	2.447	2.13	0.317	0.225	0.156	38	2.99
MON0020	3/10/2004	3.044	2.153	2.111	0.042	0.047	0.039	10	5.08
MON0020	4/7/2004	2.86	2.521	2.51	0.011	0.027	0.02	6	6.13
MON0020	5/5/2004	2.658	1.98	1.917	0.063	0.113	0.081	27	3.59
MON0020	6/2/2004	2.849	2.396	2.372	0.024	0.105	0.048	17	2.54
MON0020	7/14/2004	2.9	2.256	2.196	0.06	0.107	0.048	27	4.49
MON0020	8/4/2004	2.837	1.754	1.609	0.145	0.437	0.274	112	2.99
MON0020	9/15/2004	2.811	2.392	2.368	0.024	0.113	0.044	12	1.31
MON0020	10/6/2004	3.211	2.953	2.932	0.021	0.095	0.068	11	NA
MON0020	11/3/2004	2.437	2.11	2.1	0.01	0.049	0.027	1	4.32
MON0020	12/1/2004	2.456	2.06	2.011	0.049	0.081	0.07	6	2.24
MON0020	1/5/2005	2.982	2.654	2.604	0.05	0.05	0.041	4	1.05

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0020	2/9/2005	3.64	3.194	3.136	0.058	0.066	0.048	8	0.9
MON0020	3/9/2005	2.887	2.521	2.485	0.036	0.032	0.022	7	9.57
MON0020	4/13/2005	3.121	2.824	2.769	0.055	0.068	0.035	6	1.94
MON0020	5/4/2005	2.708	2.296	2.273	0.023	0.037	0.02	6	2.39
MON0020	6/8/2005	3.404	2.56	2.513	0.047	0.112	0.032	10	2.56
MON0020	7/6/2005	2.827	2.035	1.961	0.074	0.186	0.041	115	6.73
MON0020	8/3/2005	3.201	2.748	2.718	0.03	0.053	0.029	4	1.5
MON0020	9/7/2005	3.225	2.788	2.757	0.031	0.078	0.052	8	0.9
MON0020	10/12/2005	3.436	2.601	2.559	0.042	0.175	0.177	11	1.5
MON0020	11/9/2005	3.42	3.238	3.231	0.007	0.057	0.037	2	0.45
MON0020	12/7/2005	3.907	3.44	3.427	0.013	0.065	0.055	3	NA
MON0020	1/4/2006	3	2.385	2.325	0.06	0.168	0.098	23	5.98
MON0020	2/1/2006	3.494	3.405	3.386	0.019	0.052	0.032	4	1.2
MON0020	3/1/2006	3.504	3.329	3.328	0.001	0.021	0.009	2	3.14
MON0020	4/12/2006	2.677	2.154	2.12	0.034	0.041	0.014	5	2.84
MON0020	5/3/2006	2.19	1.885	1.865	0.02	0.041	0.02	4	1.5
MON0020	6/14/2006	2.515	2.132	2.093	0.039	0.091	0.068	6	1
MON0020	7/5/2006	2.774	2.468	2.438	0.03	0.1	0.074	20	1.07
MON0020	8/9/2006	2.725	2.529	2.482	0.047	0.084	0.076	7	1.16
MON0020	9/13/2006	2.503	1.944	1.91	0.034	0.113	0.09	11	1.28
MON0020	10/11/2006	2.777	2.402	2.39	0.012	0.065	0.045	2	1.5
MON0020	11/8/2006	3.191	2.758	2.732	0.026	0.121	0.076	28	2.99
MON0020	12/6/2006	3.566	3.218	3.204	0.014	0.038	0.025	3	0.6
MON0020	1/3/2007	2.81	2.288	2.222	0.066	0.119	0.077	20	4.11
MON0020	2/7/2007	4.053	4.031	4.022	0.009	0.018	0.009	NA	1.64
MON0020	3/7/2007	3.485	2.974	2.83	0.144	0.061	0.043	7	1.5
MON0020	4/4/2007	2.513	2.253	2.237	0.016	0.024	0.016	4	4.27
MON0020	5/2/2007	2.584	2.205	2.172	0.033	0.049	0.034	7	3.84
MON0020	6/13/2007	2.741	2.458	2.423	0.035	0.079	0.062	10	1.2
MON0020	7/18/2007	2.537	2.214	2.164	0.05	0.047	0.046	7	2.37
MON0020	8/15/2007	2.888	2.349	2.315	0.034	0.098	0.072	7	2.8
MON0020	9/12/2007	2.93	2.486	2.436	0.05	0.098	0.075	10	1.16
MON0020	10/10/2007	3.149	2.565	2.537	0.028	0.167	0.132	7	4.11
MON0020	11/1/2007	2.62	2.047	2.032	0.015	0.097	0.07	4	0.75
MON0020	12/5/2007	3.339	2.61	2.593	0.017	0.1	0.056	14	4.19
MON0020	1/9/2008	4.247	4.128	4.114	0.014	0.056	0.038	4	1.35
MON0020	2/6/2008	4.692	3.871	3.833	0.038	0.1	0.058	10	4.49
MON0020	3/12/2008	3.482	3.095	3.084	0.011	0.06	0.04	8	2.24
MON0020	4/9/2008	2.724	2.069	2.069	0	0.031	0.002	5	6.15

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0020	5/7/2008	2.32	2.111	2.096	0.015	0.036	0.033	8	0.37
MON0020	6/4/2008	2.951	2.449	2.436	0.013	0.073	0.038	20	4.78
MON0020	7/2/2008	3.025	2.798	2.776	0.022	0.059	0.044	7	1.79
MON0020	8/6/2008	3.138	2.798	2.76	0.038	0.109	0.058	7	1.2
MON0020	9/10/2008	2.902	2.3	2.246	0.054	0.172	0.156	NA	1.28
MON0020	10/15/2008	3.326	2.963	2.944	0.019	0.039	0.023	4	1
MON0020	11/12/2008	2.598	2.14	2.137	0.003	0.023	0.022	2	0.75
MON0020	12/10/2008	3.737	3.26	3.25	0.01	0.03	0.03	2	0.97
MON0020	1/7/2009	3.745	3.272	3.253	0.019	0.068	0.062	6	NA
MON0020	2/4/2009	3.376	2.89	2.856	0.034	0.084	0.056	6	2.67
MON0020	3/11/2009	2.915	2.558	2.554	0.004	0.049	0.015	2	10.32
MON0020	4/8/2009	2.465	2.024	2	0.024	0.094	0.039	6	2.59
MON0020	5/6/2009	2.358	1.637	1.554	0.083	0.149	0.089	36	4.27
MON0020	6/10/2009	3.535	2.823	2.797	0.026	0.14	0.083	37	3.2
MON0020	7/8/2009	2.818	2.444	2.432	0.012	0.051	0.04	5	1.39
MON0020	8/5/2009	2.811	2.099	2.057	0.042	0.192	0.152	28	2.99
MON0020	9/9/2009	3.152	2.806	2.787	0.019	0.078	0.062	13	1.07
MON0020	10/14/2009	2.78	2.559	2.546	0.013	0.047	0.036	3	0.64
MON0020	11/12/2009	3.373	2.925	2.916	0.009	0.056	0.039	7	1.07
MON0020	12/2/2009	3.492	3.021	3.02	0.001	0.055	0.038	4	1.07
MON0020	1/6/2010	3.761	3.392	3.373	0.019	0.043	0.036	3	0.36
MON0020	2/3/2010	3.641	3.138	3.075	0.063	0.065	0.03	7	1
MON0020	3/10/2010	2.786	2.567	2.561	0.006	0.052	0.034	7	5.98
MON0020	4/7/2010	2.46	2.273	2.262	0.011	0.034	0.015	9	7.48
MON0020	5/5/2010	2.801	2.235	2.165	0.07	0.065	0.04	21	4.17
MON0020	6/16/2010	2.705	2.233	2.199	0.034	0.072	0.058	9	2.9
MON0020	7/7/2010	2.802	2.232	2.194	0.038	0.052	0.042	3	2.14
MON0020	8/18/2010	3.119	2.557	2.492	0.065	0.142	0.123	14	1.37
MON0020	9/15/2010	3.368	2.689	2.65	0.039	0.081	0.07	6	0.85
MON0020	10/13/2010	3.797	3.296	3.278	0.018	0.079	0.074	3	0.53
MON0020	11/9/2010	2.786	2.178	2.172	0.006	0.048	0.037	1	0.8
MON0020	12/8/2010	3.28	3.06	3.05	0.01	0.055	0.036	1	0.71
MON0020	1/5/2011	3.422	3.248	3.243	0.005	0.024	0.014	1	0.96
MON0020	2/2/2011	2.793	2.394	2.376	0.018	0.026	0.012	6	4.27
MON0020	3/2/2011	3.338	2.769	2.701	0.068	0.077	0.048	17	4.06
MON0020	4/6/2011	2.424	2.063	2.049	0.014	0.024	0.005	8	6.84
MON0020	5/11/2011	2.552	2.463	2.455	0.008	0.051	0.018	21	4.17
MON0020	6/15/2011	2.806	2.543	2.533	0.01	0.064	0.033	7	9.92
MON0020	7/6/2011	2.344	1.863	1.859	0.004	0.054	0.025	6	10.37

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0020	8/10/2011	2.852	2.449	2.421	0.028	0.067	0.049	9	5.03
MON0020	9/7/2011	2.693	1.81	1.661	0.149	0.263	0.132	99	9.34
MON0020	10/5/2011	3.37	2.625	2.611	0.014	0.087	0.074	9	0.76
MON0020	11/9/2011	3.082	2.747	2.743	0.004	0.026	0.022	2	0.96
MON0020	12/7/2011	3.274	3.094	3.08	0.014	0.037	0.028	9	0.96
MON0020	1/4/2012	3.305	3.118	3.087	0.031	0.034	0.026	3	0.75
MON0020	2/1/2012	4.68	2.848	2.836	0.012	0.037	0.024	3	2.78
MON0020	3/7/2012	3.055	2.615	2.603	0.012	0.031	0.017	3	3.3
MON0020	4/4/2012	2.255	1.935	1.929	0.006	0.025	0.009	3	5.77
MON0020	5/2/2012	2.239	1.862	1.856	0.006	0.046	0.009	6	6.19
MON0020	6/13/2012	2.133	1.809	1.784	0.025	0.071	0.033	24	2.94
MON0020	7/11/2012	2.662	2.001	1.934	0.067	0.133	0.09	13	3.42
MON0020	8/8/2012	2.693	2.155	2.135	0.02	0.086	0.064	7	1.82
MON0020	9/5/2012	2.75	2.293	2.265	0.028	0.1	0.071	16	1.71
MON0020	10/3/2012	2.687	1.713	1.649	0.064	0.264	0.128	113	9.97
MON0020	11/7/2012	NA	3.141	3.132	0.009	0.063	0.056	2	0.28
MON0020	12/5/2012	2.95	2.606	2.601	0.005	0.025	0.011	2	4.63
MON0020	1/9/2013	3.246	2.935	2.912	0.023	0.043	0.035	1	0.96
MON0020	2/6/2013	3.438	3.259	3.236	0.023	0.044	0.034	5	0.92
MON0020	3/7/2013	3.11	2.581	2.556	0.025	0.026	0.012	5	3.97
MON0020	4/3/2013	2.796	2.194	2.187	0.007	0.016	0.005	3	5.34
MON0020	5/1/2013	2.514	2.149	2.103	0.046	0.044	0.019	10	2.94
MON0020	6/12/2013	2.676	2.101	2.04	0.061	0.142	0.076	69	3.38
MON0020	7/10/2013	2.462	2.155	2.13	0.025	0.074	0.054	6	2.35
MON0020	8/7/2013	2.78	2.353	2.324	0.029	0.087	0.061	15	1.22
MON0020	9/4/2013	2.667	2.194	2.172	0.022	0.067	0.055	6.8	1.07
MON0020	10/2/2013	2.895	2.437	2.42	0.017	0.19	0.171	5.2	1.07
MON0020	11/6/2013	2.678	2.285	2.284	0.001	0.054	0.038	1.5	0.69
MON0020	12/4/2013	3.703	3.275	3.27	0.005	0.056	0.045	1.8	0.96
MON0020	1/8/2014	2.984	2.512	2.403	0.109	0.099	0.071	8	1.83
MON0020	2/6/2014	4.639	2.163	2.065	0.098	0.317	0.093	222	12.28
MON0020	3/5/2014	3.736	3.301	3.296	0.005	0.029	0.021	3.8	1.16
MON0020	4/2/2014	3.182	2.503	2.436	0.067	0.105	0.039	35	8.01
MON0020	5/7/2014	2.81	2.521	2.504	0.017	0.054	0.033	12	NA
MON0020	6/11/2014	3.178	2.472	2.33	0.142	0.199	0.118	52	4.63
MON0020	7/2/2014	2.892	2.636	2.614	0.022	0.062	0.047	5.5	2.99
MON0020	8/13/2014	2.792	2.359	2.329	0.03	0.094	0.063	20	1.83
MON0020	9/3/2014	2.802	2.438	2.417	0.021	0.08	0.06	12	1.07
MON0020	10/1/2014	3.088	2.522	2.509	0.013	0.062	0.043	8.3	1

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0020	11/12/2014	2.303	1.995	1.991	0.004	0.062	0.052	1.8	0.85
MON0020	12/3/2014	3.054	2.573	2.563	0.01	0.052	0.038	5	2.49
MON0020	1/7/2015	2.949	2.376	2.373	0.003	0.055	0.036	4	2.14
MON0020	2/4/2015	3.213	2.866	2.873	0	0.027	0.015	3.5	2.46
MON0020	3/4/2015	3.398	2.986	2.987	0	0.025	0.004	6.7	14.31
MON0020	4/1/2015	2.762	2.368	2.363	0.005	0.036	0.01	4	2.99
MON0020	5/13/2015	3.017	1.82	1.789	0.031	0.072	0.032	9.3	3.31
MON0020	6/10/2015	3.199	2.313	2.234	0.079	0.198	0.105	66	4.63
MON0020	7/1/2015	2.702	2.168	2.15	0.018	0.091	0.052	26	3.47
MON0020	9/9/2015	2.427	2.077	2.047	0.03	0.067	0.054	4.5	0.75
MON0020	10/7/2015	3.295	2.739	2.723	0.016	0.148	0.101	14	0.64
MON0020	11/4/2015	3.029	2.719	2.709	0.01	0.069	0.06	4.2	0.53
MON0020	12/2/2015	2.445	1.704	1.66	0.044	0.16	0.074	54	18.16
MON0020	1/6/2016	3.22	2.932	2.919	0.013	0.053	0.034	3.2	0.64
MON0020	2/3/2016	1.693	1.398	1.372	0.026	0.035	0.02	9.8	1.07
MON0020	3/2/2016	2.837	2.536	2.522	0.014	0.044	0.028	11	0.92
MON0020	4/6/2016	2.42	1.934	1.93	0.004	0.02	0.002	4.8	4.81
MON0020	5/4/2016	2.549	1.407	1.281	0.126	0.226	0.087	117	17.62
MON0020	6/1/2016	2.076	1.804	1.781	0.023	0.05	0.031	6.8	1.98
MON0020	7/6/2016	2.647	2.236	2.209	0.027	0.065	0.046	13	1.71
MON0020	8/3/2016	2.555	2.123	2.064	0.059	0.12	0.089	22	1.87
MON0020	9/7/2016	2.629	2.314	2.283	0.031	0.054	0.041	7.3	1.07
MON0020	10/5/2016	2.375	2.098	2.077	0.021	0.093	0.071	14	0.62
MON0020	11/9/2016	2.278	1.98	1.974	0.006	0.042	0.028	3	1.28
MON0020	12/7/2016	2.152	1.902	1.886	0.016	0.041	0.021	7	3.05
MON0020	1/4/2017	2.96	2.292	2.241	0.051	0.152	0.021	109	36.31
MON0020	2/1/2017	2.958	2.892	2.885	0.007	0.033	0.019	4.3	3.84
MON0020	3/1/2017	2.309	1.907	1.899	0.008	0.029	0.008	2.3	5.47
MON0020	4/5/2017	2.661	2.286	2.257	0.029	0.068	0.032	20	2.4
MON0020	5/3/2017	1.918	1.651	1.63	0.021	0.061	0.031	15	0.92
MON0020	6/7/2017	2.203	1.789	1.775	0.014	0.037	0.02	6	0.62
MON0020	7/5/2017	2.325	2.067	2.033	0.034	0.057	0.049	6.7	0.85
MON0020	8/2/2017	2.879	2.419	2.387	0.032	0.129	0.096	17	0.76
MON0020	9/6/2017	2.052	1.812	1.784	0.028	0.062	0.038	16	1.68
MON0020	10/4/2017	2.292	2.035	2.02	0.015	0.079	0.062	3.8	1
MON0020	11/1/2017	2.515	1.807	1.778	0.029	0.185	0.139	21	3.74
MON0020	12/6/2017	1.98	1.823	1.821	0.002	0.013	0.007	1.7	0.64
MON0020	1/3/2018	3.087	2.821	2.814	0.007	0.014	0.003	1.2	2.99
MON0020	2/7/2018	2.91	2.645	2.611	0.034	0.051	0.026	7.5	1.98

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0020	3/6/2018	2.765	2.691	2.685	0.006	0.032	0.02	5.3	1.28
MON0020	4/4/2018	2.202	1.638	1.626	0.012	0.046	0.008	14	21.79
MON0020	5/2/2018	1.697	1.384	1.374	0.01	0.029	0.01	7.7	1.71
MON0020	6/6/2018	3.157	2.333	2.286	0.047	0.123	0.067	59	1.78
MON0020	7/11/2018	3.103	2.622	2.591	0.031	0.062	0.039	7.3	1.28
MON0020	8/1/2018	2.961	2.572	2.544	0.028	0.081	0.047	24	2.14
MON0020	9/5/2018	2.816	2.348	2.319	0.029	0.062	0.044	8.8	1.2
MON0020	10/3/2018	3.026	2.761	2.751	0.01	0.063	0.041	11	0.76
MON0020	11/7/2018	NA	NA	NA	NA	NA	NA	NA	NA
MON0020	12/10/2018	3.437	3.376	3.369	0.007	0.022	0.017	1.5	0.75
MON0155	1/27/1986	NA	NA	NA	NA	0.182	NA	22	5.79
MON0155	2/19/1986	4.35	2.67	2.4	0.27	0.411	0.12	212	27.91
MON0155	3/19/1986	3.58	2.91	2.8	0.11	0.114	0.06	23	1.79
MON0155	4/15/1986	2.7	2.34	2.2	0.14	0.088	0.04	9	5.16
MON0155	5/5/1986	NA	NA	NA	0.18	0.094	0.06	5	3.79
MON0155	6/4/1986	2.25	1.676	1.4	0.276	0.19	0.159	0.5	3.44
MON0155	7/1/1986	3.2	2.25	0.95	1.3	0.392	0.35	5	2.39
MON0155	8/5/1986	3.09	1.84	0.39	1.45	0.259	0.4	9	6.28
MON0155	9/22/1986	3.17	2.52	0.27	2.25	NA	0.5	0.5	3.59
MON0155	10/21/1986	4.05	3.25	1.7	1.55	0.258	0.35	0.5	1.69
MON0155	11/19/1986	2.9	2	1.7	0.3	0.217	0.158	12	0.9
MON0155	12/15/1986	4	3.484	3.2	0.284	0.105	0.086	2	0.8
MON0155	1/12/1987	4.6	4.12	3.9	0.22	0.107	0.09	4	1.3
MON0155	2/9/1987	4.85	4.272	4.1	0.172	0.08	0.086	3	1.4
MON0155	3/2/1987	3.7	2.644	2.4	0.244	0.285	0.158	103	3.89
MON0155	4/14/1987	3.1	2.616	2.5	0.116	0.089	0.052	7	2.39
MON0155	5/12/1987	2.1	1.408	1.3	0.108	0.089	0.05	9	3.89
MON0155	6/23/1987	3.05	2.244	2.1	0.144	0.143	0.068	14	8.28
MON0155	7/29/1987	3.35	2.5	1.9	0.6	0.16	0.184	10	6.73
MON0155	8/25/1987	3.9	2.4	1.6	0.8	0.169	0.2	6	1.79
MON0155	9/22/1987	3.98	3.084	2.9	0.184	0.205	0.174	37	3.29
MON0155	10/21/1987	3.7	2.45	2.1	0.35	0.241	0.108	17	2.39
MON0155	11/24/1987	3.95	3.152	2.9	0.252	NA	0.104	9	2.39
MON0155	12/8/1987	4.65	4.008	3.8	0.208	0.116	0.098	6	0.7
MON0155	1/18/1988	5.3	NA	4.2	NA	0.148	0.126	3	1.1
MON0155	2/16/1988	4.2	3.412	3.2	0.212	NA	0.106	20	3.2
MON0155	3/7/1988	4.1	3.518	3.4	0.118	0.105	0.058	24	1.94
MON0155	4/20/1988	3.05	2.32	2.2	0.12	0.081	0.06	5	4.59
MON0155	5/16/1988	3.2	2.304	2.2	0.104	0.109	0.084	20	3.59

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0155	6/27/1988	3.7	2.744	2.6	0.144	0.183	0.09	4	36.38
MON0155	7/25/1988	3.8	2.88	2.6	0.28	0.224	0.002	38	4.34
MON0155	8/29/1988	2.95	1.896	1.6	0.296	0.287	0.2	120	4.98
MON0155	9/26/1988	3.6	2.8	2.2	0.6	0.253	NA	5	2.24
MON0155	10/24/1988	2.75	NA	2.6	NA	0.082	0.17	7	2.09
MON0155	11/29/1988	3.85	3.092	3	0.092	0.152	0.13	7	1.64
MON0155	12/13/1988	5.25	4.536	4.5	0.036	0.264	0.3	5	1.94
MON0155	1/23/1989	5.2	4.672	4.6	0.072	0.098	0.07	2	1.5
MON0155	2/21/1989	3.65	3.012	3	0.012	0.062	0.046	15	6.88
MON0155	3/27/1989	4.05	3.312	3.3	0.012	0.045	0.05	43	5.55
MON0155	4/25/1989	3	2.116	2.1	0.016	0.089	0.064	7	5.23
MON0155	5/22/1989	3.6	3.032	3	0.032	0.125	0.068	16	1.79
MON0155	6/6/1989	3.7	3.016	3	0.016	NA	0.034	26	13.36
MON0155	7/31/1989	NA	2.948	2.9	0.048	NA	0.078	9	8.37
MON0155	8/21/1989	3.15	2.6	2.5	0.1	0.089	0.2	22	7.48
MON0155	9/18/1989	3.95	3.34	3.3	0.04	0.169	0.19	7	1.1
MON0155	10/30/1989	3.35	2.712	2.6	0.112	0.08	0.07	10	3.44
MON0155	11/27/1989	4	NA	3.5	NA	0.134	NA	4	0.7
MON0155	1/22/1990	NA	NA	NA	0.116	0.114	0.094	16	7.78
MON0155	2/20/1990	4.9	3.924	3.9	0.024	0.086	0.062	6	2.19
MON0155	3/28/1990	2.95	2.604	2.6	0.004	0.078	0.034	5	7.08
MON0155	4/24/1990	2.85	NA	2.4	NA	0.07	0.042	5	6.43
MON0155	5/21/1990	3.7	3.04	3	0.04	0.135	0.076	21	8.07
MON0155	6/18/1990	3.5	3.064	3	0.064	0.046	0.166	4	8.37
MON0155	7/23/1990	4.4	3.108	3	0.108	0.353	0.3	100	8.07
MON0155	8/20/1990	3.4	2.424	2.3	0.124	0.309	0.3	122	4.98
MON0155	9/17/1990	3.35	2.756	2.7	0.056	0.238	0.18	2	2.24
MON0155	10/23/1990	2.4	2	1.9	0.1	0.262	0.14	255	2.24
MON0155	11/26/1990	3.35	3.036	3	0.036	NA	0.064	2	1.35
MON0155	12/17/1990	NA	2.736	2.6	0.136	NA	0.112	17	4.49
MON0155	1/21/1991	4.1	3.596	3.5	0.096	0.083	0.054	12	1.5
MON0155	2/6/1991	4.8	4.224	4.2	0.024	0.078	0.054	10	2.99
MON0155	3/6/1991	3.25	2.568	2.5	0.068	0.153	0.088	18	9.57
MON0155	4/3/1991	NA	2.824	2.8	0.024	0.107	0.037	2	3.21
MON0155	5/1/1991	3	2.42	2.4	0.02	NA	0.036	12	4.86
MON0155	5/29/1991	2.9	2.696	2.6	0.096	0.204	0.2	11	1.5
MON0155	6/12/1991	3.75	3.156	3.1	0.056	0.261	0.3	4	2.99
MON0155	7/2/1991	4.835	3.536	3.4	0.136	0.381	0.3	23	1.99
MON0155	7/31/1991	4.75	4.06	4	0.06	0.5	0.5	3	2.84

STATION	DATE	TN mg/L	DIN mg/L	NO23 mg/L	NH4 mg/L	TP mg/L	PO4 mg/L	TSS mg/L	CHLa µg/L
MON0155	8/28/1991	5.6	4.752	4.7	0.052	1	0.8	22	1.2
MON0155	9/25/1991	4.7	3.492	3.4	0.092	0.335	0.4	45	2.62
MON0155	10/30/1991	4.35	3.708	3.7	0.008	0.36	0.5	3	0.45
MON0155	11/26/1991	4	3.004	2.9	0.104	0.207	0.3	14	1.4
MON0155	12/11/1991	5.5	4.1	3.8	0.3	0.346	0.2	42	4.49
MON0155	1/2/1992	4.65	4.08	4	0.08	0.158	0.1	11	0.75
MON0155	2/5/1992	4.3	3.884	3.8	0.084	0.148	0.108	11	3.44
MON0155	3/4/1992	4.3	3.884	3.8	0.084	0.148	0.108	11	2.09
MON0155	4/8/1992	NA	3.216	3.2	0.016	NA	0.074	6	1.94
MON0155	5/6/1992	2.8	2.312	2.3	0.012	0.115	0.068	9	4.04
MON0155	6/3/1992	4.2	3.248	3.2	0.048	0.253	0.2	25	1.79
MON0155	7/15/1992	4.3	3.62	3.6	0.02	0.3	0.2	38	1.94
MON0155	8/5/1992	4	2.728	2.6	0.128	0.391	0.2	48	3.59
MON0155	9/2/1992	4.2	3.936	3.9	0.036	0.299	0.2	5	1.1
MON0155	10/13/1992	3.25	2.432	2.4	0.032	0.216	0.182	23	1.79
MON0155	11/12/1992	3.55	3.128	3.1	0.028	0.113	0.074	4	0.45
MON0155	12/2/1992	NA	3.236	3.2	0.036	NA	0.052	2	NA
MON0155	1/12/1993	4.05	3.66	3.6	0.06	NA	0.078	9	1.2
MON0155	2/3/1993	4.4	3.928	3.8	0.128	0.123	0.069	3	1.12
MON0155	3/3/1993	3.8	3.32	3.3	0.02	0.091	0.081	1	8.97
MON0155	4/7/1993	3.4	3.031	3	0.031	0.084	0.045	15	1
MON0155	5/5/1993	3.45	2.828	2.8	0.028	0.089	0.071	14	11.56
MON0155	6/9/1993	7.6	3.781	3.7	0.081	1.2	0.14	116	7.18
MON0155	7/7/1993	3.94	2.71	2.69	0.02	0.274	0.101	32	86.22
MON0155	8/4/1993	4.72	4.556	4.51	0.046	0.031	0.32	5	2.99
MON0155	9/22/1993	3.814	3.164	3.134	0.03	0.198	0.154	6	0.8
MON0155	10/6/1993	3.896	3.434	3.416	0.018	0.247	0.204	28	0.52
MON0155	11/9/1993	3.437	3.123	3.1	0.023	0.07	0.161	4	0.64
MON0155	12/1/1993	3.825	3.158	3.1	0.058	0.108	0.115	22	1
MON0155	1/11/1994	4.465	4.137	4.1	0.037	0.097	0.078	2	0.37
MON0155	2/2/1994	3.816	3.318	3.2	0.118	0.136	0.088	9	1.5
MON0155	3/17/1994	2.99	2.527	2.3	0.227	0.145	0.104	22	1.07
MON0155	4/13/1994	3.07	2.543	2.515	0.028	0.087	0.07	22	8.97
MON0155	5/18/1994	NA	NA	NA	0.035	0.056	0.071	2	4.34
MON0155	6/8/1994	3.216	2.672	2.657	0.015	0.18	0.1	19	49.34
MON0155	7/6/1994	4.154	2.769	2.754	0.015	0.304	0.13	35	161.48
MON0155	8/10/1994	3.894	2.806	2.794	0.012	0.332	0.203	25	67.03
MON0155	9/7/1994	2.796	2.75	2.746	0.004	0.238	0.088	40	111.39
MON0155	10/18/1994	4.402	3.864	3.85	0.014	0.268	0.234	5	5.53

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0155	11/9/1994	3.27	2.816	2.8	0.016	0.202	0.165	2	3.09
MON0155	12/7/1994	3.013	2.274	2.226	0.048	0.232	0.119	57	2.78
MON0155	1/4/1995	3.107	2.729	2.664	0.065	0.142	0.093	23	2.24
MON0155	2/1/1995	NA	3.535	3.462	0.073	0.069	0.069	6	0.82
MON0155	3/1/1995	3.084	2.306	2.12	0.186	0.202	0.148	50	8.37
MON0155	4/5/1995	3.017	2.85	2.731	0.119	0.103	0.133	12	2.49
MON0155	5/3/1995	3.384	2.822	2.748	0.074	0.191	0.126	25	6.11
MON0155	6/13/1995	3.537	3.013	2.864	0.149	0.236	0.089	22	17.54
MON0155	7/5/1995	3.583	2.931	2.897	0.034	0.227	0.157	45	5.08
MON0155	8/2/1995	3.933	2.942	2.91	0.032	0.381	0.291	20	25.42
MON0155	9/13/1995	4.769	4.084	4.044	0.04	0.517	0.426	10	3.55
MON0155	10/11/1995	4.293	3.266	3.249	0.017	0.276	0.241	5	1.58
MON0155	11/8/1995	3.165	2.569	2.46	0.109	0.192	0.161	3	1.2
MON0155	12/6/1995	3.87	3.478	3.452	0.026	0.111	0.089	1	1.05
MON0155	1/18/1996	5.315	4.867	4.722	0.145	0.152	0.144	3	1
MON0155	2/7/1996	4.663	4.346	4.272	0.074	0.099	0.077	7	NA
MON0155	3/6/1996	3.448	3.172	3.138	0.034	0.09	0.054	2	2.89
MON0155	4/3/1996	3.398	2.718	2.508	0.21	0.159	0.07	36	4.78
MON0155	5/8/1996	2.442	1.859	1.804	0.055	0.098	0.064	21	11.36
MON0155	6/5/1996	3.299	2.761	2.719	0.042	0.136	0.064	32	5.23
MON0155	7/17/1996	3.382	2.658	2.642	0.016	0.161	0.096	27	3.55
MON0155	8/21/1996	2.822	2.46	2.436	0.024	0.112	0.046	9	2.79
MON0155	9/18/1996	2.481	1.58	1.509	0.071	0.255	0.086	62	3.74
MON0155	10/2/1996	3.51	2.898	2.881	0.017	0.139	0.085	15	1.84
MON0155	11/13/1996	3.189	2.772	2.74	0.032	0.093	0.063	11	1.35
MON0155	12/4/1996	3.137	2.546	2.469	0.077	0.165	0.126	24	0.3
MON0155	1/8/1997	3.984	3.617	3.582	0.035	0.109	0.063	12	0.92
MON0155	2/5/1997	3.164	2.648	2.549	0.099	0.142	0.058	19	5.08
MON0155	3/12/1997	2.413	2.371	2.332	0.039	0.059	0.049	6	5.83
MON0155	4/9/1997	NA	2.379	2.323	0.056	0.073	0.05	12	7.33
MON0155	5/7/1997	NA	2.765	2.727	0.038	0.138	0.083	8	5.08
MON0155	6/4/1997	3.076	2.136	1.932	0.204	0.22	0.109	56	10.28
MON0155	7/9/1997	4.039	2.999	2.969	0.03	0.364	0.218	15	9.87
MON0155	8/6/1997	3.729	2.668	2.649	0.019	0.35	0.265	17	31.4
MON0155	9/3/1997	4.225	3.492	3.465	0.027	0.507	0.444	4	NA
MON0155	10/8/1997	3.76	3.222	3.2	0.022	0.373	0.349	6	NA
MON0155	11/12/1997	5.021	4.144	4.051	0.093	0.135	0.101	7	0.45
MON0155	12/3/1997	4.242	3.497	3.492	0.005	0.149	0.118	5	0.9
MON0155	1/21/1998	4.166	3.639	3.566	0.073	0.126	0.115	6	0.6

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0155	2/4/1998	3.33	3.001	2.95	0.051	0.108	0.092	9	1.05
MON0155	3/4/1998	2.668	1.997	1.908	0.089	0.157	0.101	38	2.99
MON0155	4/1/1998	2.915	2.322	2.315	0.007	0.1	0.081	5	9.22
MON0155	5/13/1998	2.281	1.391	1.211	0.18	0.257	0.146	63	6.98
MON0155	6/10/1998	3.028	2.589	2.498	0.091	0.113	0.074	7	3.89
MON0155	7/15/1998	4.324	3.275	3.264	0.011	0.213	0.123	10	5.98
MON0155	8/12/1998	3.664	2.298	2.124	0.174	0.434	0.279	60	5.73
MON0155	9/9/1998	4.208	3.427	3.398	0.029	0.269	0.117	9	2.39
MON0155	10/7/1998	4.617	3.949	3.927	0.022	0.287	0.146	16	2.49
MON0155	11/12/1998	5.12	4.096	3.95	0.146	0.374	0.101	8	1.5
MON0155	12/9/1998	3.937	3.497	3.407	0.09	0.276	0.275	11	3.29
MON0155	1/6/1999	4.601	3.748	3.431	0.317	0.386	0.182	10	4.49
MON0155	2/3/1999	5.133	4.097	3.903	0.194	0.207	0.133	49	1.92
MON0155	3/10/1999	3.63	3.027	3.01	0.017	0.081	0.064	2	2.29
MON0155	4/7/1999	2.809	2.117	2.069	0.048	0.128	0.087	11	7.69
MON0155	5/5/1999	2.659	2.071	2.039	0.032	0.143	0.113	7.5	3.59
MON0155	6/2/1999	3.727	3.063	2.997	0.066	0.338	0.176	7.5	1.27
MON0155	7/14/1999	3.618	3.041	2.968	0.073	0.459	0.414	3	3.69
MON0155	8/11/1999	1.279	0.464	0.419	0.045	0.565	0.351	4	0.65
MON0155	9/15/1999	1.646	0.915	0.846	0.069	0.478	0.383	13	1.65
MON0155	10/13/1999	4.49	3.601	3.56	0.041	0.21	0.163	11	2.84
MON0155	11/9/1999	3.213	2.685	2.683	0.002	0.173	0.164	4	1.23
MON0155	12/1/1999	3.05	2.403	2.4	0.003	0.146	0.123	3	2.16
MON0155	1/12/2000	3.586	2.656	2.546	0.11	0.295	0.173	33	3.59
MON0155	2/9/2000	3.129	2.896	2.869	0.027	0.076	0.059	5	1.1
MON0155	3/8/2000	3.452	2.957	2.932	0.025	0.082	0.066	13	1.94
MON0155	4/5/2000	2.472	2.243	2.132	0.111	0.075	0.065	7	4.86
MON0155	5/3/2000	2.965	2.354	2.335	0.019	0.111	0.068	7	3.44
MON0155	6/7/2000	2.8	NA	2.09	NA	0.015	0.069	20	2.99
MON0155	7/6/2000	3.146	2.36	2.256	0.104	0.209	0.168	20	4.19
MON0155	8/2/2000	4.111	2.084	2.021	0.063	0.508	0.151	217	7.48
MON0155	9/6/2000	4.137	3.053	2.977	0.076	0.311	0.249	23	2.69
MON0155	10/4/2000	3.68	3.129	3.11	0.019	0.157	0.124	11	2.24
MON0155	11/1/2000	3.364	2.808	2.794	0.014	0.231	0.2	1	1.59
MON0155	12/6/2000	4.072	3.44	3.412	0.028	0.242	0.231	1	1.35
MON0155	1/3/2001	4.813	4.302	4.223	0.079	0.184	0.165	1	0.6
MON0155	2/7/2001	4.272	3.697	3.632	0.065	0.102	0.078	5	1.79
MON0155	3/14/2001	2.696	1.949	1.906	0.043	0.126	0.067	29	17.44
MON0155	4/11/2001	2.73	2.012	1.96	0.052	0.116	0.051	21	12.26

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0155	5/2/2001	3.136	2.534	2.496	0.038	0.119	0.06	8	5.08
MON0155	6/6/2001	3.57	2.796	2.78	0.016	0.208	0.134	18	14.05
MON0155	7/18/2001	4.2	3.317	3.29	0.027	0.392	0.303	10	16.6
MON0155	8/8/2001	4.65	3.669	3.66	0.009	0.479	0.381	20	45.75
MON0155	9/5/2001	4.85	3.994	3.96	0.034	0.504	0.479	12	8.41
MON0155	10/10/2001	5.08	4.527	4.51	0.017	0.463	0.406	8	2.8
MON0155	11/7/2001	3.78	3.11	3.08	0.03	0.439	0.361	6	1.94
MON0155	12/5/2001	3.8	3.189	3.08	0.109	0.384	0.362	4	1.3
MON0155	1/2/2002	4.98	4.291	3.84	0.451	0.28	0.277	2	0.7
MON0155	2/6/2002	4.65	4.261	3.62	0.641	0.258	0.213	1	2.59
MON0155	3/6/2002	3.89	3.099	2.74	0.359	0.225	0.202	6	2.99
MON0155	4/3/2002	2.81	2.174	1.93	0.244	0.13	0.102	6	3.29
MON0155	5/1/2002	1.94	1.402	1.22	0.182	0.129	0.081	7	1.99
MON0155	6/12/2002	1.77	1.255	1.21	0.045	0.23	0.225	3	0.5
MON0155	7/10/2002	2.41	1.436	1.43	0.006	0.417	0.309	3	1.3
MON0155	8/7/2002	1.83	1.17	1.11	0.06	0.402	0.387	2	1.2
MON0155	9/11/2002	2.56	1.628	1.5	0.128	0.621	0.55	20	4.19
MON0155	10/9/2002	3.55	2.732	2.69	0.042	0.4	0.391	4	0.93
MON0155	11/6/2002	3.086	2.505	2.476	0.029	0.098	0.071	10	1.94
MON0155	12/4/2002	4.244	3.89	3.884	0.006	0.071	0.051	2	0.4
MON0155	1/8/2003	3.806	3.373	3.306	0.067	0.082	0.042	8	0.9
MON0155	2/5/2003	4.19	3.297	3.1	0.197	0.166	0.147	38	3.49
MON0155	3/5/2003	3.67	3.096	2.83	0.266	0.142	0.071	12	1.5
MON0155	4/2/2003	2.43	2.082	2.05	0.032	0.084	0.064	6	3.29
MON0155	5/1/2003	2.39	2.047	2.02	0.027	0.088	0.046	11	6.58
MON0155	6/11/2003	2.66	2.125	2.1	0.025	0.094	0.057	20	NA
MON0155	7/2/2003	2.79	2.058	2.03	0.028	0.126	0.073	13	5.98
MON0155	8/13/2003	3.22	2.017	1.94	0.077	0.298	0.138	70	5.98
MON0155	9/10/2003	3.254	2.7	2.664	0.036	0.14	0.084	11	6.58
MON0155	10/1/2003	3.916	3.233	3.186	0.047	0.119	0.096	8	0.6
MON0155	11/12/2003	3.659	3.134	3.109	0.025	0.085	0.053	5	1.82
MON0155	12/10/2003	3.078	2.816	2.778	0.038	0.062	0.037	2	1.5
MON0155	1/7/2004	3.033	2.663	2.613	0.05	0.065	0.047	7	1.79
MON0155	2/11/2004	3.276	2.36	1.986	0.374	0.238	0.182	34	1.79
MON0155	3/10/2004	2.321	2.041	2.013	0.028	0.046	0.043	10	3.89
MON0155	4/7/2004	2.645	2.263	2.247	0.016	0.036	0.024	7	4.78
MON0155	5/5/2004	2.776	2.18	2.136	0.044	0.105	0.081	21	2.99
MON0155	6/2/2004	3.02	2.41	2.376	0.034	0.102	0.058	24	2.09
MON0155	7/14/2004	2.473	1.824	1.75	0.074	0.104	0.024	44	9.97

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0155	8/4/2004	2.673	1.663	1.556	0.107	0.34	0.216	77	3.36
MON0155	9/15/2004	3.58	2.885	2.834	0.051	0.133	0.066	13	0.93
MON0155	10/6/2004	3.058	2.78	2.738	0.042	0.124	0.095	17	0.9
MON0155	11/3/2004	2.332	1.908	1.894	0.014	0.074	0.048	2	2.09
MON0155	12/1/2004	2.087	1.511	1.48	0.031	0.087	0.067	15	2.99
MON0155	1/5/2005	3.248	2.839	2.766	0.073	0.064	0.052	5	1.33
MON0155	2/9/2005	3.268	2.756	2.702	0.054	0.057	0.043	9	0.85
MON0155	3/9/2005	2.928	2.473	2.458	0.015	0.047	0.035	18	8.67
MON0155	4/13/2005	2.887	2.708	2.676	0.032	0.051	0.015	6	1.94
MON0155	5/4/2005	2.781	2.399	2.365	0.034	0.039	0.022	7	4.19
MON0155	6/8/2005	2.931	2.334	2.276	0.058	0.099	0.044	12	2.56
MON0155	7/6/2005	2.488	1.777	1.712	0.065	0.092	0.026	18	5.38
MON0155	8/3/2005	3.064	2.678	2.642	0.036	0.064	0.034	4	2.09
MON0155	9/7/2005	3.248	2.779	2.746	0.033	0.104	0.069	3	1.5
MON0155	10/12/2005	3.426	2.805	2.767	0.038	NA	NA	11	1.12
MON0155	11/9/2005	3.147	3.255	3.248	0.007	0.062	0.035	3	2.99
MON0155	12/8/2005	3.669	3.341	3.293	0.048	0.101	0.081	11	NA
MON0155	1/4/2006	3.029	2.532	2.483	0.049	0.136	0.081	29	4.49
MON0155	2/1/2006	3.207	3.147	3.129	0.018	0.053	0.029	7	1.5
MON0155	3/1/2006	3.55	3.299	3.28	0.019	0.05	0.029	4	4.34
MON0155	4/12/2006	2.555	2.05	2.013	0.037	0.036	0.011	6	5.38
MON0155	5/3/2006	2.15	1.758	1.736	0.022	0.042	0.019	4	2.56
MON0155	6/14/2006	2.272	1.895	1.844	0.051	0.11	0.089	3	1.94
MON0155	7/5/2006	2.403	1.924	1.901	0.023	0.1	0.046	29	4.91
MON0155	8/9/2006	2.533	2.246	2.166	0.08	0.095	0.079	5	1.07
MON0155	9/13/2006	2.361	1.82	1.786	0.034	0.106	0.073	12	3.63
MON0155	10/11/2006	2.766	2.319	2.3	0.019	0.137	0.107	5	4.49
MON0155	11/8/2006	1.525	0.636	0.611	0.025	0.164	0.064	92	2.24
MON0155	12/6/2006	3.383	3.035	3.004	0.031	0.084	0.061	4	0.9
MON0155	1/3/2007	2.785	2.38	2.325	0.055	0.087	0.058	16	2.99
MON0155	2/7/2007	4.01	3.927	3.83	0.097	0.019	0.013	2	1.69
MON0155	3/7/2007	3.199	2.578	2.473	0.105	0.102	0.044	11	1.2
MON0155	4/4/2007	2.369	2.062	2.037	0.025	0.029	0.015	5	4.49
MON0155	5/2/2007	2.447	1.97	1.914	0.056	0.046	0.027	8	5.68
MON0155	6/13/2007	2.746	2.333	2.294	0.039	0.109	0.089	5	3.18
MON0155	7/18/2007	2.586	2.167	2.099	0.068	0.067	0.058	2	1.79
MON0155	8/15/2007	2.32	1.896	1.852	0.044	0.102	0.082	4	2.09
MON0155	9/12/2007	3.342	2.642	2.563	0.079	0.121	0.096	7	1.28
MON0155	10/10/2007	2.673	2.125	2.085	0.04	0.11	0.079	7	1.79

STATION	DATE	TN mg/L	DIN mg/L	NO23 mg/L	NH4 mg/L	TP mg/L	PO4 mg/L	TSS mg/L	CHLa µg/L
MON0155	11/1/2007	2.56	2.107	2.071	0.036	0.115	0.092	5	0.3
MON0155	12/5/2007	3.084	2.361	2.321	0.04	0.114	0.066	13	3.89
MON0155	1/9/2008	4.212	3.932	3.912	0.02	0.072	0.047	5	1.35
MON0155	2/6/2008	3.931	3.638	3.593	0.045	0.088	0.052	12	4.49
MON0155	3/12/2008	3.217	2.906	2.882	0.024	0.061	0.035	11	2.62
MON0155	4/9/2008	2.751	1.946	1.939	0.007	0.027	0.003	4	9.97
MON0155	5/7/2008	2.693	1.87	1.852	0.018	0.031	0.024	8	2.99
MON0155	6/4/2008	2.566	2.076	2.059	0.017	0.103	0.034	57	10.47
MON0155	7/2/2008	2.922	2.52	2.484	0.036	0.067	0.033	7	NA
MON0155	8/6/2008	2.962	2.449	2.385	0.064	0.096	0.076	14	2.35
MON0155	9/10/2008	2.814	2.276	2.216	0.06	0.139	0.133	NA	1.05
MON0155	10/15/2008	3.293	2.89	2.859	0.031	0.04	0.022	5	0.9
MON0155	11/12/2008	2.509	2.088	2.075	0.013	0.024	0.021	2	2.14
MON0155	12/10/2008	3.622	3.12	3.089	0.031	0.043	0.034	3	1.5
MON0155	1/7/2009	3.605	3.175	3.156	0.019	0.064	0.053	8	NA
MON0155	2/4/2009	3.19	2.835	2.811	0.024	0.083	0.056	6	3.2
MON0155	3/11/2009	2.854	2.499	2.481	0.018	0.049	0.025	3	9.61
MON0155	4/8/2009	2.25	1.91	1.89	0.02	0.051	0.033	6	3.34
MON0155	5/6/2009	2.35	1.659	1.588	0.071	0.135	0.07	43	4.27
MON0155	6/10/2009	3.129	2.358	2.328	0.03	0.134	0.05	52	24.83
MON0155	7/8/2009	2.667	2.275	2.246	0.029	0.07	0.056	4	1.28
MON0155	8/5/2009	2.611	1.863	1.809	0.054	0.155	0.12	17	1.22
MON0155	9/9/2009	3.446	2.711	2.669	0.042	0.097	0.075	6	1.5
MON0155	10/14/2009	2.963	2.493	2.472	0.021	0.061	0.041	3	2.35
MON0155	11/12/2009	2.758	2.345	2.335	0.01	0.055	0.033	5	4.27
MON0155	12/2/2009	3.24	2.866	2.856	0.01	0.049	0.032	6	1.28
MON0155	1/6/2010	3.695	3.271	3.25	0.021	0.038	0.033	3	0.53
MON0155	2/3/2010	3.484	2.995	2.976	0.019	0.043	0.028	7	0.96
MON0155	3/10/2010	2.692	2.475	2.47	0.005	0.039	0.032	6	6.41
MON0155	4/7/2010	3.279	2.117	2.11	0.007	0.064	0.014	17	12.39
MON0155	5/5/2010	2.479	1.961	1.895	0.066	0.067	0.035	8	4.17
MON0155	6/16/2010	2.477	2.052	1.997	0.055	0.078	0.057	13	3.36
MON0155	7/7/2010	2.332	1.896	1.828	0.068	0.13	0.114	6	1.71
MON0155	8/18/2010	2.792	2.313	2.237	0.076	0.138	0.115	19	1.22
MON0155	9/15/2010	2.953	2.32	2.275	0.045	0.105	0.082	8	2.97
MON0155	10/13/2010	3.562	2.962	2.931	0.031	0.083	0.076	2	NA
MON0155	11/9/2010	2.72	2.117	2.108	0.009	0.057	0.044	2	0.53
MON0155	12/8/2010	3.392	2.975	2.948	0.027	0.045	0.036	2	0.93
MON0155	1/5/2011	3.493	3.107	3.093	0.014	0.033	0.02	1.3	0.64

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0155	2/2/2011	3.656	3.066	2.985	0.081	0.067	0.046	16	6.23
MON0155	3/2/2011	3.145	2.605	2.559	0.046	0.063	0.039	14	3.63
MON0155	4/6/2011	2.267	1.942	1.935	0.007	0.029	0.008	13	7.9
MON0155	5/11/2011	2.188	2.115	2.106	0.009	0.033	0.021	7	4.17
MON0155	6/15/2011	2.753	2.269	2.245	0.024	0.08	0.03	24	11.32
MON0155	7/6/2011	1.936	1.386	1.368	0.018	0.068	0.026	8	14.19
MON0155	8/10/2011	2.708	2.274	2.243	0.031	0.072	0.054	9	5.8
MON0155	9/7/2011	2.985	2.114	1.885	0.229	0.212	0.118	60	12.02
MON0155	10/5/2011	3.078	2.5	2.481	0.019	0.08	0.063	7	1.07
MON0155	11/9/2011	2.909	2.526	2.517	0.009	0.027	0.02	2	1.21
MON0155	12/7/2011	2.842	2.748	2.733	0.015	0.039	0.027	6	0.75
MON0155	1/4/2012	3.226	2.952	2.941	0.011	0.039	0.028	4	1.01
MON0155	2/1/2012	2.997	2.709	2.702	0.007	0.043	0.024	4	4.27
MON0155	3/7/2012	2.898	2.461	2.451	0.01	0.036	0.017	0.8	4.14
MON0155	4/4/2012	2.094	1.708	1.696	0.012	0.025	0.011	3	4.17
MON0155	5/2/2012	2.272	1.759	1.725	0.034	0.033	0.014	4	3.74
MON0155	6/13/2012	1.997	1.474	1.44	0.034	0.089	0.032	34	8.54
MON0155	7/11/2012	2.476	1.938	1.873	0.065	0.099	0.061	7	5.1
MON0155	8/8/2012	2.253	1.734	1.698	0.036	0.097	0.073	5	1.34
MON0155	9/5/2012	1.875	1.321	1.288	0.033	0.16	0.09	58	3.56
MON0155	10/3/2012	2.456	1.562	1.523	0.039	0.157	0.128	102	8.01
MON0155	11/7/2012	NA	2.9	2.872	0.028	0.07	0.06	4	0.53
MON0155	12/5/2012	2.974	2.442	2.434	0.008	0.034	0.017	1	6.48
MON0155	1/9/2013	2.886	2.707	2.691	0.016	0.045	0.037	2	0.93
MON0155	2/6/2013	3.213	2.972	2.952	0.02	0.043	0.031	6	0.92
MON0155	3/7/2013	2.918	2.399	2.388	0.011	0.029	0.012	6	5.46
MON0155	4/3/2013	2.411	2.034	2.029	0.005	0.015	0.006	3	5.34
MON0155	5/1/2013	2.213	1.85	1.799	0.051	0.035	0.016	9	5.55
MON0155	6/12/2013	2.169	1.683	1.618	0.065	0.129	0.073	33	6.19
MON0155	7/10/2013	2.094	1.698	1.644	0.054	0.083	0.053	9	3.2
MON0155	8/7/2013	2.603	2.058	2.008	0.05	0.089	0.069	8.3	2.35
MON0155	9/4/2013	2.425	1.843	1.79	0.053	0.071	0.057	4.9	1.25
MON0155	10/2/2013	2.451	2.116	2.093	0.023	0.039	0.025	5.6	1.71
MON0155	11/6/2013	2.434	2.036	2.03	0.006	0.05	0.035	2	2.99
MON0155	12/4/2013	3.454	2.91	2.89	0.02	0.059	0.043	2.9	1.17
MON0155	1/14/2014	3.263	2.821	2.796	0.025	0.098	0.06	15	1.87
MON0155	2/6/2014	3.76	2.05	1.968	0.082	0.235	0.072	154	10.68
MON0155	3/5/2014	3.323	2.971	2.963	0.008	0.027	0.019	4.7	1.28
MON0155	4/2/2014	2.761	2.223	2.222	0.001	0.075	0.017	25	4.27

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0155	5/7/2014	2.348	2.131	2.11	0.021	0.043	0.021	10	3.05
MON0155	6/11/2014	2.488	1.972	1.928	0.044	0.121	0.055	68	3.92
MON0155	7/2/2014	2.583	2.328	2.303	0.025	0.053	0.03	7.3	4.27
MON0155	8/13/2014	2.511	2.031	1.986	0.045	0.078	0.034	19	7.02
MON0155	9/3/2014	2.116	1.594	1.56	0.034	0.064	0.025	11	7.26
MON0155	10/1/2014	2.784	2.236	2.209	0.027	0.062	0.038	7.2	1.5
MON0155	11/12/2014	2.28	1.888	1.889	-0.001	0.078	0.063	1.5	2.56
MON0155	12/3/2014	2.385	2.005	1.972	0.033	0.034	0.025	3.7	2.14
MON0155	1/7/2015	2.864	2.347	2.333	0.014	0.055	0.03	4.8	1.98
MON0155	2/4/2015	3.096	2.757	2.756	0.001	0.026	0.018	3.5	1.6
MON0155	3/4/2015	3.039	2.702	2.693	0.009	0.025	0.013	4.8	5.34
MON0155	4/1/2015	2.616	2.237	2.227	0.01	0.027	0.011	5	3.42
MON0155	5/13/2015	2.25	1.682	1.641	0.041	0.058	0.025	5.3	2.46
MON0155	6/10/2015	2.81	1.953	1.862	0.091	0.161	0.092	45	3.92
MON0155	7/1/2015	2.456	1.904	1.875	0.029	0.09	0.043	29	4.81
MON0155	8/12/2015	2.641	2.194	2.151	0.043	0.059	0.042	5.2	1.6
MON0155	9/9/2015	2.31	1.92	1.884	0.036	0.052	0.045	2.5	0.93
MON0155	10/7/2015	3.253	2.646	2.626	0.02	0.111	0.091	9.7	1.07
MON0155	11/4/2015	2.636	2.429	2.408	0.021	0.07	0.059	2.9	0.67
MON0155	12/2/2015	2.483	1.761	1.721	0.04	0.141	0.076	35	14.68
MON0155	1/6/2016	2.93	2.739	2.71	0.029	0.051	0.042	2.8	0.85
MON0155	2/3/2016	1.917	1.602	1.579	0.023	0.037	0.023	12	0.8
MON0155	3/2/2016	2.787	2.441	2.415	0.026	0.052	0.028	17	0.76
MON0155	4/6/2016	2.317	1.869	1.863	0.006	0.019	0.003	4	6.41
MON0155	5/4/2016	2.151	1.294	1.2	0.094	0.148	0.059	58	11.21
MON0155	6/1/2016	2.203	1.794	1.758	0.036	0.051	0.029	5.8	2.03
MON0155	7/6/2016	2.421	2.068	2.03	0.038	0.054	0.035	9.5	3.84
MON0155	8/3/2016	2.504	2.062	2.007	0.055	0.099	0.08	12	2.35
MON0155	9/7/2016	2.524	2.14	2.078	0.062	0.05	0.034	4.8	0.85
MON0155	10/5/2016	2.293	1.964	1.935	0.029	0.088	0.071	6.3	1.26
MON0155	11/9/2016	2.231	1.93	1.92	0.01	0.028	0.016	2	0.96
MON0155	12/7/2016	1.873	1.57	1.488	0.082	0.046	0.021	9.7	3.63
MON0155	1/4/2017	2.863	2.224	2.15	0.074	0.145	0.043	83	21
MON0155	2/1/2017	2.725	2.688	2.671	0.017	0.03	0.016	3.7	6.51
MON0155	3/1/2017	2.224	1.915	1.895	0.02	0.029	0.009	2	4.45
MON0155	4/5/2017	2.418	2.082	2.044	0.038	0.057	0.028	14	2.85
MON0155	5/3/2017	1.903	1.588	1.57	0.018	0.043	0.021	7	1.31
MON0155	6/7/2017	2.171	1.796	1.745	0.051	0.044	0.023	9.2	1.68
MON0155	7/5/2017	2.318	2.02	1.956	0.064	0.058	0.044	12	1.28

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0155	8/2/2017	2.791	2.413	2.382	0.031	0.113	0.086	8.8	1.53
MON0155	9/6/2017	1.708	1.346	1.305	0.041	0.053	0.028	14	1.07
MON0155	10/4/2017	2.102	1.858	1.836	0.022	0.068	0.049	2.5	0.78
MON0155	11/1/2017	2.531	1.905	1.875	0.03	0.171	0.129	16	3.2
MON0155	12/6/2017	1.772	1.558	1.552	0.006	0.018	0.009	2.5	1.39
MON0155	1/3/2018	2.893	2.726	2.719	0.007	0.017	0.004	2	3.34
MON0155	2/7/2018	2.886	2.589	2.559	0.03	0.042	0.025	7.3	1.83
MON0155	3/6/2018	2.689	2.566	2.561	0.005	0.031	0.018	5.1	2.24
MON0155	4/4/2018	2.157	1.665	1.651	0.014	0.039	0.008	11	13.46
MON0155	5/2/2018	1.708	1.35	1.339	0.011	0.029	0.006	10	6.26
MON0155	6/6/2018	2.957	2.255	2.219	0.036	0.108	0.057	54	3.2
MON0155	7/11/2018	3.147	2.569	2.526	0.043	0.069	0.042	6.7	1.82
MON0155	8/1/2018	2.509	2.16	2.12	0.04	0.076	0.037	22	4.27
MON0155	9/5/2018	2.652	2.227	2.185	0.042	0.061	0.039	9.2	0.89
MON0155	10/3/2018	2.851	2.752	2.736	0.016	0.073	0.036	11	0.92
MON0155	11/7/2018	2.265	1.563	1.55	0.013	0.205	0.115	58	3.74
MON0155	12/10/2018	3.298	3.232	3.22	0.012	0.024	0.017	2.3	1.39
MON0269	1/27/1986	3.9	3	2.8	0.2	0.145	0.09	32	10.18
MON0269	2/19/1986	4.15	2.64	2.4	0.24	0.374	0.11	161	19.81
MON0269	3/19/1986	3.2	2.83	2.8	0.03	0.07	0.04	13	1.3
MON0269	4/15/1986	2.35	2.03	2	0.03	0.041	0.01	6	5.91
MON0269	5/5/1986	NA	NA	NA	0.03	0.053	0.03	2	1.05
MON0269	6/4/1986	1.93	1.428	1.4	0.028	0.097	0.077	7	2.39
MON0269	7/1/1986	1.47	0.826	0.77	0.056	0.096	0.068	11	3.14
MON0269	8/5/1986	1.65	0.956	0.9	0.056	0.099	0.093	10	0.67
MON0269	9/22/1986	1.65	1.236	1.2	0.036	0.078	0.064	3	1.2
MON0269	10/21/1986	2.48	1.918	1.9	0.018	0.077	0.09	0.5	0.15
MON0269	11/19/1986	3.3	2.625	2.6	0.025	0.133	0.12	5	0.6
MON0269	12/15/1986	4.6	3.982	3.9	0.082	0.084	0.102	0.5	0.4
MON0269	1/12/1987	4.95	4.425	4.3	0.125	0.089	0.078	3	1
MON0269	2/9/1987	4.75	4.256	4.2	0.056	0.071	0.068	7	1.5
MON0269	3/2/1987	4.1	2.87	2.6	0.27	0.267	0.172	130	8.22
MON0269	4/14/1987	NA	NA	NA	NA	NA	NA	NA	2.19
MON0269	5/12/1987	2.1	1.524	1.5	0.024	0.045	0.036	4	2.62
MON0269	6/23/1987	2.25	1.52	1.5	0.02	0.116	0.086	21	11.21
MON0269	7/29/1987	2.65	1.936	1.9	0.036	0.098	0.088	22	1.2
MON0269	8/25/1987	3.35	2.152	2.1	0.052	0.134	0.13	21	0.93
MON0269	9/22/1987	4.4	3.548	3.5	0.048	0.16	0.17	22	1.2
MON0269	10/21/1987	2.65	2.104	2.1	0.004	0.071	0.05	9	1.72

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0269	11/24/1987	3.9	3.212	3.2	0.012	NA	0.068	2	0.75
MON0269	12/8/1987	4.95	4.324	4.3	0.024	0.053	0.058	4	0.6
MON0269	1/18/1988	4.6	NA	3.7	NA	0.115	0.114	0.5	0.97
MON0269	2/16/1988	4.35	3.492	3.3	0.192	0.171	0.14	32	1.71
MON0269	3/7/1988	4.3	3.56	3.5	0.06	0.09	0.054	16	2.69
MON0269	4/20/1988	2.5	1.816	1.8	0.016	0.053	0.04	0.5	2.84
MON0269	5/16/1988	2.8	2.236	2.2	0.036	0.104	0.062	22	1.87
MON0269	6/27/1988	2.6	2.144	2.1	0.044	0.127	0.08	8	4.59
MON0269	7/25/1988	3.25	1.932	1.8	0.132	0.264	0.002	47	3.59
MON0269	8/29/1988	2.65	1.744	1.7	0.044	0.117	0.118	21	0.9
MON0269	9/26/1988	2.75	2.228	2.2	0.028	0.117	NA	6	0.9
MON0269	10/24/1988	3.25	NA	2.5	NA	0.109	0.088	10	1.64
MON0269	11/29/1988	4.35	3.624	3.6	0.024	0.121	0.09	9	2.39
MON0269	12/13/1988	4.15	3.604	3.6	0.004	0.092	0.08	2	0.8
MON0269	1/23/1989	5.6	5.056	5	0.056	0.062	0.048	0.5	0.97
MON0269	2/21/1989	4.5	3.54	3.5	0.04	0.089	0.042	23	5.98
MON0269	3/27/1989	4.35	3.624	3.6	0.024	0.027	0.044	26	3.63
MON0269	4/25/1989	2.55	1.92	1.9	0.02	0.036	0.022	6	5.38
MON0269	5/22/1989	3.15	2.628	2.6	0.028	0.08	0.044	13	1.35
MON0269	6/6/1989	3.1	2.416	2.4	0.016	NA	0.018	16	13.06
MON0269	7/31/1989	NA	2.74	2.7	0.04	NA	0.08	9	4.49
MON0269	8/21/1989	2.9	2.028	1.9	0.128	0.232	0.2	32	5.08
MON0269	9/18/1989	3.3	2.628	2.6	0.028	0.134	0.098	6	1.05
MON0269	10/30/1989	3.75	3.304	3.3	0.004	0.08	0.066	6	0.7
MON0269	11/27/1989	3.95	NA	3.5	NA	0.071	NA	3	0.75
MON0269	1/22/1990	4.05	3.572	3.5	0.072	0.086	0.052	20	7.48
MON0269	2/20/1990	4.6	3.708	3.7	0.008	0.073	0.04	4	1.2
MON0269	3/28/1990	2.65	2.204	2.2	0.004	0.029	0.01	3	2.92
MON0269	4/24/1990	2.5	NA	2.1	NA	0.041	0.02	2	8.37
MON0269	5/21/1990	3.45	2.948	2.9	0.048	0.101	0.066	61	2.39
MON0269	6/18/1990	3.05	2.724	2.7	0.024	0.062	0.036	10	5.38
MON0269	7/23/1990	5	3.428	3.3	0.128	0.33	0.4	120	5.98
MON0269	8/20/1990	3.45	2.652	2.6	0.052	0.199	0.162	24	0.9
MON0269	9/17/1990	2.85	2.336	2.3	0.036	0.132	0.08	5	0.6
MON0269	10/23/1990	3.6	2.896	2.8	0.096	0.242	0.158	14	7.48
MON0269	11/26/1990	3.05	2.708	2.7	0.008	NA	0.034	2	0.97
MON0269	12/17/1990	3.5	2.54	2.4	0.14	NA	0.096	15	3.89
MON0269	1/21/1991	4.1	3.54	3.5	0.04	0.056	0.034	2	1.2
MON0269	2/6/1991	4.05	3.516	3.5	0.016	0.048	0.034	4	1.27

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0269	3/6/1991	2.95	2.26	2.2	0.06	0.109	0.054	10	8.07
MON0269	4/3/1991	3	2.51	2.5	0.01	0.044	0.016	4	2.02
MON0269	5/1/1991	NA	2.132	2.1	0.032	NA	0.032	11	3.36
MON0269	5/29/1991	2.55	1.972	1.9	0.072	0.19	0.174	14	1.69
MON0269	6/12/1991	2.35	1.836	1.8	0.036	0.154	0.092	4	0.6
MON0269	7/2/1991	1.75	1.048	1	0.048	0.107	0.086	11	1.5
MON0269	7/31/1991	2	1.452	1.4	0.052	0.157	0.132	1	1.69
MON0269	8/28/1991	NA	2.764	2.7	0.064	NA	0.168	40	1.2
MON0269	9/25/1991	4.45	3.64	3.6	0.04	0.157	0.154	8	NA
MON0269	10/30/1991	2.3	1.704	1.7	0.004	0.098	0.058	2	0.75
MON0269	11/26/1991	3.65	2.736	2.7	0.036	0.136	0.11	13	1.05
MON0269	12/11/1991	5.35	3.992	3.9	0.092	0.245	0.2	30	2.99
MON0269	1/2/1992	5	4.336	4.3	0.036	0.101	0.084	11	0.5
MON0269	2/5/1992	4.1	3.62	3.6	0.02	0.068	0.042	9	0.52
MON0269	3/4/1992	4.1	3.62	3.6	0.02	0.068	0.042	9	1.35
MON0269	4/8/1992	NA	2.812	2.8	0.012	NA	0.06	6	1.3
MON0269	5/6/1992	2.3	1.808	1.8	0.008	0.104	0.04	7	1
MON0269	6/3/1992	3.55	2.848	2.8	0.048	0.172	0.14	18	1.05
MON0269	7/15/1992	2.4	1.832	1.8	0.032	0.153	0.156	29	0.8
MON0269	8/5/1992	3.6	2.512	2.4	0.112	0.345	0.2	37	2.99
MON0269	9/2/1992	2.9	2.148	2.1	0.048	0.135	0.128	6	1
MON0269	10/13/1992	3.25	2.428	2.4	0.028	0.184	0.156	11	0.6
MON0269	11/11/1992	3.35	3.012	3	0.012	0.077	0.046	3	0
MON0269	12/2/1992	3.6	3.22	3.2	0.02	NA	0.032	6	NA
MON0269	1/12/1993	3.55	3.156	3.1	0.056	NA	0.048	12	0.9
MON0269	2/3/1993	3.8	3.208	3.2	0.008	0.04	0.028	5	0.75
MON0269	3/3/1993	3.45	3.027	3	0.027	0.055	0.045	3	8.07
MON0269	4/7/1993	2.85	2.512	2.5	0.012	0.064	0.027	11	0.67
MON0269	5/5/1993	2.8	2.322	2.3	0.022	0.037	0.035	11	5.16
MON0269	6/9/1993	6.9	4.187	4	0.187	1	0.412	182	13.46
MON0269	7/7/1993	4.87	3.088	2.93	0.158	0.559	0.21	168	22.43
MON0269	8/4/1993	3.09	2.776	2.73	0.046	0.048	0.08	3	0.9
MON0269	9/22/1993	3.407	2.882	2.847	0.035	0.17	0.123	4	0.9
MON0269	10/6/1993	3.323	2.849	2.833	0.016	0.122	0.088	32	0.15
MON0269	11/9/1993	3.092	2.604	2.6	0.004	0.188	0.054	4	0.19
MON0269	12/1/1993	3.942	3.235	3.2	0.035	0.056	0.066	15	1.05
MON0269	1/11/1994	3.924	3.628	3.6	0.028	0.039	0.032	4	0.45
MON0269	2/2/1994	3.583	3.188	3.1	0.088	0.086	0.056	3	0.8
MON0269	3/17/1994	2.707	2.267	2	0.267	0.128	0.104	22	0.85

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0269	4/13/1994	2.676	2.279	2.261	0.018	0.059	0.035	18	4.86
MON0269	5/18/1994	NA	NA	NA	0.048	0.043	0.054	2	NA
MON0269	6/8/1994	2.617	2.108	2.094	0.014	0.105	0.05	15	31.1
MON0269	7/6/1994	2.631	1.245	1.231	0.014	0.165	0.058	35	151.02
MON0269	8/10/1994	2.374	1.876	1.864	0.012	0.149	0.053	31	40.12
MON0269	9/7/1994	1.874	1.828	1.824	0.004	0.176	0.019	32	114.01
MON0269	10/18/1994	2.664	2.249	2.232	0.017	0.039	0.037	3	3.51
MON0269	11/9/1994	2.377	1.912	1.9	0.012	0.098	0.078	2	0.9
MON0269	12/7/1994	2.815	2.175	2.141	0.034	0.177	0.112	55	2.82
MON0269	1/4/1995	2.721	2.365	2.314	0.051	0.07	0.058	12	1.3
MON0269	2/1/1995	NA	3.34	3.305	0.035	0.031	0.038	8	NA
MON0269	3/1/1995	2.799	2.096	1.932	0.164	0.148	0.132	45	4.19
MON0269	4/5/1995	2.242	1.916	1.908	0.008	0.034	0.007	5	3.9
MON0269	5/3/1995	2.532	1.929	1.886	0.043	0.121	0.052	28	3.86
MON0269	6/13/1995	2.056	1.327	1.273	0.054	0.181	0.043	30	51.21
MON0269	7/5/1995	3.587	2.905	2.875	0.03	0.195	0.125	33	2.43
MON0269	8/2/1995	2.305	1.393	1.373	0.02	0.167	0.093	41	24.99
MON0269	9/13/1995	2.037	1.395	1.358	0.037	0.128	0.115	22	1.32
MON0269	10/11/1995	2.733	2.06	2.043	0.017	0.142	0.118	4	0.6
MON0269	11/8/1995	2.723	2.236	2.227	0.009	0.104	0.07	5	0.52
MON0269	12/6/1995	3.245	2.948	2.939	0.009	0.044	0.032	1	0.75
MON0269	1/18/1996	NA	NA	NA	0.089	0.056	0.062	4	0.82
MON0269	2/7/1996	4.521	4.206	4.128	0.078	0.07	0.05	4	NA
MON0269	3/6/1996	3.139	2.822	2.799	0.023	0.035	0.032	4	1.59
MON0269	4/3/1996	3.546	2.732	2.391	0.341	0.2	0.095	35	5.08
MON0269	5/8/1996	2.22	1.524	1.448	0.076	0.112	0.072	22	9.57
MON0269	6/5/1996	2.855	2.307	2.255	0.052	0.094	0.04	31	1.87
MON0269	7/17/1996	3.315	2.631	2.609	0.022	0.12	0.066	25	2.54
MON0269	8/21/1996	2.052	1.653	1.637	0.016	0.082	0.033	4	1.79
MON0269	9/18/1996	2.415	1.562	1.452	0.11	0.231	0.079	44	3.59
MON0269	10/2/1996	2.661	2.486	2.476	0.01	0.092	0.067	7	1.5
MON0269	11/13/1996	2.836	2.693	2.685	0.008	0.072	0.046	10	0.97
MON0269	12/4/1996	3.441	2.577	2.54	0.037	0.146	0.067	13	2.54
MON0269	1/8/1997	3.447	3.138	3.135	0.003	0.044	0.035	4	0.82
MON0269	2/5/1997	3.626	2.739	2.595	0.144	0.188	0.07	41	7.01
MON0269	3/12/1997	2.263	2.202	2.191	0.011	0.044	0.022	3	6.92
MON0269	4/9/1997	NA	2	1.987	0.013	0.05	0.024	6	6.33
MON0269	5/7/1997	NA	2.01	1.991	0.019	0.068	0.032	10	4.09
MON0269	6/4/1997	3.04	2.217	2.056	0.161	0.164	0.08	36	12.56

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0269	7/9/1997	2.207	1.538	1.527	0.011	0.06	0.058	20	13.61
MON0269	8/6/1997	2.206	1.493	1.436	0.057	0.114	0.076	18	2.78
MON0269	9/3/1997	2.072	1.635	1.592	0.043	0.118	0.075	10	NA
MON0269	10/8/1997	2.232	1.657	1.632	0.025	0.078	0.045	4	NA
MON0269	11/12/1997	4.249	3.788	3.709	0.079	0.093	0.063	6	0.75
MON0269	12/3/1997	3.347	2.904	2.897	0.007	0.057	0.038	4	0.7
MON0269	1/21/1998	3.856	3.306	3.276	0.03	0.054	0.049	5	0.6
MON0269	2/4/1998	3.21	2.983	2.92	0.063	0.061	0.046	2	0.93
MON0269	3/4/1998	2.21	1.577	1.49	0.087	0.15	0.1	32	2.99
MON0269	4/1/1998	2.435	1.94	1.935	0.005	0.041	0.025	2	15.7
MON0269	5/13/1998	2.187	1.308	1.097	0.211	0.259	0.166	54	3.99
MON0269	6/11/1998	2.782	2.253	2.212	0.041	0.087	0.032	7	5.78
MON0269	7/15/1998	2.97	2.387	2.37	0.017	0.064	0.037	6	2.04
MON0269	8/12/1998	2.627	1.625	1.437	0.188	0.293	0.097	23	2.99
MON0269	9/9/1998	2.59	2.076	2.05	0.026	0.101	0.034	9	1.3
MON0269	10/7/1998	2.994	2.632	2.614	0.018	0.076	0.04	6	1.89
MON0269	11/12/1998	3.2	2.83	2.82	0.01	0.056	0.007	6	0.9
MON0269	12/9/1998	2.596	2.249	2.216	0.033	0.068	0.038	3	1.57
MON0269	1/6/1999	4.303	3.042	2.743	0.299	0.358	0.29	6	1.79
MON0269	2/3/1999	4.289	3.373	3.209	0.164	0.199	0.13	35	1.5
MON0269	3/11/1999	3.246	2.809	2.796	0.013	0.043	0.028	2.5	1.5
MON0269	4/7/1999	2.482	1.807	1.782	0.025	0.07	0.045	5	5.23
MON0269	5/5/1999	2.11	1.446	1.41	0.036	0.065	0.043	3.5	0.9
MON0269	6/2/1999	1.989	1.466	1.409	0.057	0.114	0.088	7	0.75
MON0269	7/14/1999	1.53	0.843	0.8	0.043	0.156	0.107	4	1.64
MON0269	8/11/1999	1.474	0.74	0.704	0.036	0.132	0.027	5	2.49
MON0269	9/15/1999	2.148	1.591	1.558	0.033	0.136	0.05	15	1.5
MON0269	10/13/1999	2.215	1.538	1.515	0.023	0.128	0.1	4.5	0.37
MON0269	11/9/1999	2.052	1.662	1.662	0	0.039	0.015	2	0.64
MON0269	12/1/1999	2.25	1.79	1.79	0	0.037	0.026	2	1.79
MON0269	1/12/2000	3.338	2.181	2.088	0.093	0.157	0.137	26	2.69
MON0269	2/9/2000	3.82	3.437	3.38	0.057	0.05	0.036	6	0.6
MON0269	3/8/2000	2.798	2.494	2.488	0.006	0.054	0.023	7	1.1
MON0269	4/5/2000	1.99	1.793	1.77	0.023	0.03	0.028	5	6.73
MON0269	5/3/2000	2.369	1.988	1.949	0.039	0.052	0.027	4	1.5
MON0269	6/7/2000	2.234	1.663	1.634	0.029	0.092	0.037	15	1.87
MON0269	7/6/2000	2.446	2.037	2.006	0.031	0.123	0.101	20	0.6
MON0269	8/2/2000	3.01	2.208	2.15	0.058	0.187	0.155	26	1.5
MON0269	9/6/2000	3.431	2.162	2.041	0.121	0.244	0.177	15	0.9

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0269	10/4/2000	3.427	2.941	2.927	0.014	0.076	0.068	8	0.9
MON0269	11/1/2000	2.153	1.672	1.663	0.009	0.033	0.01	1	0.75
MON0269	12/6/2000	2.946	2.566	2.566	0	0.054	0.034	3	0.75
MON0269	1/3/2001	3.979	3.631	3.599	0.032	0.056	0.049	1	0.5
MON0269	2/7/2001	3.86	3.404	3.35	0.054	0.072	0.048	7	1.35
MON0269	3/14/2001	2.894	1.859	1.814	0.045	0.114	0.082	31	20.93
MON0269	4/11/2001	2.769	1.883	1.779	0.104	0.153	0.088	17	15.17
MON0269	5/2/2001	2.377	1.792	1.767	0.025	0.063	0.029	6	3.89
MON0269	6/6/2001	2.29	1.754	1.74	0.014	0.088	0.05	11	13.46
MON0269	7/18/2001	1.95	1.268	1.24	0.028	0.097	0.022	9	19.29
MON0269	8/8/2001	2.57	1.748	1.71	0.038	0.124	0.083	18	13.64
MON0269	9/5/2001	1.95	1.36	1.32	0.04	0.107	0.08	13	3.95
MON0269	10/10/2001	2.33	1.738	1.72	0.018	0.052	0.021	4	1.79
MON0269	11/7/2001	1.425	0.935	0.925	0.01	0.024	0.013	2	1.79
MON0269	12/5/2001	1.88	1.562	1.55	0.012	0.07	0.045	1	1.3
MON0269	1/2/2002	3.66	3.182	3.17	0.012	0.046	0.036	1	0.6
MON0269	2/6/2002	3.73	3.349	3.33	0.019	0.069	0.057	1	1.28
MON0269	3/6/2002	3.06	2.285	2.26	0.025	0.108	0.079	5	2.09
MON0269	4/3/2002	2.69	2.065	2.05	0.015	0.064	0.039	7	1.79
MON0269	5/1/2002	1.78	1.134	1.09	0.044	0.102	0.056	7	1.79
MON0269	6/12/2002	1.777	1.021	0.967	0.054	0.166	0.12	12	1.5
MON0269	7/10/2002	0.879	0.197	0.149	0.048	0.156	0.119	7	9.72
MON0269	8/7/2002	0.775	0.066	0.045	0.021	0.145	0.108	4	1.25
MON0269	9/11/2002	1.447	0.724	0.657	0.067	0.129	0.097	4	1.12
MON0269	10/9/2002	2.52	1.87	1.84	0.03	0.112	0.088	4	0.38
MON0269	11/6/2002	4.694	3.99	3.894	0.096	0.189	0.159	19	1.87
MON0269	12/4/2002	4.058	3.632	3.628	0.004	0.044	0.031	1	0.45
MON0269	1/8/2003	4.431	4.02	3.971	0.049	0.061	0.033	5	0.9
MON0269	2/5/2003	4.09	3.243	2.97	0.273	0.198	0.173	38	4.11
MON0269	3/5/2003	1.296	0.838	0.576	0.262	0.097	0.079	10	1.5
MON0269	4/2/2003	2.81	2.374	2.36	0.014	0.064	0.031	4	2.39
MON0269	5/1/2003	2.15	1.751	1.72	0.031	0.045	0.022	3	4.81
MON0269	6/11/2003	3.17	2.508	2.48	0.028	0.084	0.056	20	1.05
MON0269	7/2/2003	2.83	2.262	2.25	0.012	0.054	0.022	9	8.37
MON0269	8/13/2003	2.96	2.015	1.94	0.075	0.27	0.17	58	4.49
MON0269	9/10/2003	3.794	3.356	3.334	0.022	0.095	0.069	9	0.96
MON0269	10/1/2003	3.749	3.229	3.199	0.03	0.091	0.071	5	0.83
MON0269	11/12/2003	3.317	2.8	2.777	0.023	0.07	0.04	6	1.2
MON0269	12/10/2003	3.366	3.014	2.986	0.028	0.048	0.029	3	1.3

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0269	1/7/2004	2.794	2.383	2.334	0.049	0.071	0.061	9	1.5
MON0269	2/11/2004	3.978	2.586	2.074	0.512	0.41	0.224	109	3.49
MON0269	3/10/2004	2.311	1.842	1.816	0.026	0.04	0.031	5	2.39
MON0269	4/7/2004	2.504	2.119	2.107	0.012	0.029	0.019	4	7.63
MON0269	5/5/2004	2.384	1.821	1.785	0.036	0.087	0.068	15	2.39
MON0269	6/2/2004	2.556	2.144	2.12	0.024	0.096	0.063	21	1.87
MON0269	7/14/2004	3.064	2.383	2.268	0.115	0.189	0.154	34	2.09
MON0269	8/4/2004	2.435	1.59	1.51	0.08	0.289	0.176	61	2.99
MON0269	9/15/2004	2.32	1.954	1.93	0.024	0.118	0.071	8	0.37
MON0269	10/6/2004	2.792	2.545	2.534	0.011	0.082	0.063	2	0.56
MON0269	11/3/2004	1.989	1.4	1.389	0.011	0.033	0.021	1	2.09
MON0269	12/1/2004	2.418	1.688	1.631	0.057	0.18	0.156	46	8.22
MON0269	1/5/2005	2.698	2.351	2.32	0.031	0.054	0.04	4	1.2
MON0269	2/9/2005	3.017	2.605	2.544	0.061	0.076	0.055	12	1.2
MON0269	3/9/2005	2.529	2.096	2.077	0.019	0.065	0.059	25	8.37
MON0269	4/13/2005	2.529	2.297	2.271	0.026	0.027	0.009	2	1.6
MON0269	5/4/2005	2.315	2.116	2.091	0.025	0.036	0.019	1	1.56
MON0269	6/8/2005	2.943	2.44	2.383	0.057	0.069	0.051	8	1.5
MON0269	7/6/2005	2.455	1.902	1.824	0.078	0.176	0.104	19	1
MON0269	8/3/2005	2.837	2.417	2.384	0.033	0.078	0.027	4	1.1
MON0269	9/7/2005	2.604	2.115	2.083	0.032	0.092	0.054	3	1.68
MON0269	10/12/2005	3.611	3.131	3.109	0.022	0.162	0.161	10	1.5
MON0269	11/9/2005	2.863	2.673	2.673	0	0.041	0.035	1	0.3
MON0269	12/8/2005	3.826	3.544	3.522	0.022	0.073	0.074	2	0.9
MON0269	1/4/2006	3.097	2.631	2.584	0.047	0.121	0.084	22	3.49
MON0269	2/1/2006	2.963	2.845	2.832	0.013	0.046	0.029	4	1.99
MON0269	3/1/2006	3.451	3.13	3.119	0.011	0.018	0.009	2	2.09
MON0269	4/12/2006	2.232	1.662	1.644	0.018	0.027	0.006	6	1.92
MON0269	5/3/2006	1.646	1.388	1.359	0.029	0.039	0.024	5	1.07
MON0269	6/14/2006	1.786	1.37	1.326	0.044	0.078	0.059	6	0.9
MON0269	7/5/2006	2.378	2.021	2	0.021	0.083	0.064	10	0.9
MON0269	8/9/2006	1.937	1.596	1.545	0.051	0.09	0.08	4	0.64
MON0269	9/13/2006	2.103	1.637	1.616	0.021	0.109	0.095	6	1.05
MON0269	10/11/2006	2.006	1.641	1.633	0.008	0.06	0.043	1	1.94
MON0269	11/8/2006	3.381	2.802	2.738	0.064	0.202	0.124	63	3.99
MON0269	12/6/2006	3.334	2.977	2.948	0.029	0.034	0.02	2	0.6
MON0269	1/3/2007	2.937	2.46	2.367	0.093	0.089	0.066	9	1.71
MON0269	2/7/2007	3.64	3.524	3.524	0	0.016	0.011	2	NA
MON0269	3/7/2007	3.065	2.87	2.823	0.047	0.046	0.028	5	0.9

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0269	4/4/2007	1.959	1.719	1.702	0.017	0.022	0.014	3	5.13
MON0269	5/2/2007	2.273	1.857	1.815	0.042	0.042	0.032	5	1.83
MON0269	6/13/2007	1.982	1.695	1.663	0.032	0.053	0.052	2	1.05
MON0269	7/18/2007	1.746	1.343	1.287	0.056	0.061	0.062	3	1.07
MON0269	8/15/2007	1.489	1.012	0.969	0.043	0.112	0.09	5	2.99
MON0269	9/12/2007	2.074	1.397	1.327	0.07	0.105	0.08	6	0.9
MON0269	10/10/2007	1.434	0.93	0.887	0.043	0.076	0.05	4	1.2
MON0269	11/1/2007	1.85	1.428	1.414	0.014	0.098	0.084	3	NA
MON0269	12/5/2007	3.54	2.873	2.859	0.014	0.118	0.079	9	2.99
MON0269	1/9/2008	4.263	4.181	4.173	0.008	0.06	0.036	5	1.79
MON0269	2/6/2008	4.306	4.067	4.03	0.037	0.072	0.05	5	2.78
MON0269	3/12/2008	3.301	3.021	3.016	0.005	0.046	0.035	6	1.71
MON0269	4/9/2008	2.1	1.618	1.613	0.005	0.022	0.006	2	9.72
MON0269	5/7/2008	2.135	1.723	1.705	0.018	0.027	0.028	6	1.28
MON0269	6/4/2008	5.712	2.368	2.083	0.285	0.901	0.247	653	24.3
MON0269	7/2/2008	2.438	2.067	2.023	0.044	0.071	0.06	5	1.05
MON0269	8/6/2008	2.484	2.186	2.145	0.041	0.087	0.069	5	1
MON0269	9/10/2008	2.456	2.151	2.116	0.035	0.147	0.124	NA	1.5
MON0269	10/15/2008	2.996	2.683	2.67	0.013	0.034	0.017	2	3.29
MON0269	11/12/2008	1.952	1.583	1.58	0.003	0.018	0.018	0.7	1.37
MON0269	12/10/2008	3.675	3.232	3.223	0.009	0.042	0.039	1	0.5
MON0269	1/7/2009	3.329	2.89	2.869	0.021	0.062	0.038	10	NA
MON0269	2/4/2009	2.822	2.341	2.322	0.019	0.083	0.046	6	1.68
MON0269	3/11/2009	2.343	1.957	1.946	0.011	0.051	0.005	2	4.94
MON0269	4/8/2009	1.913	1.675	1.664	0.011	0.048	0.031	2	1.82
MON0269	5/6/2009	2.611	1.811	1.736	0.075	0.148	0.082	44	3.74
MON0269	6/10/2009	3.397	2.298	2.256	0.042	0.221	0.108	70	3.2
MON0269	7/8/2009	2.13	1.618	1.591	0.027	0.047	0.03	3	1.17
MON0269	8/5/2009	2.532	1.877	1.843	0.034	0.175	0.14	22	2.35
MON0269	9/9/2009	2.724	2.327	2.304	0.023	0.079	0.072	6	0.85
MON0269	10/14/2009	2.237	1.897	1.882	0.015	0.05	0.039	2	0.57
MON0269	11/12/2009	2.9	2.588	2.574	0.014	0.087	0.063	7	1.22
MON0269	12/2/2009	3.243	2.987	2.986	0.001	0.055	0.042	2	0.71
MON0269	1/6/2010	3.583	3.132	3.118	0.014	0.037	0.033	3	0.32
MON0269	2/3/2010	3.239	2.834	2.815	0.019	0.049	0.034	5	0.64
MON0269	3/10/2010	2.474	2.331	2.325	0.006	0.037	0.022	6	6.87
MON0269	4/7/2010	2.12	1.88	1.861	0.019	0.034	0.019	5	6.56
MON0269	5/5/2010	2.16	1.551	1.492	0.059	0.069	0.045	6	5.45
MON0269	6/16/2010	2.081	1.645	1.6	0.045	0.076	0.073	6	2.35

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0269	7/7/2010	1.703	1.298	1.255	0.043	0.069	0.059	6	1.68
MON0269	8/18/2010	2.915	2.434	2.384	0.05	0.139	0.125	12	0.92
MON0269	9/15/2010	1.994	1.584	1.558	0.026	0.043	0.038	4	1.39
MON0269	10/13/2010	3.334	2.912	2.897	0.015	0.069	0.067	1	0.64
MON0269	11/9/2010	2.61	2.061	2.056	0.005	0.039	0.03	1	NA
MON0269	12/8/2010	3.515	3.194	3.186	0.008	0.042	0.035	2	0.53
MON0269	1/5/2011	2.957	2.677	2.673	0.004	0.026	0.019	1	0.64
MON0269	2/2/2011	3.055	2.906	2.872	0.034	0.045	0.039	2	1.28
MON0269	3/2/2011	3.582	2.781	2.731	0.05	0.065	0.046	8	2.59
MON0269	4/6/2011	1.996	1.605	1.601	0.004	0.026	0.009	8	5.34
MON0269	5/11/2011	2.089	1.903	1.895	0.008	0.029	0.021	6	1.68
MON0269	6/15/2011	2.201	1.894	1.872	0.022	0.061	0.045	4	4.85
MON0269	7/6/2011	1.964	1.003	0.996	0.007	0.075	0.012	12	54.93
MON0269	8/10/2011	2.635	2.063	2.041	0.022	0.081	0.06	8	6.01
MON0269	9/7/2011	5.006	2.833	2.752	0.081	0.582	0.243	256	16.55
MON0269	10/5/2011	3.122	2.528	2.519	0.009	0.095	0.079	7	0.85
MON0269	11/9/2011	2.623	2.286	2.282	0.004	0.024	0.02	3	0.78
MON0269	12/7/2011	2.918	2.752	2.744	0.008	0.041	0.029	4	0.93
MON0269	1/4/2012	3.077	2.742	2.735	0.007	0.035	0.026	2	1.07
MON0269	2/1/2012	2.864	2.48	2.47	0.01	0.037	0.029	3	1.71
MON0269	3/7/2012	2.7	2.368	2.364	0.004	0.032	0.02	2	2.88
MON0269	4/4/2012	1.819	1.422	1.416	0.006	0.024	0.011	2	4.17
MON0269	5/2/2012	1.699	1.308	1.295	0.013	0.029	0.01	4	2.49
MON0269	6/13/2012	2.019	1.418	1.389	0.029	0.114	0.06	27	10.04
MON0269	7/11/2012	2.395	1.861	1.823	0.038	0.116	0.091	8	1.34
MON0269	8/8/2012	1.325	0.858	0.838	0.02	0.116	0.095	4	1.39
MON0269	9/5/2012	2.206	1.402	1.348	0.054	0.284	0.191	58	4.63
MON0269	10/3/2012	2.697	1.611	1.595	0.016	0.37	0.21	86	6.94
MON0269	11/7/2012	2.856	2.732	2.728	0.004	0.044	0.041	2	NA
MON0269	12/5/2012	2.401	1.952	1.95	0.002	0.016	0.003	2	3.42
MON0269	1/9/2013	2.752	2.521	2.51	0.011	0.042	0.036	2	0.78
MON0269	2/6/2013	3.085	2.964	2.95	0.014	0.036	0.029	3	0.59
MON0269	3/7/2013	2.9	2.372	2.361	0.011	0.039	0.02	6	3.03
MON0269	4/3/2013	2.142	1.694	1.69	0.004	0.013	0.004	1	4.91
MON0269	5/1/2013	1.966	1.57	1.518	0.052	0.046	0.024	8	2.99
MON0269	6/12/2013	2.405	1.726	1.64	0.086	0.147	0.105	25	2.85
MON0269	7/10/2013	2.094	1.601	1.552	0.049	0.114	0.093	5.3	1.28
MON0269	8/7/2013	2.174	1.863	1.838	0.025	0.087	0.076	3.8	0.85
MON0269	9/4/2013	1.938	1.481	1.451	0.03	0.083	0.075	1.8	1.71

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0269	10/2/2013	2.172	1.808	1.794	0.014	0.032	0.022	1.3	1.07
MON0269	11/6/2013	1.914	1.646	1.642	0.004	0.017	0.008	1	1.07
MON0269	12/4/2013	3.494	3.112	3.107	0.005	0.044	0.037	0.3	1.07
MON0269	1/8/2014	3.064	2.809	2.774	0.035	0.085	0.066	5.5	1.37
MON0269	2/6/2014	3.254	2.043	1.943	0.1	0.225	0.095	112	6.94
MON0269	3/5/2014	3.503	3.102	3.098	0.004	0.026	0.019	2.7	1.39
MON0269	4/2/2014	3.006	2.565	2.528	0.037	0.07	0.034	19	6.19
MON0269	5/7/2014	2.497	2.219	2.203	0.016	0.045	0.028	11	1.71
MON0269	6/11/2014	3.014	2.088	2.007	0.081	0.155	0.066	49	6.14
MON0269	7/2/2014	2.378	2.124	2.112	0.012	0.046	0.031	4.3	3.66
MON0269	8/13/2014	2.541	1.802	1.772	0.03	0.159	0.098	24	2.94
MON0269	9/3/2014	2.606	2.232	2.207	0.025	0.071	0.06	2.7	0.76
MON0269	10/1/2014	2.388	1.98	1.965	0.015	0.041	0.03	2	0.92
MON0269	11/12/2014	2.353	1.921	1.922	-0.001	0.025	0.013	1.7	1.07
MON0269	12/3/2014	2.781	2.357	2.347	0.01	0.061	0.047	6.8	2.35
MON0269	1/7/2015	2.717	2.348	2.345	0.003	0.052	0.036	2.3	1.92
MON0269	2/4/2015	2.863	2.388	2.387	0.001	0.03	0.017	3	2.24
MON0269	3/4/2015	3.158	2.557	2.541	0.016	0.027	0.008	5.3	5.74
MON0269	4/1/2015	2.298	1.99	1.984	0.006	0.027	0.013	5.5	1.39
MON0269	5/13/2015	1.791	1.189	1.16	0.029	0.058	0.028	7	2.14
MON0269	6/10/2015	3.223	2.228	2.152	0.076	0.167	0.106	37	6.19
MON0269	7/1/2015	2.448	1.942	1.928	0.014	0.09	0.056	20	1.6
MON0269	8/12/2015	2.167	1.735	1.703	0.032	0.062	0.053	4	0.8
MON0269	9/9/2015	1.592	1.307	1.283	0.024	0.052	0.046	2	0.75
MON0269	10/7/2015	3.536	2.958	2.95	0.008	0.104	0.092	7	0.24
MON0269	11/4/2015	2.887	2.694	2.686	0.008	0.061	0.052	2	0.5
MON0269	12/2/2015	2.459	1.689	1.63	0.059	0.184	0.123	50	16.02
MON0269	1/6/2016	3.101	2.92	2.898	0.022	0.036	0.03	3	0.75
MON0269	2/3/2016	2.341	1.884	1.826	0.058	0.069	0.048	13	1.2
MON0269	3/2/2016	2.395	2.193	2.183	0.01	0.04	0.029	9.5	0.75
MON0269	4/6/2016	2.022	1.535	1.528	0.007	0.017	0.003	2.8	NA
MON0269	5/4/2016	2.156	1.233	1.122	0.111	0.17	0.073	70	10.68
MON0269	6/1/2016	1.642	1.36	1.334	0.026	0.051	0.032	4.7	1.5
MON0269	7/6/2016	2.331	2.013	1.99	0.023	0.061	0.052	6.8	1.34
MON0269	8/3/2016	2.569	2.109	2.064	0.045	0.129	0.099	27	1.6
MON0269	9/7/2016	2.17	1.873	1.847	0.026	0.047	0.033	3.2	1.39
MON0269	10/5/2016	2.036	1.777	1.756	0.021	0.08	0.07	5.3	0.75
MON0269	11/9/2016	1.435	1.207	1.2	0.007	0.018	0.007	1.7	1.82
MON0269	12/7/2016	2.14	1.734	1.717	0.017	0.131	0.089	15	5.77

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0269	1/4/2017	3.947	2.924	2.898	0.026	0.292	0.057	235	42.72
MON0269	2/1/2017	2.707	2.667	2.66	0.007	0.024	0.014	3	1.83
MON0269	3/1/2017	1.924	1.605	1.596	0.009	0.026	0.005	2.2	3.95
MON0269	4/5/2017	2.302	2.038	2.026	0.012	0.056	0.03	10	3.42
MON0269	5/3/2017	1.508	1.217	1.205	0.012	0.041	0.021	7	1.53
MON0269	6/7/2017	1.864	1.446	1.429	0.017	0.04	0.022	4	0.92
MON0269	7/5/2017	1.671	1.325	1.293	0.032	0.071	0.063	3.7	1.07
MON0269	8/2/2017	2.722	2.343	2.318	0.025	0.107	0.088	6.1	0.92
MON0269	9/6/2017	1.803	1.492	1.458	0.034	0.059	0.047	4.8	0.71
MON0269	10/4/2017	1.68	1.483	1.467	0.016	0.034	0.024	3.7	0.93
MON0269	11/1/2017	2.609	2.014	1.988	0.026	0.181	0.146	12	1.92
MON0269	12/6/2017	1.621	1.433	1.434	0	0.013	0.005	1.8	1.17
MON0269	1/3/2018	2.887	2.663	2.657	0.006	0.012	0.004	1.7	1.51
MON0269	2/8/2018	3.296	2.362	2.248	0.114	0.249	0.089	121	11.75
MON0269	3/6/2018	2.631	2.539	2.534	0.005	0.026	0.018	4.7	1.31
MON0269	4/4/2018	2.33	1.537	1.514	0.023	0.069	0.014	45	25.63
MON0269	5/2/2018	1.428	1.093	1.084	0.009	0.023	0.006	5.5	2.44
MON0269	6/6/2018	3.059	2.123	2.073	0.05	0.209	0.105	105	2.67
MON0269	7/11/2018	2.447	2.118	2.094	0.024	0.066	0.046	3.2	1.19
MON0269	8/1/2018	2.597	2.217	2.199	0.018	0.071	0.047	16	0.85
MON0269	9/5/2018	2.542	2.302	2.282	0.02	0.054	0.044	4	0.85
MON0269	10/3/2018	2.703	2.452	2.44	0.012	0.05	0.039	7.3	0.53
MON0269	11/7/2018	2.411	1.709	1.697	0.012	0.187	0.12	48	4
MON0269	12/10/2018	3.221	3.137	3.13	0.007	0.02	0.016	1.5	0.53
MON0528	1/27/1986	3.35	2.58	1.95	0.63	0.264	0.19	4	6.66
MON0528	2/19/1986	3.45	2.49	2.3	0.19	0.224	0.09	45	5.98
MON0528	3/19/1986	2.8	2.24	2.2	0.04	0.083	0.05	8	0.82
MON0528	4/15/1986	0.94	0.52	0.49	0.03	0.083	0.05	6	2.77
MON0528	5/5/1986	NA	NA	NA	0.03	0.085	0.06	4	1.72
MON0528	6/4/1986	1.07	0.021	0.01	0.011	0.18	0.089	9	35.59
MON0528	7/1/1986	0.92	0.106	0.04	0.066	0.172	0.122	26	9.27
MON0528	8/5/1986	1.67	0.506	0.37	0.136	0.285	0.3	50	5.68
MON0528	9/22/1986	0.71	0.026	0.01	0.016	0.136	0.078	7	10.77
MON0528	10/21/1986	0.87	0.052	0.04	0.012	0.139	0.136	6	4.68
MON0528	11/19/1986	4	2.372	2.2	0.172	0.496	0.4	152	5.98
MON0528	12/15/1986	4.15	3.552	3.4	0.152	0.119	0.13	3	0.8
MON0528	1/12/1987	4	3.38	3.3	0.08	0.071	0.06	2	1.1
MON0528	2/9/1987	3.55	3.164	3.1	0.064	0.062	0.066	2	1
MON0528	3/2/1987	3.75	2.76	2.5	0.26	0.205	0.144	50	9.72

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0528	4/14/1987	1.85	1.412	1.4	0.012	0.062	0.038	1	2.24
MON0528	5/12/1987	1.08	0.462	0.43	0.032	0.062	0.04	2	1.35
MON0528	6/23/1987	2.13	1.256	1.2	0.056	0.151	0.126	9	5.51
MON0528	7/29/1987	1.92	0.354	0.27	0.084	0.214	0.088	46	11.06
MON0528	8/25/1987	1.97	0.118	0.07	0.048	0.169	0.116	42	20.04
MON0528	9/22/1987	3.6	2.3	1.8	0.5	0.249	0.2	22	2.09
MON0528	10/21/1987	2.35	1.604	1.6	0.004	0.089	0.082	12	3.89
MON0528	11/24/1987	3.55	2.664	2.5	0.164	NA	0.088	6	1.14
MON0528	12/8/1987	4	3.34	3.3	0.04	0.053	0.06	3	0.36
MON0528	1/18/1988	4.05	NA	3.4	NA	0.101	0.064	2	0.3
MON0528	2/16/1988	3.3	2.46	2.3	0.16	0.148	0.108	45	3.49
MON0528	3/7/1988	3.6	2.952	2.9	0.052	0.08	0.052	13	2.09
MON0528	4/20/1988	1.44	0.714	0.69	0.024	0.044	0.028	4	1.87
MON0528	5/16/1988	1.33	0.62	0.58	0.04	0.069	0.042	13	5.28
MON0528	6/27/1988	0.82	0.148	0.12	0.028	0.155	0.008	8	21.53
MON0528	7/25/1988	2.7	1.672	1.5	0.172	0.156	0.138	49	8.67
MON0528	8/29/1988	3.25	1.628	1.6	0.028	0.164	0.08	33	77.75
MON0528	9/26/1988	1.01	0.278	0.21	0.068	0.102	0.074	12	8.07
MON0528	10/24/1988	4	NA	2.8	NA	0.121	0.056	16	19.74
MON0528	11/29/1988	3.45	2.712	2.7	0.012	0.081	0.048	8	1.37
MON0528	12/13/1988	2.75	2.204	2.2	0.004	0.087	0.072	1	0.88
MON0528	1/23/1989	5.5	5.008	5	0.008	0.053	0.036	1	0.8
MON0528	2/21/1989	3.9	3.116	3.1	0.016	0.053	0.034	9	1.99
MON0528	3/27/1989	4.1	3.316	3.3	0.016	0.036	0.046	13	1.5
MON0528	4/25/1989	1.33	0.558	0.53	0.028	0.045	0.028	4	2.89
MON0528	5/22/1989	2.15	1.528	1.5	0.028	0.089	0.046	6	1.05
MON0528	6/6/1989	1.7	1.04	1	0.04	NA	0.052	12	5.68
MON0528	7/31/1989	NA	1.056	1	0.056	NA	0.08	24	16.15
MON0528	8/21/1989	2.5	1.508	1.4	0.108	0.285	NA	24	5.38
MON0528	9/18/1989	7	6.1	1.2	4.9	0.624	0.6	8	29.6
MON0528	10/30/1989	3	2.404	2.4	0.004	0.089	0.056	5	1.89
MON0528	11/27/1989	2.65	NA	2.3	NA	0.053	NA	2	0.75
MON0528	1/22/1990	3.65	3.068	3	0.068	0.076	0.056	15	4.04
MON0528	2/20/1990	3.8	2.812	2.8	0.012	0.073	0.04	2	0.52
MON0528	3/28/1990	2.25	1.616	1.6	0.016	0.047	0.002	3	3.19
MON0528	4/24/1990	3.75	NA	3.2	NA	0.045	0.022	2	2.24
MON0528	5/21/1990	NA	NA	NA	0.056	0.091	0.07	34	NA
MON0528	6/18/1990	1.8	1.22	1.2	0.02	0.072	0.046	10	10.47
MON0528	7/23/1990	4.8	3.428	3.3	0.128	0.315	0.3	54	7.18

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0528	8/20/1990	2.1	0.436	0.4	0.036	0.188	0.104	27	25.12
MON0528	9/17/1990	1.43	0.762	0.73	0.032	0.117	0.06	7	6.13
MON0528	10/23/1990	3.6	2.732	2.7	0.032	0.116	0.118	35	2.49
MON0528	11/26/1990	2.25	1.804	1.8	0.004	NA	0.04	51	1.59
MON0528	12/17/1990	3	2.248	2.2	0.048	NA	0.07	10	2.54
MON0528	1/21/1991	2.85	2.344	2.3	0.044	0.039	0.03	5	1.05
MON0528	2/6/1991	2.9	2.336	2.3	0.036	0.039	0.048	2	0.75
MON0528	3/6/1991	2.6	2.032	2	0.032	0.11	0.06	8	3.74
MON0528	4/3/1991	2.3	1.516	1.5	0.016	0.044	0.018	6	1.94
MON0528	5/1/1991	1.29	0.7	0.64	0.06	NA	0.018	8	1.72
MON0528	5/29/1991	1.15	0.468	0.4	0.068	0.17	0.136	18	22.58
MON0528	6/12/1991	0.87	0.044	0.02	0.024	0.173	0.054	17	22.13
MON0528	7/2/1991	1.28	0.255	0.18	0.075	0.198	0.128	35	18.44
MON0528	7/31/1991	0.96	0.03	0.01	0.02	0.192	0.108	3	12.86
MON0528	8/28/1991	1.58	0.796	0.78	0.016	0.127	0.096	10	25.12
MON0528	9/25/1991	6	4.768	4.7	0.068	0.206	0.174	7	5.08
MON0528	10/30/1991	1.9	1.312	1.3	0.012	0.064	0.014	3	2.84
MON0528	11/26/1991	3.65	2.748	2.7	0.048	0.128	0.094	12	5.53
MON0528	12/11/1991	5.9	4.644	4.6	0.044	0.172	0.134	13	1.79
MON0528	1/2/1992	5.3	4.628	4.6	0.028	0.077	0.046	13	1
MON0528	2/5/1992	3.8	3.316	3.3	0.016	0.062	0.034	5	0.22
MON0528	3/4/1992	3.8	3.316	3.3	0.016	0.062	0.034	5	0.67
MON0528	4/8/1992	NA	1.512	1.5	0.012	NA	0.014	7	1.79
MON0528	5/6/1992	1.35	0.716	0.7	0.016	0.093	0.02	5	2.19
MON0528	6/3/1992	2.75	2.136	2.1	0.036	0.111	0.102	18	2.54
MON0528	7/15/1992	1.25	0.226	0.15	0.076	0.134	0.122	42	16.15
MON0528	8/5/1992	1.45	0.898	0.85	0.048	0.144	0.088	19	4.34
MON0528	9/2/1992	0.44	0.154	0.09	0.064	0.141	0.098	14	1.64
MON0528	10/13/1992	2.9	1.928	1.9	0.028	0.183	0.142	8	0.9
MON0528	11/11/1992	2.9	2.512	2.5	0.012	0.07	0.04	3	0.2
MON0528	12/2/1992	NA	2.632	2.6	0.032	NA	0.04	2	NA
MON0528	1/12/1993	2.7	2.42	2.4	0.02	NA	0.034	7	0.45
MON0528	2/3/1993	2.9	2.304	2.3	0.004	0.042	0.027	5	0.37
MON0528	3/3/1993	2.8	2.424	2.4	0.024	0.043	0.046	0.5	1.89
MON0528	4/7/1993	1.85	1.413	1.4	0.013	0.053	0.024	7	0.67
MON0528	5/5/1993	1.31	0.59	0.53	0.06	0.096	0.075	18	3.79
MON0528	6/9/1993	3.2	2.132	1.9	0.232	0.313	0.31	148	8.22
MON0528	7/7/1993	2.59	1.218	1.18	0.038	0.261	0.114	76	7.6
MON0528	8/4/1993	0.73	0.138	0.06	0.078	0.105	0.103	24	7.03

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0528	9/22/1993	NA	1.685	1.621	0.064	NA	0.124	2	2.77
MON0528	10/6/1993	2.296	1.75	1.726	0.024	0.123	0.083	32	0.3
MON0528	11/9/1993	2.152	1.511	1.5	0.011	0.193	0.058	4	0.2
MON0528	12/1/1993	3.198	2.426	2.4	0.026	0.015	0.066	10	1.94
MON0528	1/11/1994	3.143	2.745	2.7	0.045	0.084	0.029	23	0.6
MON0528	2/2/1994	2.777	2.404	2.3	0.104	0.092	0.045	4	1.79
MON0528	3/17/1994	1.838	1.47	1.4	0.07	0.088	0.074	9	0.9
MON0528	4/13/1994	1.371	0.704	0.684	0.02	0.069	0.036	15	5.76
MON0528	5/18/1994	NA	NA	NA	0.057	0.047	0.049	2	1.05
MON0528	6/8/1994	0.697	0.17	0.125	0.045	0.129	0.08	24	14.1
MON0528	7/6/1994	1.325	0.05	0.025	0.025	0.212	0.09	30	99.28
MON0528	8/10/1994	0.87	0.041	0.02	0.021	0.154	0.075	24	14.95
MON0528	9/7/1994	0.07	0.024	0.02	0.004	0.157	0.047	37	46.91
MON0528	10/18/1994	0.704	0.169	0.157	0.012	0.051	0.036	11	1.79
MON0528	11/9/1994	1.678	1.124	1.1	0.024	0.106	0.077	8	NA
MON0528	12/7/1994	2.395	1.89	1.846	0.044	0.148	0.094	36	1.79
MON0528	1/4/1995	2.216	1.799	1.75	0.049	0.074	0.063	13	0.9
MON0528	2/1/1995	2.118	1.929	1.914	0.015	0.032	0.034	10	0.22
MON0528	3/1/1995	2.356	1.651	1.55	0.101	0.156	0.115	18	2.99
MON0528	4/5/1995	0.837	0.565	0.561	0.004	0.037	0.02	8	2.99
MON0528	5/3/1995	1.254	0.713	0.666	0.047	0.088	0.053	17	1.87
MON0528	6/13/1995	1.115	0.494	0.451	0.043	0.164	0.073	21	19.29
MON0528	7/5/1995	2.402	1.769	1.733	0.036	0.162	0.107	23	4.3
MON0528	8/2/1995	1.481	0.31	0.206	0.104	0.178	0.145	20	2.84
MON0528	9/13/1995	2.419	1.658	1.619	0.039	0.208	0.156	19	2.09
MON0528	10/11/1995	1.805	1.155	1.128	0.027	0.145	0.115	12	0.75
MON0528	11/8/1995	1.865	1.226	1.222	0.004	0.082	0.063	3	0.35
MON0528	12/6/1995	2.33	1.959	1.955	0.004	0.044	0.025	1	1.35
MON0528	1/18/1996	2.88	2.563	2.491	0.072	0.05	0.053	5	0.75
MON0528	3/6/1996	2.013	1.779	1.755	0.024	0.027	0.034	1	0.7
MON0528	4/3/1996	2.914	2.243	1.958	0.285	0.144	0.065	17	3.59
MON0528	5/8/1996	1.945	1.164	1.122	0.042	0.117	0.079	22	6.92
MON0528	6/5/1996	1.456	0.962	0.858	0.104	0.119	0.08	24	2.62
MON0528	7/17/1996	2.685	1.863	1.685	0.178	0.195	0.129	22	5.77
MON0528	8/21/1996	1.769	1.137	1.119	0.018	0.106	0.037	8	4.78
MON0528	9/18/1996	2.552	1.486	1.184	0.302	0.226	0.091	27	2.69
MON0528	10/2/1996	1.795	1.113	1.102	0.011	0.123	0.091	9	1.59
MON0528	11/13/1996	1.891	1.681	1.672	0.009	0.059	0.047	10	0.67
MON0528	12/4/1996	2.48	1.925	1.676	0.249	0.157	0.148	10	1.94

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0528	1/8/1997	1.862	1.528	1.52	0.008	0.049	0.036	8	0.6
MON0528	2/5/1997	2.731	1.677	1.551	0.126	0.193	0.066	89	7.48
MON0528	3/12/1997	1.381	1.619	1.11	0.509	0.025	0.024	2	4.01
MON0528	4/9/1997	NA	0.476	0.464	0.012	0.037	0.022	8	4.49
MON0528	5/7/1997	NA	0.451	0.396	0.055	0.083	0.041	9	3.59
MON0528	6/4/1997	2.883	1.99	1.877	0.113	0.129	0.088	16	5.13
MON0528	7/9/1997	1.013	0.021	0.013	0.008	0.047	0.063	24	33.64
MON0528	8/6/1997	1.343	0.317	0.233	0.084	0.215	0.154	21	15.17
MON0528	9/3/1997	0.872	0.204	0.122	0.082	0.194	0.138	12	NA
MON0528	10/8/1997	1.214	0.472	0.454	0.018	0.108	0.035	15	NA
MON0528	11/12/1997	4.16	3.636	3.57	0.066	0.06	0.055	4	0.8
MON0528	12/3/1997	3.002	2.557	2.552	0.005	0.048	0.032	5	1.4
MON0528	1/21/1998	3.214	2.915	2.894	0.021	0.051	0.049	2	0.6
MON0528	2/4/1998	2.43	2.215	2.19	0.025	0.045	0.037	1	0.55
MON0528	3/4/1998	1.853	1.217	1.113	0.104	0.139	0.114	14	1.5
MON0528	4/1/1998	1.095	0.485	0.475	0.01	0.046	0.037	4	7.58
MON0528	5/13/1998	2.505	1.087	0.745	0.342	0.329	0.139	22	3.49
MON0528	6/11/1998	0.493	0.178	0.143	0.035	0.033	0.027	10	27.66
MON0528	7/15/1998	1.356	0.549	0.526	0.023	0.107	0.06	10	8.97
MON0528	8/12/1998	2.014	1.266	1.154	0.112	0.243	0.096	13	2.09
MON0528	9/9/1998	0.913	0.168	0.113	0.055	0.134	0.105	17	1.94
MON0528	10/7/1998	0.627	0.085	0.067	0.018	0.064	0.018	3	0.7
MON0528	11/12/1998	0.805	0.255	0.245	0.01	0.039	0.005	14	1.59
MON0528	12/9/1998	1.622	0.976	0.892	0.084	0.097	0.076	9.5	3.44
MON0528	2/3/1999	3.689	2.866	2.789	0.077	0.132	0.098	8	0.9
MON0528	3/11/1999	2.65	2.14	2.13	0.01	0.054	0.028	2	1.08
MON0528	4/7/1999	1.699	0.983	0.969	0.014	0.051	0.032	2	3.89
MON0528	5/5/1999	0.954	0.241	0.214	0.027	0.053	0.031	4	1.12
MON0528	6/2/1999	1.125	0.348	0.235	0.113	0.154	0.12	8	0.9
MON0528	7/14/1999	0.991	0.074	0.051	0.023	0.184	0.127	14	15.25
MON0528	8/11/1999	1.027	0.063	0.037	0.026	0.18	0.06	14	3.89
MON0528	9/15/1999	1.046	0.367	0.326	0.041	0.112	0.035	23	1.31
MON0528	10/13/1999	4.42	3.563	3.54	0.023	0.115	0.093	2	0.75
MON0528	11/9/1999	0.849	0.299	0.299	0	0.048	0.025	3	1.6
MON0528	12/1/1999	1.549	0.881	0.879	0.002	0.066	0.045	4	1.4
MON0528	1/12/2000	3.531	2.41	2.341	0.069	0.155	0.144	15	2.39
MON0528	2/9/2000	3.52	3.089	3.06	0.029	0.061	0.047	2	0.3
MON0528	3/8/2000	2	1.614	1.61	0.004	0.058	0.019	6	0.9
MON0528	4/5/2000	1.284	0.93	0.924	0.006	0.046	0.041	5	4.93

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0528	5/3/2000	0.98	0.52	0.46	0.06	0.053	0.03	6	1.3
MON0528	6/7/2000	1.367	0.826	0.777	0.049	0.09	0.048	9	1.35
MON0528	7/6/2000	1.951	1.311	1.261	0.05	0.174	0.135	18	0.9
MON0528	8/2/2000	2.916	1.833	1.746	0.087	0.227	0.177	18	2.99
MON0528	9/6/2000	2.888	1.522	1.428	0.094	0.264	0.236	21	1.05
MON0528	10/4/2000	2.33	1.751	1.73	0.021	0.083	0.07	7	0.9
MON0528	11/1/2000	0.722	0.168	0.162	0.006	0.059	0.023	1	0.45
MON0528	12/6/2000	2.789	2.012	2.009	0.003	0.069	0.046	5	1.79
MON0528	1/3/2001	3.304	2.807	2.744	0.063	0.084	0.059	1	0.4
MON0528	2/7/2001	3.498	2.986	2.958	0.028	0.064	0.049	3	1.12
MON0528	3/14/2001	2.812	1.812	1.722	0.09	0.128	0.118	15	6.88
MON0528	4/11/2001	1.683	0.888	0.863	0.025	0.073	0.048	7	6.62
MON0528	5/2/2001	1.003	0.496	0.453	0.043	0.065	0.035	5	2.99
MON0528	6/6/2001	0.919	0.461	0.419	0.042	0.118	0.059	11	5.23
MON0528	7/18/2001	1.121	0.023	0.011	0.012	0.203	0.048	22	27.98
MON0528	8/8/2001	1.196	0.017	0.006	0.011	0.206	0.131	19	20.63
MON0528	9/5/2001	1.051	0.028	0.011	0.017	0.174	0.118	17	32.74
MON0528	10/10/2001	1.486	0.236	0.216	0.02	0.1	0.043	17	43.66
MON0528	11/7/2001	1.114	0.129	0.114	0.015	0.122	0.056	8	14.05
MON0528	12/5/2001	1.563	0.951	0.933	0.018	0.089	0.074	4	8.22
MON0528	1/2/2002	2.53	1.834	1.82	0.014	0.107	0.093	1	1.69
MON0528	2/6/2002	NA	NA	NA	0.029	0.082	0.074	1	0.96
MON0528	3/6/2002	3.6	2.582	2.51	0.072	0.163	0.119	4	2.09
MON0528	4/3/2002	2.48	1.904	1.89	0.014	0.063	0.047	4	1.5
MON0528	5/1/2002	1.656	0.944	0.916	0.028	0.099	0.052	7	1.94
MON0528	6/12/2002	1.694	0.838	0.754	0.084	0.217	0.171	23	9.27
MON0528	7/10/2002	1.02	0.113	0.09	0.023	0.248	0.168	17	19.25
MON0528	8/7/2002	1.012	0.2	0.122	0.078	0.298	0.275	18	7.85
MON0528	9/11/2002	1.115	0.345	0.265	0.08	0.201	0.156	15	5.42
MON0528	10/9/2002	3.48	2.634	2.59	0.044	0.135	0.119	8	0.8
MON0528	11/6/2002	4.257	3.766	3.757	0.009	0.091	0.068	9	1.5
MON0528	12/4/2002	2.87	2.494	2.48	0.014	0.068	0.049	2	0.32
MON0528	1/8/2003	3.133	2.79	2.783	0.007	0.053	0.03	4	0.75
MON0528	2/5/2003	3.42	2.314	1.97	0.344	0.262	0.262	26	2.24
MON0528	3/5/2003	2.52	1.852	1.62	0.232	0.098	0.082	7	1.2
MON0528	4/2/2003	2.28	1.874	1.86	0.014	0.053	0.033	3	1.79
MON0528	5/1/2003	0.769	0.32	0.289	0.031	0.052	0.025	4	3.42
MON0528	6/11/2003	2.18	1.422	1.4	0.022	0.073	0.056	12	1.1
MON0528	7/2/2003	0.97	0.554	0.52	0.034	0.084	0.047	8	3.29

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0528	8/13/2003	2.31	1.366	1.31	0.056	0.242	0.198	18	5.68
MON0528	9/10/2003	2.91	2.387	2.35	0.037	0.129	0.094	8	0.9
MON0528	10/1/2003	2.695	2.025	1.995	0.03	0.103	0.086	5	1.17
MON0528	11/12/2003	2.214	1.624	1.604	0.02	0.086	0.055	10	3.14
MON0528	12/10/2003	2.122	1.602	1.582	0.02	0.044	0.03	2	1.59
MON0528	1/7/2004	1.951	1.413	1.371	0.042	0.079	0.064	6	1.79
MON0528	2/11/2004	3.031	2.038	1.49	0.548	0.199	0.129	14	1.79
MON0528	3/10/2004	1.846	1.376	1.346	0.03	0.042	0.032	4	1.2
MON0528	4/7/2004	1.529	1.124	1.113	0.011	0.03	0.022	4	3.74
MON0528	5/5/2004	1.917	1.365	1.341	0.024	0.085	0.066	11	2.99
MON0528	6/2/2004	1.679	1.275	1.238	0.037	0.112	0.088	12	2.19
MON0528	7/14/2004	2.273	1.655	1.571	0.084	0.158	0.132	28	4.19
MON0528	8/4/2004	2.034	1.232	1.205	0.027	0.17	0.107	16	10.77
MON0528	9/15/2004	1.144	0.608	0.562	0.046	0.151	0.082	11	1
MON0528	10/6/2004	1.95	1.679	1.671	0.008	0.089	0.062	3	NA
MON0528	11/3/2004	1.149	0.466	0.456	0.01	0.051	0.027	2	1.79
MON0528	12/1/2004	2.159	1.552	1.507	0.045	0.13	0.121	22	7.23
MON0528	1/5/2005	1.975	1.513	1.479	0.034	0.064	0.055	4	1.79
MON0528	2/9/2005	2.226	1.781	1.701	0.08	0.088	0.063	10	0.85
MON0528	3/9/2005	1.998	1.549	1.506	0.043	0.083	0.041	18	4.78
MON0528	4/13/2005	1.065	0.676	0.656	0.02	0.036	0.011	3	4.19
MON0528	5/4/2005	1.408	0.974	0.95	0.024	0.048	0.031	3	1.23
MON0528	6/8/2005	2.364	1.404	1.242	0.162	0.135	0.087	8	4.88
MON0528	7/6/2005	1.179	0.468	0.394	0.074	0.158	0.095	12	3.84
MON0528	8/3/2005	1.106	0.449	0.382	0.067	0.165	0.098	10	2.54
MON0528	9/7/2005	1.32	0.657	0.599	0.058	0.167	0.133	13	1.2
MON0528	10/12/2005	3.573	2.77	2.135	0.635	0.381	0.345	7	1.5
MON0528	11/9/2005	1.87	1.774	1.774	0	0.062	0.053	2	1.2
MON0528	12/8/2005	3.165	2.733	2.718	0.015	0.06	0.06	2	NA
MON0528	1/4/2006	2.707	2.207	2.176	0.031	0.106	0.084	10	1.74
MON0528	2/1/2006	1.883	1.551	1.539	0.012	0.065	0.037	5	2.24
MON0528	3/1/2006	1.945	1.683	1.673	0.01	0.027	0.015	2	0.45
MON0528	4/12/2006	0.845	0.329	0.29	0.039	0.05	0.028	5	2.78
MON0528	5/3/2006	0.49	0.133	0.12	0.013	0.029	0.014	2	1.71
MON0528	6/14/2006	0.743	0.21	0.151	0.059	0.113	0.088	8	1.79
MON0528	7/5/2006	1.29	0.961	0.945	0.016	0.076	0.058	10	0.6
MON0528	8/9/2006	0.65	0.131	0.072	0.059	0.174	0.152	10	1.2
MON0528	9/13/2006	0.924	0.428	0.389	0.039	0.111	0.095	7	0.9
MON0528	10/11/2006	0.756	0.373	0.346	0.027	0.103	0.077	8	0.64

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0528	11/8/2006	3.164	2.475	2.403	0.072	0.263	0.218	22	1.87
MON0528	12/6/2006	1.96	1.648	1.643	0.005	0.041	0.029	2	1.35
MON0528	1/3/2007	2.379	1.873	1.847	0.026	0.083	0.068	5	2.35
MON0528	3/7/2007	2.337	2.092	2.031	0.061	0.055	0.047	4	NA
MON0528	4/4/2007	0.963	0.629	0.612	0.017	0.028	0.016	3	7.05
MON0528	5/2/2007	0.975	0.422	0.383	0.039	0.046	0.028	2	2.78
MON0528	6/13/2007	0.606	0.075	0.036	0.039	0.124	0.102	8	3.2
MON0528	7/18/2007	0.645	0.079	0.042	0.037	0.134	0.125	6	NA
MON0528	8/15/2007	0.833	0.211	0.151	0.06	0.169	0.128	16	5.13
MON0528	9/12/2007	0.981	0.278	0.15	0.128	0.2	0.163	13	5.68
MON0528	10/10/2007	0.732	0.136	0.082	0.054	0.14	0.096	7	4.19
MON0528	11/1/2007	1.067	0.651	0.632	0.019	0.14	0.119	4	0.6
MON0528	12/5/2007	3.942	3.007	2.993	0.014	0.112	0.082	9	3.59
MON0528	1/9/2008	3.838	3.676	3.669	0.007	0.065	0.045	4	1.2
MON0528	2/6/2008	4.559	4.213	4.128	0.085	0.085	0.059	5	1.5
MON0528	3/12/2008	2.779	2.413	2.39	0.023	0.053	0.036	10	1.07
MON0528	4/9/2008	1.099	0.472	0.465	0.007	0.037	0.011	2	4.34
MON0528	5/7/2008	1.037	0.647	0.634	0.013	0.021	0.023	4	1.5
MON0528	6/4/2008	2.388	1.488	1.408	0.08	0.204	0.137	39	11.96
MON0528	7/2/2008	0.657	0.128	0.081	0.047	0.114	0.093	8	1.94
MON0528	8/6/2008	0.681	0.101	0.054	0.047	0.142	0.116	10	1.5
MON0528	9/10/2008	1.49	1.031	0.98	0.051	0.17	0.173	NA	1.79
MON0528	10/15/2008	1.224	0.617	0.584	0.033	0.099	0.066	20	9.83
MON0528	11/12/2008	0.599	0.197	0.191	0.006	0.064	0.068	2	0.75
MON0528	12/10/2008	2.734	2.38	2.37	0.01	0.051	0.051	0.8	0.45
MON0528	1/7/2009	2.715	2.144	2.115	0.029	0.089	0.069	14	NA
MON0528	2/4/2009	2.402	1.668	1.55	0.118	0.147	0.089	5	1.07
MON0528	3/11/2009	1.52	1.082	1.036	0.046	0.042	0.027	3	2.4
MON0528	4/8/2009	1.618	1.281	1.273	0.008	0.05	0.034	3	1.82
MON0528	5/6/2009	1.983	1.172	1.124	0.048	0.131	0.079	20	3.74
MON0528	6/10/2009	1.932	1.163	1.139	0.024	0.135	0.086	31	2.49
MON0528	7/8/2009	0.852	0.286	0.251	0.035	0.099	0.076	9	3.66
MON0528	8/5/2009	2.494	1.522	1.479	0.043	0.206	0.166	19	5.55
MON0528	9/9/2009	1.261	0.584	0.544	0.04	0.133	0.122	11	1.39
MON0528	10/14/2009	0.575	0.174	0.161	0.013	0.083	0.067	4	0.32
MON0528	11/12/2009	2.039	1.447	1.438	0.009	0.064	0.052	3	0.83
MON0528	12/2/2009	2.168	1.766	1.762	0.004	0.062	0.05	2	0.75
MON0528	2/3/2010	2.179	1.845	1.83	0.015	0.041	0.038	2	0.64
MON0528	3/10/2010	1.571	1.288	1.283	0.005	0.044	0.029	6	4.27

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0528	4/7/2010	0.834	0.436	0.412	0.024	0.04	0.026	5	3.97
MON0528	5/5/2010	1.306	0.73	0.686	0.044	0.069	0.045	8	4.27
MON0528	6/16/2010	1.012	0.402	0.353	0.049	0.14	0.115	12	18.37
MON0528	7/7/2010	0.842	0.014	0.004	0.01	0.247	0.132	17	23.8
MON0528	8/18/2010	1.899	0.958	0.898	0.06	0.183	0.157	12	7.48
MON0528	9/15/2010	0.987	0.021	0.009	0.012	0.146	0.082	23	78.6
MON0528	10/13/2010	3.385	2.834	2.812	0.022	0.074	0.072	3	1.17
MON0528	11/9/2010	2.253	1.582	1.577	0.005	0.067	0.055	1	0.78
MON0528	12/8/2010	3.126	2.943	2.935	0.008	0.055	0.042	0.2	0.32
MON0528	1/5/2011	3.679	3.402	3.393	0.009	0.049	0.039	1	0.53
MON0528	3/2/2011	3.516	2.792	2.749	0.043	0.075	0.055	4	NA
MON0528	4/6/2011	1.284	0.82	0.814	0.006	0.034	0.017	6	4.49
MON0528	5/11/2011	0.838	0.529	0.521	0.008	0.035	0.017	9	2.9
MON0528	6/15/2011	0.651	0.124	0.101	0.023	0.066	0.035	9	13.14
MON0528	7/6/2011	1.928	1.245	1.204	0.041	0.131	0.111	6	5.61
MON0528	8/10/2011	0.787	0.024	0.02	0.004	0.112	0.071	15	27.77
MON0528	9/7/2011	3.876	2.368	2.31	0.058	0.298	0.229	114	12.28
MON0528	10/5/2011	2.183	1.552	1.542	0.01	0.093	0.08	6	0.64
MON0528	11/9/2011	1.392	1.011	1.007	0.004	0.027	0.024	2	0.64
MON0528	12/7/2011	1.872	1.567	1.556	0.011	0.044	0.035	2	1.22
MON0528	1/4/2012	1.808	1.481	1.437	0.044	0.058	0.047	2	0.83
MON0528	2/1/2012	2.004	1.61	1.596	0.014	0.049	0.037	4	1.17
MON0528	3/7/2012	1.72	1.334	1.331	0.003	0.031	0.024	2	1.07
MON0528	4/4/2012	1.19	0.73	0.708	0.022	0.039	0.02	3	2.44
MON0528	5/2/2012	0.763	0.296	0.276	0.02	0.038	0.014	4	8.24
MON0528	6/13/2012	1.437	0.899	0.854	0.045	0.116	0.079	19	6.41
MON0528	7/11/2012	0.631	0.116	0.075	0.041	0.205	0.176	4	2.27
MON0528	8/8/2012	0.972	0.517	0.476	0.041	0.187	0.164	4	1.39
MON0528	9/5/2012	2.359	1.276	1.221	0.055	0.353	0.26	21	6.76
MON0528	10/3/2012	2.505	1.32	1.289	0.031	0.293	0.21	20	3.74
MON0528	11/7/2012	1.892	1.627	1.622	0.005	0.051	0.049	1	NA
MON0528	12/5/2012	1.441	0.904	0.89	0.014	0.054	0.036	2	4.91
MON0528	1/9/2013	1.86	1.434	1.393	0.041	0.065	0.054	0.8	0.85
MON0528	2/6/2013	2.163	1.983	1.965	0.018	0.038	0.035	0.8	0.64
MON0528	3/7/2013	2.055	1.554	1.535	0.019	0.049	0.035	4	1.68
MON0528	4/3/2013	0.868	0.539	0.536	0.003	0.022	0.008	1	2.2
MON0528	5/1/2013	1.111	0.607	0.562	0.045	0.057	0.031	4	1.71
MON0528	6/12/2013	3.152	2.358	2.268	0.09	0.208	0.175	14	1.96
MON0528	7/10/2013	0.906	0.288	0.213	0.075	0.242	0.211	9.5	1.83

STATION	DATE	TN	DIN	NO23	NH4	TP	PO4	TSS	CHLa
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
MON0528	8/7/2013	0.788	0.315	0.251	0.064	0.15	0.136	7.5	0.89
MON0528	9/4/2013	0.604	0.072	0.04	0.032	0.166	0.149	10	1.68
MON0528	10/2/2013	0.507	0.043	0.035	0.008	0.067	0.048	8.7	1.28
MON0528	11/6/2013	1.007	0.603	0.598	0.005	0.041	0.024	1.7	1.64
MON0528	12/4/2013	2.542	2.039	2.03	0.009	0.086	0.068	3.7	6.84
MON0528	1/8/2014	2.651	2.236	2.189	0.047	0.115	0.095	2.5	1.42
MON0528	2/6/2014	2.665	1.671	1.528	0.143	0.136	0.088	18	3.2
MON0528	3/5/2014	2.697	2.075	1.969	0.106	0.051	0.032	2.2	0.85
MON0528	4/2/2014	2.376	1.911	1.894	0.017	0.069	0.046	5.5	3.74
MON0528	5/7/2014	1.33	0.816	0.797	0.019	0.051	0.033	5.7	1.42
MON0528	6/11/2014	1.972	1.179	1.135	0.044	0.115	0.08	8	8.33
MON0528	7/2/2014	0.725	0.235	0.211	0.024	0.089	0.068	6	7.48
MON0528	8/13/2014	2.327	0.896	0.834	0.062	0.537	0.348	80	7.48
MON0528	9/3/2014	0.6	0.142	0.102	0.04	0.121	0.105	9.2	1.22
MON0528	10/1/2014	0.532	0.102	0.086	0.016	0.088	0.069	5.7	1.07
MON0528	11/12/2014	0.595	0.242	0.239	0.003	0.041	0.033	1.3	0.76
MON0528	12/3/2014	5.273	3.975	2.653	1.322	0.214	0.154	22	12.28
MON0528	1/7/2015	2.147	1.598	1.586	0.012	0.079	0.054	3	4.27
MON0528	2/4/2015	2.03	1.691	1.677	0.014	0.03	0.024	1.7	0.75
MON0528	3/12/2015	2.09	1.081	0.801	0.28	0.291	0.178	72	12.28
MON0528	4/1/2015	1.691	1.21	1.193	0.017	0.041	0.021	4.8	0.75
MON0528	5/13/2015	0.921	0.202	0.159	0.043	0.098	0.052	7.8	3.38
MON0528	6/10/2015	2.721	1.781	1.718	0.063	0.177	0.13	15	3.84
MON0528	7/1/2015	1.698	1.173	1.153	0.02	0.096	0.064	28	3.2
MON0528	8/12/2015	0.772	0.271	0.213	0.058	0.119	0.101	5.8	0.93
MON0528	9/9/2015	0.478	0.081	0.048	0.033	0.105	0.091	7.2	1.28
MON0528	10/7/2015	2.482	1.913	1.905	0.008	0.122	0.115	1.7	0.59
MON0528	11/4/2015	1.961	1.576	1.567	0.009	0.082	0.073	2.5	0.36
MON0528	12/2/2015	2.393	1.438	1.374	0.064	0.255	0.189	12	13.08
MON0528	1/6/2016	2.125	1.849	1.821	0.028	0.057	0.05	2	0.62
MON0528	2/3/2016	1.777	1.378	1.315	0.063	0.068	0.053	7	0.76
MON0528	3/2/2016	1.526	1.296	1.286	0.01	0.044	0.035	6	0.62
MON0528	4/6/2016	0.475	0.119	0.111	0.008	0.019	0.006	3.2	NA
MON0528	5/4/2016	2.378	1.333	1.192	0.141	0.182	0.099	38	6.76
MON0528	6/1/2016	0.973	0.509	0.446	0.063	0.121	0.095	6.7	1.74
MON0528	7/6/2016	0.793	0.244	0.204	0.04	0.118	0.105	7.2	3.66
MON0528	8/3/2016	1.126	0.651	0.603	0.048	0.17	0.141	18	2.14
MON0528	9/7/2016	0.602	0.03	0.022	0.008	0.172	0.143	14	1.71
MON0528	10/5/2016	1.514	1.088	1.055	0.033	0.125	0.105	8.2	1.07

STATION	DATE	TN mg/L	DIN mg/L	NO23 mg/L	NH4 mg/L	TP mg/L	PO4 mg/L	TSS mg/L	CHLa µg/L
MON0528	11/9/2016	0.398	0.021	0.016	0.005	0.065	0.049	2.7	0.62
MON0528	12/7/2016	1.103	0.538	0.534	0.004	0.123	0.086	14	8.76
MON0528	1/4/2017	4.098	3.22	3.168	0.052	0.255	0.168	39	12.68
MON0528	2/1/2017	2.646	2.515	2.508	0.007	0.031	0.024	2.3	0.62
MON0528	3/1/2017	1.353	0.933	0.914	0.019	0.037	0.016	2.9	2.88
MON0528	4/5/2017	1.647	1.288	1.273	0.015	0.049	0.03	5.2	2.99
MON0528	5/3/2017	0.737	0.309	0.279	0.03	0.071	0.043	5.7	2.44
MON0528	6/7/2017	1.025	0.55	0.51	0.04	0.077	0.054	5.5	0.64
MON0528	7/5/2017	0.844	0.332	0.277	0.055	0.122	0.114	3.5	1.28
MON0528	8/2/2017	3.213	2.672	2.627	0.045	0.144	0.122	5.3	0.64
MON0528	9/6/2017	0.705	0.323	0.28	0.043	0.085	0.071	6.3	1.07
MON0528	10/4/2017	0.494	0.057	0.034	0.023	0.083	0.063	10	0.64
MON0528	11/1/2017	2.615	2.067	2.046	0.021	0.182	0.16	6.5	1.28
MON0528	12/6/2017	0.851	0.491	0.489	0.002	0.02	0.009	2.2	4.54
MON0528	2/8/2018	2.741	2.163	2.072	0.091	0.145	0.1	26	2.49
MON0528	3/6/2018	2.113	2.001	1.999	0.002	0.031	0.024	3.3	0.85
MON0528	4/4/2018	2.172	1.279	1.188	0.091	0.111	0.037	24	16.82
MON0528	5/2/2018	0.603	0.139	0.124	0.015	0.031	0.011	6.5	3.2
MON0528	6/6/2018	2.169	1.571	1.546	0.025	0.103	0.085	8	1.07
MON0528	7/11/2018	1.142	0.585	0.541	0.044	0.111	0.084	4.5	2.02
MON0528	8/1/2018	1.825	1.229	1.198	0.031	0.085	0.062	12	8.97
MON0528	9/5/2018	1.096	0.622	0.579	0.043	0.091	0.076	2.3	0.71
MON0528	10/3/2018	1.845	1.47	1.455	0.015	0.071	0.055	3.2	0.43
MON0528	11/7/2018	2.113	1.581	1.569	0.012	0.138	0.112	12	1.71
MON0528	12/10/2018	1.902	1.719	1.712	0.007	0.034	0.026	1.3	1.6

Appendix B

Plots of monthly state-collected water quality data from 1986-2018. Station locations can be found in Table 1. Graphs in blue represent data from MON0528, red BPC0035, green MON0269, maroon MON0155, and purple MON0020. Average (±standard error, se) concentrations for the 33 year period are indicated for each station and graph. Y-axes were kept are similar maxima to allow easy comparison of each water quality parameter for TN, DIN, and NO23 and for TP and PO4.

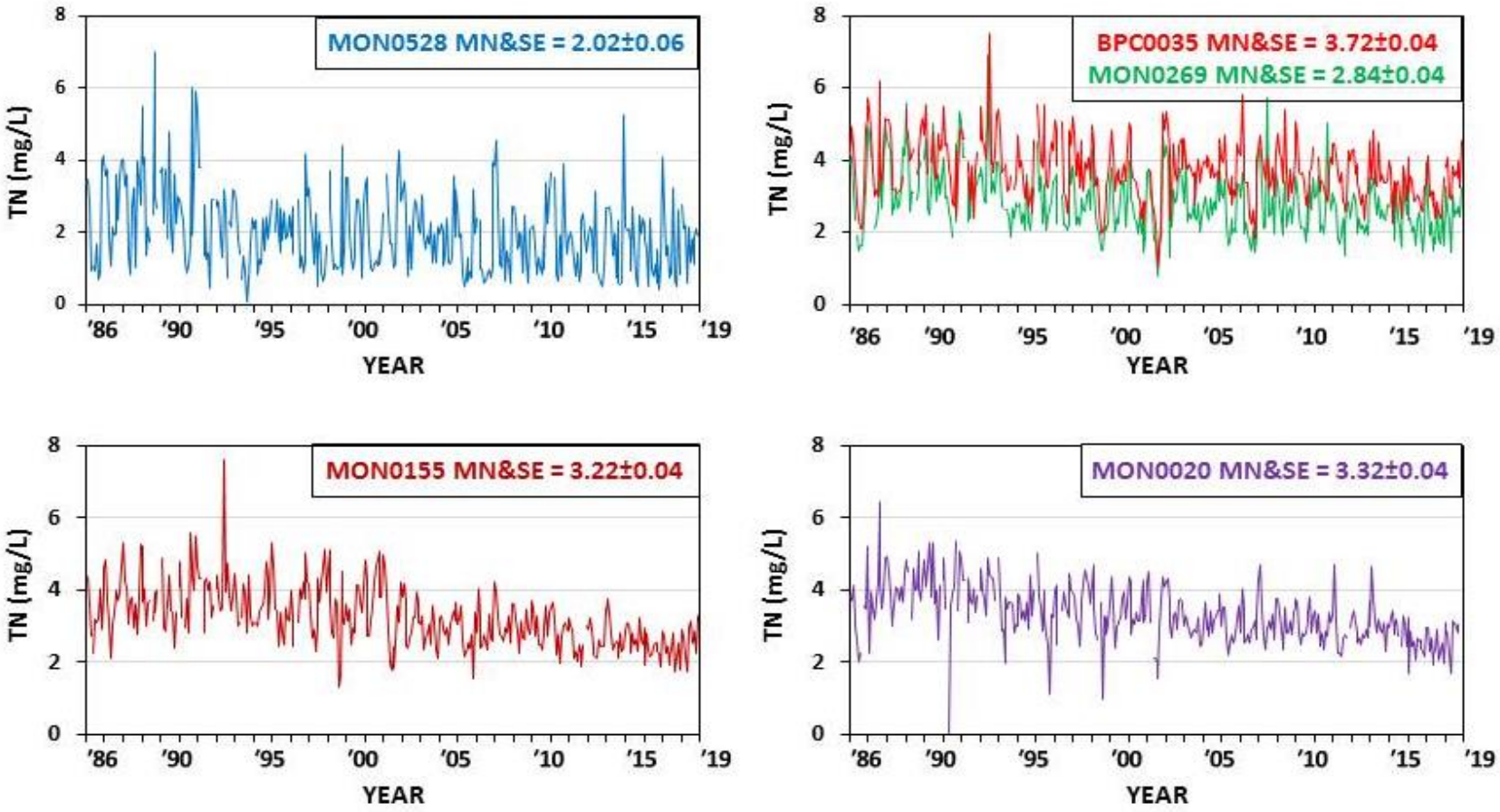


Figure B1. Monthly TN concentrations (mg/L) at the Monocacy River (MON0528, MON0269, MON0155, MON0020) and Big Pipe Creek (BPC0035) stations for the 1986-2018 period. The insert provides the average (±standard error, se) concentrations over 33 years. The graph in the upper right shows concentrations at BPC0035 and MON0269 to indicate the similarities between the two as a result of mixing of water from MON0528 and BPC0035.

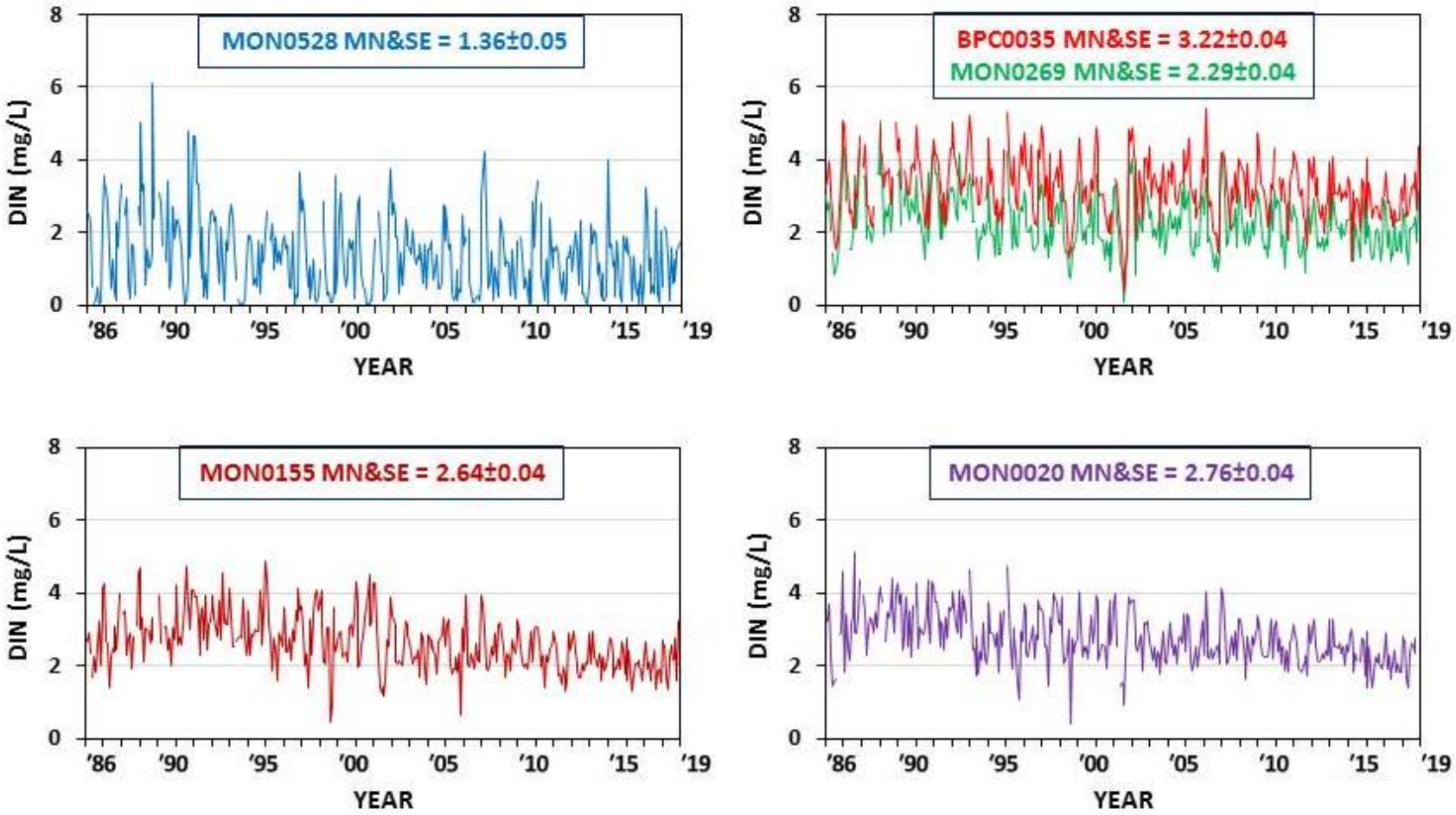


Figure B2. Monthly DIN concentrations (mg/L) at the Monocacy River (MON0528, MON0269, MON0155, MON0020) and Big Pipe Creek (BPC0035) stations for the 1986-2018 period. The insert provides the average (±standard error, se) concentrations over 33 years. The graph in the upper right shows concentrations at BPC0035 and MON0269 to indicate the similarities between the two as a result of mixing of water from MON0528 and BPC0035.

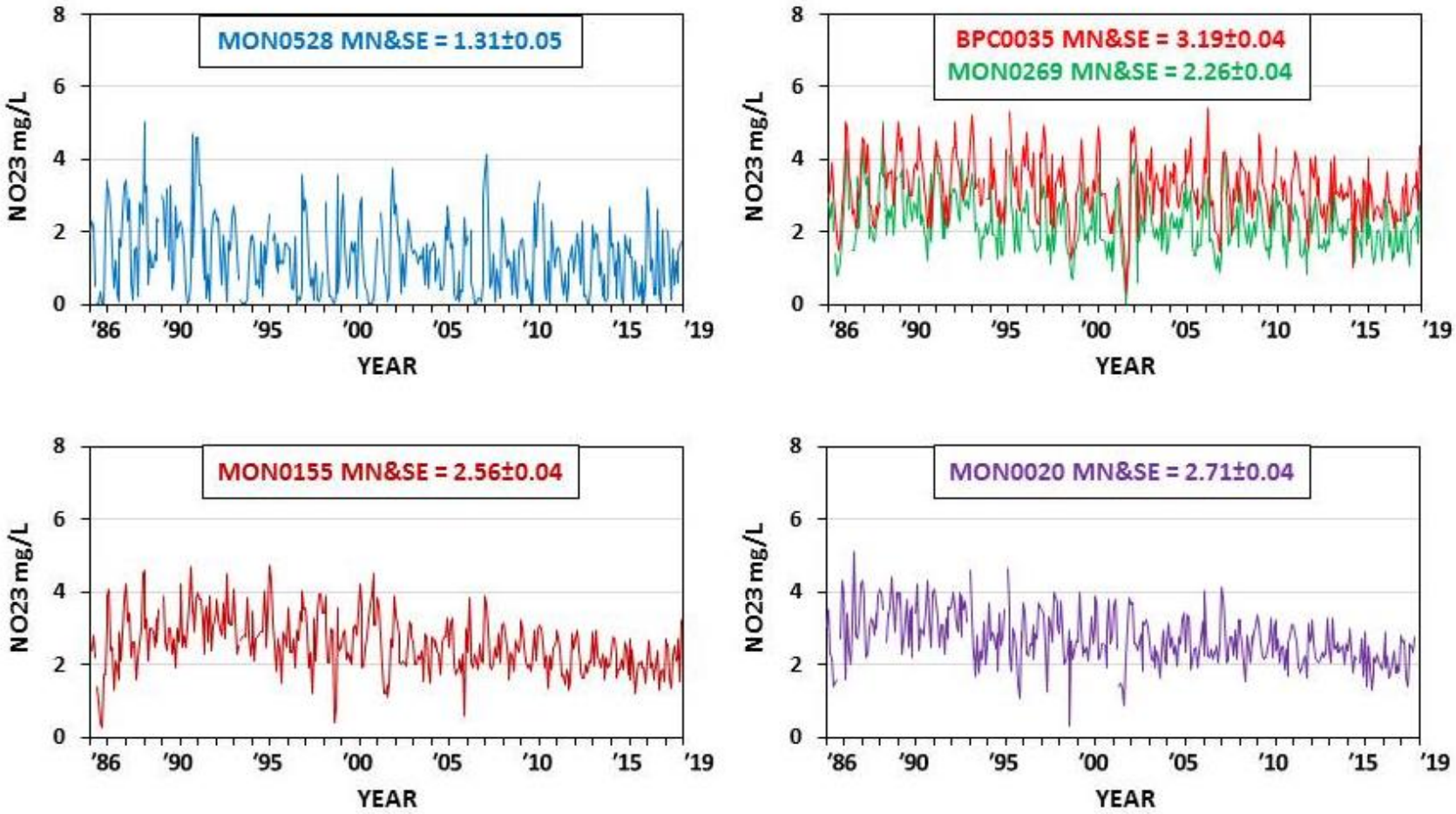


Figure B3. Monthly NO23 concentrations (mg/L) at the Monocacy River (MON0528, MON0269, MON0155, MON0020) and Big Pipe Creek (BPC0035) stations for the 1986-2018 period. The insert provides the average (±standard error, se) concentrations over 33 years. The graph in the upper right shows concentrations at BPC0035 and MON0269 to indicate the similarities between the two as a result of mixing of water from MON0528 and BPC0035.

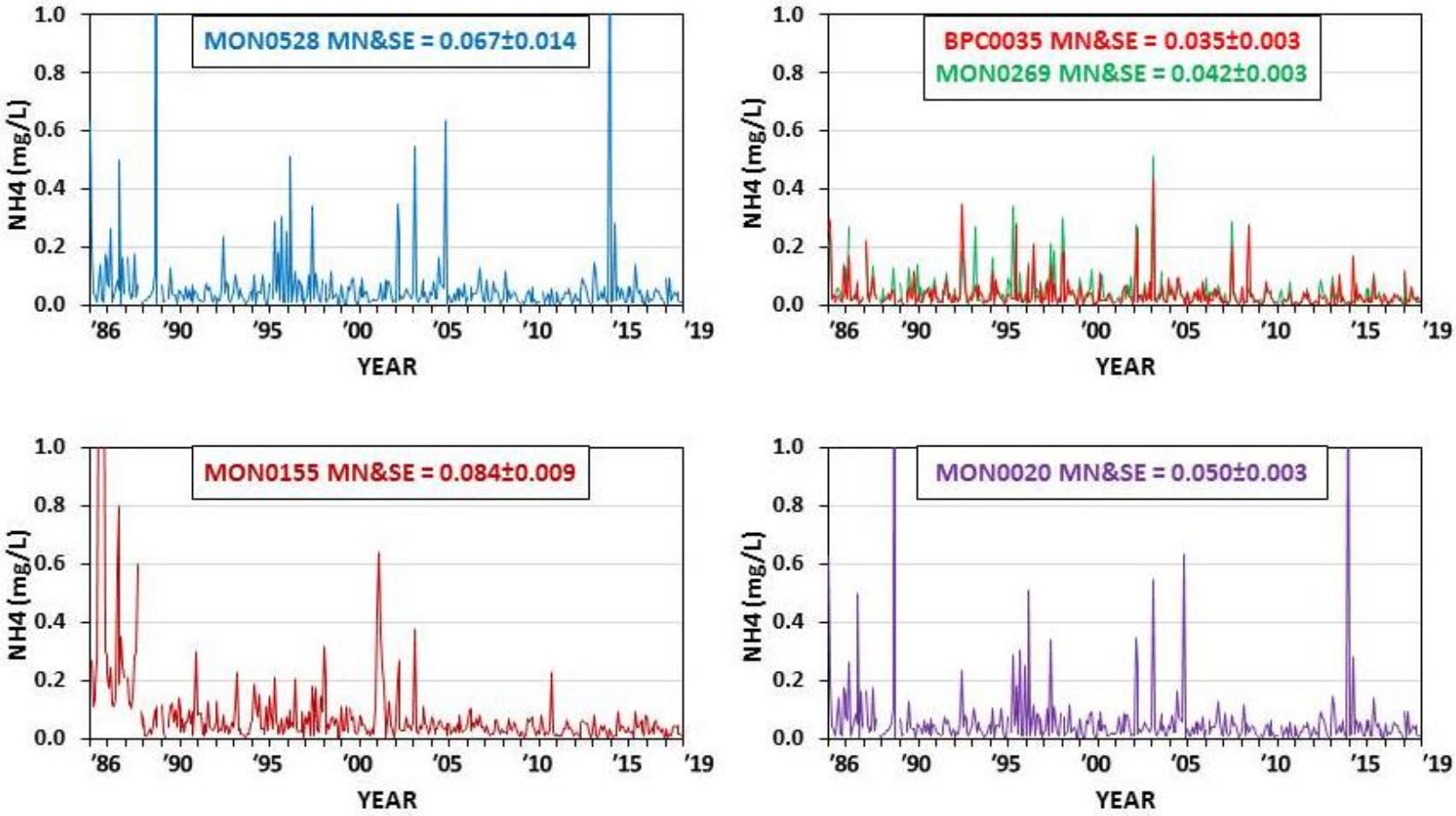


Figure B4. Monthly NH4 concentrations (mg/L) at the Monocacy River (MON0528, MON0269, MON0155, MON0020) and Big Pipe Creek (BPC0035) stations for the 1986-2018 period. The insert provides the average (±standard error, se) concentrations over 33 years. The graph in the upper right shows concentrations at BPC0035 and MON0269 to indicate the similarities between the two as a result of mixing of water from MON0528 and BPC0035. Note the scale change in the Y axis vs. graphs B1-B3.

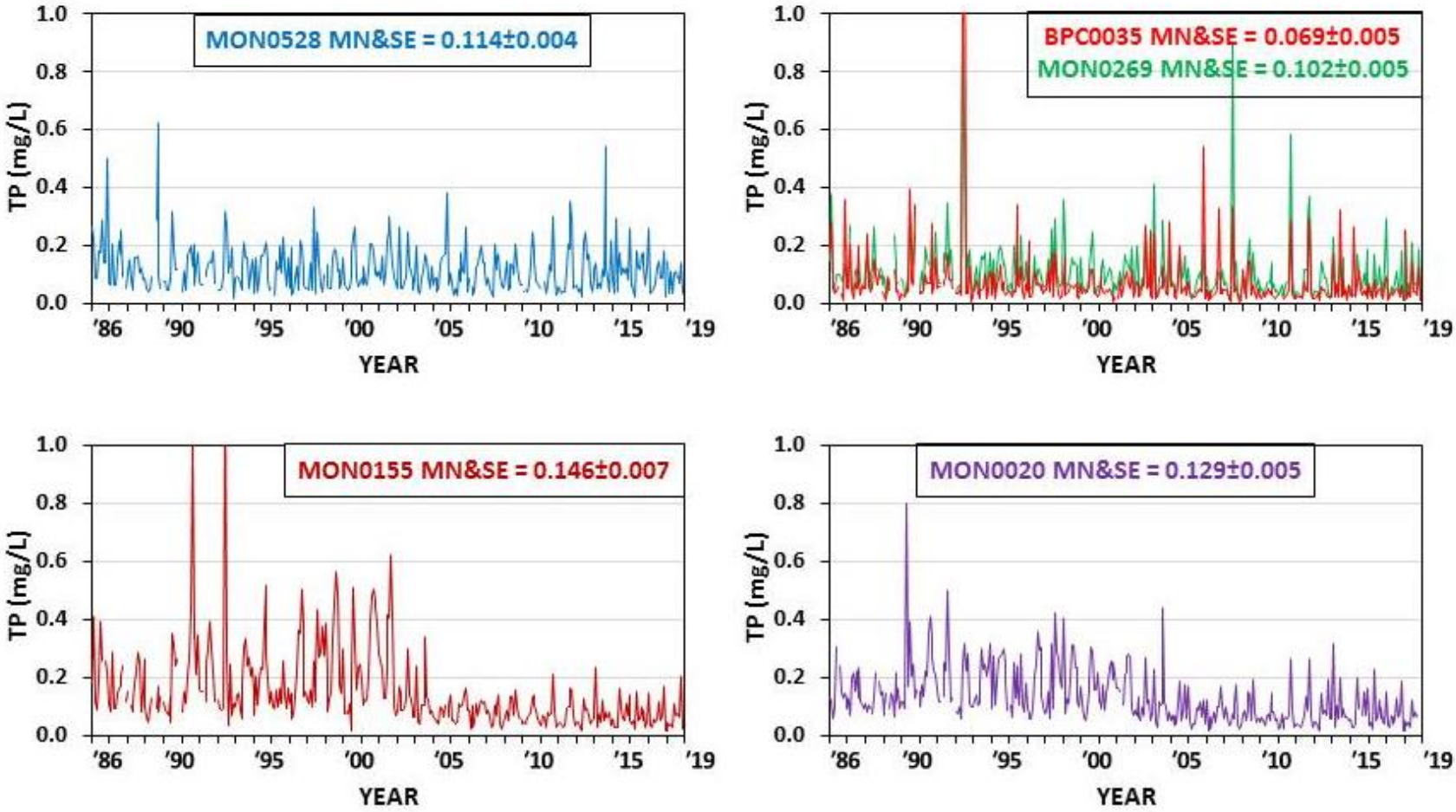


Figure B5. Monthly TP concentrations (mg/L) at the Monocacy River (MON0528, MON0269, MON0155, MON0020) and Big Pipe Creek (BPC0035) stations for the 1986-2018 period. The insert provides the average (±standard error, se) concentrations over 33 years. The graph in the upper right shows concentrations at BPC0035 and MON0269 to indicate the similarities between the two as a result of mixing of water from MON0528 and BPC0035.

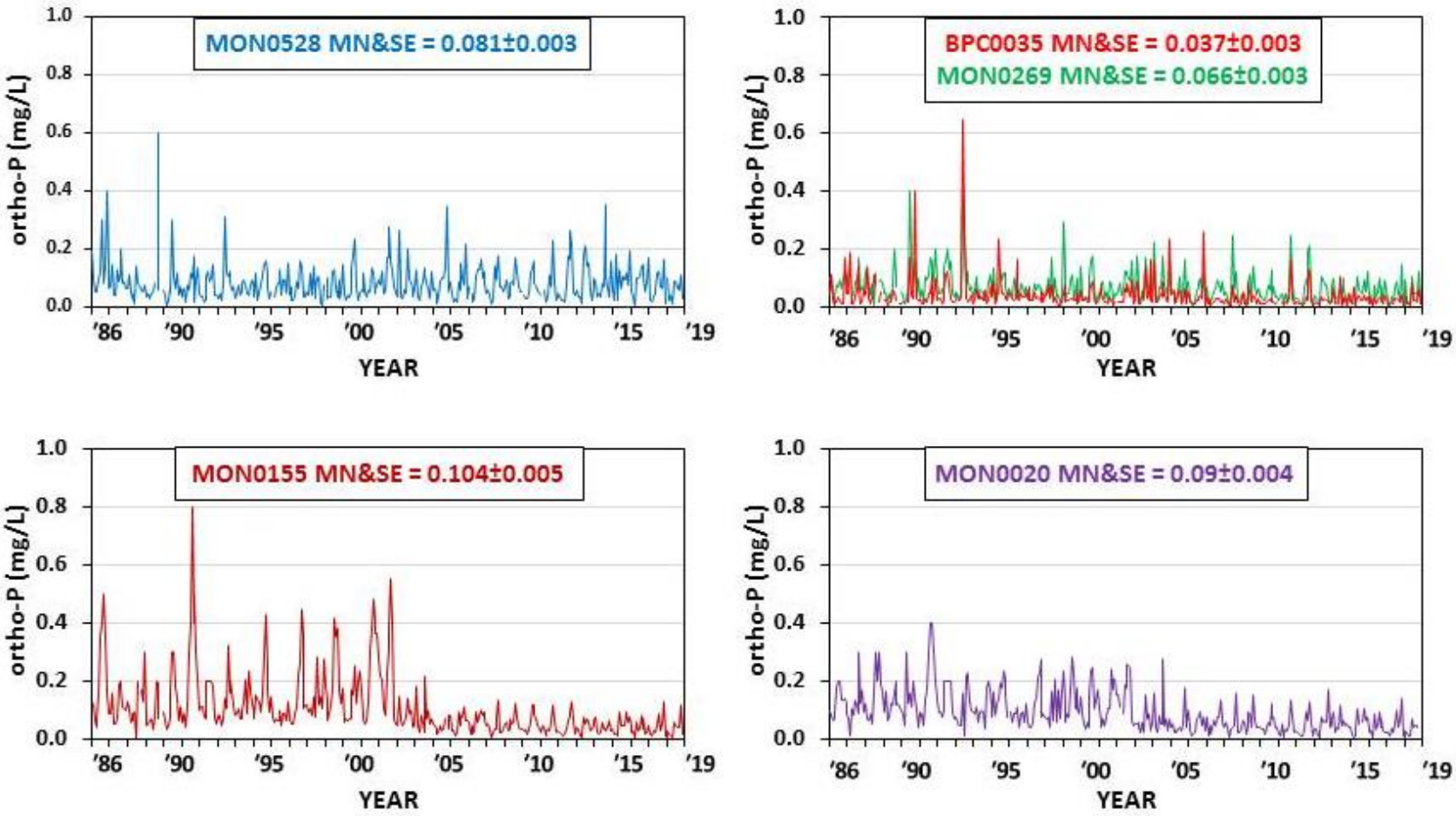


Figure B6. Monthly PO4 concentrations (mg/L) at the Monocacy River (MON0528, MON0269, MON0155, MON0020) and Big Pipe Creek (BPC0035) stations for the 1986-2018 period. The insert provides the average (±standard error, se) concentrations over 33 years. The graph in the upper right shows concentrations at BPC0035 and MON0269 to indicate the similiarities between the two as a result of mixing of water from MON0528 and BPC0035.

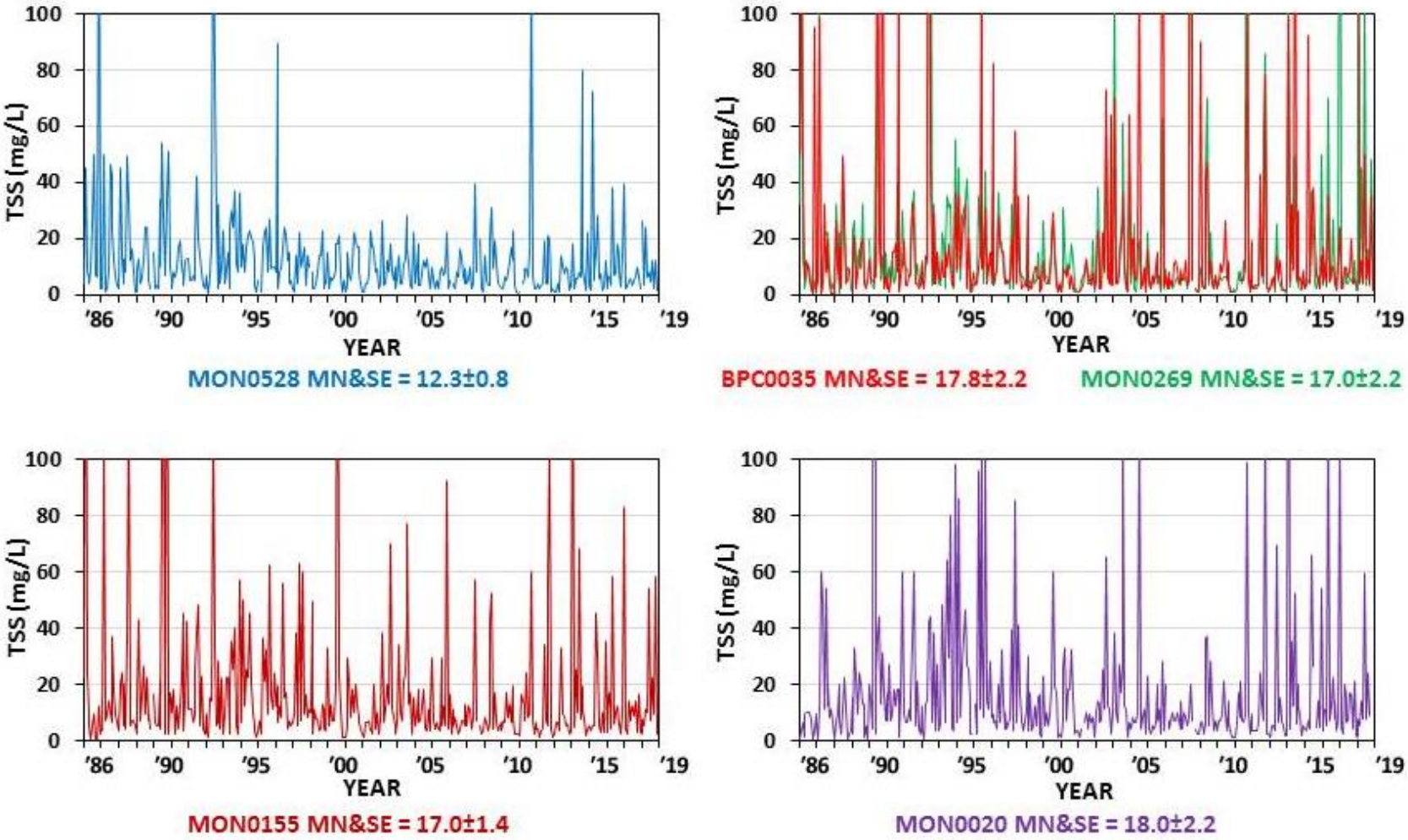


Figure B7. Monthly TSS concentrations (mg/L) at the Monocacy River (MON0528, MON0269, MON0155, MON0020) and Big Pipe Creek (BPC0035) stations for the 1986-2018 period. The insert provides the average (±standard error, se) concentrations over 33 years. The graph in the upper right shows concentrations at BPC0035 and MON0269 to indicate the similarities between the two as a result of mixing of water from MON0528 and BPC0035.

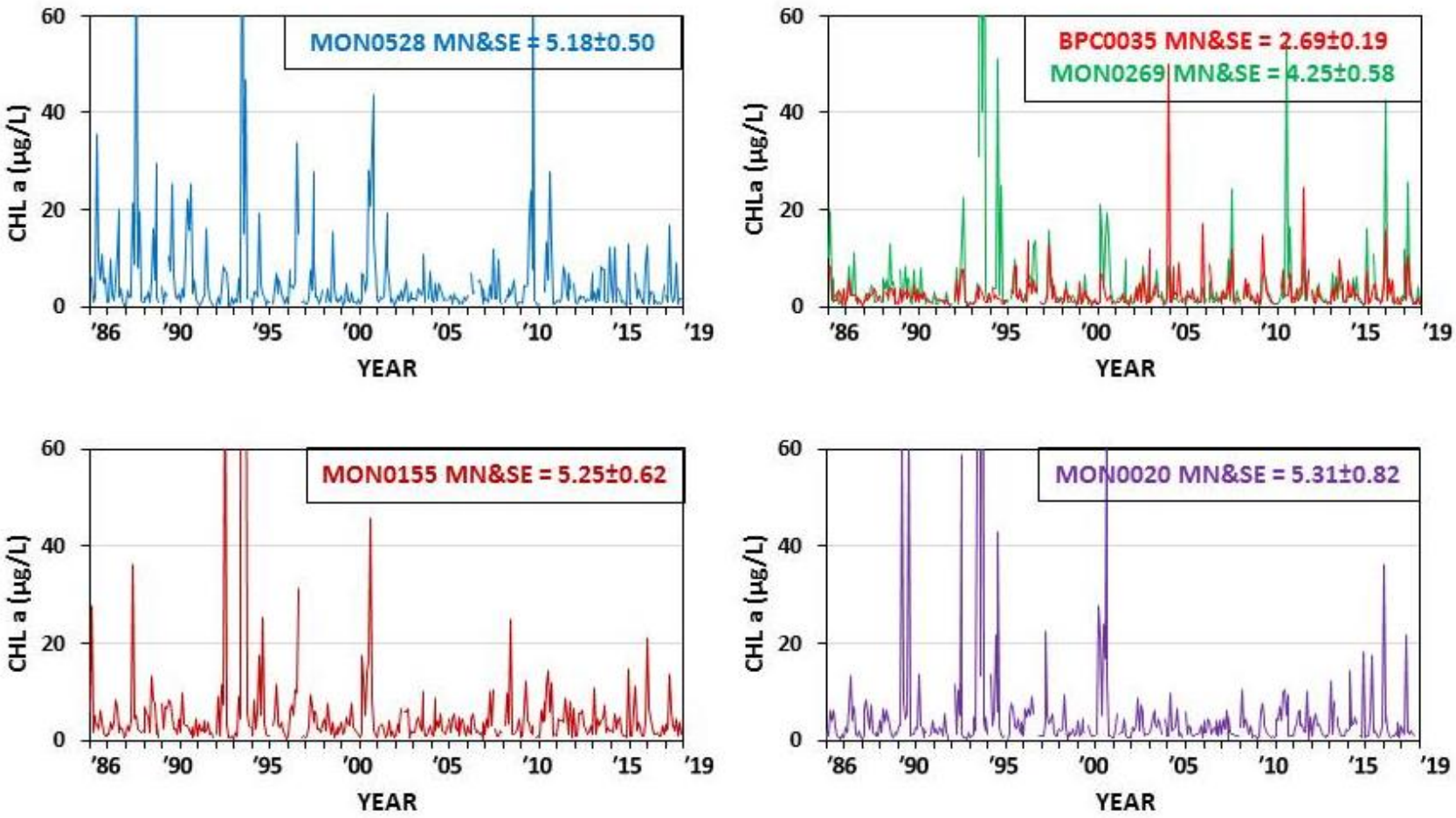


Figure B8. Monthly CHLa concentrations (µg/L) at the Monocacy River (MON0528, MON0269, MON0155, MON0020) and Big Pipe Creek (BPC0035) stations for the 1986-2018 period. The insert provides the average (±standard error, se) concentrations over 33 years. The graph in the upper right shows concentrations at BPC0035 and MON0269 to indicate the similiarities between the two as a result of mixing of water from MON0528 and BPC0035.

Appendix C

Plots and statistics (General Additive Models, GAMs) of season (GAM# 2) and season+flow (GAM# 4) smoothed data to identify time and time plus hydrologic controls of river and creek water quality parameters. Flow models were developed by adding a flow term with time and season interactions to long term trend models. Flow data from USGS gages were matched against nutrient concentration data for each monitoring station as shown in Table C1. Flow data were pre-processed by natural log transformation and removing seasonal trend by subtracting out the predictions from a simple GAM ((i.e., ln(flow) ~ s(doy,bs='cc')). This pre-processing produced a flow variable that measures whether flow was above or below average for a given time of year. Flow data were then averaged for 1, 3, or 7 days prior to the nutrient observation date and the average that had the highest Spearman rank correlation (best fit) with the observed concentration was used as the predictive flow variable in the trend model.

Table C1. Monitoring stations matched against USGS gaging stations for flow adjustment trend models.

Monitoring Station	USGS Gage	USGS Gage ID	Latitude	Longitude
MON0528	Monocacy River at Bridgeport, MD	01639000	39°40'44.6	77°14'04.3
BPC0035	Big Pipe Creek at Bruceville, MD	01639500	39°36'44.5	77°14'14.8
MON0269	Monocacy River at Jug Bridge near Frederick, MD	01643000	39°24'10.2	77°21'57.9
MON0155	Monocacy River at Jug Bridge near Frederick, MD	01643000	39°24'10.2	77°21'57.9
MON0020	Monocacy River at Jug Bridge near Frederick, MD	01643000	39°24'10.2	77°21'57.9

Results are presented in the order TN, DIN, NO23, NH4, TP, PO4, TSS, and CHLa.

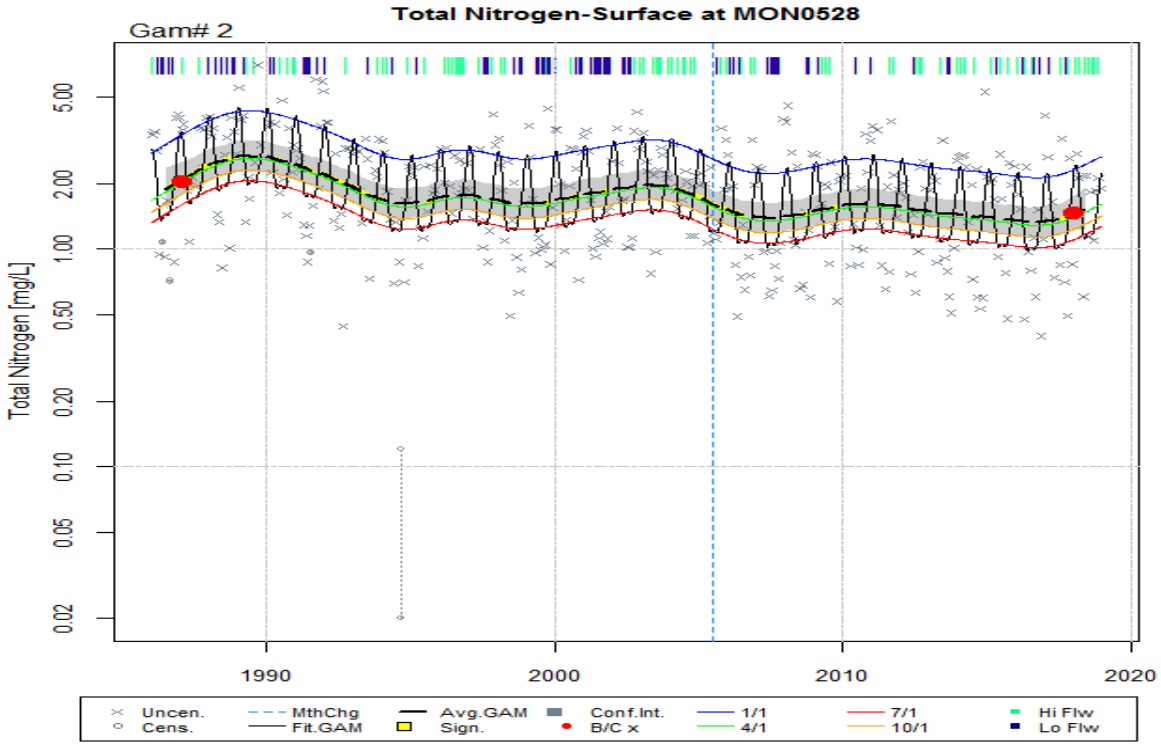
Key elements of the graphs include:

- GAM# 2, data smoothed for season and GAM# 4, data smoother for season+flow
- Short vertical bars at the top of each graph represent high (green) or low (blue) flows.
- Seasonal differences in modeled data: Winter (January-March, blue, as 1/1); spring (April-June, green, as 4/1); summer (July-September, red, as 7/1); and fall (October-December, yellow, as 10/1).
- An oscillating light black line represents the fitted seasonal pattern in a year.
- A dark black dashed line is the average of those yearly variations over the 33 years.
- A light gray shaded area around the dashed black line is the confidence interval for the smoothed average data.
- A dotted fuschia line in GAM# 4 graphs indicating the importance of flow events in describing the observations.
- Red dots at the beginning and end of the records represent average concentrations for the first and last 2 years of the 33-year period, used to calculate overall change or trend in the collected and smoothed data.

Symbols below the graphs and in the tables of statistical results are:

- gam number 2 model is a combination of linear and non-linear (i.e., exponential) time terms to explain the observations; gam number 4 model is a combination of linear and non-linear time and flow terms to explain the observations
- model = combination of linear and non-linear time and flow parameters to smooth the data to best fit the overall pattern of observations
- type = parametric or linear terms; smoothed terms are non-linear time or time and flow terms
- source = for Gam# 2, part of each model that yields the best fit to the observations by year (cyear), day of year (doy), or the ti-the interaction of year and day of year; for GAM# 4, the same as GAM# 2 but with the addition of flow terms
- df = degrees of freedom, the number of independent values which can be assigned to a statistical distribution
- F = a statistic derived from an analysis of variance (ANOVA) to determine if the averages of two populations are significantly different; the larger the value, the larger the difference and more important the variable in determining its effect on the pattern
- p.value = probability that the results are significant ($p<0.05$, better than 1 in 20) in explaining the observations
- std.error = the standard deviation of a population average divided by the square root of the number of observations
- t.value = the size of the difference in two population averages relative to the variation in sample data; the smaller the value, the less chance for a true difference
- AIC = an estimator of out-of-sample prediction error and hence relative quality of statistical models for a given set of data; given a collection of models for the data, AIC estimates the quality of each model, relative to the other models (Wikipedia, 1/1/20)
- RMSE = a statistic that indicates how concentrated observations are around the line of best fit
- AdjRsquare = a measure of the importance of model terms in predicting observations; it increases if a new term improves the model more than would be expected by chance and decreases when a term improves the model by less than expected by chance (https://bIog.minitab.com/blog/adventures-in-statistics-2/multiple-regession-analysis-use-adjusted-r-squared-and-predicted-r-squared-to-include-the-correct-number-of-variables)

Total Nitrogen (TN)



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - tn gam# = 2

type	source	df	F	p.value	Note
parametric terms	cyear	1	3.3824	0.0667	-
smoothed terms	s(cyear)	10.72	1.8279	0.0364	-
" "	s(doy)	4.92	18.6942	<0.0001	-
" "	ti(cyear,doy)	0	0	0.3049	-

Table: GAM Parameter Coefficients. - MON0528 - S - tn gam# = 2

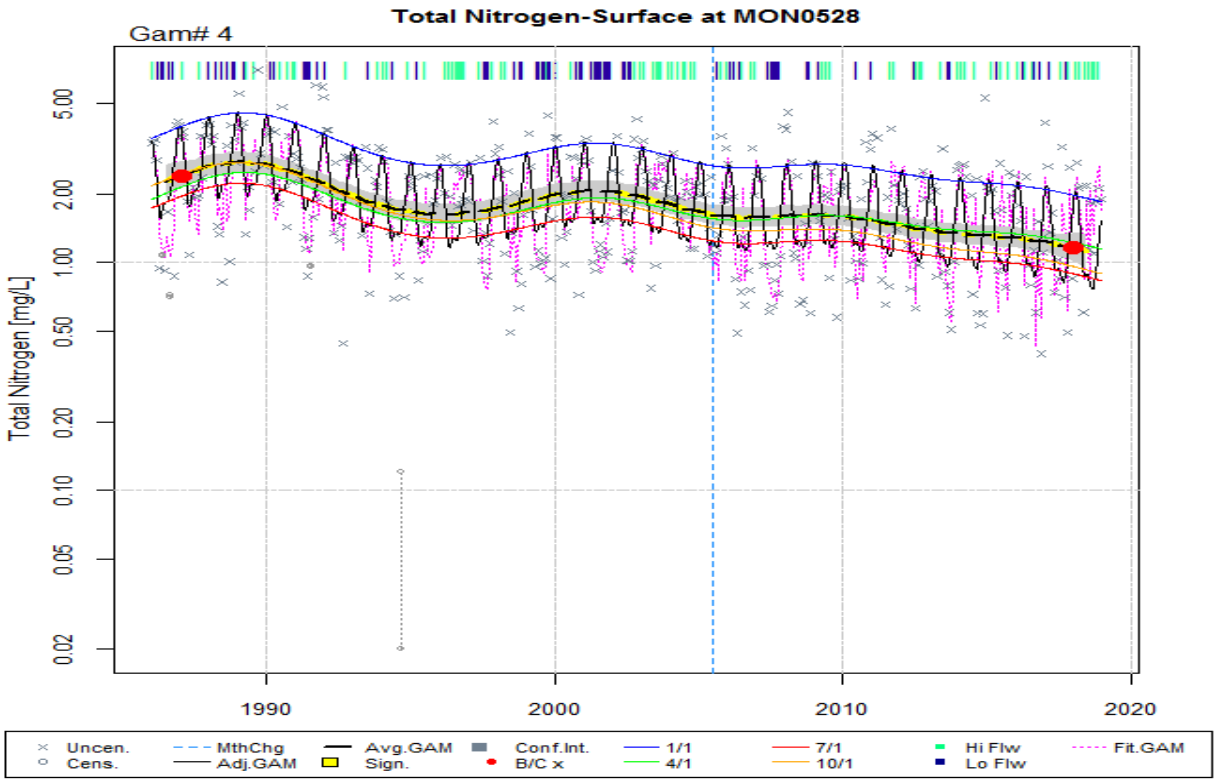
source	estimate	std.error	t.value	p.value
(Intercept)	0.523003	0.026152	19.9986	<0.0001
cyear	0.167968	0.091331	1.8391	0.0667

Table: GAM Diagnostics. - MON0528 - S - tn

AIC	RMSE	AdjRsquare
524.57	0.4697	0.3627

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - tn gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	0.715 (2.0441)
Current ln mean (geometric mean)	0.3768 (1.4576)
Estimated ln difference	-0.3382
Std. Err. ln difference	0.1297
95% Confidence interval for ln difference	(-0.5924 , -0.084)
Difference p-value	0.0095
Period of Record Percent Change Estimate (%)	-28.69%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - tn gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	0.455	0.5004
smoothed terms	s(cyear)	7.29	4.0804	0.0001
" "	s(doy)	5.7	26.8881	<0.0001
" "	ti(cyear,doy)	1.25	0.3357	0.0770
" "	s(flw_sal)	3.61	44.2419	<0.0001
" "	ti(flw_sal,doy)	5.23	2.5688	<0.0001
" "	ti(flw_sal,cyear)	2.89	2.3535	0.0523
" "	ti(flw_sal,doy,cyear)	1.19	0.0827	0.1270

Table: GAM Parameter Coefficients. - MON0528 - S - tn gam# = 4

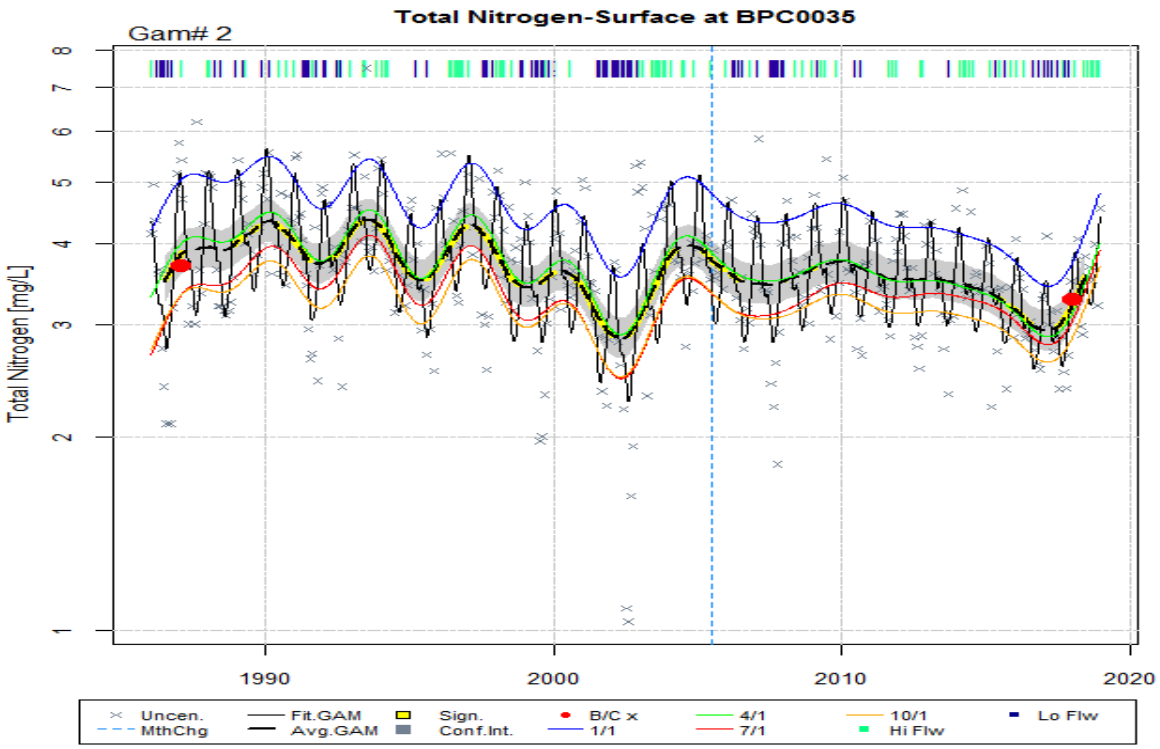
source	estimate	std.error	t.value	p.value
(Intercept)	0.537422	0.019719	27.2536	<0.0001
cyear	0.024203	0.035882	0.6745	0.5004

Table: GAM Diagnostics. - MON0528 - S - tn

AIC	RMSE	AdjRsquare
306.74	0.3479	0.6497

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - tn gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	0.8705 (2.3881)
Current ln mean (geometric mean)	0.146 (1.1572)
Estimated ln difference	-0.7245
Std. Err. ln difference	0.1005
95% Confidence interval for ln difference	(-0.9214 , -0.5276)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-51.54%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - tn gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	15.8772	<0.0001
smoothed terms	s(cyear)	19.1	5.2235	<0.0001
" "	s(doy)	6.1	30.9708	<0.0001
" "	ti(cyear,doy)	5.87	0.9576	0.0417

Table: GAM Parameter Coefficients. - BPC0035 - S - tn gam# = 2

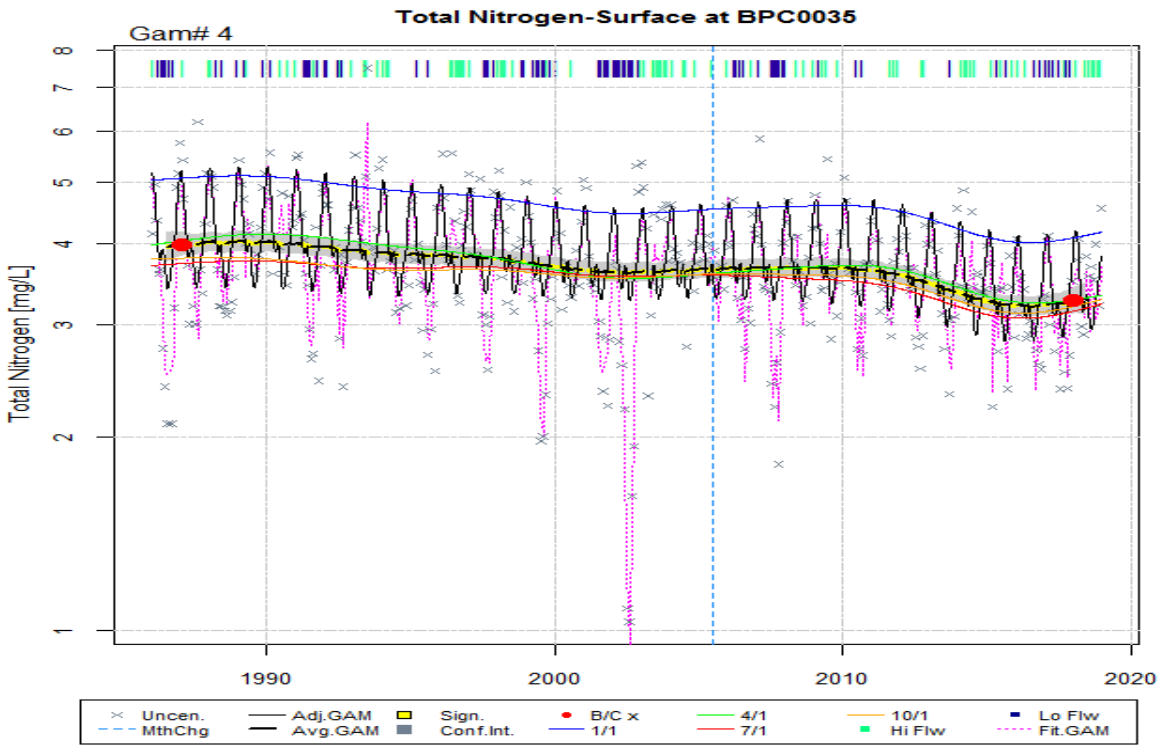
source	estimate	std.error	t.value	p.value
(Intercept)	1.258195	0.01094	115.0103	<0.0001
cyear	0.25782	0.064704	3.9846	<0.0001

Table: GAM Diagnostics. - BPC0035 - S - tn

AIC	RMSE	AdjRsquare
-235.35	0.1703	0.509

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - tn gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	1.3089 (3.7019)
Current ln mean (geometric mean)	1.1894 (3.2852)
Estimated ln difference	-0.1194
Std. Err. ln difference	0.0481
95% Confidence interval for ln difference	(-0.2138 , -0.0251)
Difference p-value	0.0135
Period of Record Percent Change Estimate (%)	-11.26%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - tn gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	1.5649	0.2118
smoothed terms	s(cyear)	6.74	1.8611	0.0106
" "	s(doy)	6.92	48.7231	<0.0001
" "	ti(cyear,doy)	3.76	0.4877	0.1260
" "	s(flw_sal)	4.73	8.1935	<0.0001
" "	ti(flw_sal,doy)	10.86	11.2052	<0.0001
" "	ti(flw_sal,cyear)	2.12	0.8113	0.0017
" "	ti(flw_sal,doy,cyear)	3.3	0.1186	0.0825

Table: GAM Parameter Coefficients. - BPC0035 - S - tn gam# = 4

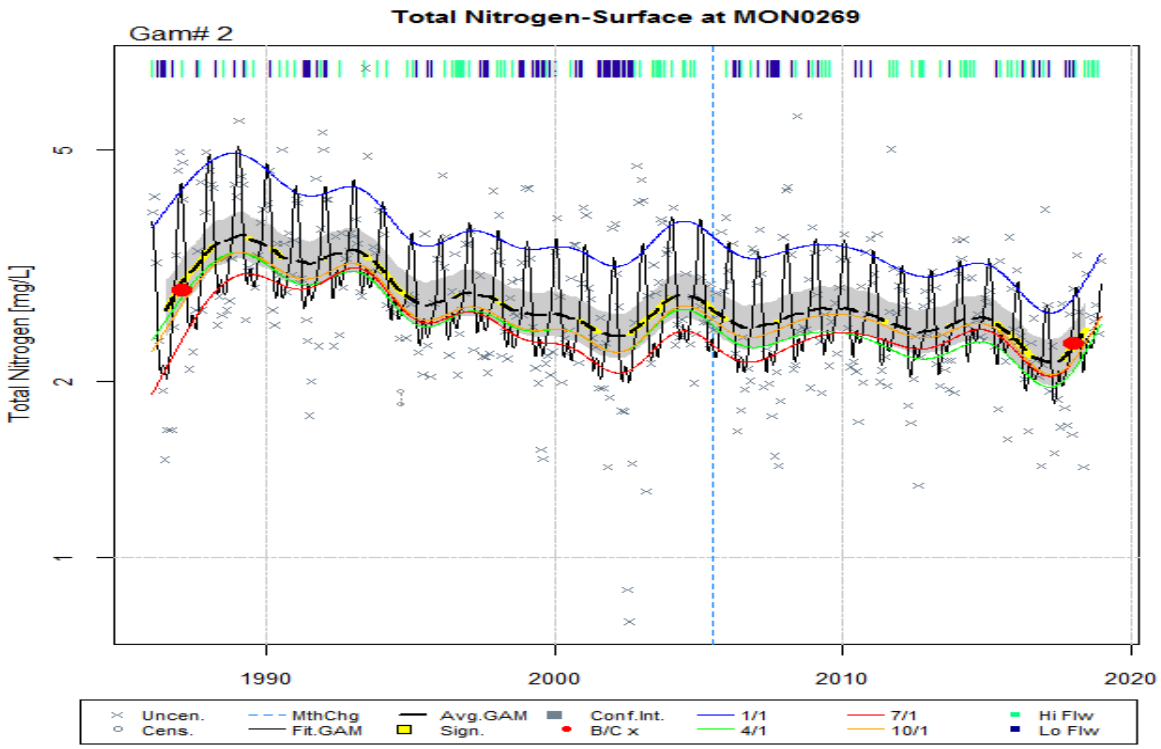
source	estimate	std.error	t.value	p.value
(Intercept)	1.292218	0.006472	199.6689	<0.0001
cyear	0.014805	0.011835	1.2509	0.2118

Table: GAM Diagnostics. - BPC0035 - S - tn

AIC	RMSE	AdjRsquare
-499.81	0.1196	0.758

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - tn gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	1.3826 (3.9853)
Current ln mean (geometric mean)	1.1837 (3.2664)
Estimated ln difference	-0.1989
Std. Err. ln difference	0.0333
95% Confidence interval for ln difference	(-0.2643 , -0.1336)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-18.04%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - tn gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	7.7743	0.0056
smoothed terms	s(cyear)	15.67	2.6761	0.0003
" "	s(doy)	6.25	21.3094	<0.0001
" "	ti(cyear,doy)	6.8	1.0953	0.0403

Table: GAM Parameter Coefficients. - MON0269 - S - tn gam# = 2

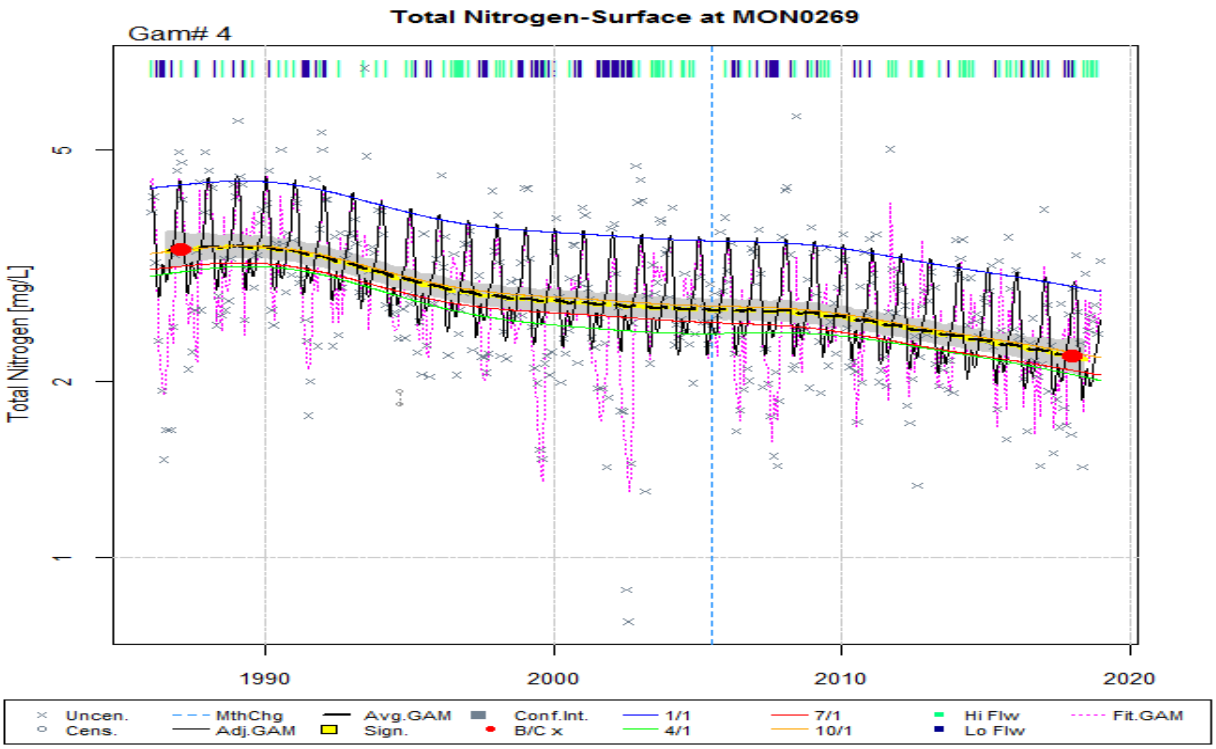
source	estimate	std.error	t.value	p.value
(Intercept)	0.955082	0.019572	48.7985	<0.0001
cyear	0.190981	0.068495	2.7882	0.0056

Table: GAM Diagnostics. - MON0269 - S - tn

AIC	RMSE	AdjRsquare
-23.82	0.2253	0.4364

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - tn gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	1.0563 (2.8756)
Current ln mean (geometric mean)	0.8439 (2.3254)
Estimated ln difference	-0.2124
Std. Err. ln difference	0.0636
95% Confidence interval for ln difference	(-0.337 , -0.0878)
Difference p-value	0.0009
Period of Record Percent Change Estimate (%)	-19.13%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - tn gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	0.1046	0.7466	-
smoothed terms	s(cyear)	4.58	1.8412	0.0910	-
" "	s(doy)	6.73	29.4799	<0.0001	-
" "	ti(cyear,doy)	0	0	0.8962	-
" "	s(flw_sal)	2.51	36.2209	<0.0001	-
" "	ti(flw_sal,doy)	4.19	7.0327	<0.0001	-
" "	ti(flw_sal,cyear)	10.58	1.5983	0.0835	-
" "	ti(flw_sal,doy,cyear)	3.01	0.106	0.0694	-

Table: GAM Parameter Coefficients. - MON0269 - S - tn gam# = 4

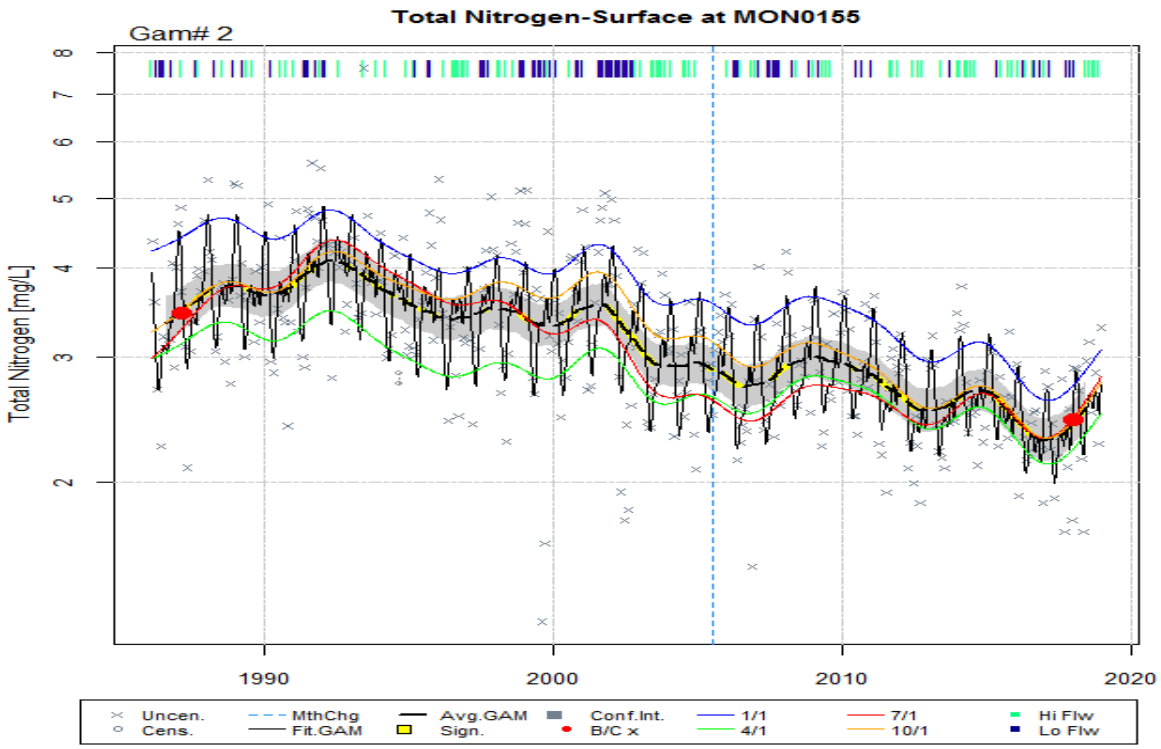
source	estimate	std.error	t.value	p.value
(Intercept)	1.006162	0.010072	99.9019	<0.0001
cyear	-0.00391	0.012092	-0.3234	0.7466

Table: GAM Diagnostics. - MON0269 - S - tn

AIC	RMSE	AdjRsquare
-199.41	0.1788	0.6448

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - tn gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	1.2131 (3.364)
Current ln mean (geometric mean)	0.7931 (2.2103)
Estimated ln difference	-0.42
Std. Err. ln difference	0.0502
95% Confidence interval for ln difference	(-0.5184 , -0.3216)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-34.29%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - tn gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	2.8937	0.0898
smoothed terms	s(cyear)	16.97	2.6224	0.0003
" "	s(doy)	7.09	18.6712	<0.0001
" "	ti(cyear,doy)	7.96	2.2971	0.0002

Table: GAM Parameter Coefficients. - MON0155 - S - tn gam# = 2

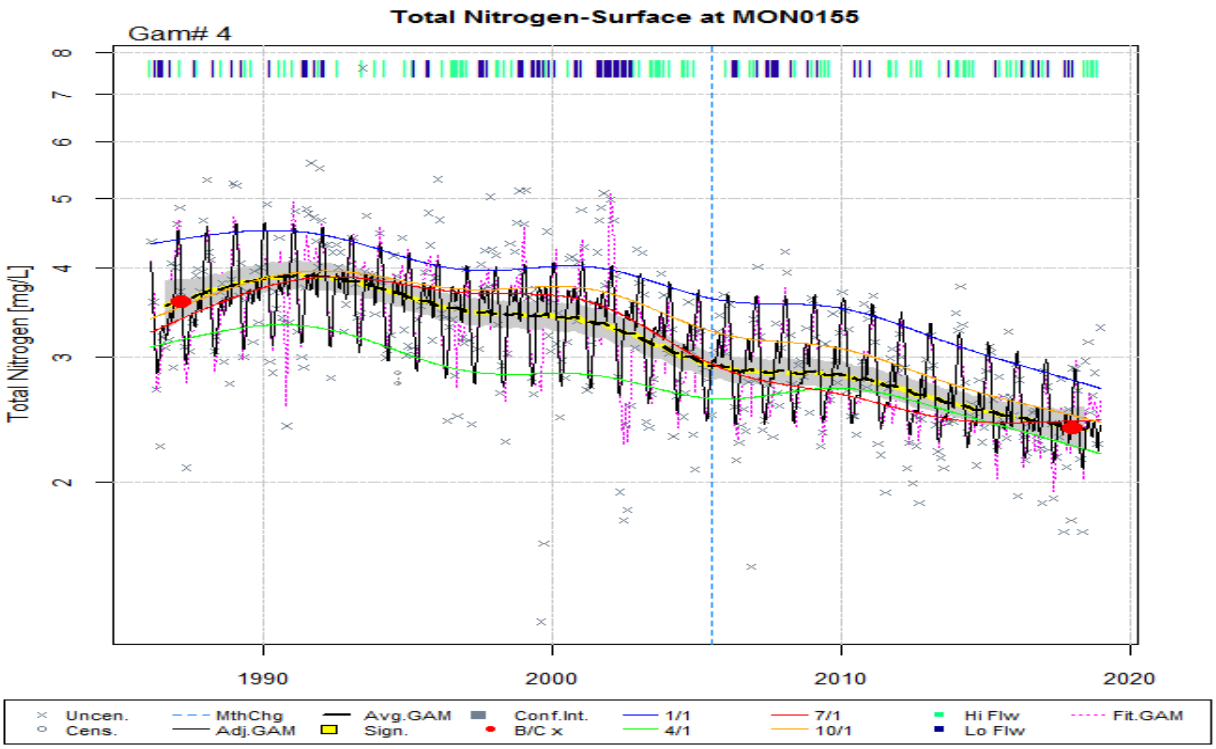
source	estimate	std.error	t.value	p.value
(Intercept)	1.114039	0.016636	66.9666	<0.0001
cyear	0.096455	0.056702	1.7011	0.0898

Table: GAM Diagnostics. - MON0155 - S - tn

AIC	RMSE	AdjRsquare
-246.99	0.1677	0.5669

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - tn gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	1.2384 (3.45)
Current ln mean (geometric mean)	0.8951 (2.4475)
Estimated ln difference	-0.3433
Std. Err. ln difference	0.0481
95% Confidence interval for ln difference	(-0.4375 , -0.2491)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-29.06%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - tn gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	0.3911	0.5321
smoothed terms	s(cyear)	6.3	3.6986	0.0008
" "	s(doy)	7.22	19.5017	<0.0001
" "	ti(cyear,doy)	7.25	1.9721	0.0003
" "	s(flw_sal)	2.09	2.3748	0.0849
" "	ti(flw_sal,doy)	1.54	1.4055	0.0017
" "	ti(flw_sal,cyear)	9.6	2.5813	0.0032
" "	ti(flw_sal,doy,cyear)	9.6	0.6462	<0.0001

Table: GAM Parameter Coefficients. - MON0155 - S - tn gam# = 4

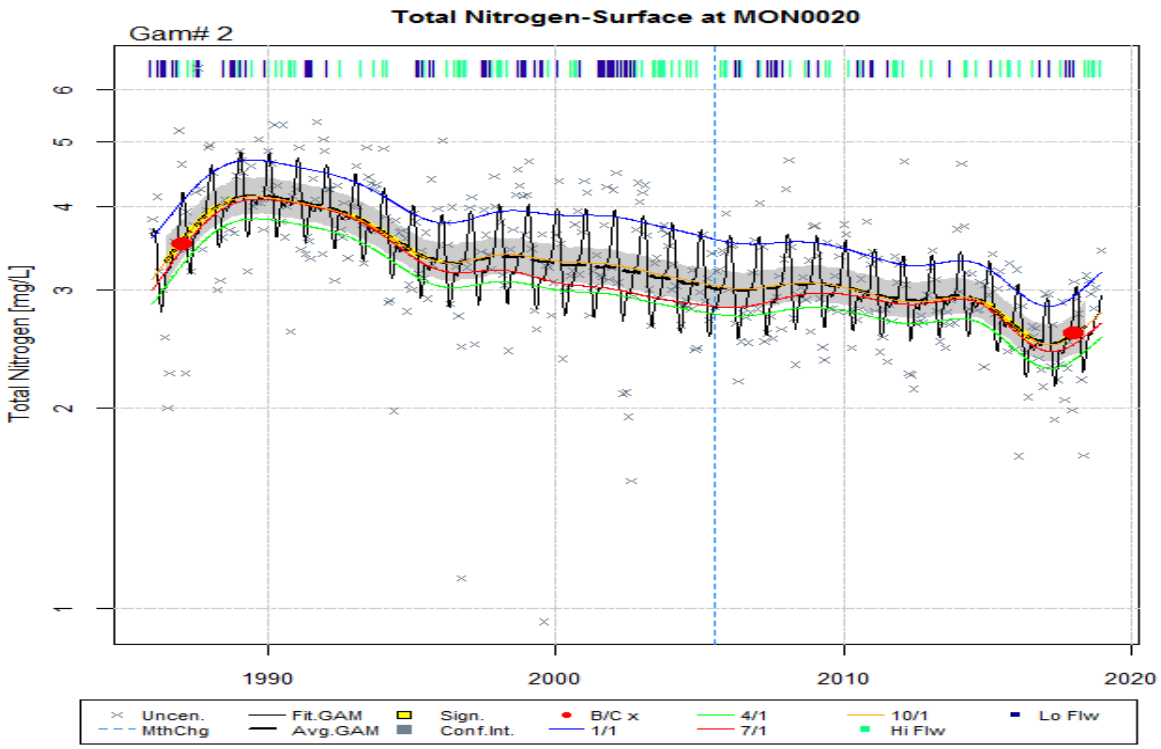
source	estimate	std.error	t.value	p.value
(Intercept)	1.136025	0.009182	123.7191	<0.0001
cyear	0.009277	0.014834	0.6254	0.5321

Table: GAM Diagnostics. - MON0155 - S - tn

AIC	RMSE	AdjRsquare
-289.27	0.1567	0.6223

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - tn gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	1.2766 (3.5845)
Current ln mean (geometric mean)	0.8701 (2.3871)
Estimated ln difference	-0.4065
Std. Err. ln difference	0.0482
95% Confidence interval for ln difference	(-0.5009 , -0.3122)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-33.4%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - tn gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	7.3119	0.0072
smoothed terms	s(cyear)	12.24	2.0572	<0.0001
" "	s(doy)	6.1	12.6115	<0.0001
" "	ti(cyear,doy)	1.67	0.3771	0.0428

Table: GAM Parameter Coefficients. - MON0020 - S - tn gam# = 2

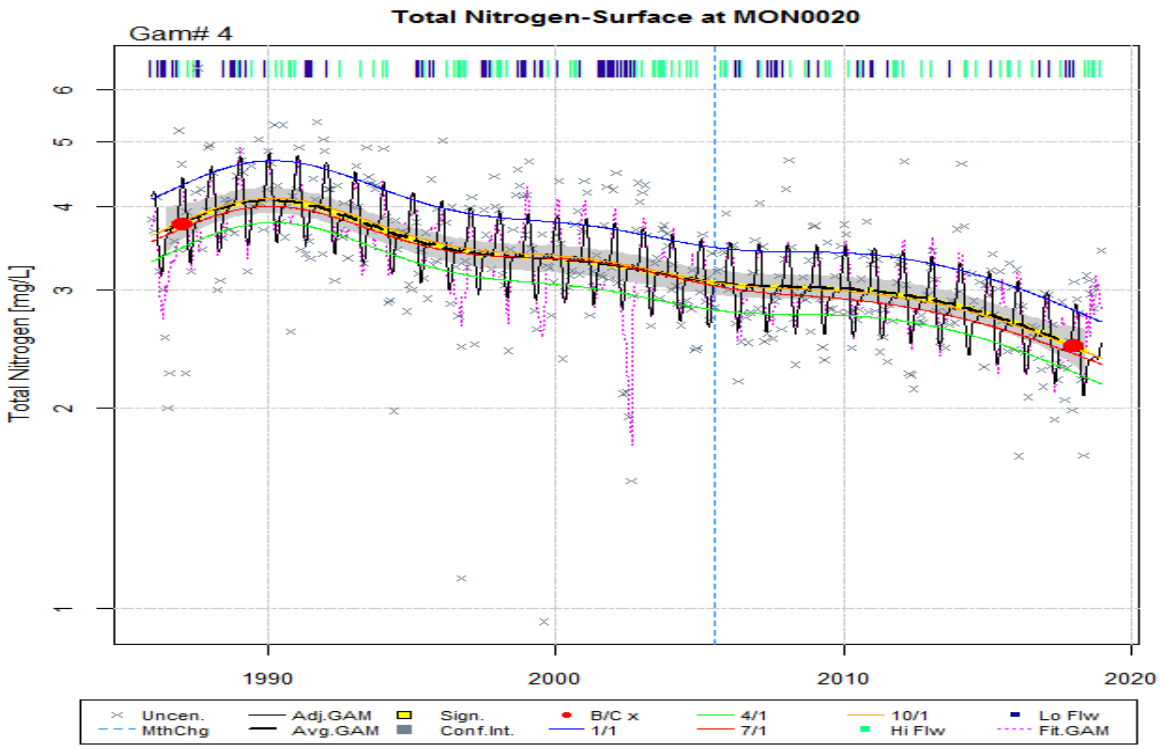
source	estimate	std.error	t.value	p.value
(Intercept)	1.159771	0.010348	112.0765	<0.0001
cyear	0.110397	0.040826	2.704	0.0072

Table: GAM Diagnostics. - MON0020 - S - tn

AIC	RMSE	AdjRsquare
-222.1	0.1755	0.4582

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - tn gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	1.2583 (3.5193)
Current ln mean (geometric mean)	0.9509 (2.588)
Estimated ln difference	-0.3074
Std. Err. ln difference	0.049
95% Confidence interval for ln difference	(-0.4033 , -0.2114)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-26.46%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - tn gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	0.0041	0.9489
smoothed terms	s(cyear)	5.79	2.2505	0.0009
" "	s(doy)	6.07	13.1165	<0.0001
" "	ti(cyear,doy)	1.02	0.1519	0.1356
" "	s(flw_sal)	0.88	0.1361	0.0397
" "	ti(flw_sal,doy)	2.98	0.6359	0.0181
" "	ti(flw_sal,cyear)	6.44	2.7286	<0.0001
" "	ti(flw_sal,doy,cyear)	4.4	0.2527	0.0036

Table: GAM Parameter Coefficients. - MON0020 - S - tn gam# = 4

source	estimate	std.error	t.value	p.value
(Intercept)	1.179192	0.009004	130.9626	<0.0001
cyear	0.001049	0.016358	0.0641	0.9489

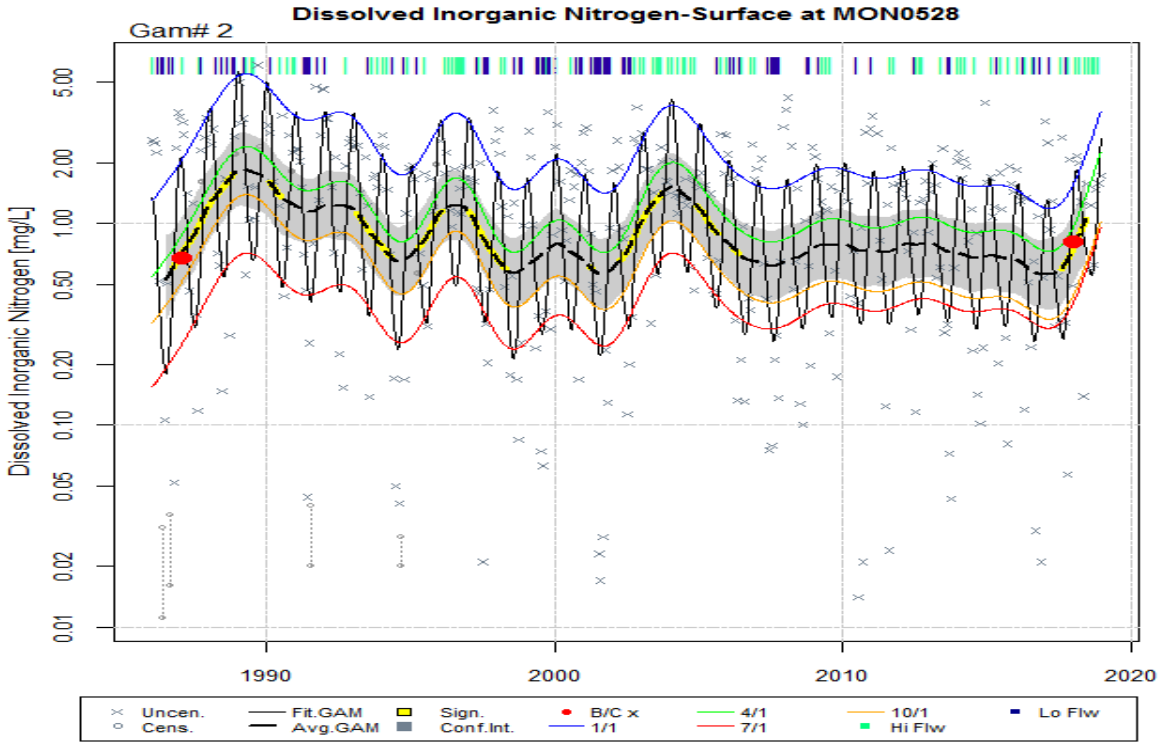
Table: GAM Diagnostics. - MON0020 - S - tn

AIC	RMSE	AdjRsquare
-271.07	0.1631	0.5321

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - tn gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	1.3276 (3.7721)
Current ln mean (geometric mean)	0.9062 (2.4748)
Estimated ln difference	-0.4215
Std. Err. ln difference	0.0475
95% Confidence interval for ln difference	(-0.5146 , -0.3283)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-34.39%
Period of Record	1986 - 2018

Dissolved Inorganic Nitrogen (DIN)



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0528 - S - din gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	4.9447	0.0268
smoothed terms	s(cyear)	16.96	2.2153	0.0027
" "	s(doy)	3.68	23.1479	<0.0001
" "	ti(cyear,doy)	1.7	0.4181	0.0741

Table: GAM Parameter Coefficients. - MON0528 - S - din gam# = 2

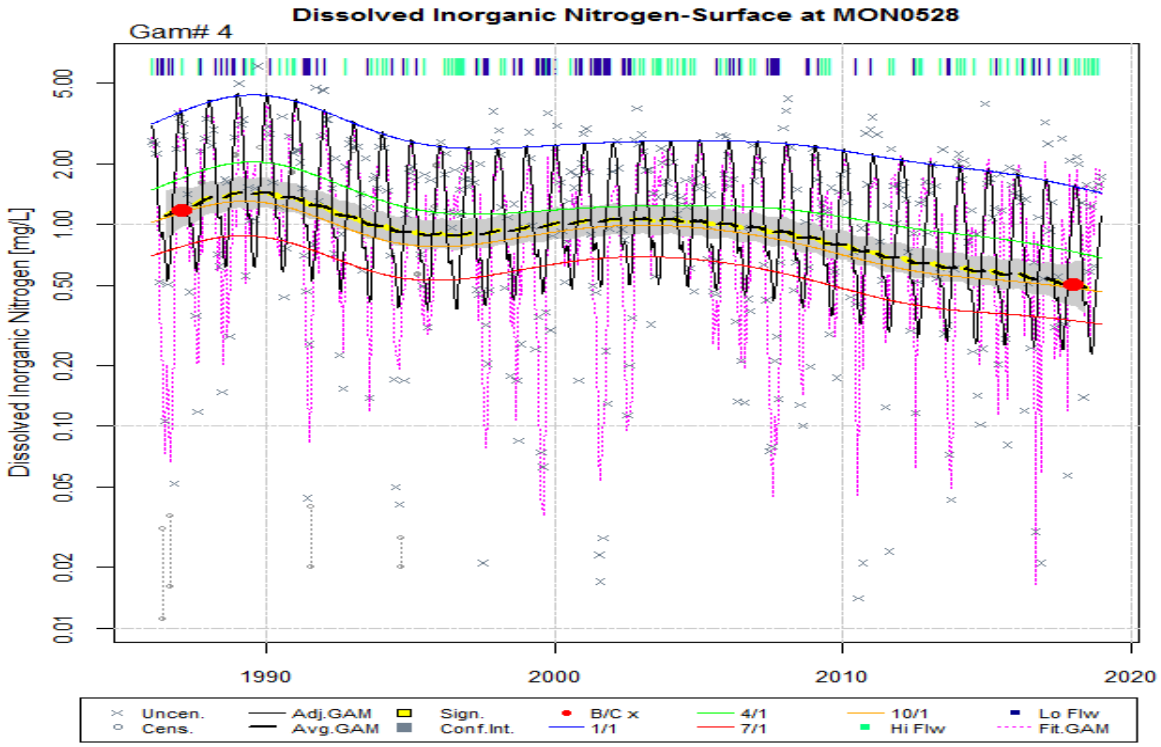
source	estimate	std.error	t.value	p.value
(Intercept)	-0.255211	0.061216	-4.1691	<0.0001
cyear	0.700349	0.314954	2.2237	0.0268

Table: GAM Diagnostics. - MON0528 - S - din

AIC	RMSE	AdjRsquare
1087.67	0.9682	0.3772

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - din gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-0.3908 (0.6765)
Current ln mean (geometric mean)	-0.2113 (0.8095)
Estimated ln difference	0.1795
Std. Err. ln difference	0.2747
95% Confidence interval for ln difference	(-0.359 , 0.7179)
Difference p-value	0.5140
Period of Record Percent Change Estimate (%)	19.66%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0528 - S - din gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	0.4284	0.5132	-
smoothed terms	s(cyear)	5.73	2.8178	0.0069	-
" "	s(doy)	6.85	43.552	<0.0001	-
" "	ti(cyear,doy)	1.5	0.296	0.0606	-
" "	s(flw_sal)	3.63	61.8741	<0.0001	-
" "	ti(flw_sal,doy)	4.86	7.8311	<0.0001	-
" "	ti(flw_sal,cyear)	5.93	2.9909	0.0030	-
" "	ti(flw_sal,doy,cyear)	0	0	0.4400	-

Table: GAM Parameter Coefficients. - MON0528 - S - din gam# = 4

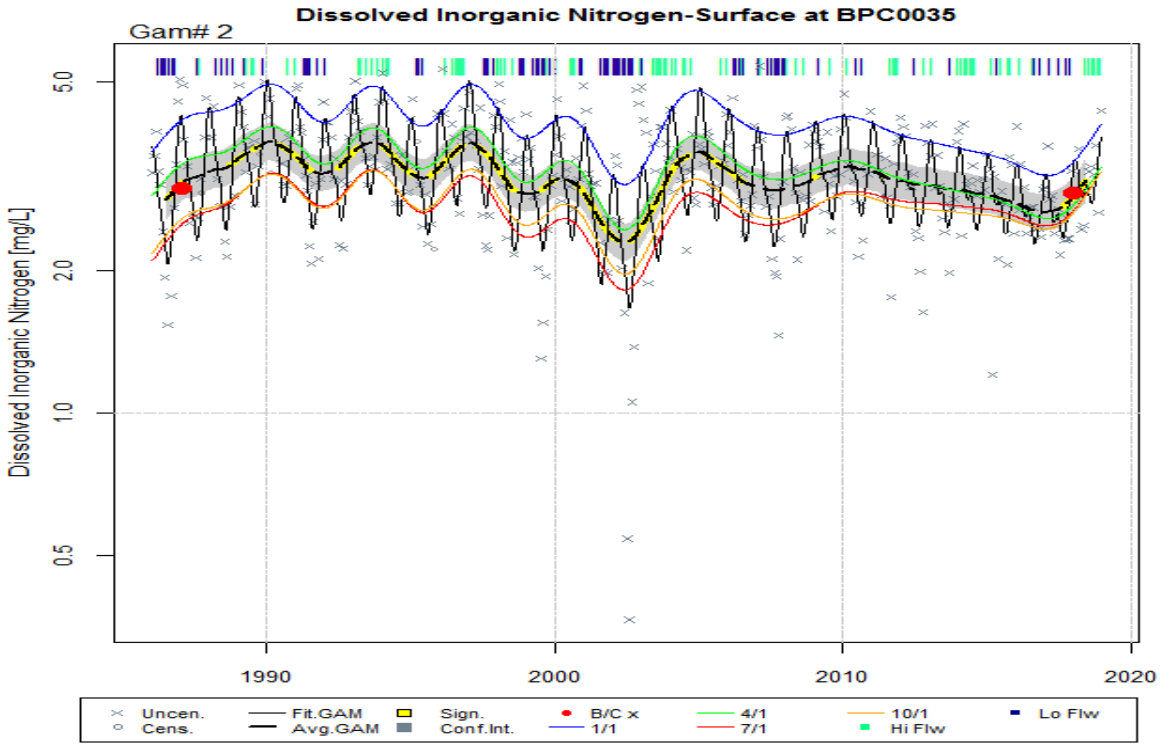
source	estimate	std.error	t.value	p.value
(Intercept)	-0.17488	0.035543	-4.9202	<0.0001
cyear	0.033914	0.051817	0.6545	0.5132

Table: GAM Diagnostics. - MON0528 - S - din

AIC	RMSE	AdjRsquare
763.13	0.6291	0.7365

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - din gam# = 4

Calculation	Estimate
Baseline In mean (geometric mean)	0.1668 (1.1815)
Current In mean (geometric mean)	-0.6843 (0.5044)
Estimated In difference	-0.8511
Std. Err. In difference	0.178
95% Confidence interval for In difference	(-1.2 , -0.5022)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-57.31%
Period of Record	1986 – 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - BPC0035 - S - din gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	6.6109	0.0105
smoothed terms	s(cyear)	18.62	4.8852	<0.0001
" "	s(doy)	5.52	30.3787	<0.0001
" "	ti(cyear,doy)	6	1.4589	0.0022

Table: GAM Parameter Coefficients. - BPC0035 - S - din gam# = 2

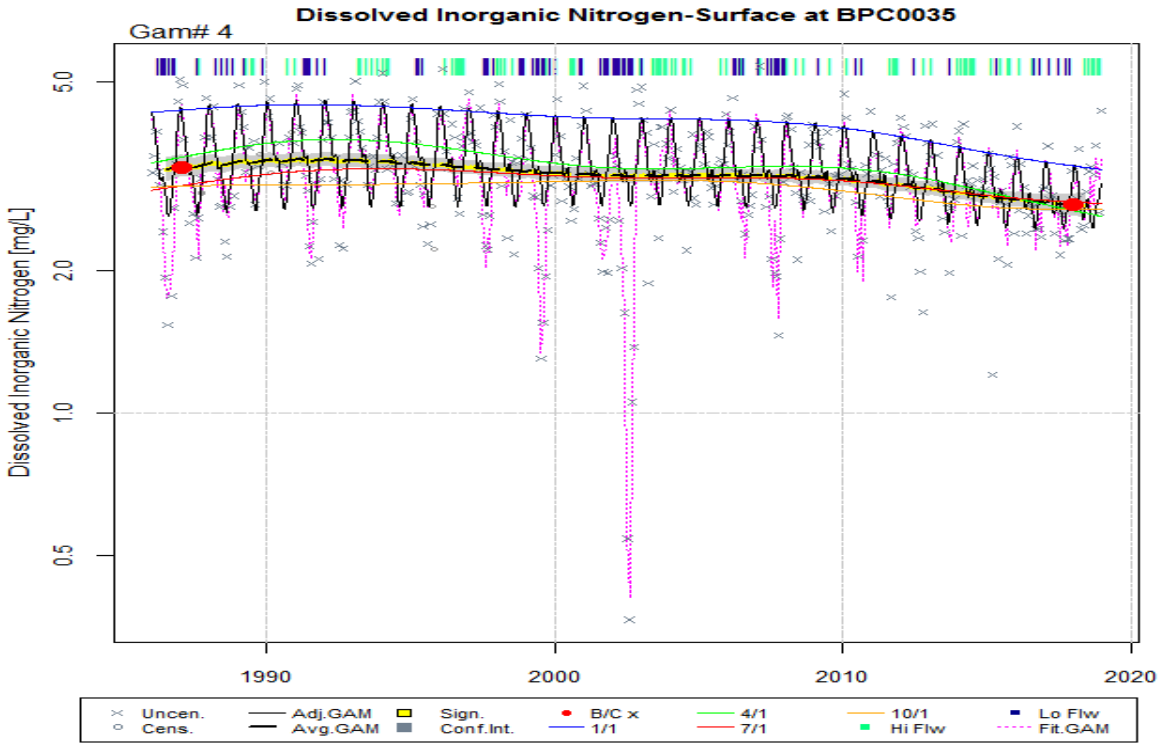
source	estimate	std.error	t.value	p.value
(Intercept)	1.111332	0.013096	84.8587	<0.0001
cyear	0.197918	0.076976	2.5712	0.0105

Table: GAM Diagnostics. - BPC0035 - S - din

AIC	RMSE	AdjRsquare
-67.45	0.2125	0.4838

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - din gam# = 2

Calculation	Estimate
Baseline In mean (geometric mean)	1.0887 (2.9703)
Current In mean (geometric mean)	1.0676 (2.9084)
Estimated In difference	-0.0211
Std. Err. In difference	0.06
95% Confidence interval for In difference	(-0.1387 , 0.0966)
Difference p-value	0.7260
Period of Record Percent Change Estimate (%)	-2.08%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - BPC0035 - S - din gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	0.0657	0.7978	-
smoothed terms	s(cyear)	3.7	2.3264	0.0458	-
" "	s(doy)	6.85	48.7888	<0.0001	-
" "	ti(cyear,doy)	6.6	1.3908	0.0057	-
" "	s(flw_sal)	4.46	26.404	<0.0001	-
" "	ti(flw_sal,doy)	8.57	7.5087	<0.0001	-
" "	ti(flw_sal,cyear)	4.21	1.4337	0.2042	-
" "	ti(flw_sal,doy,cyear)	0.57	0.0167	0.1974	-

Table: GAM Parameter Coefficients. - BPC0035 - S - din gam# = 4

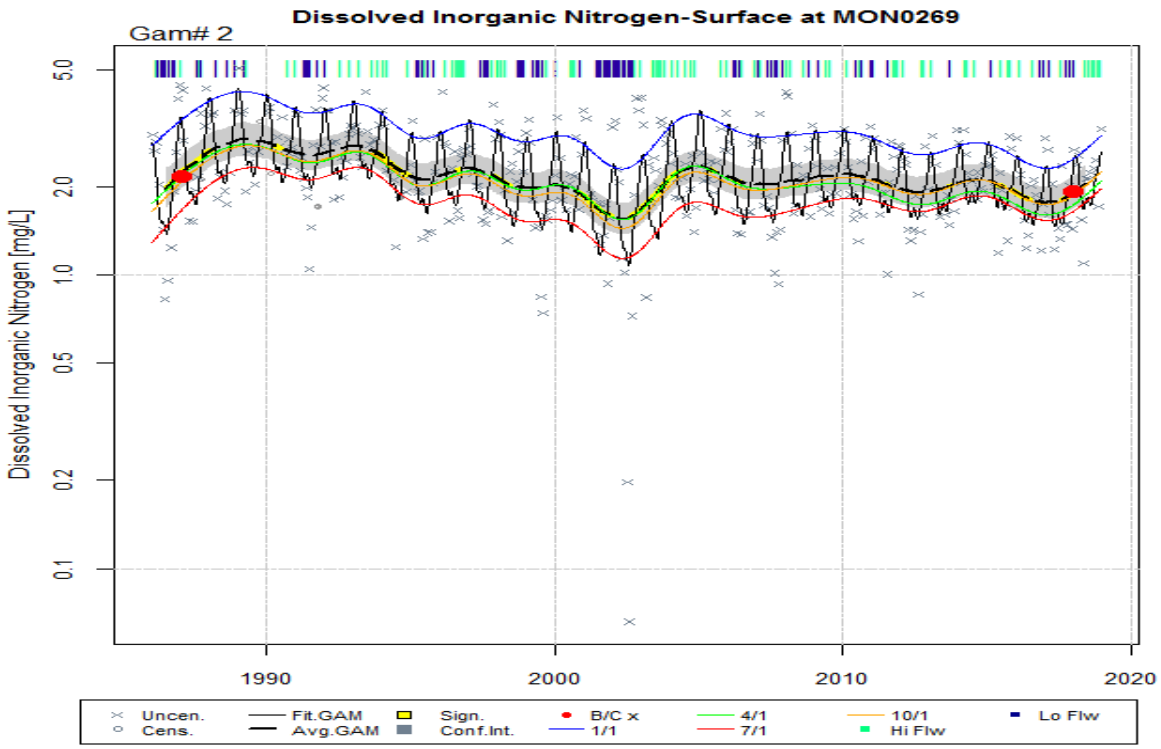
source	estimate	std.error	t.value	p.value
(Intercept)	1.139369	0.007951	143.3025	<0.0001
cyear	0.002041	0.007961	0.2564	0.7978

Table: GAM Diagnostics. - BPC0035 - S - din

AIC	RMSE	AdjRsquare
-339.01	0.1485	0.7479

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - din gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	1.1925 (3.2952)
Current ln mean (geometric mean)	1.0135 (2.7552)
Estimated ln difference	-0.179
Std. Err. ln difference	0.0387
95% Confidence interval for ln difference	(-0.2548 , -0.1032)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-16.39%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0269 - S - din gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	4.6512	0.0317
smoothed terms	s(cyear)	16.35	3.283	<0.0001
" "	s(doy)	6.07	22.2129	<0.0001
" "	ti(cyear,doy)	5.49	0.9102	0.0399

Table: GAM Parameter Coefficients. - MON0269 - S - din gam# = 2

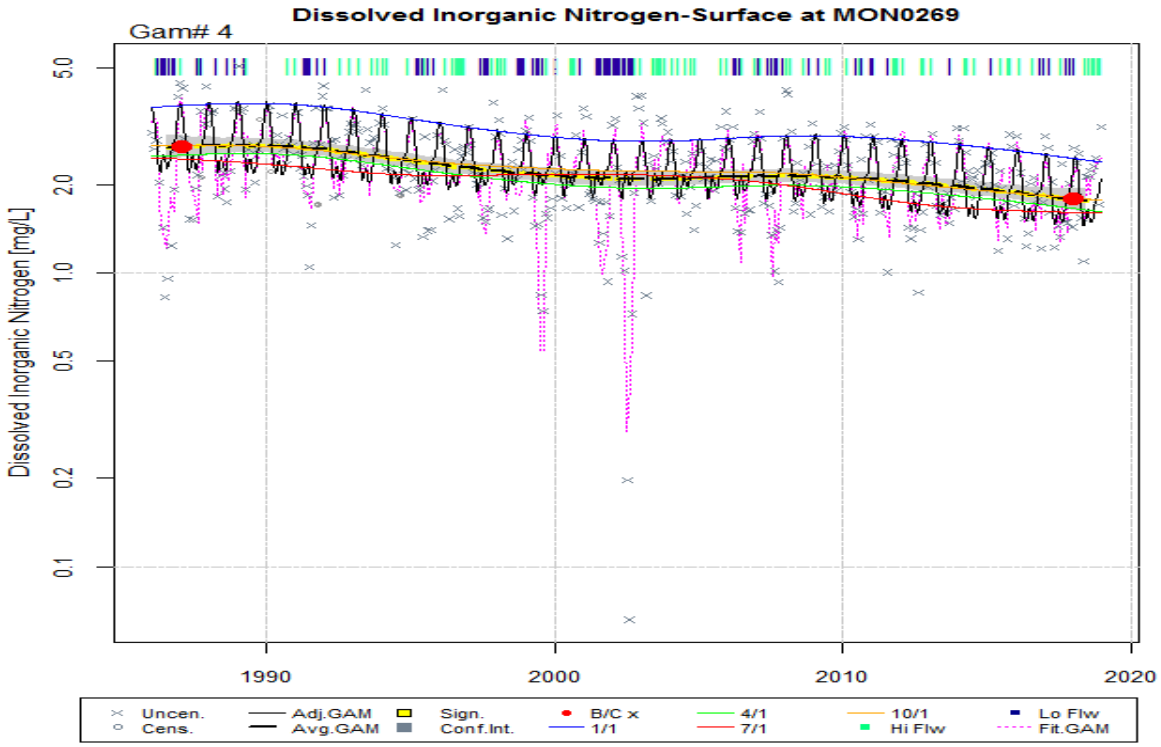
source	estimate	std.error	t.value	p.value
(Intercept)	0.718381	0.02559	28.0729	<0.0001
cyear	0.213014	0.09877	2.1567	0.0317

Table: GAM Diagnostics. - MON0269 - S - din

AIC	RMSE	AdjRsquare
228.01	0.3118	0.4028

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - din gam# = 2

Calculation	Estimate
Baseline In mean (geometric mean)	0.772 (2.164)
Current In mean (geometric mean)	0.6546 (1.9243)
Estimated In difference	-0.1174
Std. Err. In difference	0.0883
95% Confidence interval for In difference	(-0.2905 , 0.0557)
Difference p-value	0.1845
Period of Record Percent Change Estimate (%)	-11.08%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0269 - S - din gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	0.3038	0.5818	-
smoothed terms	s(cyear)	3.91	2.3804	0.0381	-
" "	s(doy)	6.82	29.2267	<0.0001	-
" "	ti(cyear,doy)	0	0	0.8666	-
" "	s(flw_sal)	2.74	23.6272	<0.0001	-
" "	ti(flw_sal,doy)	4.91	4.5036	<0.0001	-
" "	ti(flw_sal,cyear)	7.7	3.9075	<0.0001	-
" "	ti(flw_sal,doy,cyear)	6.52	0.6438	<0.0001	-

Table: GAM Parameter Coefficients. - MON0269 - S - din gam# = 4

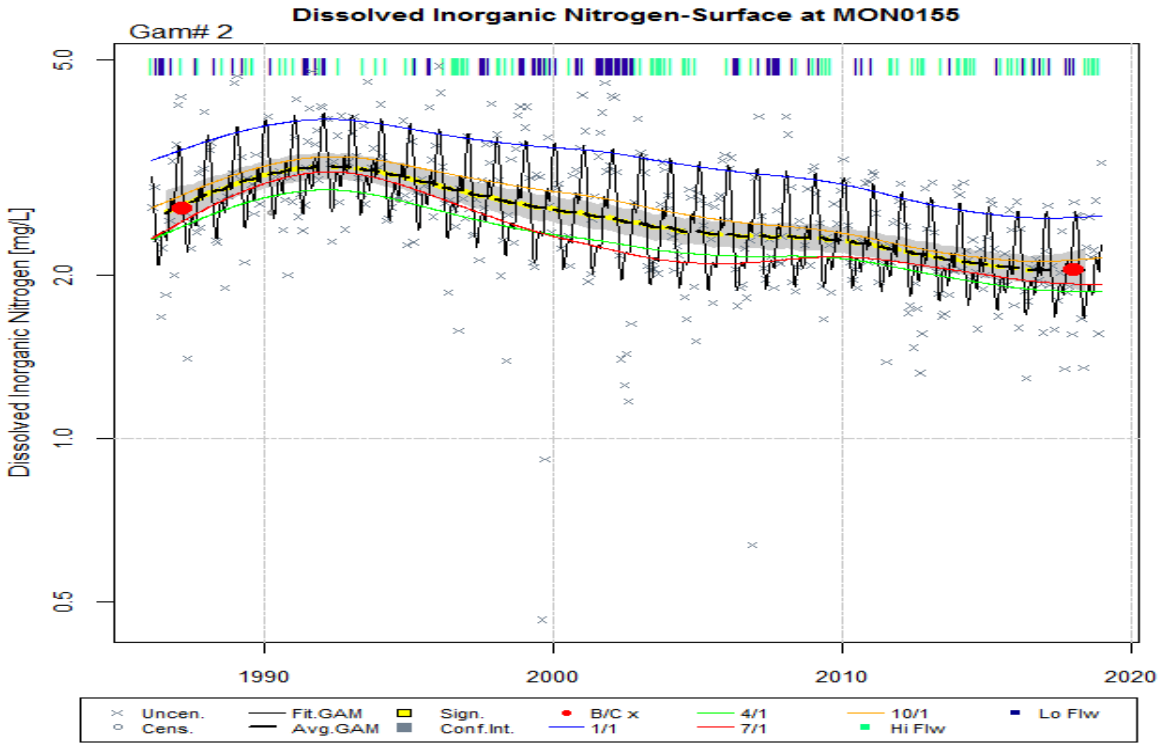
source	estimate	std.error	t.value	p.value
(Intercept)	0.785151	0.013259	59.2157	<0.0001
cyear	-0.007497	0.013601	-0.5512	0.5818

Table: GAM Diagnostics. - MON0269 - S - din

AIC	RMSE	AdjRsquare
13.4	0.2354	0.6598

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - din gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	0.9877 (2.6851)
Current ln mean (geometric mean)	0.5771 (1.7809)
Estimated ln difference	-0.4106
Std. Err. ln difference	0.0639
95% Confidence interval for ln difference	(-0.5358 , -0.2853)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-33.67%
Period of Record	1986 – 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0155 - S - din gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	2.5523	0.1110
smoothed terms	s(cyear)	5.32	3.6048	0.0011
" "	s(doy)	7.09	17.5607	<0.0001
" "	ti(cyear,doy)	3.13	0.6035	0.0315

Table: GAM Parameter Coefficients. - MON0155 - S - din gam# = 2

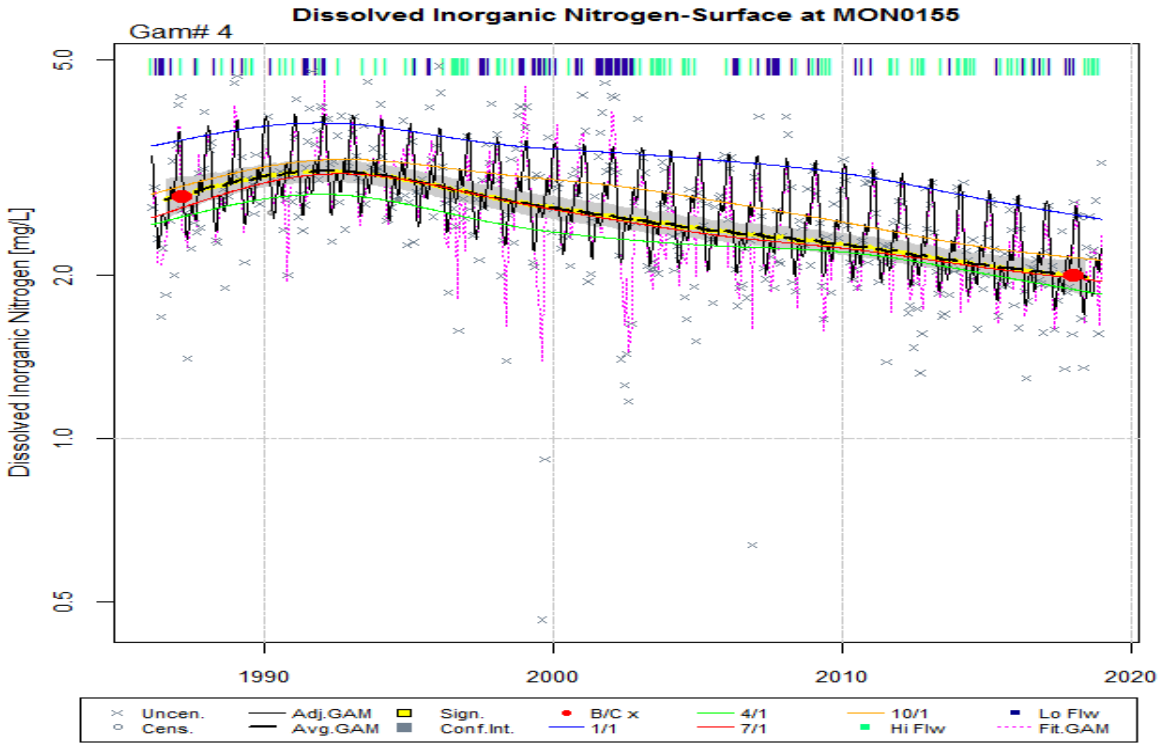
source	estimate	std.error	t.value	p.value
(Intercept)	0.922976	0.012285	75.13	<0.0001
cyear	0.030971	0.019386	1.5976	0.1110

Table: GAM Diagnostics. - MON0155 - S - din

AIC	RMSE	AdjRsquare
-34.4	0.2258	0.4315

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - din gam# = 2

Calculation	Estimate
Baseline In mean (geometric mean)	0.9822 (2.6704)
Current In mean (geometric mean)	0.717 (2.0483)
Estimated In difference	-0.2652
Std. Err. In difference	0.0586
95% Confidence interval for In difference	(-0.3801 , -0.1504)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-23.3%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0155 - S - din gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	1.0554	0.3050	-
smoothed terms	s(cyear)	4.11	3.6495	0.0025	-
" "	s(doy)	7.03	19.7247	<0.0001	-
" "	ti(cyear,doy)	3.49	0.5599	0.0514	-
" "	s(flw_sal)	7.79	4.6602	<0.0001	-
" "	ti(flw_sal,doy)	8.93	4.5501	<0.0001	-
" "	ti(flw_sal,cyear)	8.08	3.1279	0.0006	-
" "	ti(flw_sal,doy,cyear)	0.7	0.0199	0.1949	-

Table: GAM Parameter Coefficients. - MON0155 - S - din gam# = 4

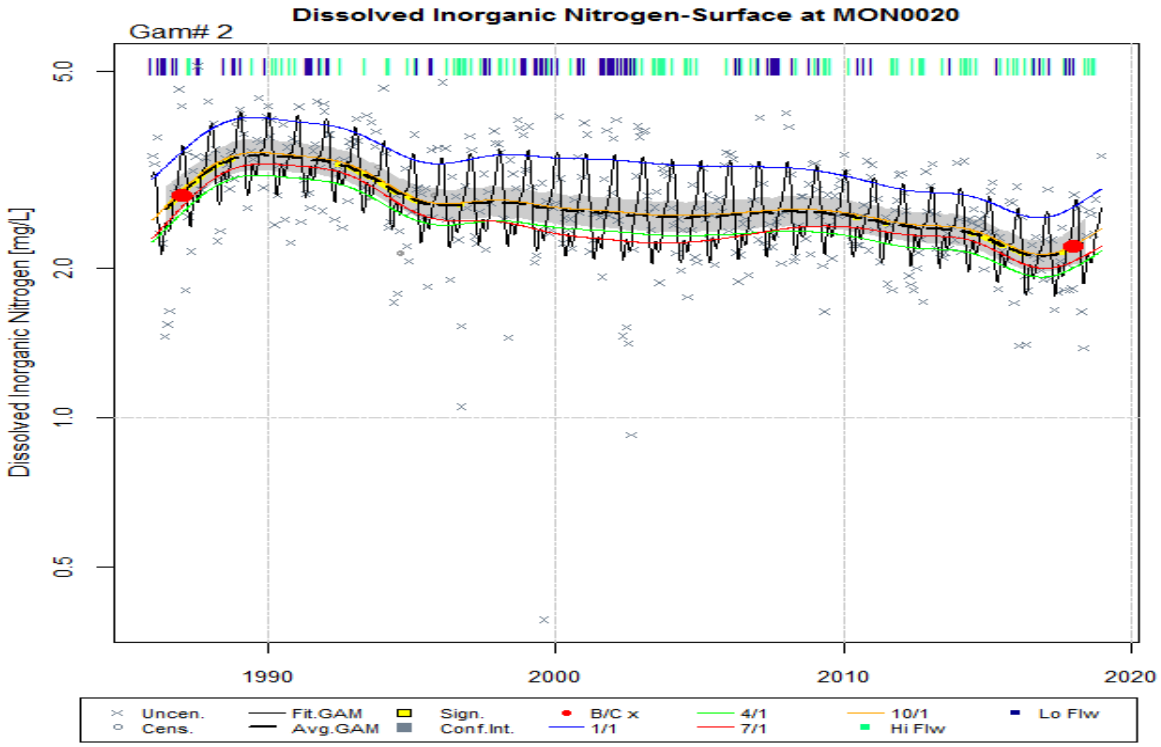
source	estimate	std.error	t.value	p.value
(Intercept)	0.917936	0.011147	82.3519	<0.0001
cyear	0.012126	0.011803	1.0274	0.3050

Table: GAM Diagnostics. - MON0155 - S - din

AIC	RMSE	AdjRsquare
-117.98	0.197	0.5675

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - din gam# = 4

Calculation	Estimate
Baseline In mean (geometric mean)	1.0306 (2.8029)
Current In mean (geometric mean)	0.6929 (1.9994)
Estimated In difference	-0.3378
Std. Err. In difference	0.054
95% Confidence interval for In difference	(-0.4436 , -0.232)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-28.66%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0020 - S - din gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	6.6889	0.0101
smoothed terms	s(cyear)	10.76	2.4176	0.0033
" "	s(doy)	6.5	16.7411	<0.0001
" "	ti(cyear,doy)	1.69	0.455	0.0214

Table: GAM Parameter Coefficients. - MON0020 - S - din gam# = 2

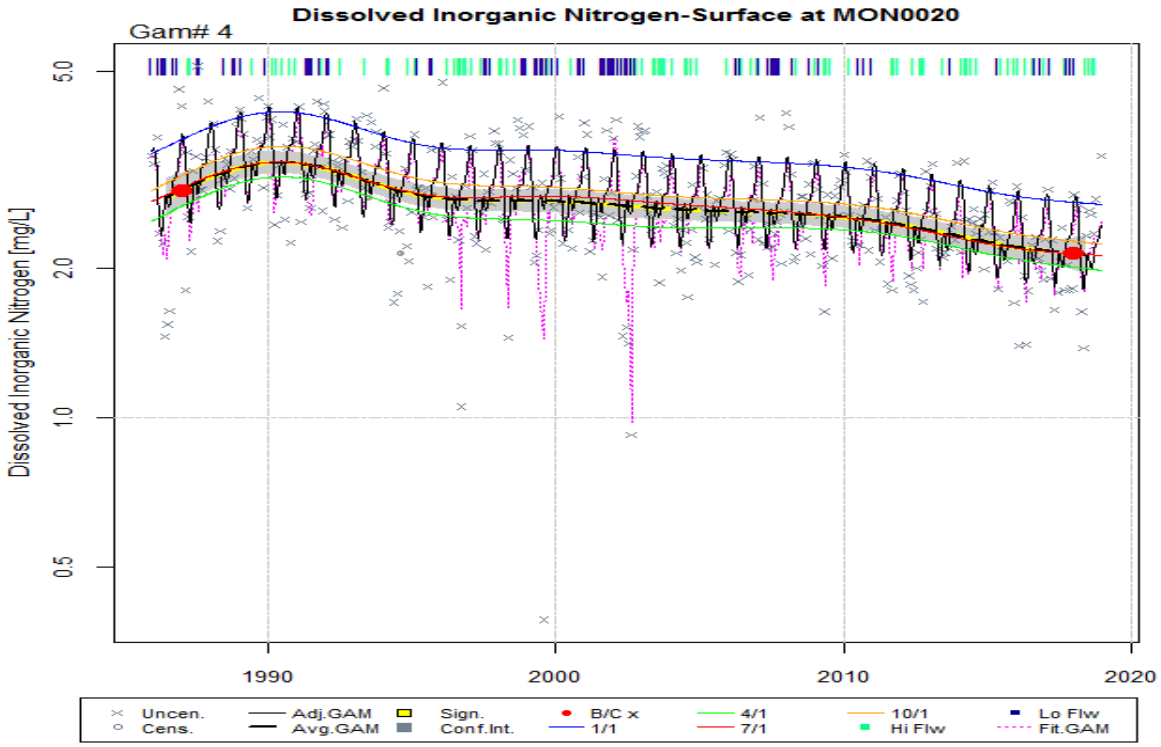
source	estimate	std.error	t.value	p.value
(Intercept)	0.974363	0.011049	88.1825	<0.0001
cyear	0.109204	0.042224	2.5863	0.0101

Table: GAM Diagnostics. - MON0020 - S - din

AIC	RMSE	AdjRsquare
-71.31	0.2145	0.4021

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - din gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	1.0364 (2.8191)
Current ln mean (geometric mean)	0.7971 (2.2191)
Estimated ln difference	-0.2393
Std. Err. ln difference	0.0595
95% Confidence interval for ln difference	(-0.356 , -0.1226)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-21.28%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0020 - S - din gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	2.6211	0.1063	-
smoothed terms	s(cyear)	6.06	2.7039	0.0073	-
" "	s(doy)	6.85	18.3326	<0.0001	-
" "	ti(cyear,doy)	0.88	0.128	0.1445	-
" "	s(flw_sal)	4.29	8.1649	<0.0001	-
" "	ti(flw_sal,doy)	7.87	3.859	<0.0001	-
" "	ti(flw_sal,cyear)	1.72	2.1979	0.1126	-
" "	ti(flw_sal,doy,cyear)	5.41	0.1624	0.1118	-

Table: GAM Parameter Coefficients. - MON0020 - S - din gam# = 4

source	estimate	std.error	t.value	p.value
(Intercept)	0.970693	0.010393	93.3985	<0.0001
cyear	0.026686	0.016483	1.619	0.1063

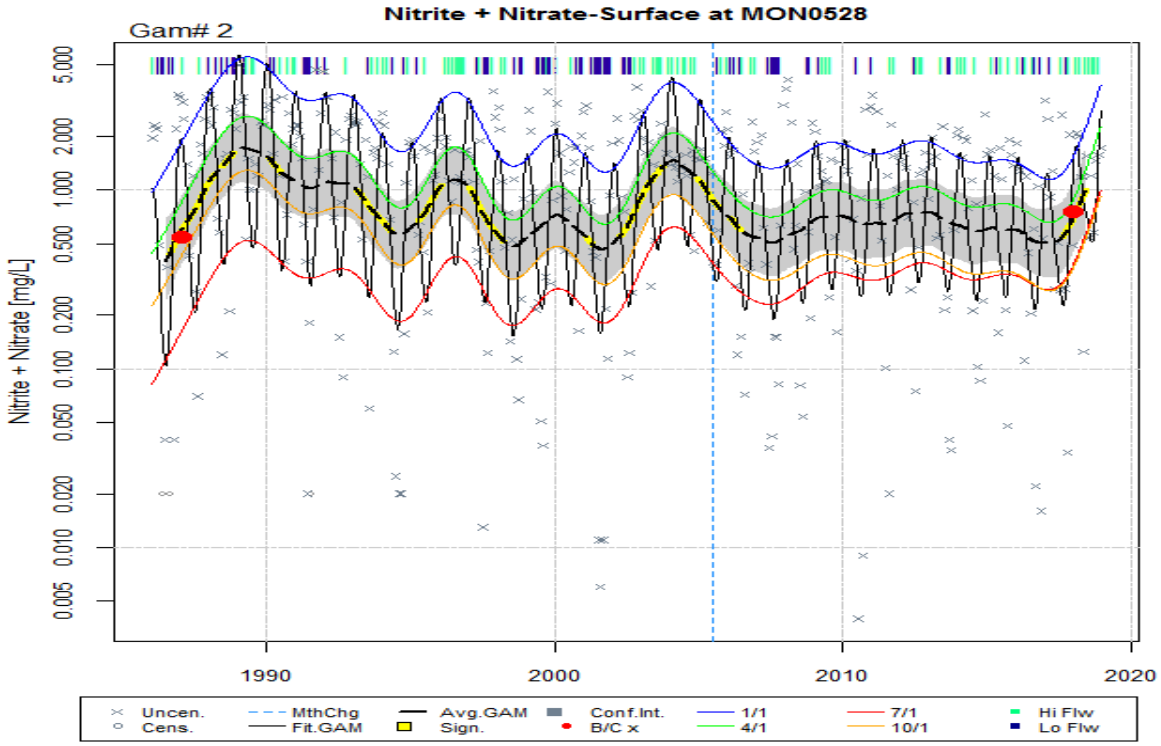
Table: GAM Diagnostics. - MON0020 - S - din

AIC	RMSE	AdjRsquare
-147.64	0.1912	0.5248

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - din gam# = 4

Calculation	Estimate
Baseline In mean (geometric mean)	1.0551 (2.8721)
Current In mean (geometric mean)	0.7632 (2.1451)
Estimated In difference	-0.2919
Std. Err. In difference	0.056
95% Confidence interval for In difference	(-0.4016 , -0.1821)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-25.31%
Period of Record	1986 - 2018

Nitrite + Nitrate (NO23)



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - no23 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	5.9245	0.0154
smoothed terms	s(cyear)	17.03	2.3266	0.0015
" "	s(doy)	3.44	24.0401	<0.0001
" "	ti(cyear,doy)	2.33	1.1738	0.0611

Table: GAM Parameter Coefficients. - MON0528 - S - no23 gam# = 2

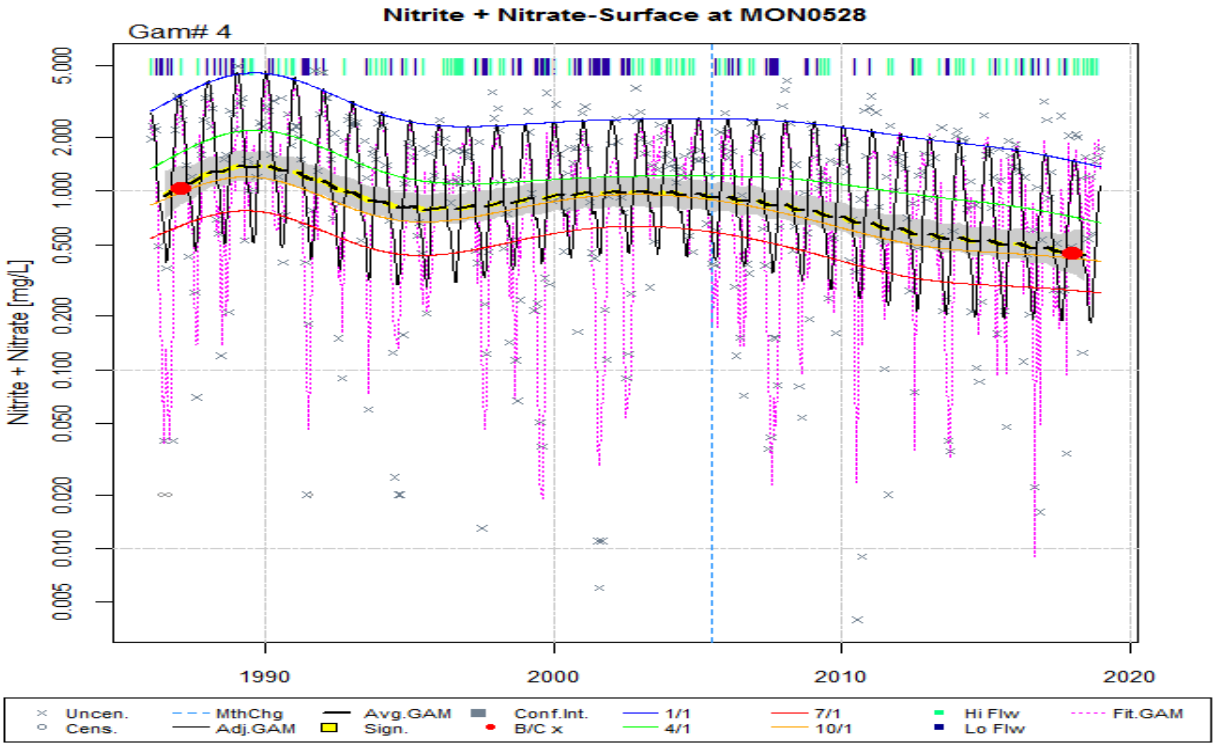
source	estimate	std.error	t.value	p.value
(Intercept)	-0.260748	0.055245	-4.7198	<0.0001
cyear	0.850433	0.349394	2.434	0.0154

Table: GAM Diagnostics. - MON0528 - S - no23

AIC	RMSE	AdjRsquare
1179.54	1.0741	0.3866

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - no23 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-0.6042 (0.5465)
Current ln mean (geometric mean)	-0.2793 (0.7563)
Estimated ln difference	0.3248
Std. Err. ln difference	0.3041
95% Confidence interval for ln difference	(-0.2711 , 0.9208)
Difference p-value	0.2860
Period of Record Percent Change Estimate (%)	38.38%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - no23 gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	1.177	0.2787	-
smoothed terms	s(cyear)	6.11	3.0476	0.0044	-
" "	s(doy)	6.5	47.6394	<0.0001	-
" "	ti(cyear,doy)	1.75	0.4603	0.0193	-
" "	s(flw_sal)	3.96	57.2323	<0.0001	-
" "	ti(flw_sal,doy)	5.08	10.2187	<0.0001	-
" "	ti(flw_sal,cyear)	5.6	2.9731	0.0040	-
" "	ti(flw_sal,doy,cyear)	0.1	0.002	0.3793	-

Table: GAM Parameter Coefficients. - MON0528 - S - no23 gam# = 4

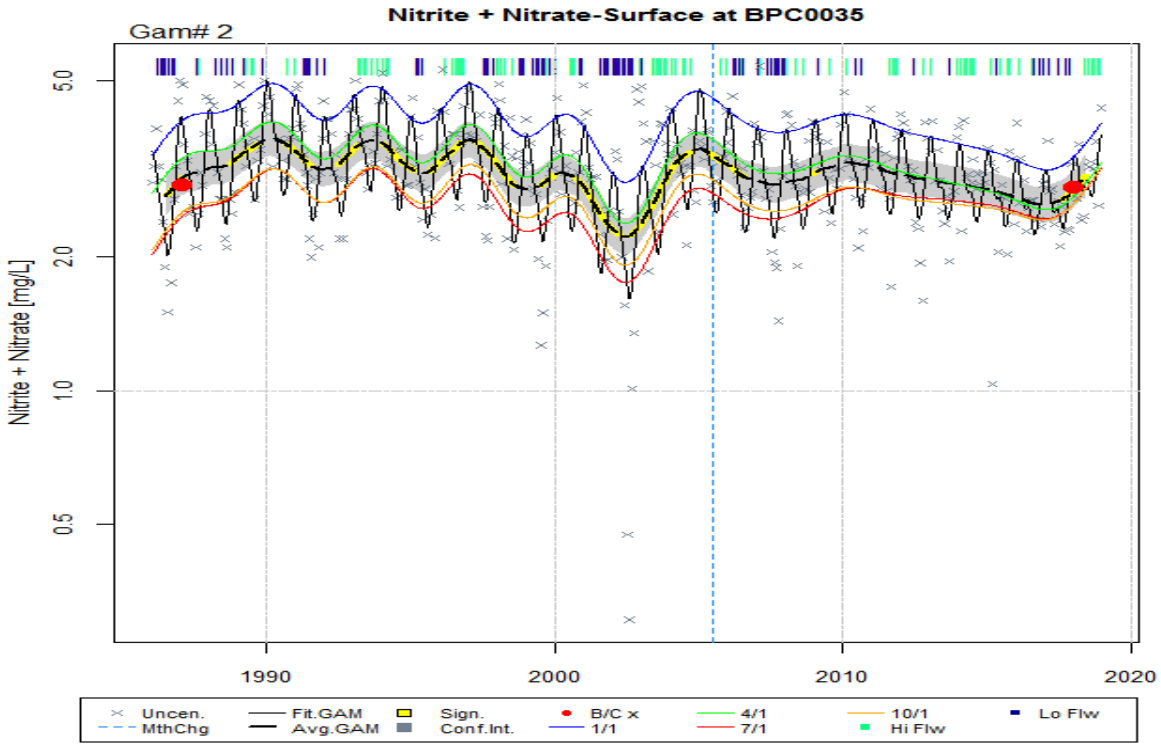
source	estimate	std.error	t.value	p.value
(Intercept)	-0.270315	0.038246	-7.0677	<0.0001
cyear	0.064881	0.059804	1.0849	0.2787

Table: GAM Diagnostics. - MON0528 - S - no23

AIC	RMSE	AdjRsquare
837.03	0.6849	0.75

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - no23 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	0.0338 (1.0344)
Current ln mean (geometric mean)	-0.7947 (0.4517)
Estimated ln difference	-0.8285
Std. Err. ln difference	0.1952
95% Confidence interval for ln difference	(-1.211 , -0.4459)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-56.33%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - no23 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	6.452	0.0115
smoothed terms	s(cyear)	18.59	4.5856	<0.0001
" "	s(doy)	5.31	28.8012	<0.0001
" "	ti(cyear,doy)	5.67	1.3511	0.0030

Table: GAM Parameter Coefficients. - BPC0035 - S - no23 gam# = 2

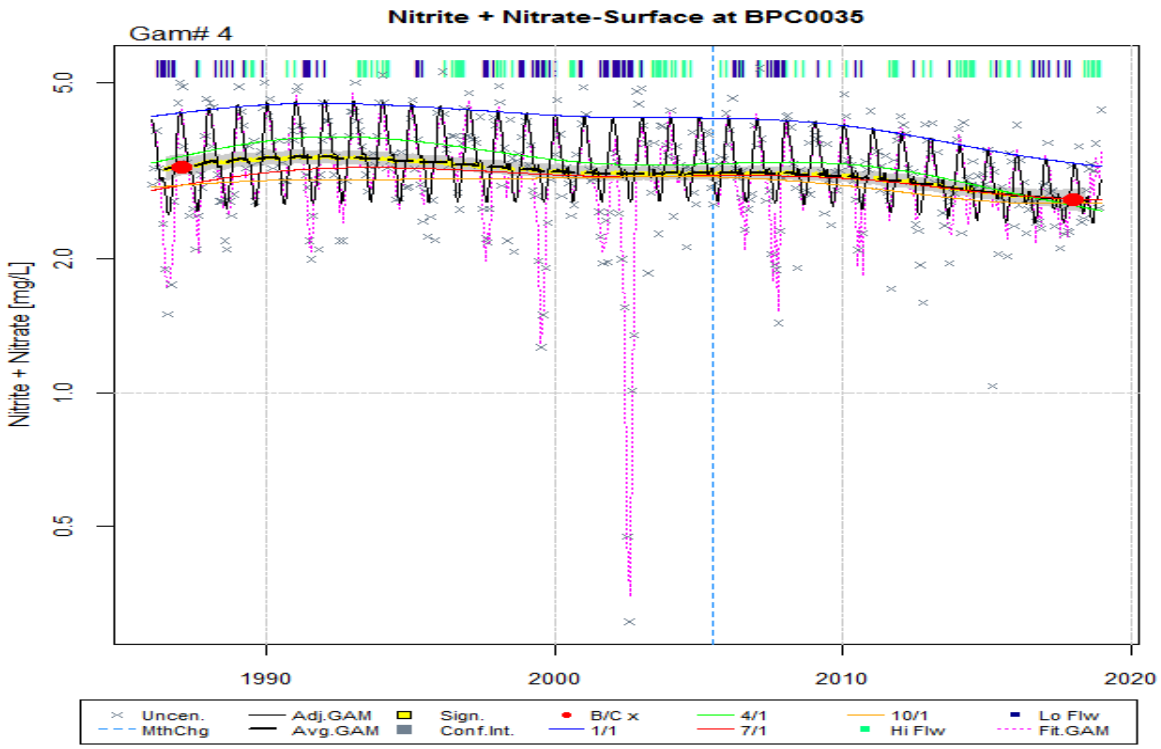
source	estimate	std.error	t.value	p.value
(Intercept)	1.120746	0.011371	98.5645	<0.0001
cyear	0.20955	0.082497	2.5401	0.0115

Table: GAM Diagnostics. - BPC0035 - S - no23

AIC	RMSE	AdjRsquare
-30.57	0.2232	0.4675

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - no23 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	1.0689 (2.9122)
Current ln mean (geometric mean)	1.0592 (2.8841)
Estimated ln difference	-0.0097
Std. Err. ln difference	0.0629
95% Confidence interval for ln difference	(-0.133 , 0.1136)
Difference p-value	0.8776
Period of Record Percent Change Estimate (%)	-0.96%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - no23 gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	0.1851	0.6673
smoothed terms	s(cyear)	3.96	1.2868	0.0107
" "	s(doy)	6.9	48.0893	<0.0001
" "	ti(cyear,doy)	6.62	1.3689	0.0070
" "	s(flw_sal)	4.33	6.1358	<0.0001
" "	ti(flw_sal,doy)	8.75	8.4522	<0.0001
" "	ti(flw_sal,cyear)	4.31	0.5844	0.0358
" "	ti(flw_sal,doy,cyear)	0	0	0.3310

Table: GAM Parameter Coefficients. - BPC0035 - S - no23 gam# = 4

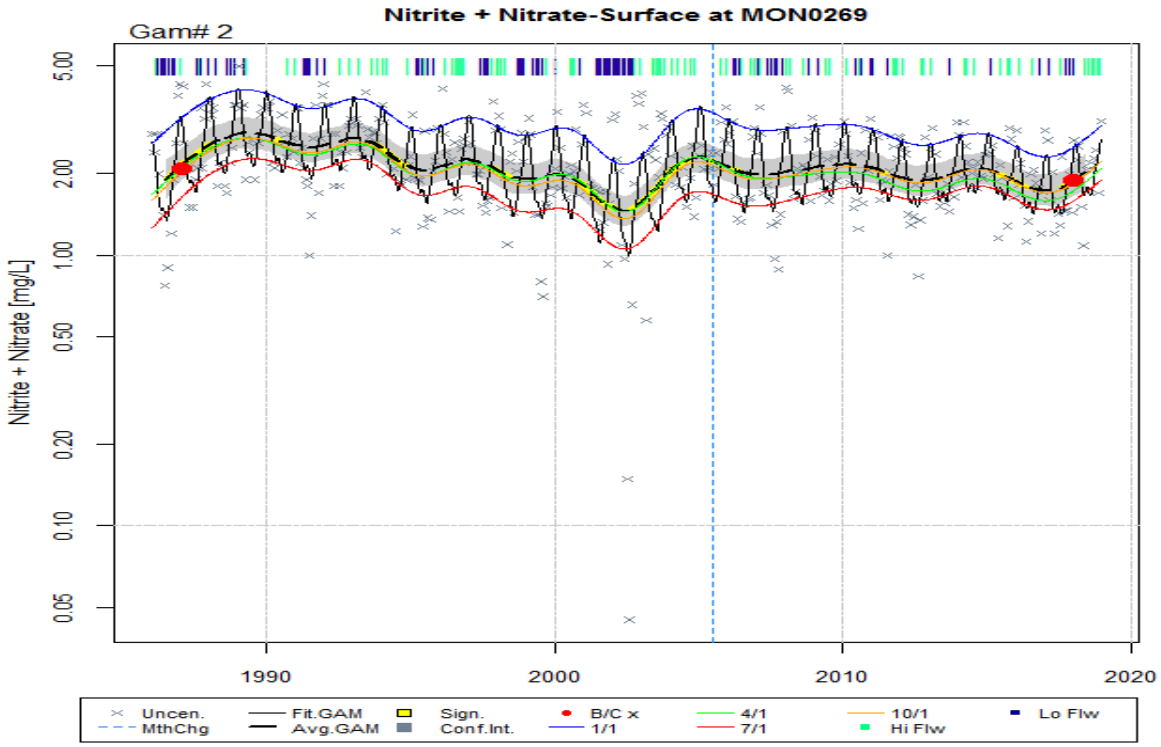
source	estimate	std.error	t.value	p.value
(Intercept)	1.128705	0.008242	136.9385	<0.0001
cyear	0.003906	0.009079	0.4302	0.6673

Table: GAM Diagnostics. - BPC0035 - S - no23

AIC	RMSE	AdjRsquare
-306.5	0.1554	0.7417

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - no23 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	1.1737 (3.2339)
Current ln mean (geometric mean)	1.0026 (2.7254)
Estimated ln difference	-0.1711
Std. Err. ln difference	0.041
95% Confidence interval for ln difference	(-0.2514 , -0.0908)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-15.72%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - no23 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	4.3901	0.0368
smoothed terms	s(cyear)	16.45	3.2233	<0.0001
" "	s(doy)	5.95	20.9518	<0.0001
" "	ti(cyear,doy)	4.66	0.7128	0.0662

Table: GAM Parameter Coefficients. - MON0269 - S - no23 gam# = 2

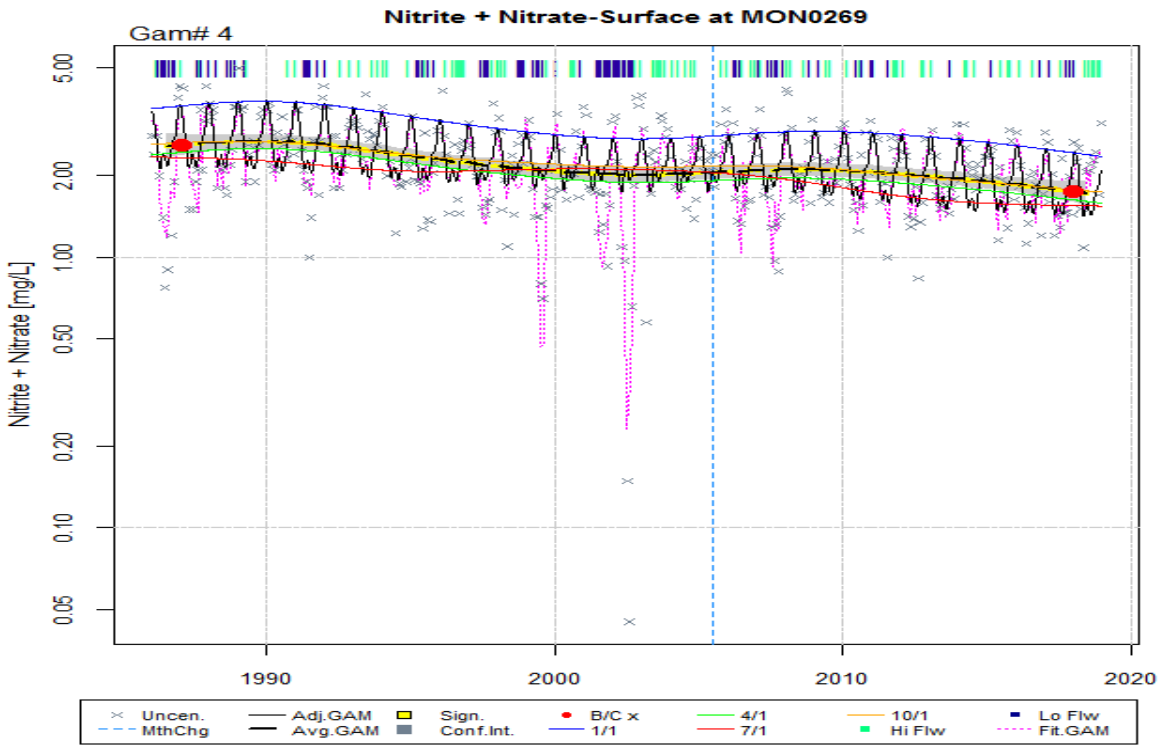
source	estimate	std.error	t.value	p.value
(Intercept)	0.7279	0.018138	40.1319	<0.0001
cyear	0.221892	0.105903	2.0952	0.0368

Table: GAM Diagnostics. - MON0269 - S - no23

AIC	RMSE	AdjRsquare
276.03	0.3309	0.3879

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - no23 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	0.7409 (2.0977)
Current ln mean (geometric mean)	0.643 (1.9021)
Estimated ln difference	-0.0979
Std. Err. ln difference	0.0935
95% Confidence interval for ln difference	(-0.2811 , 0.0853)
Difference p-value	0.2955
Period of Record Percent Change Estimate (%)	-9.33%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - no23 gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	0.1127	0.7372
smoothed terms	s(cyear)	4.22	1.7169	0.0017
" "	s(doy)	6.78	27.6038	<0.0001
" "	ti(cyear,doy)	0	0	0.8394
" "	s(flw_sal)	2.47	3.1432	<0.0001
" "	ti(flw_sal,doy)	4.75	4.1907	<0.0001
" "	ti(flw_sal,cyear)	6.78	2.623	<0.0001
" "	ti(flw_sal,doy,cyear)	7.68	0.8157	<0.0001

Table: GAM Parameter Coefficients. - MON0269 - S - no23 gam# = 4

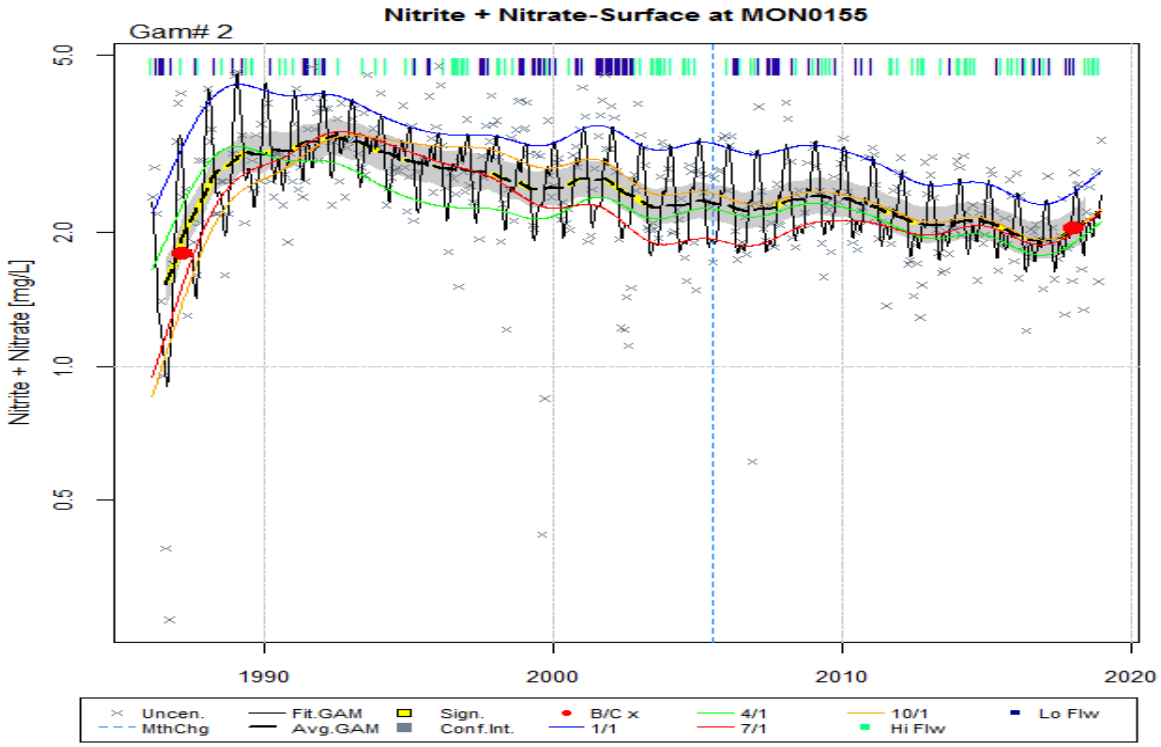
source	estimate	std.error	t.value	p.value
(Intercept)	0.764922	0.013571	56.3641	<0.0001
cyear	-0.005299	0.015781	-0.3358	0.7372

Table: GAM Diagnostics. - MON0269 - S - no23

AIC	RMSE	AdjRsquare
62.03	0.2504	0.6495

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - no23 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	0.9538 (2.5955)
Current ln mean (geometric mean)	0.559 (1.7489)
Estimated ln difference	-0.3948
Std. Err. ln difference	0.0688
95% Confidence interval for ln difference	(-0.5297 , -0.2599)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-32.62%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - no23 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	13.0011	0.0004
smoothed terms	s(cyear)	14.42	6.1482	<0.0001
" "	s(doy)	6.92	16.4635	<0.0001
" "	ti(cyear,doy)	9.52	4.7664	<0.0001

Table: GAM Parameter Coefficients. - MON0155 - S - no23 gam# = 2

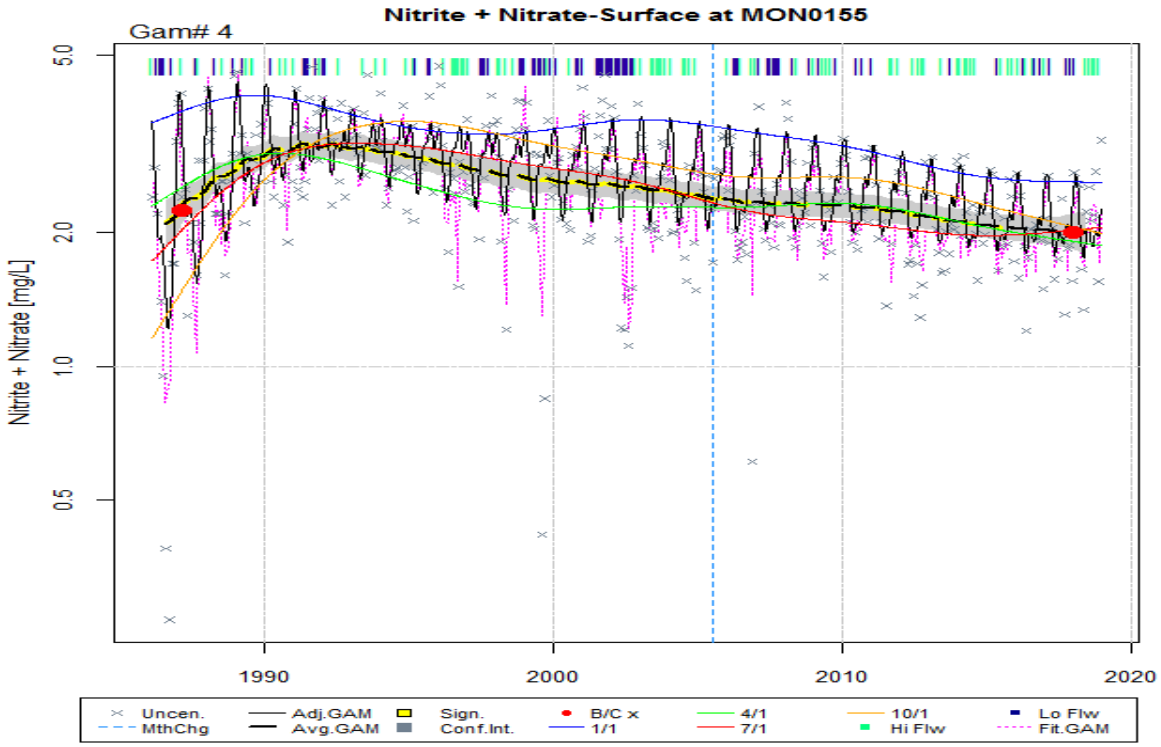
source	estimate	std.error	t.value	p.value
(Intercept)	0.867923	0.014086	61.6156	<0.0001
cyear	0.258962	0.07182	3.6057	0.0004

Table: GAM Diagnostics. - MON0155 - S - no23

AIC	RMSE	AdjRsquare
63.1	0.2513	0.4636

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - no23 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	0.5839 (1.793)
Current ln mean (geometric mean)	0.7147 (2.0436)
Estimated ln difference	0.1308
Std. Err. ln difference	0.0715
95% Confidence interval for ln difference	(-0.0094 , 0.271)
Difference p-value	0.0682
Period of Record Percent Change Estimate (%)	13.98%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - no23 gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	4.595	0.0328
smoothed terms	s(cyear)	5.99	5.9661	<0.0001
" "	s(doy)	6.69	16.1404	<0.0001
" "	ti(cyear,doy)	10.87	5.2183	<0.0001
" "	s(flw_sal)	12.51	2.3893	<0.0001
" "	ti(flw_sal,doy)	2.4	1.3036	0.0039
" "	ti(flw_sal,cyear)	8.32	1.7376	0.0001
" "	ti(flw_sal,doy,cyear)	16.32	0.8863	<0.0001

Table: GAM Parameter Coefficients. - MON0155 - S - no23 gam# = 4

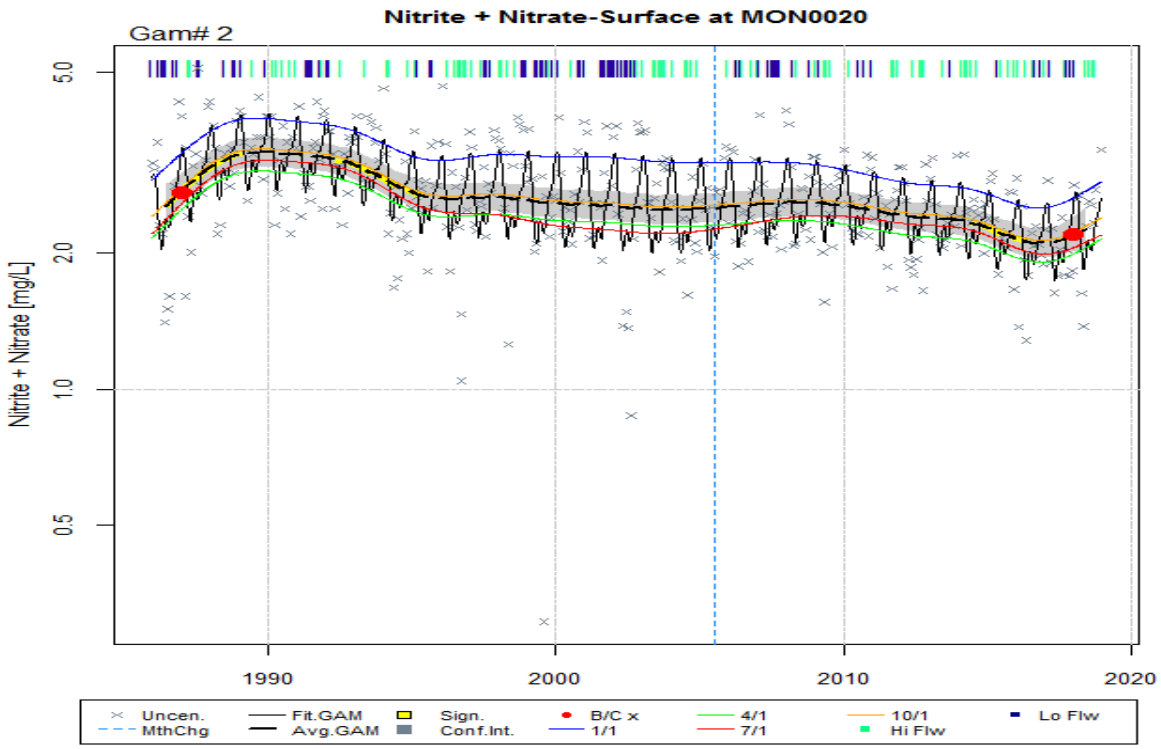
source	estimate	std.error	t.value	p.value
(Intercept)	0.887931	0.012166	72.9873	<0.0001
cyear	0.064217	0.029957	2.1436	0.0328

Table: GAM Diagnostics. - MON0155 - S - no23

AIC	RMSE	AdjRsquare
-10.84	0.2208	0.5858

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - no23 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	0.8077 (2.2427)
Current ln mean (geometric mean)	0.6935 (2.0007)
Estimated ln difference	-0.1142
Std. Err. ln difference	0.0711
95% Confidence interval for ln difference	(-0.2536 , 0.0252)
Difference p-value	0.1092
Period of Record Percent Change Estimate (%)	-10.79%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - no23 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	6.6861	0.0101
smoothed terms	s(cyear)	10.44	1.7847	<0.0001
" "	s(doy)	6.49	15.5483	<0.0001
" "	ti(cyear,doy)	1.59	0.4087	0.0268

Table: GAM Parameter Coefficients. - MON0020 - S - no23 gam# = 2

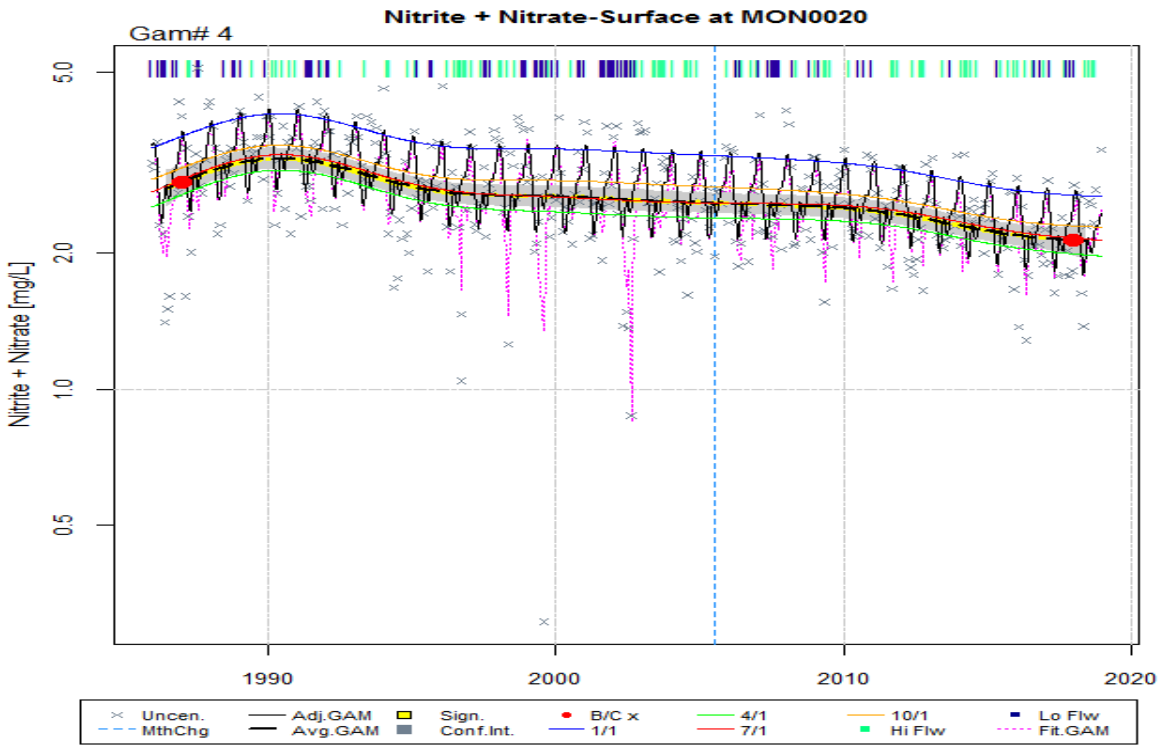
source	estimate	std.error	t.value	p.value
(Intercept)	0.959939	0.011467	83.712	<0.0001
cyear	0.112139	0.043368	2.5858	0.0101

Table: GAM Diagnostics. - MON0020 - S - no23

AIC	RMSE	AdjRsquare
-30.22	0.2263	0.3755

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - no23 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	0.9976 (2.7117)
Current ln mean (geometric mean)	0.7861 (2.1949)
Estimated ln difference	-0.2115
Std. Err. ln difference	0.0625
95% Confidence interval for ln difference	(-0.334 , -0.0889)
Difference p-value	0.0008
Period of Record Percent Change Estimate (%)	-19.06%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - no23 gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	2.1732	0.1413
smoothed terms	s(cyear)	5.82	2.1045	0.0018
" "	s(doy)	6.88	18.4307	<0.0001
" "	ti(cyear,doy)	0.75	0.1009	0.1734
" "	s(flw_sal)	5.19	2.5336	<0.0001
" "	ti(flw_sal,doy)	8.12	4.7103	<0.0001
" "	ti(flw_sal,cyear)	1.47	0.6716	0.0074
" "	ti(flw_sal,doy,cyear)	0.73	0.0262	0.1870

Table: GAM Parameter Coefficients. - MON0020 - S - no23 gam# = 4

source	estimate	std.error	t.value	p.value
(Intercept)	0.9544	0.010626	89.8137	<0.0001
cyear	0.025272	0.017143	1.4742	0.1413

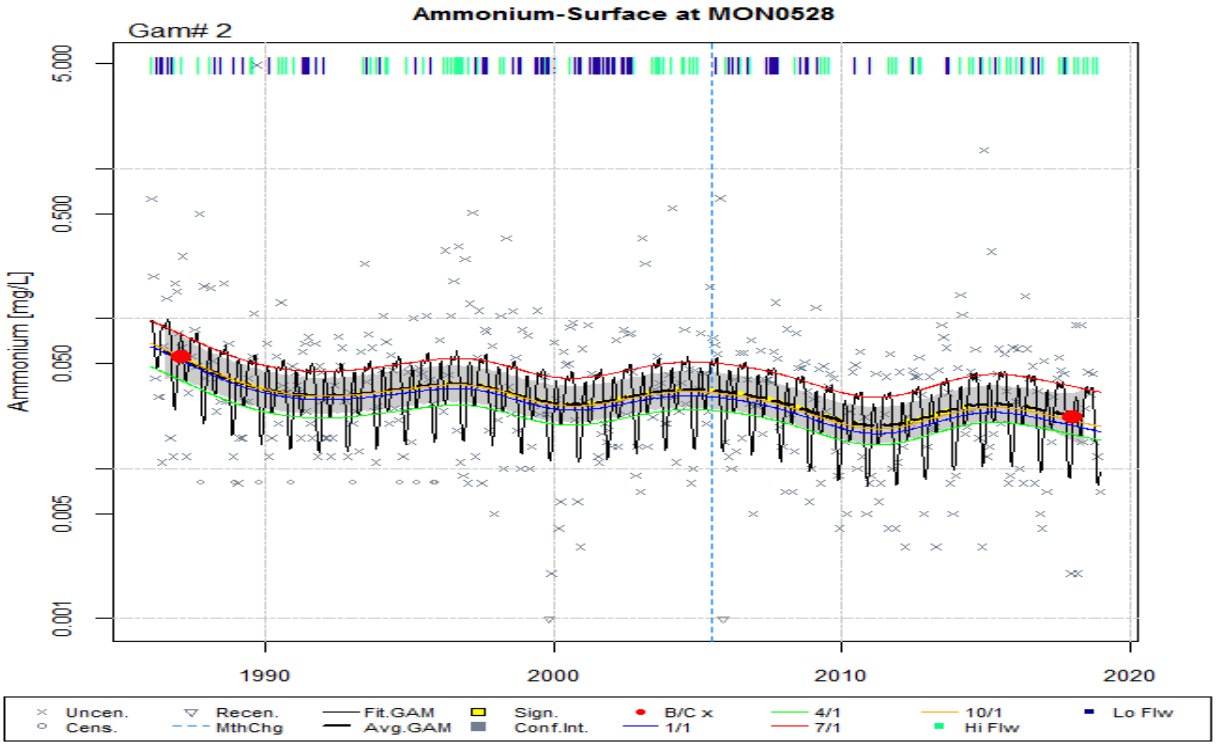
Table: GAM Diagnostics. - MON0020 - S - no23

AIC	RMSE	AdjRsquare
-114.2	0.2007	0.5089

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - no23 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	1.049 (2.8549)
Current ln mean (geometric mean)	0.7544 (2.1264)
Estimated ln difference	-0.2946
Std. Err. ln difference	0.0577
95% Confidence interval for ln difference	(-0.4078 , -0.1814)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-25.52%
Period of Record	1986 - 2018

Ammonium (NH4)



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - nh4 gam# = 2

type	source	df	F	p.value	Note
parametric terms	cyear	1	1.5015	0.2212	-
smoothed terms	s(cyear)	7.19	1.2852	0.2434	-
" "	s(doy)	6.36	9.6194	<0.0001	-
" "	ti(cyear,doy)	0.63	0.0906	0.2322	-

Table: GAM Parameter Coefficients. - MON0528 - S - nh4 gam# = 2

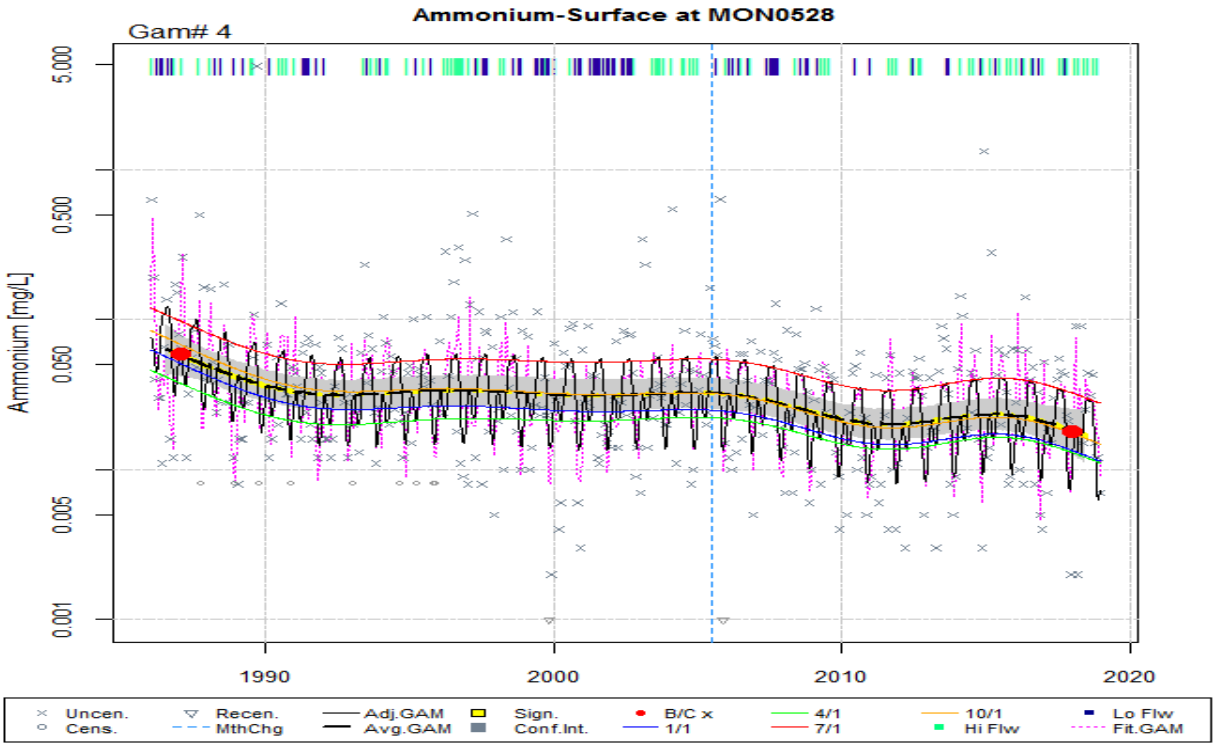
source	estimate	std.error	t.value	p.value
(Intercept)	-3.520491	0.050503	-69.7092	<0.0001
cyear	-0.146691	0.119712	-1.2254	0.2212

Table: GAM Diagnostics. - MON0528 - S - nh4

AIC	RMSE	AdjRsquare
1110.17	0.9924	0.2106

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - nh4 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.887 (0.0557)
Current ln mean (geometric mean)	-3.8092 (0.0222)
Estimated ln difference	-0.9222
Std. Err. ln difference	0.2622
95% Confidence interval for ln difference	(-1.4362 , -0.4082)
Difference p-value	0.0005
Period of Record Percent Change Estimate (%)	-60.24%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - nh4 gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	5.7959	0.0166	-
smoothed terms	s(cyear)	6	1.4125	0.2394	-
" "	s(doy)	6.06	10.8104	<0.0001	-
" "	ti(cyear,doy)	1.22	0.1576	0.1767	-
" "	s(flw_sal)	3.14	17.5606	<0.0001	-
" "	ti(flw_sal,doy)	5	2.0915	<0.0001	-
" "	ti(flw_sal,cyear)	4.94	1.6555	0.1220	-
" "	ti(flw_sal,doy,cyear)	0	0	0.5647	-

Table: GAM Parameter Coefficients. - MON0528 - S - nh4 gam# = 4

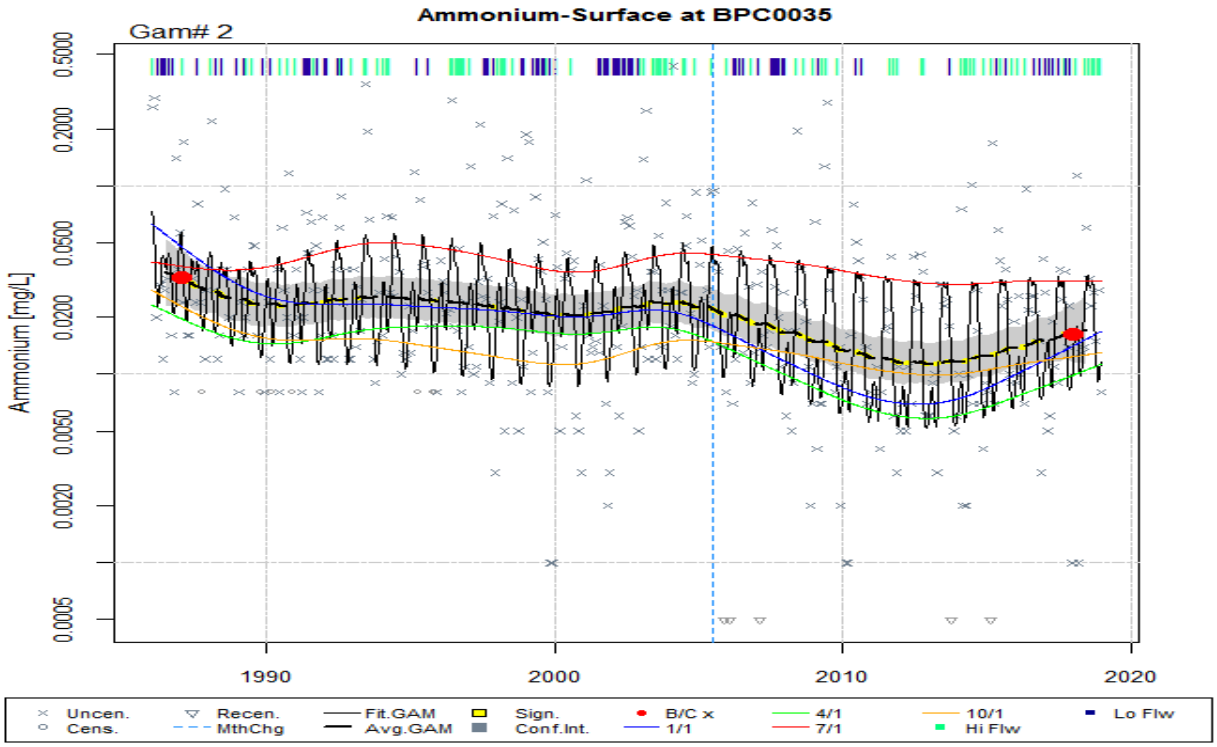
source	estimate	std.error	t.value	p.value
(Intercept)	-3.521517	0.048172	-73.1033	<0.0001
cyear	-0.179764	0.074669	-2.4075	0.0166

Table: GAM Diagnostics. - MON0528 - S - nh4

AIC	RMSE	AdjRsquare
1033.56	0.8857	0.3713

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - nh4 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.8325 (0.0589)
Current ln mean (geometric mean)	-4.025 (0.0179)
Estimated ln difference	-1.1925
Std. Err. ln difference	0.2465
95% Confidence interval for ln difference	(-1.6757 , -0.7093)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-69.65%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - nh4 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	0.1574	0.6918
smoothed terms	s(cyear)	6.18	1.4044	0.2017
" "	s(doy)	6.71	12.4702	<0.0001
" "	ti(cyear,doy)	7	1.6387	0.0026

Table: GAM Parameter Coefficients. - BPC0035 - S - nh4 gam# = 2

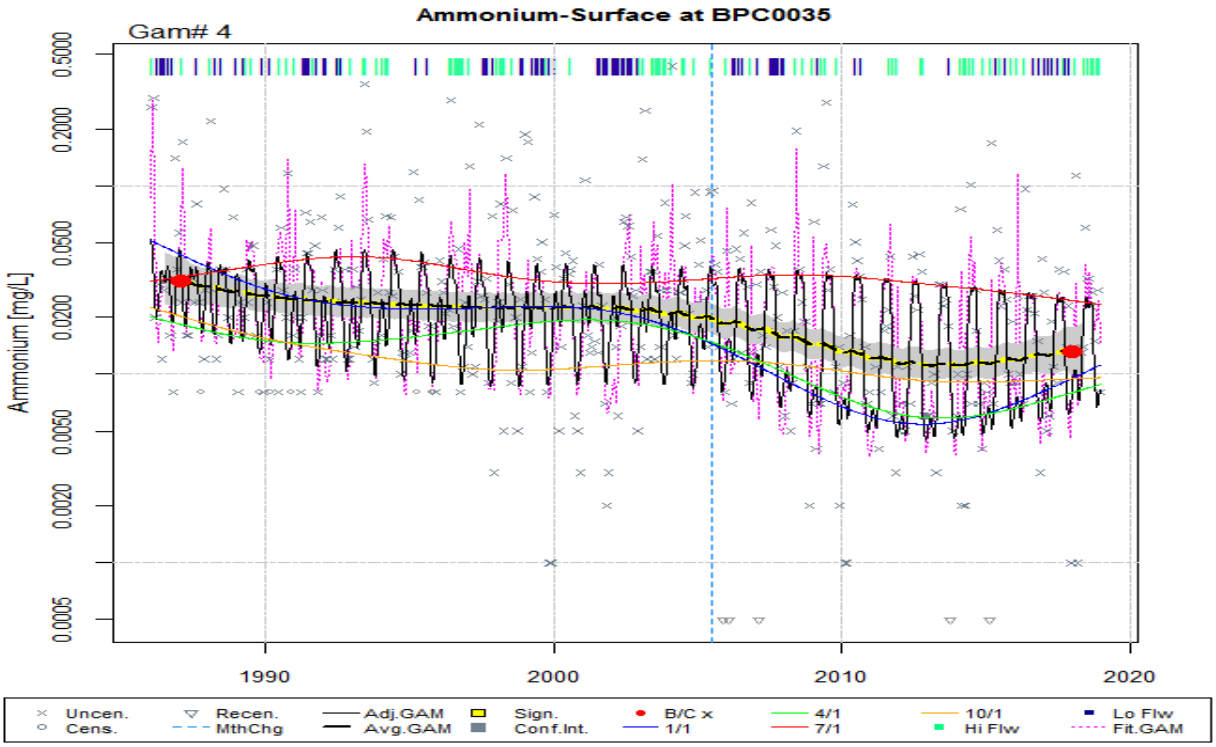
source	estimate	std.error	t.value	p.value
(Intercept)	-3.936313	0.048931	-80.4465	<0.0001
cyear	-0.038852	0.097942	-0.3967	0.6918

Table: GAM Diagnostics. - BPC0035 - S - nh4

AIC	RMSE	AdjRsquare
1098.62	0.964	0.2827

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - nh4 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-3.4223 (0.0326)
Current ln mean (geometric mean)	-4.1139 (0.0163)
Estimated ln difference	-0.6916
Std. Err. ln difference	0.2515
95% Confidence interval for ln difference	(-1.1845 , -0.1987)
Difference p-value	0.0062
Period of Record Percent Change Estimate (%)	-49.92%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - nh4 gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	0.0531	0.8179	-
smoothed terms	s(cyear)	3.79	1.8952	0.1613	-
" "	s(doy)	6.75	16.1357	<0.0001	-
" "	ti(cyear,doy)	7.9	2.901	<0.0001	-
" "	s(flw_sal)	2.97	29.5674	<0.0001	-
" "	ti(flw_sal,doy)	2.54	3.0216	<0.0001	-
" "	ti(flw_sal,cyear)	1	1.3599	0.2443	-
" "	ti(flw_sal,doy,cyear)	0	0	0.4089	-

Table: GAM Parameter Coefficients. - BPC0035 - S - nh4 gam# = 4

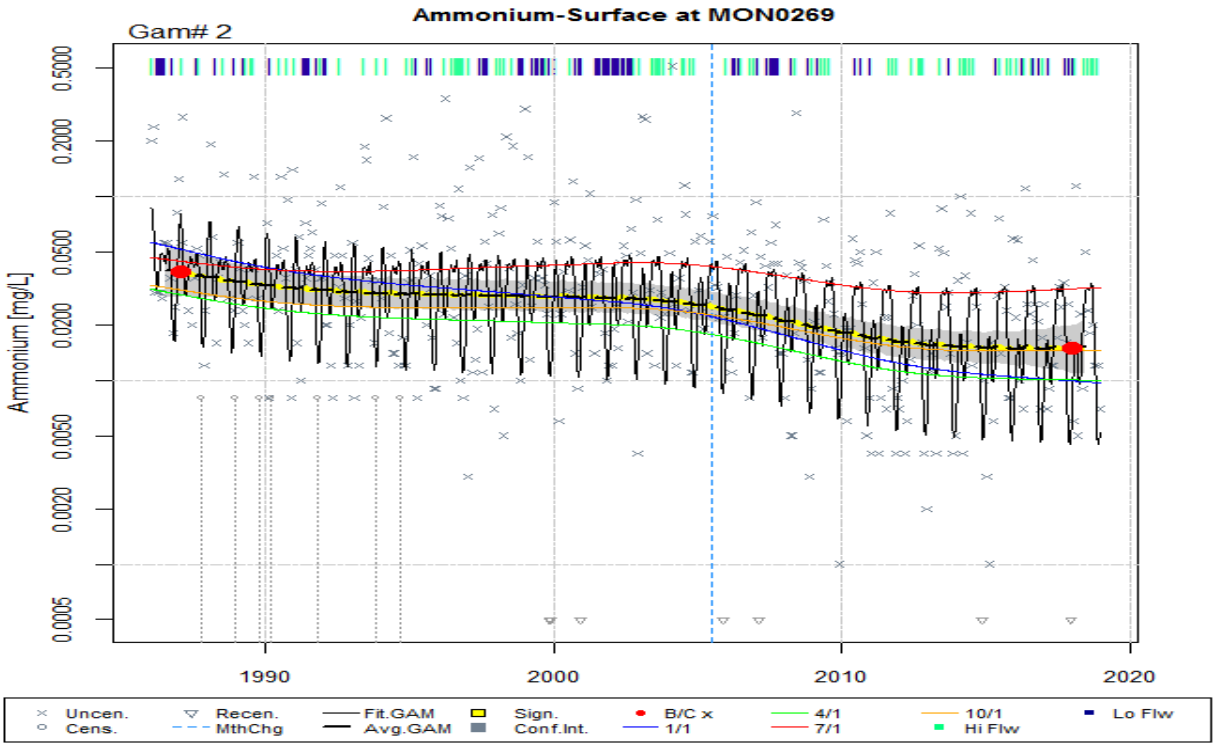
source	estimate	std.error	t.value	p.value
(Intercept)	-3.944337	0.04244	-92.9398	<0.0001
cyear	-0.009936	0.043114	-0.2305	0.8179

Table: GAM Diagnostics. - BPC0035 - S - nh4

AIC	RMSE	AdjRsquare
985.04	0.828	0.4688

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - nh4 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-3.464 (0.0313)
Current ln mean (geometric mean)	-4.3247 (0.0132)
Estimated ln difference	-0.8607
Std. Err. ln difference	0.2033
95% Confidence interval for ln difference	(-1.2592 , -0.4622)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-57.71%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - nh4 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	0.7753	0.3791
smoothed terms	s(cyear)	3.1	0.8986	0.3974
" "	s(doy)	6.63	13.0798	<0.0001
" "	ti(cyear,doy)	1.83	2.1729	0.0015

Table: GAM Parameter Coefficients. - MON0269 - S - nh4 gam# = 2

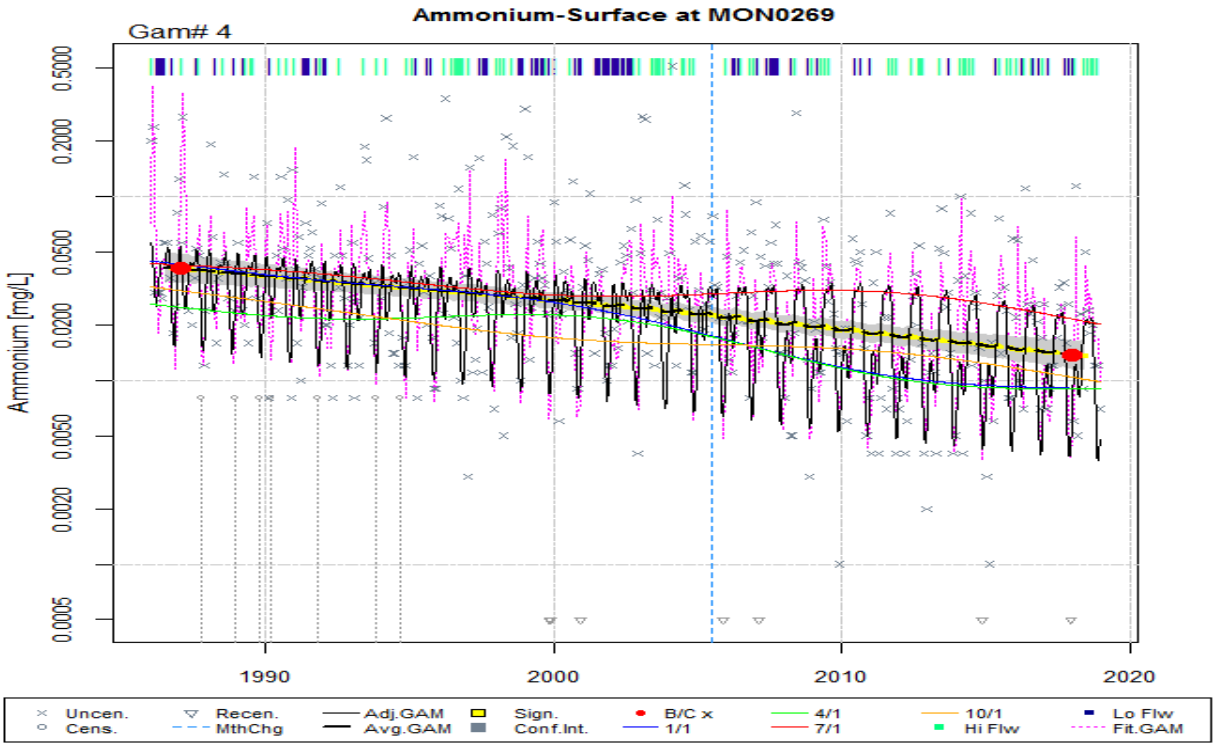
source	estimate	std.error	t.value	p.value
(Intercept)	-3.725452	0.048458	-76.8808	<0.0001
cyear	-0.03872	0.043975	-0.8805	0.3791

Table: GAM Diagnostics. - MON0269 - S - nh4

AIC	RMSE	AdjRsquare
1090.17	0.9532	0.2889

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - nh4 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-3.2467 (0.0389)
Current ln mean (geometric mean)	-4.2084 (0.0149)
Estimated ln difference	-0.9617
Std. Err. ln difference	0.2196
95% Confidence interval for ln difference	(-1.392 , -0.5313)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-61.77%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - nh4 gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	28.7584	<0.0001	-
smoothed terms	s(cyear)	0.41	1.0694	0.3839	-
" "	s(doy)	6.72	16.4907	<0.0001	-
" "	ti(cyear,doy)	5.19	1.7642	<0.0001	-
" "	s(flw_sal)	4.09	24.2451	<0.0001	-
" "	ti(flw_sal,doy)	2.33	4.3285	<0.0001	-
" "	ti(flw_sal,cyear)	1.69	1.4161	0.2534	-
" "	ti(flw_sal,doy,cyear)	0.84	0.0234	0.2176	-

Table: GAM Parameter Coefficients. - MON0269 - S - nh4 gam# = 4

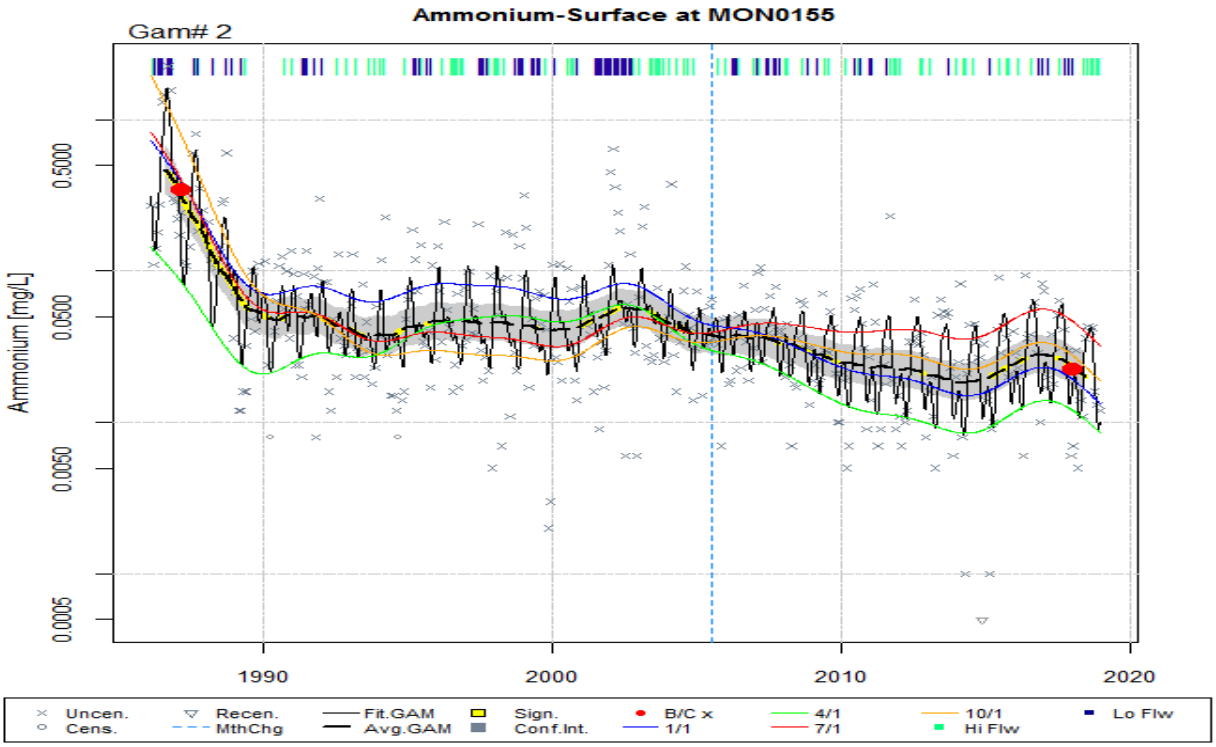
source	estimate	std.error	t.value	p.value
(Intercept)	-3.715858	0.041327	-89.9135	<0.0001
cyear	-0.040028	0.007464	-5.3627	<0.0001

Table: GAM Diagnostics. - MON0269 - S - nh4

AIC	RMSE	AdjRsquare
969.53	0.8077	0.487

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - nh4 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-3.2035 (0.0406)
Current ln mean (geometric mean)	-4.2925 (0.0137)
Estimated ln difference	-1.089
Std. Err. ln difference	0.1406
95% Confidence interval for ln difference	(-1.3646 , -0.8134)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-66.34%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - nh4 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	6.886	0.0091
smoothed terms	s(cyear)	13.55	7.0449	<0.0001
" "	s(doy)	6.37	6.8508	<0.0001
" "	ti(cyear,doy)	8.02	7.2743	<0.0001

Table: GAM Parameter Coefficients. - MON0155 - S - nh4 gam# = 2

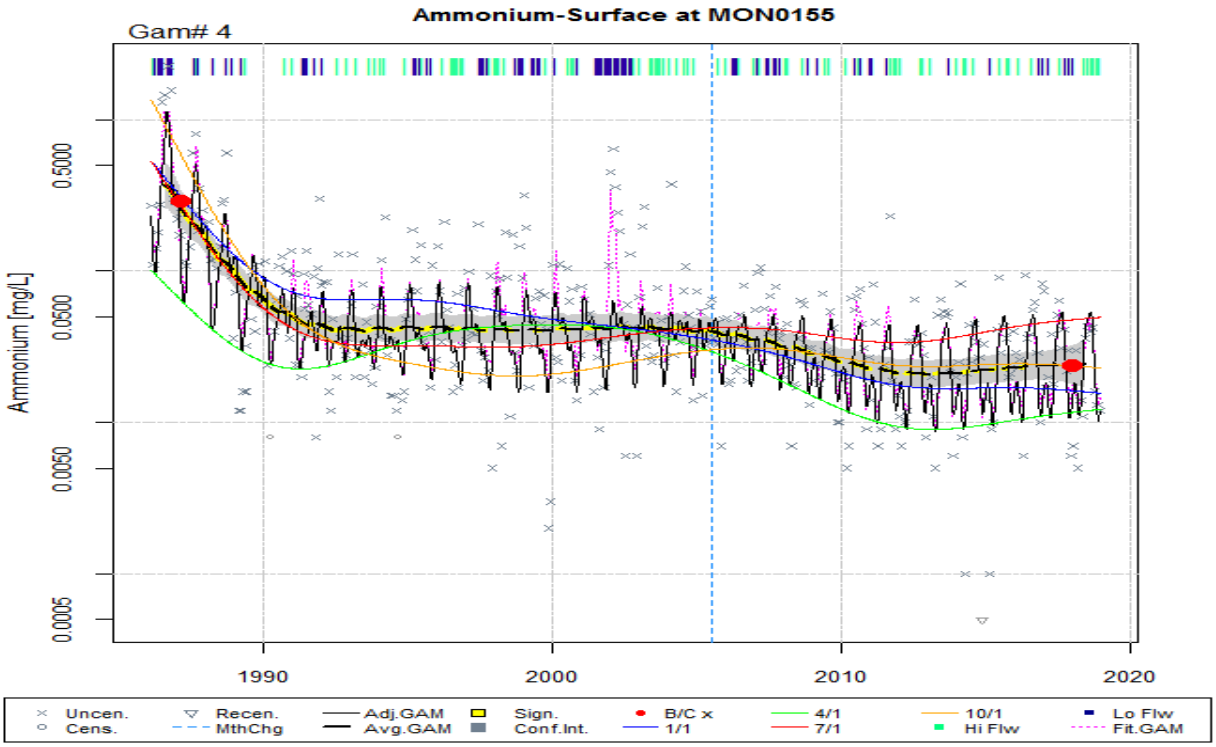
source	estimate	std.error	t.value	p.value
(Intercept)	-3.12417	0.047618	-65.6085	<0.0001
cyear	-0.52526	0.200166	-2.6241	0.0091

Table: GAM Diagnostics. - MON0155 - S - nh4

AIC	RMSE	AdjRsquare
945.88	0.7798	0.5056

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - nh4 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-1.0659 (0.3444)
Current ln mean (geometric mean)	-3.7851 (0.0227)
Estimated ln difference	-2.7192
Std. Err. ln difference	0.2183
95% Confidence interval for ln difference	(-3.1471 , -2.2914)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-93.41%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - nh4 gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	20.1856	<0.0001
smoothed terms	s(cyear)	6.45	11.8334	<0.0001
" "	s(doy)	6.45	7.2655	<0.0001
" "	ti(cyear,doy)	8.32	8.0002	<0.0001
" "	s(flw_sal)	3.34	3.5068	0.0067
" "	ti(flw_sal,doy)	1.66	0.2957	0.0816
" "	ti(flw_sal,cyear)	2.36	0.5093	0.7504
" "	ti(flw_sal,doy,cyear)	4.19	0.2914	0.0009

Table: GAM Parameter Coefficients. - MON0155 - S - nh4 gam# = 4

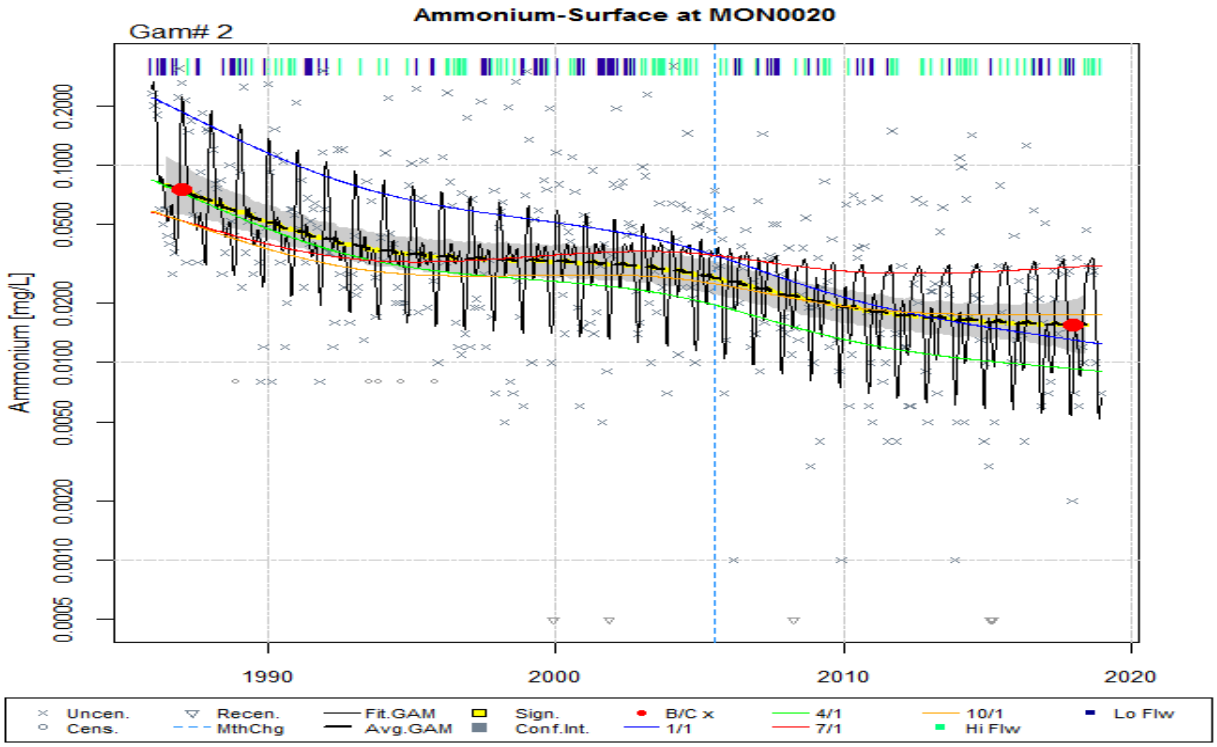
source	estimate	std.error	t.value	p.value
(Intercept)	-3.153455	0.040559	-77.7491	<0.0001
cyear	-0.309985	0.068995	-4.4928	<0.0001

Table: GAM Diagnostics. - MON0155 - S - nh4

AIC	RMSE	AdjRsquare
928.26	0.7582	0.5324

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - nh4 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-1.2463 (0.2876)
Current ln mean (geometric mean)	-3.7426 (0.0237)
Estimated ln difference	-2.4964
Std. Err. ln difference	0.2149
95% Confidence interval for ln difference	(-2.9176 , -2.0752)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-91.76%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - nh4 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	2.3233	0.1283
smoothed terms	s(cyear)	3.21	1.4262	0.2152
" "	s(doy)	6.77	7.791	<0.0001
" "	ti(cyear,doy)	2.09	4.3839	<0.0001

Table: GAM Parameter Coefficients. - MON0020 - S - nh4 gam# = 2

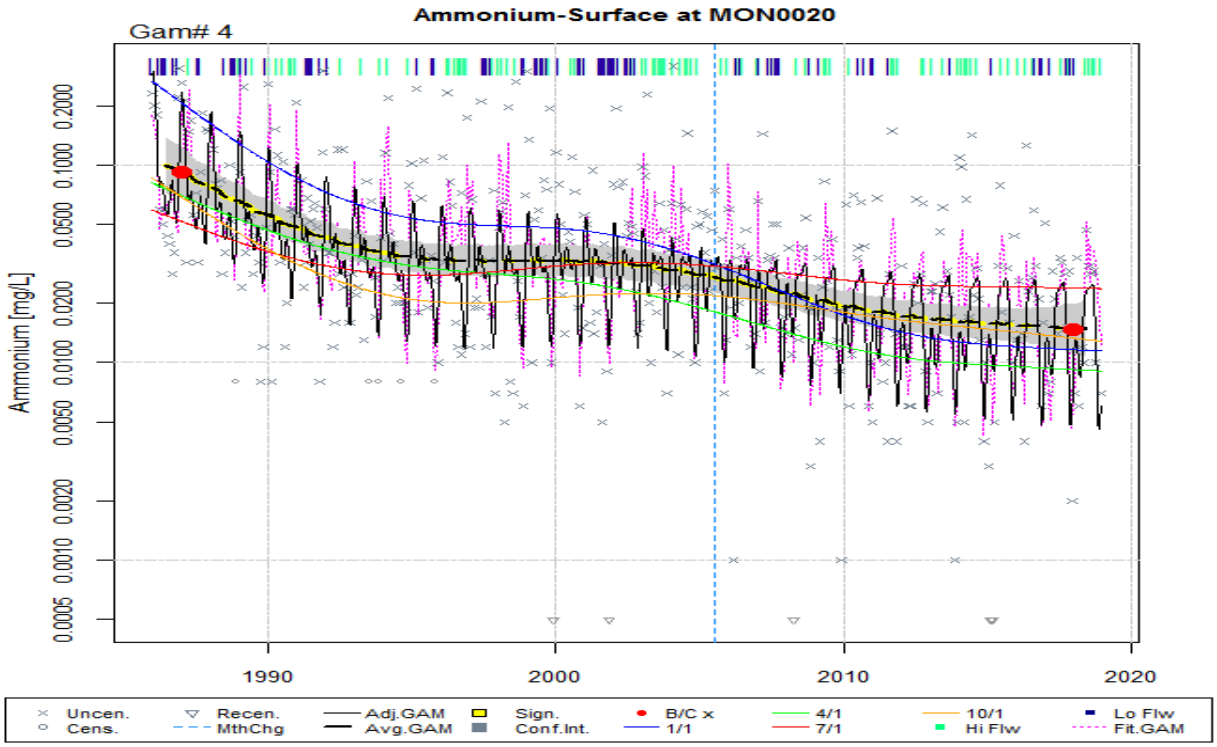
source	estimate	std.error	t.value	p.value
(Intercept)	-3.553507	0.047882	-74.2145	<0.0001
cyear	-0.069552	0.045631	-1.5242	0.1283

Table: GAM Diagnostics. - MON0020 - S - nh4

AIC	RMSE	AdjRsquare
1087.76	0.9464	0.3208

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - nh4 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.5827 (0.0756)
Current ln mean (geometric mean)	-4.173 (0.0154)
Estimated ln difference	-1.5903
Std. Err. ln difference	0.2192
95% Confidence interval for ln difference	(-2.0199 , -1.1606)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-79.61%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - nh4 gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	5.8067	0.0165
smoothed terms	s(cyear)	3.52	2.9548	0.0203
" "	s(doy)	6.77	8.7565	<0.0001
" "	ti(cyear,doy)	6.44	3.5924	<0.0001
" "	s(flw_sal)	3.35	18.6239	<0.0001
" "	ti(flw_sal,doy)	2.37	2.7179	<0.0001
" "	ti(flw_sal,cyear)	1	0.0332	0.8555
" "	ti(flw_sal,doy,cyear)	1.36	0.0419	0.1805

Table: GAM Parameter Coefficients. - MON0020 - S - nh4 gam# = 4

source	estimate	std.error	t.value	p.value
(Intercept)	-3.546563	0.043602	-81.3389	<0.0001
cyear	-0.098623	0.040927	-2.4097	0.0165

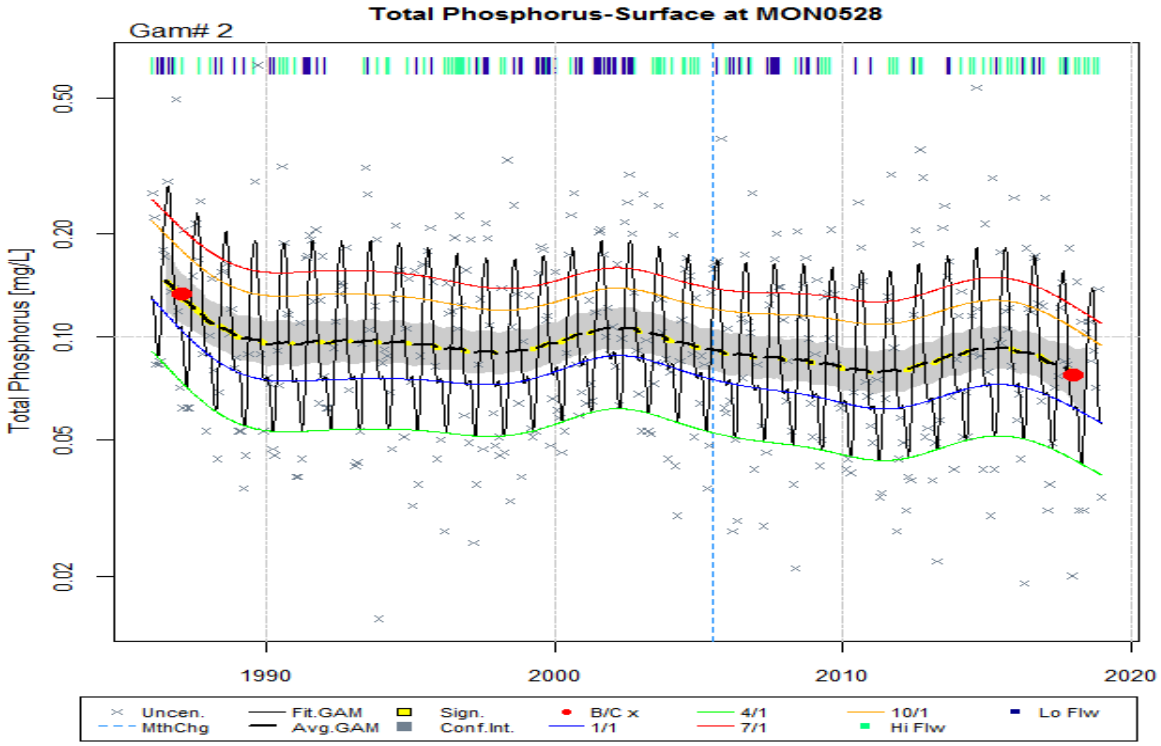
Table: GAM Diagnostics. - MON0020 - S - nh4

AIC	RMSE	AdjRsquare
1013.55	0.848	0.4538

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - nh4 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.3785 (0.0927)
Current ln mean (geometric mean)	-4.2176 (0.0147)
Estimated ln difference	-1.839
Std. Err. ln difference	0.2071
95% Confidence interval for ln difference	(-2.2449 , -1.4332)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-84.1%
Period of Record	1986 - 2018

Total Phosphorus (TP)



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - tp gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	5.7436	0.0171
smoothed terms	s(cyear)	7.87	0.8682	0.0159
" "	s(doy)	5.95	32.7161	<0.0001
" "	ti(cyear,doy)	1.04	0.1481	0.1620

Table: GAM Parameter Coefficients. - MON0528 - S - tp gam# = 2

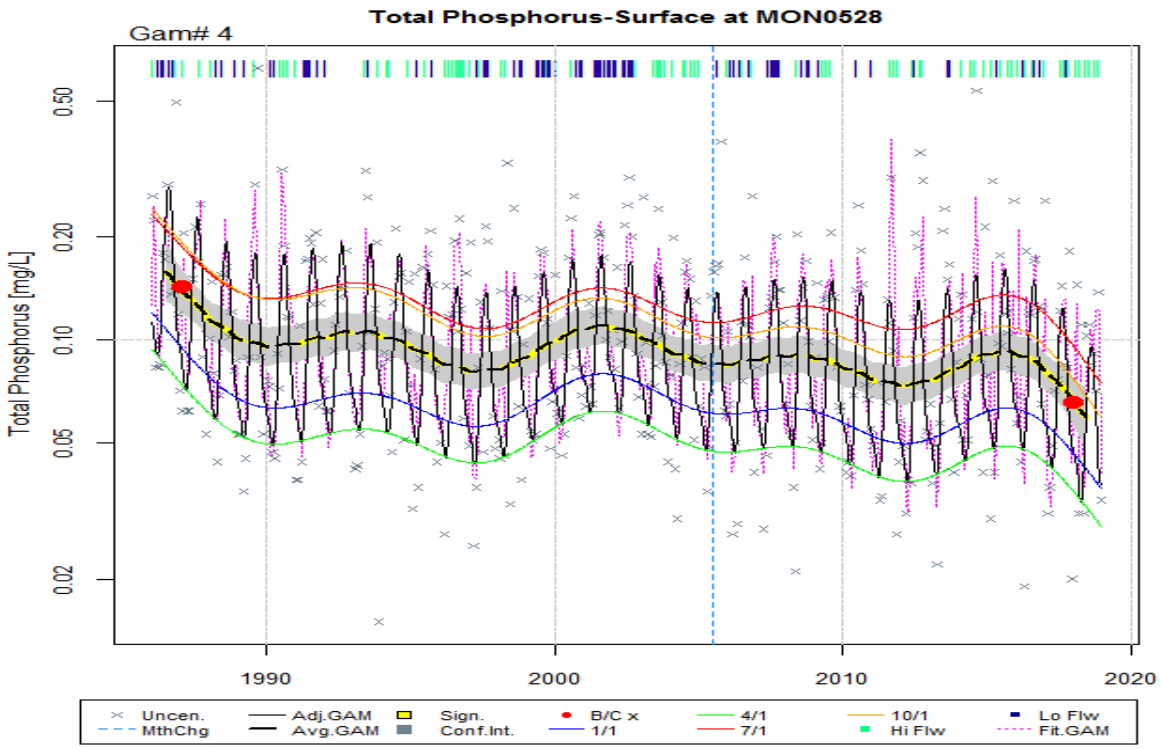
source	estimate	std.error	t.value	p.value
(Intercept)	-2.340956	0.027471	-85.2161	<0.0001
cyear	-0.159306	0.066472	-2.3966	0.0171

Table: GAM Diagnostics. - MON0528 - S - tp

AIC	RMSE	AdjRsquare
548.55	0.4851	0.4276

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - tp gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.0103 (0.1339)
Current ln mean (geometric mean)	-2.5585 (0.0774)
Estimated ln difference	-0.5482
Std. Err. ln difference	0.1295
95% Confidence interval for ln difference	(-0.802 , -0.2944)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-42.2%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - tp gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	26.0871	<0.0001
smoothed terms	s(cyear)	8.36	3.9787	<0.0001
" "	s(doy)	5.27	38.745	<0.0001
" "	ti(cyear,doy)	1.38	0.2732	0.0665
" "	s(flw_sal)	4.5	6.1519	<0.0001
" "	ti(flw_sal,doy)	4.76	2.6332	<0.0001
" "	ti(flw_sal,cyear)	0.78	0.348	0.0688
" "	ti(flw_sal,doy,cyear)	4.89	0.5718	0.0010

Table: GAM Parameter Coefficients. - MON0528 - S - tp gam# = 4

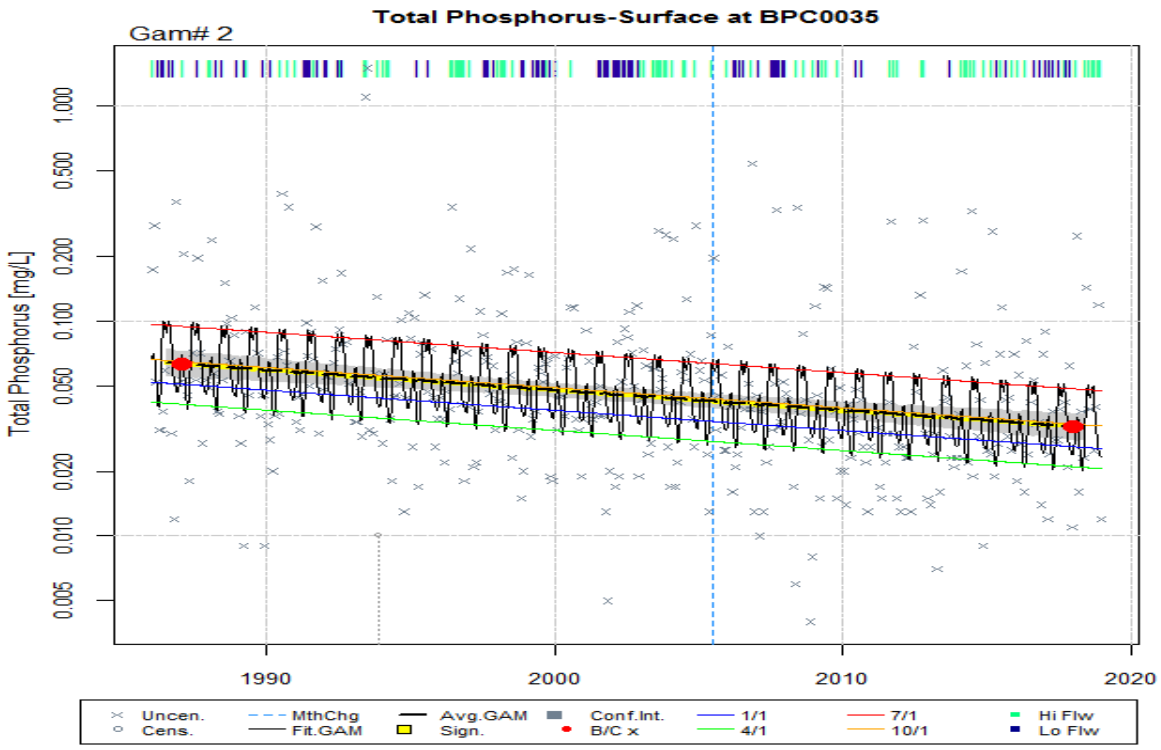
source	estimate	std.error	t.value	p.value
(Intercept)	-2.321253	0.023202	-100.0453	<0.0001
cyear	-0.242363	0.047452	-5.1076	<0.0001

Table: GAM Diagnostics. - MON0528 - S - tp

AIC	RMSE	AdjRsquare
414.86	0.3996	0.6116

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - tp gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-1.941 (0.1436)
Current ln mean (geometric mean)	-2.7218 (0.0658)
Estimated ln difference	-0.7807
Std. Err. ln difference	0.1166
95% Confidence interval for ln difference	(-1.0093 , -0.5521)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-54.19%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - tp gam# = 2

type	source	df	F	p.value	Note
parametric terms	cyear	1	42.4034	<0.0001	-
smoothed terms	s(cyear)	0.01	328738.4429	<0.0001	-
" "	s(doy)	7	7.7884	<0.0001	-
" "	ti(cyear,doy)	0	0	0.7347	-

Table: GAM Parameter Coefficients. - BPC0035 - S - tp gam# = 2

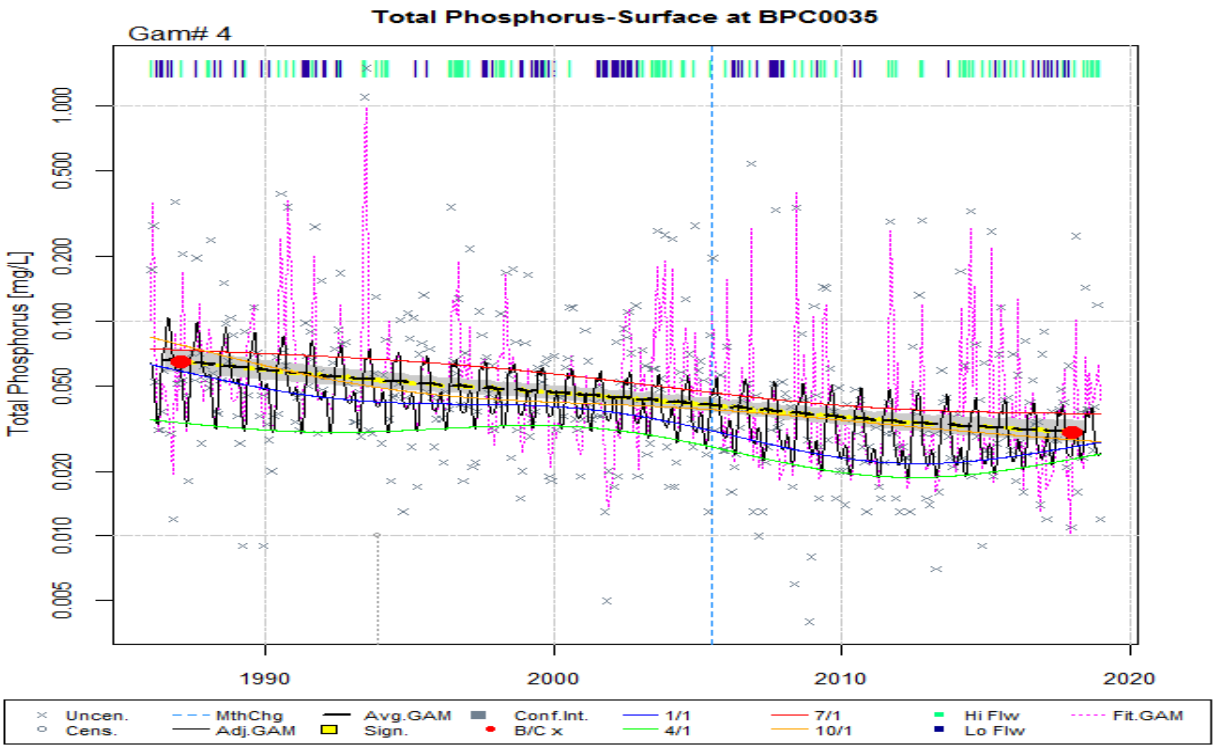
source	estimate	std.error	t.value	p.value
(Intercept)	-3.098925	0.038515	-80.4611	<0.0001
cyear	-0.026313	0.004041	-6.5118	<0.0001

Table: GAM Diagnostics. - BPC0035 - S - tp

AIC	RMSE	AdjRsquare
884.62	0.7548	0.1816

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - tp gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.7639 (0.063)
Current ln mean (geometric mean)	-3.4351 (0.0322)
Estimated ln difference	-0.6712
Std. Err. ln difference	0.1267
95% Confidence interval for ln difference	(-0.9195 , -0.4229)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-48.89%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - tp gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	89.5264	<0.0001	-
smoothed terms	s(cyear)	0.01	520136.5841	<0.0001	-
" "	s(doy)	6.76	9.9546	<0.0001	-
" "	ti(cyear,doy)	6.62	0.8752	0.0929	-
" "	s(flw_sal)	9.93	20.4761	<0.0001	-
" "	ti(flw_sal,doy)	2.9	0.705	0.0120	-
" "	ti(flw_sal,cyear)	7.39	1.5288	0.1331	-
" "	ti(flw_sal,doy,cyear)	9.59	0.4928	0.0018	-

Table: GAM Parameter Coefficients. - BPC0035 - S - tp gam# = 4

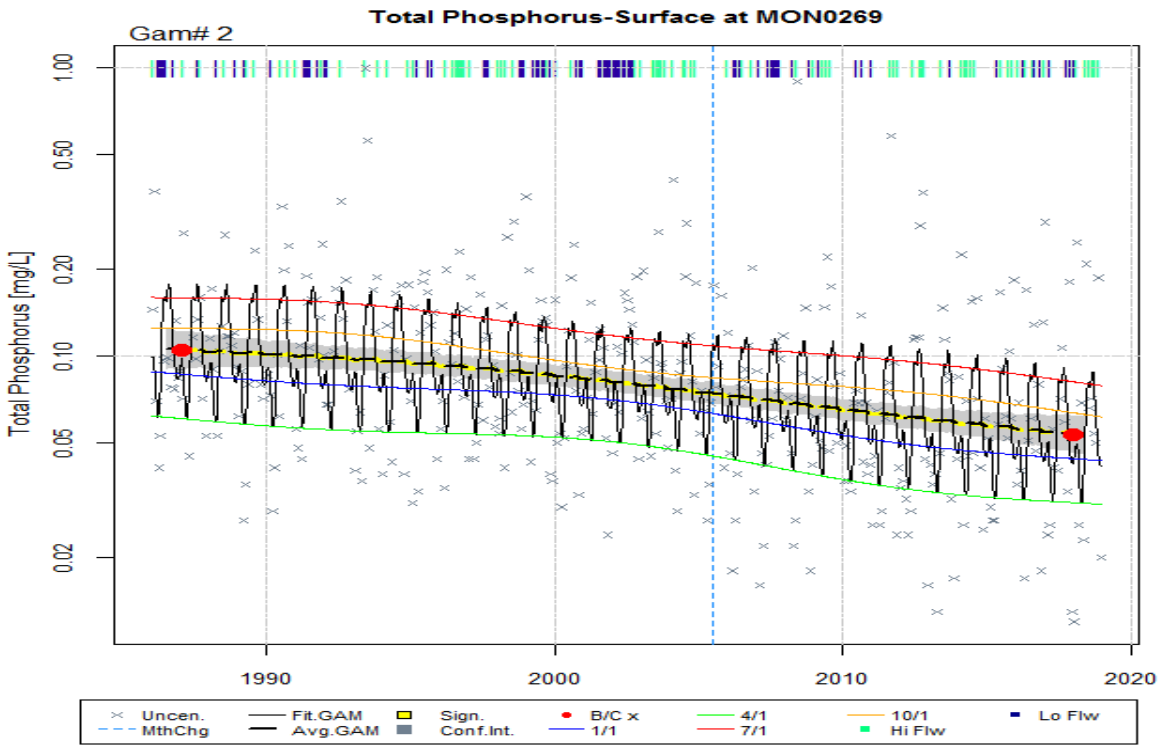
source	estimate	std.error	t.value	p.value
(Intercept)	-3.086757	0.030059	-102.6888	<0.0001
cyear	-0.030286	0.003201	-9.4618	<0.0001

Table: GAM Diagnostics. - BPC0035 - S - tp

AIC	RMSE	AdjRsquare
672.84	0.5485	0.5673

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - tp gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.735 (0.0649)
Current ln mean (geometric mean)	-3.4951 (0.0303)
Estimated ln difference	-0.7601
Std. Err. ln difference	0.1015
95% Confidence interval for ln difference	(-0.9591 , -0.5611)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-53.24%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - tp gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	0.0782	0.7800
smoothed terms	s(cyear)	1.05	0.0794	0.2024
" "	s(doy)	6.89	15.0153	<0.0001
" "	ti(cyear,doy)	1.09	0.1698	0.1342

Table: GAM Parameter Coefficients. - MON0269 - S - tp gam# = 2

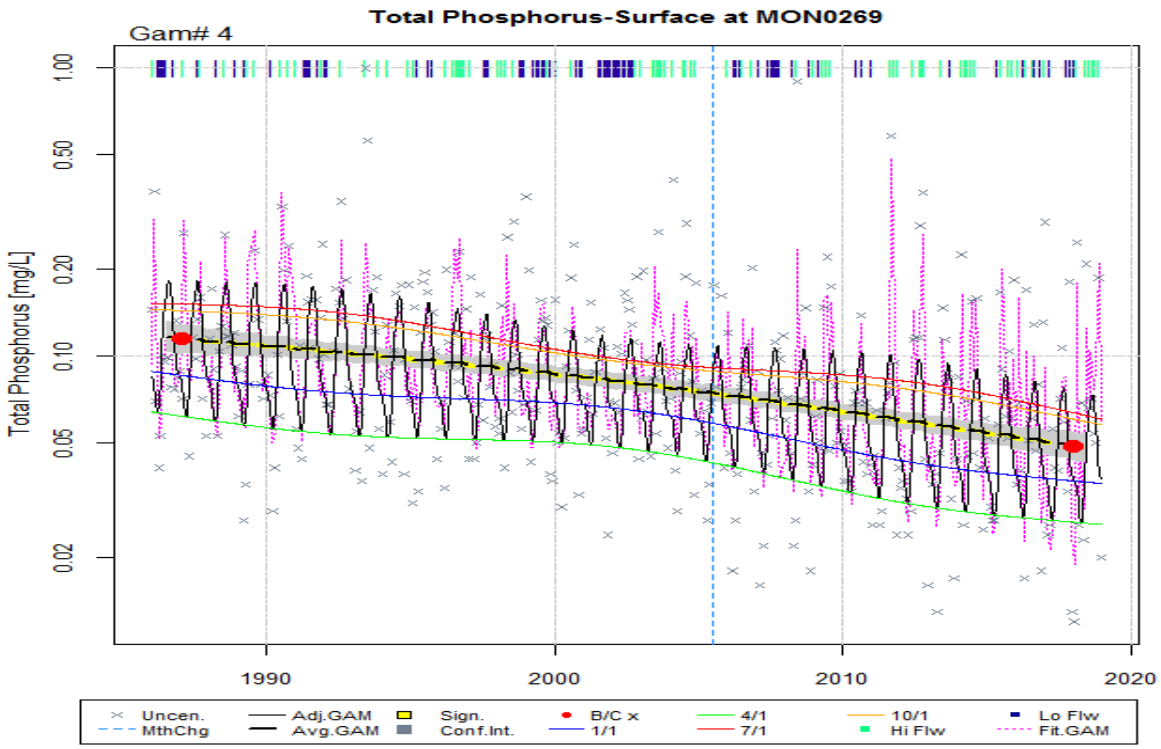
source	estimate	std.error	t.value	p.value
(Intercept)	-2.55209	0.035094	-72.7224	<0.0001
cyear	-0.017334	0.062002	-0.2796	0.7800

Table: GAM Diagnostics. - MON0269 - S - tp

AIC	RMSE	AdjRsquare
706.93	0.5946	0.3058

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - tp gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.2528 (0.1051)
Current ln mean (geometric mean)	-2.9306 (0.0534)
Estimated ln difference	-0.6778
Std. Err. ln difference	0.1099
95% Confidence interval for ln difference	(-0.8933 , -0.4624)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-49.23%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - tp gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	1.0641	0.3030
smoothed terms	s(cyear)	0.83	0.2868	0.0478
" "	s(doy)	5.78	19.9158	<0.0001
" "	ti(cyear,doy)	1.76	0.3502	0.0597
" "	s(flw_sal)	3.14	9.9066	<0.0001
" "	ti(flw_sal,doy)	4.74	1.6498	0.0003
" "	ti(flw_sal,cyear)	1.86	1.1959	0.0027
" "	ti(flw_sal,doy,cyear)	6.59	0.8364	0.0033

Table: GAM Parameter Coefficients. - MON0269 - S - tp gam# = 4

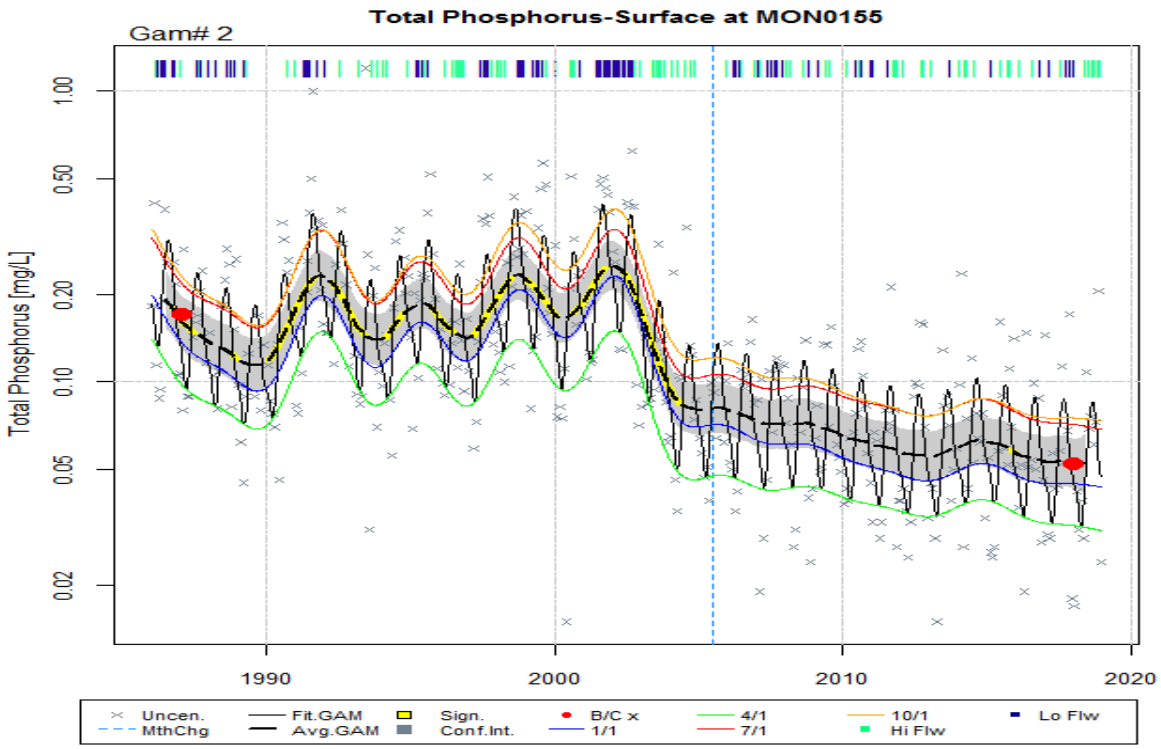
source	estimate	std.error	t.value	p.value
(Intercept)	-2.537852	0.02508	-101.1885	<0.0001
cyear	-0.026546	0.025734	-1.0315	0.3030

Table: GAM Diagnostics. - MON0269 - S - tp

AIC	RMSE	AdjRsquare
514.38	0.4545	0.5944

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - tp gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.1615 (0.1152)
Current ln mean (geometric mean)	-3.0243 (0.0486)
Estimated ln difference	-0.8628
Std. Err. ln difference	0.0861
95% Confidence interval for ln difference	(-1.0316 , -0.694)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-57.8%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - tp gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	1.5314	0.2167
smoothed terms	s(cyear)	18.67	8.2798	<0.0001
" "	s(doy)	4.98	24.5005	<0.0001
" "	ti(cyear,doy)	1.21	0.1995	0.1178

Table: GAM Parameter Coefficients. - MON0155 - S - tp gam# = 2

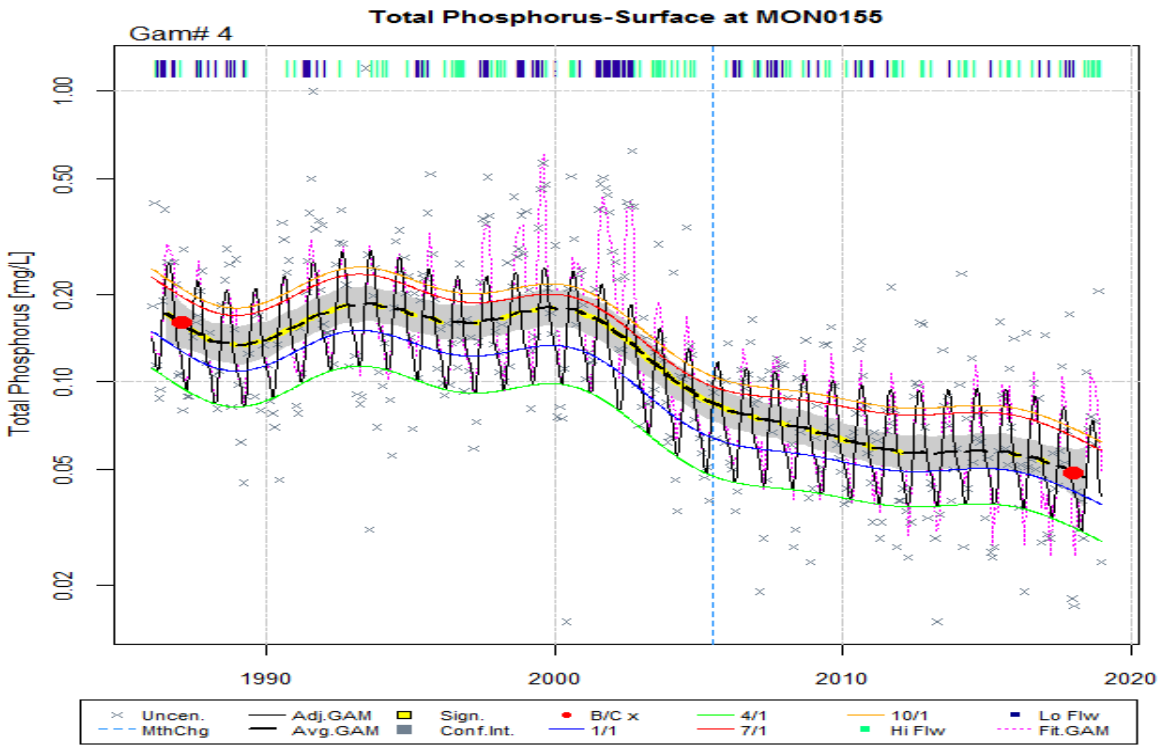
source	estimate	std.error	t.value	p.value
(Intercept)	-2.162027	0.057337	-37.7072	<0.0001
cyear	-0.222409	0.179722	-1.2375	0.2167

Table: GAM Diagnostics. - MON0155 - S - tp

AIC	RMSE	AdjRsquare
544.4	0.4732	0.6348

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - tp gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-1.7682 (0.1706)
Current ln mean (geometric mean)	-2.9481 (0.0524)
Estimated ln difference	-1.1799
Std. Err. ln difference	0.1343
95% Confidence interval for ln difference	(-1.4431 , -0.9167)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-69.27%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - tp gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	6.4566	0.0115
smoothed terms	s(cyear)	7.94	9.8664	<0.0001
" "	s(doy)	4.94	21.4152	<0.0001
" "	ti(cyear,doy)	0.34	0.0348	0.2790
" "	s(flw_sal)	3.04	0.5617	0.0027
" "	ti(flw_sal,doy)	1.85	0.3258	0.0553
" "	ti(flw_sal,cyear)	6.54	2.9936	<0.0001
" "	ti(flw_sal,doy,cyear)	0.89	0.0294	0.1931

Table: GAM Parameter Coefficients. - MON0155 - S - tp gam# = 4

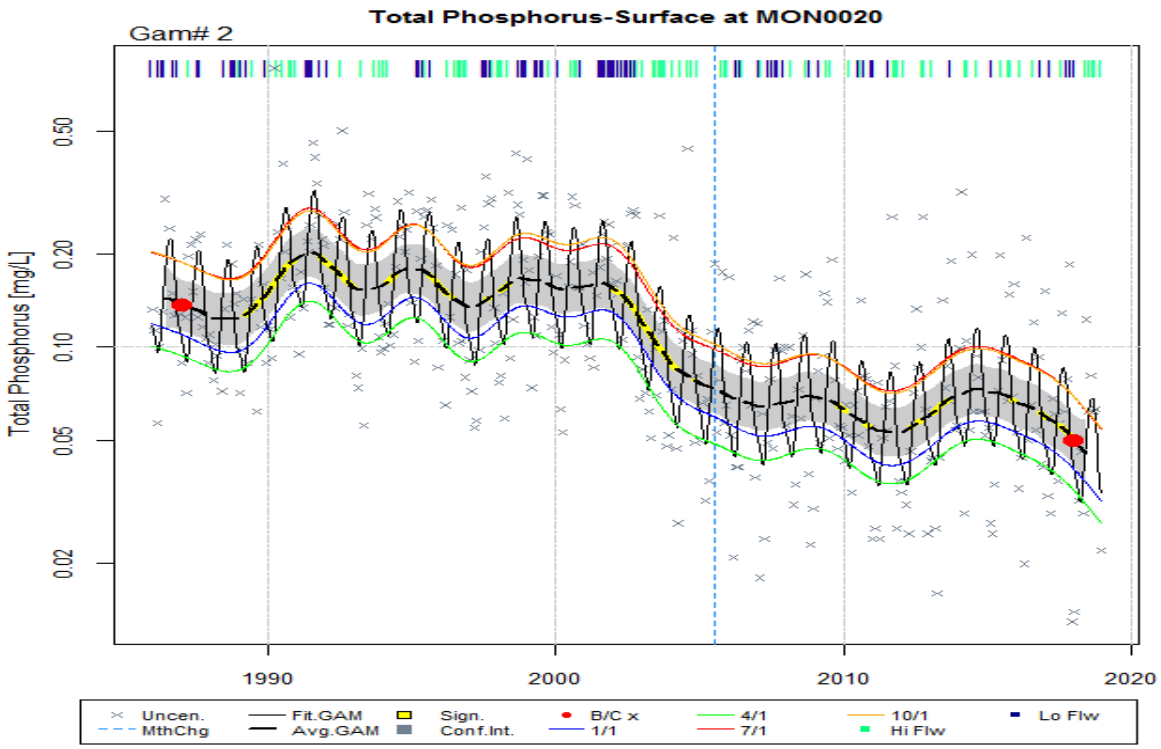
source	estimate	std.error	t.value	p.value
(Intercept)	-2.217036	0.028473	-77.8642	<0.0001
cyear	-0.132662	0.052209	-2.541	0.0115

Table: GAM Diagnostics. - MON0155 - S - tp

AIC	RMSE	AdjRsquare
511.37	0.453	0.6653

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - tp gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-1.8302 (0.1604)
Current ln mean (geometric mean)	-3.0234 (0.0486)
Estimated ln difference	-1.1932
Std. Err. ln difference	0.1376
95% Confidence interval for ln difference	(-1.4628 , -0.9235)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-69.67%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - tp gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	1.2192	0.2703
smoothed terms	s(cyear)	16.04	5.0129	<0.0001
" "	s(doy)	4.91	20.995	<0.0001
" "	ti(cyear,doy)	0.72	0.086	0.2247

Table: GAM Parameter Coefficients. - MON0020 - S - tp gam# = 2

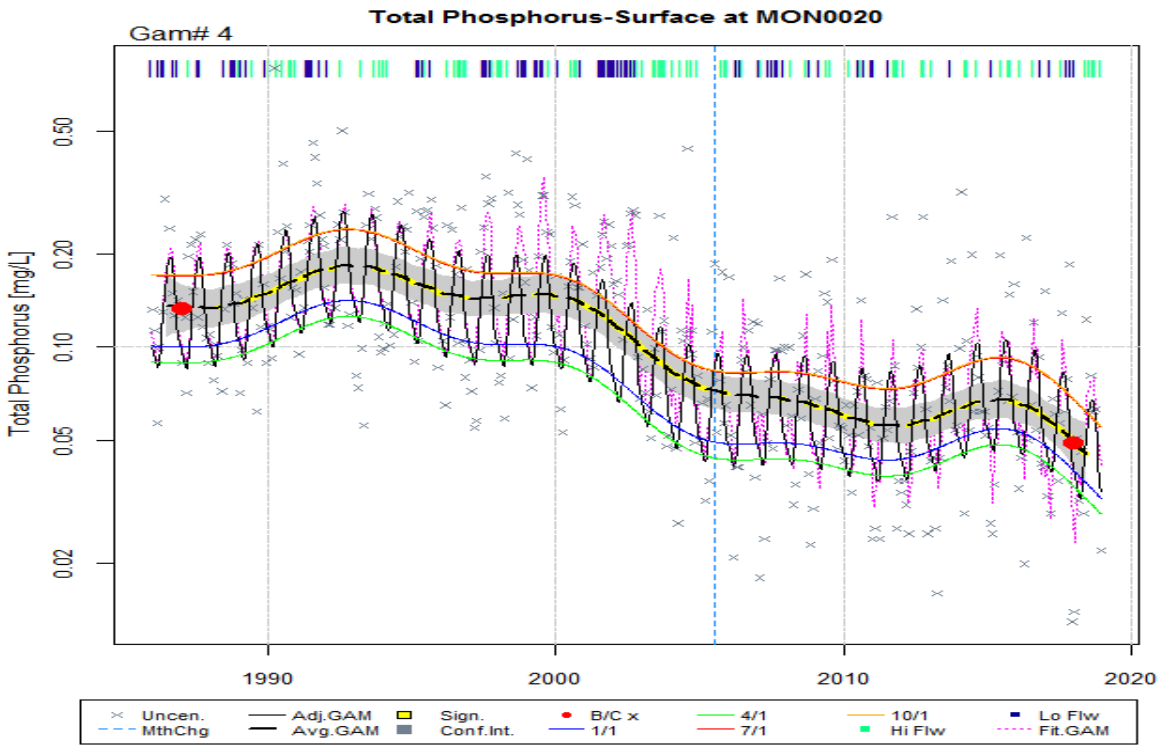
source	estimate	std.error	t.value	p.value
(Intercept)	-2.262884	0.034291	-65.9904	<0.0001
cyear	-0.166066	0.150398	-1.1042	0.2703

Table: GAM Diagnostics. - MON0020 - S - tp

AIC	RMSE	AdjRsquare
529.83	0.4662	0.5811

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - tp gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-1.9853 (0.1373)
Current ln mean (geometric mean)	-2.9985 (0.0499)
Estimated ln difference	-1.0132
Std. Err. ln difference	0.1321
95% Confidence interval for ln difference	(-1.272 , -0.7543)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-63.69%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - tp gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	0.5679	0.4516
smoothed terms	s(cyear)	8.01	7.0897	<0.0001
" "	s(doy)	5.06	20.2246	<0.0001
" "	ti(cyear,doy)	0	0	0.4245
" "	s(flw_sal)	3.73	0.7806	0.0005
" "	ti(flw_sal,doy)	1.1	0.1974	0.1054
" "	ti(flw_sal,cyear)	6.73	2.7754	<0.0001
" "	ti(flw_sal,doy,cyear)	0	0	0.8849

Table: GAM Parameter Coefficients. - MON0020 - S - tp gam# = 4

source	estimate	std.error	t.value	p.value
(Intercept)	-2.294191	0.034951	-65.6403	<0.0001
cyear	-0.11943	0.158479	-0.7536	0.4516

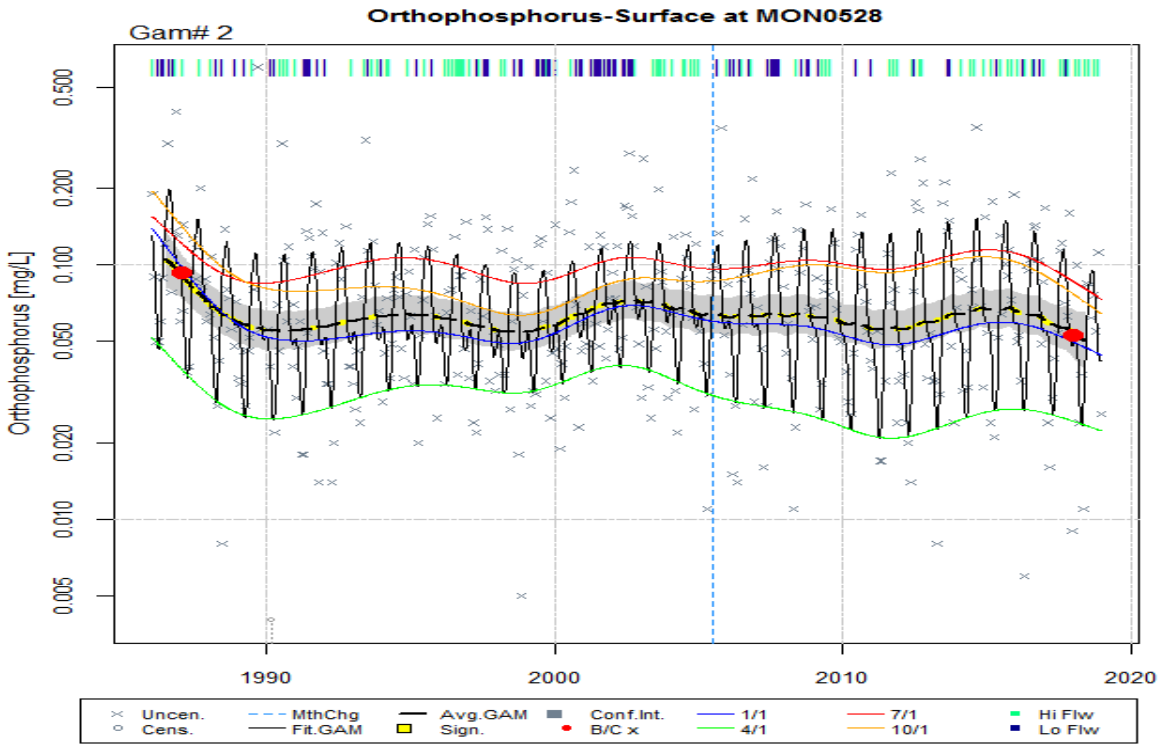
Table: GAM Diagnostics. - MON0020 - S - tp

AIC	RMSE	AdjRsquare
485.21	0.4384	0.6296

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - tp gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.0108 (0.1339)
Current ln mean (geometric mean)	-3.0106 (0.0493)
Estimated ln difference	-0.9998
Std. Err. ln difference	0.1353
95% Confidence interval for ln difference	(-1.265 , -0.7346)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-63.2%
Period of Record	1986 - 2018

Ortho-phosphate Phosphorus (PO4)



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - po4 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	6.0486	0.0144
smoothed terms	s(cyear)	8.83	2.1977	0.0123
" "	s(doy)	6.15	30.637	<0.0001
" "	ti(cyear,doy)	6.24	1.4883	0.0026

Table: GAM Parameter Coefficients. - MON0528 - S - po4 gam# = 2

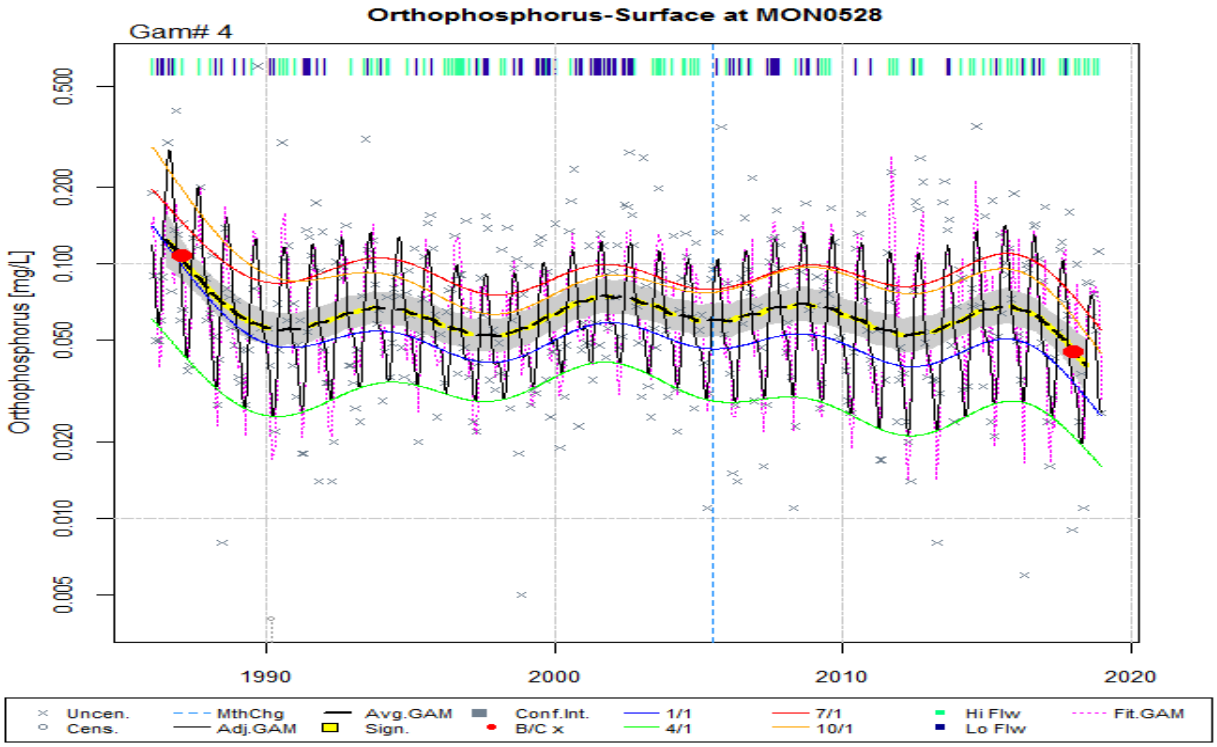
source	estimate	std.error	t.value	p.value
(Intercept)	-2.783872	0.029128	-95.5735	<0.0001
cyear	-0.214711	0.087302	-2.4594	0.0144

Table: GAM Diagnostics. - MON0528 - S - po4

AIC	RMSE	AdjRsquare
686.87	0.5669	0.4197

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - po4 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.371 (0.0934)
Current ln mean (geometric mean)	-2.9374 (0.053)
Estimated ln difference	-0.5664
Std. Err. ln difference	0.1527
95% Confidence interval for ln difference	(-0.8657 , -0.2671)
Difference p-value	0.0002
Period of Record Percent Change Estimate (%)	-43.24%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - po4 gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	31.0023	<0.0001
smoothed terms	s(cyear)	8.5	5.3347	<0.0001
" "	s(doy)	5.58	33.0885	<0.0001
" "	ti(cyear,doy)	5.93	1.4418	0.0017
" "	s(flw_sal)	4.92	16.6355	<0.0001
" "	ti(flw_sal,doy)	5.92	2.3068	<0.0001
" "	ti(flw_sal,cyear)	3.9	1.617	0.1579
" "	ti(flw_sal,doy,cyear)	3.35	0.2886	0.0071

Table: GAM Parameter Coefficients. - MON0528 - S - po4 gam# = 4

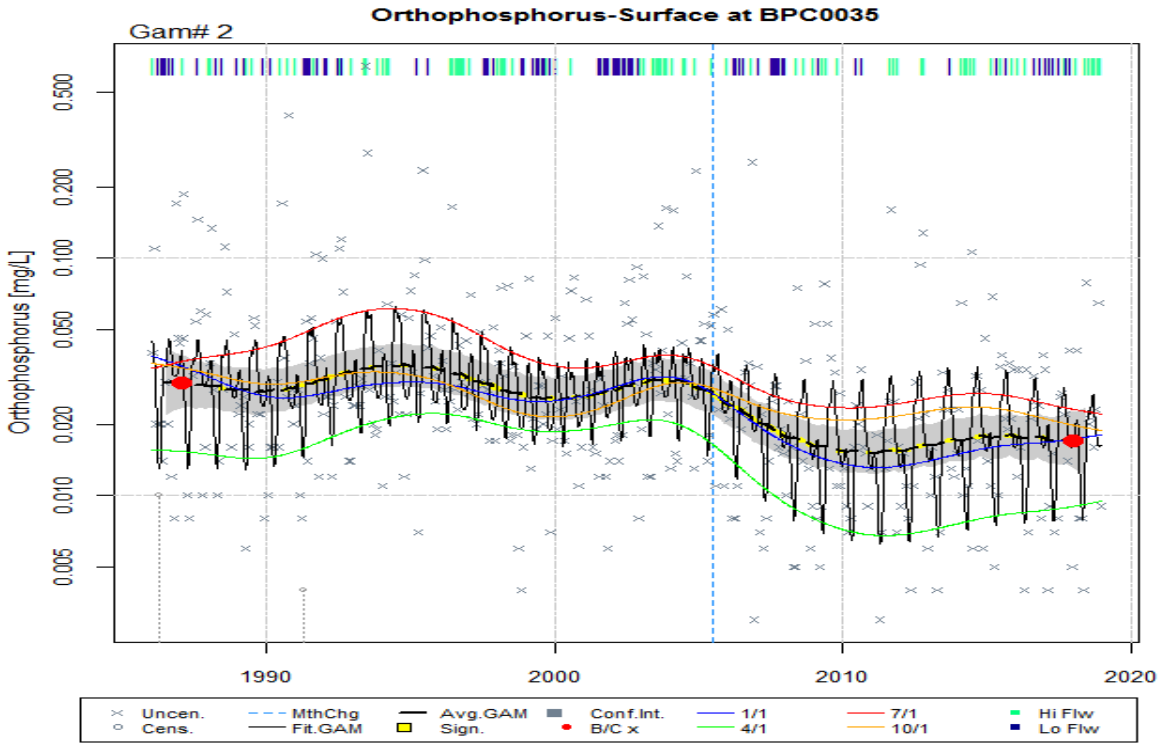
source	estimate	std.error	t.value	p.value
(Intercept)	-2.782706	0.026814	-103.7766	<0.0001
cyear	-0.317122	0.056955	-5.568	<0.0001

Table: GAM Diagnostics. - MON0528 - S - po4

AIC	RMSE	AdjRsquare
575.66	0.4818	0.5808

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - po4 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.2247 (0.1081)
Current ln mean (geometric mean)	-3.0989 (0.0451)
Estimated ln difference	-0.8742
Std. Err. ln difference	0.1421
95% Confidence interval for ln difference	(-1.1526 , -0.5958)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-58.28%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - po4 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	0.0086	0.9260
smoothed terms	s(cyear)	7.29	2.1824	0.0216
" "	s(doy)	7.03	10.4325	<0.0001
" "	ti(cyear,doy)	6.46	1.4845	0.0037

Table: GAM Parameter Coefficients. - BPC0035 - S - po4 gam# = 2

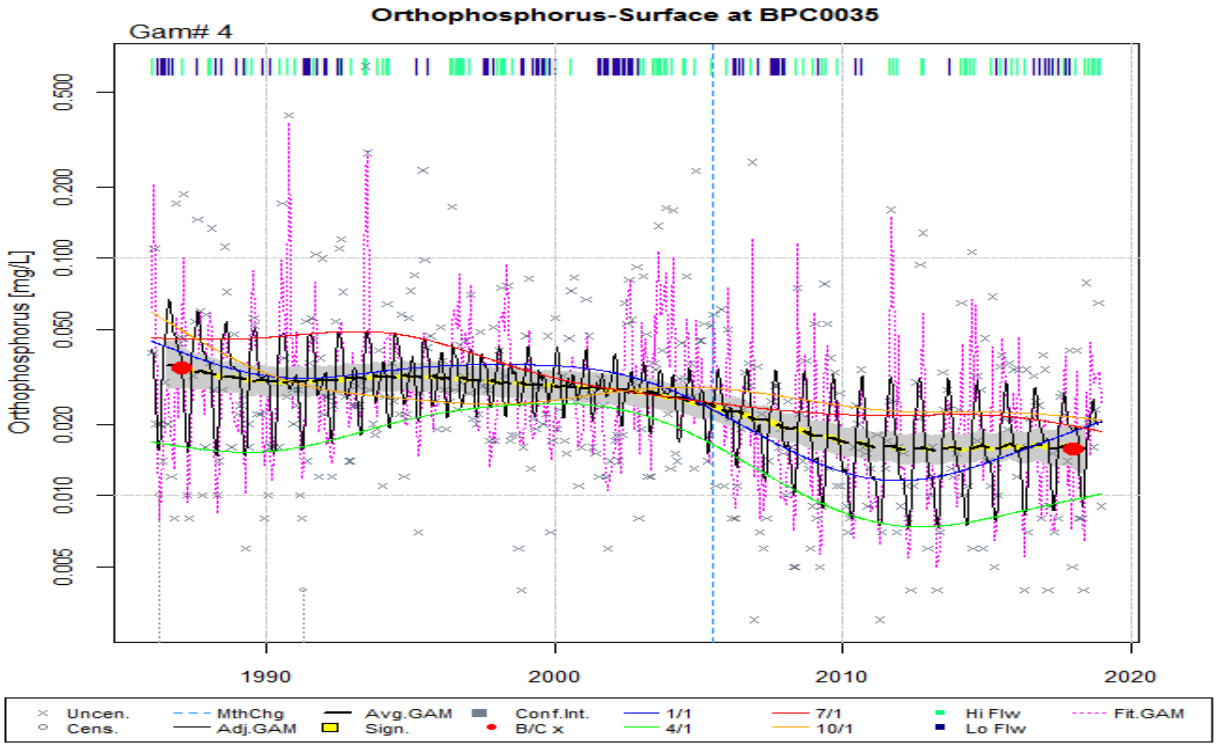
source	estimate	std.error	t.value	p.value
(Intercept)	-3.733559	0.037383	-99.872	<0.0001
cyear	-0.00841	0.090478	-0.0929	0.9260

Table: GAM Diagnostics. - BPC0035 - S - po4

AIC	RMSE	AdjRsquare
891.17	0.7354	0.283

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - po4 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-3.5081 (0.03)
Current ln mean (geometric mean)	-4.0775 (0.0169)
Estimated ln difference	-0.5694
Std. Err. ln difference	0.195
95% Confidence interval for ln difference	(-0.9516 , -0.1872)
Difference p-value	0.0037
Period of Record Percent Change Estimate (%)	-43.41%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - po4 gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	1.0308	0.3107	-
smoothed terms	s(cyear)	4.62	2.025	0.0578	-
" "	s(doy)	6.78	12.1255	<0.0001	-
" "	ti(cyear,doy)	8.62	3.4601	<0.0001	-
" "	s(flw_sal)	12.44	18.5109	<0.0001	-
" "	ti(flw_sal,doy)	3.45	1.49	0.0001	-
" "	ti(flw_sal,cyear)	7.41	2.0733	0.0327	-
" "	ti(flw_sal,doy,cyear)	0.99	0.0878	0.1084	-

Table: GAM Parameter Coefficients. - BPC0035 - S - po4 gam# = 4

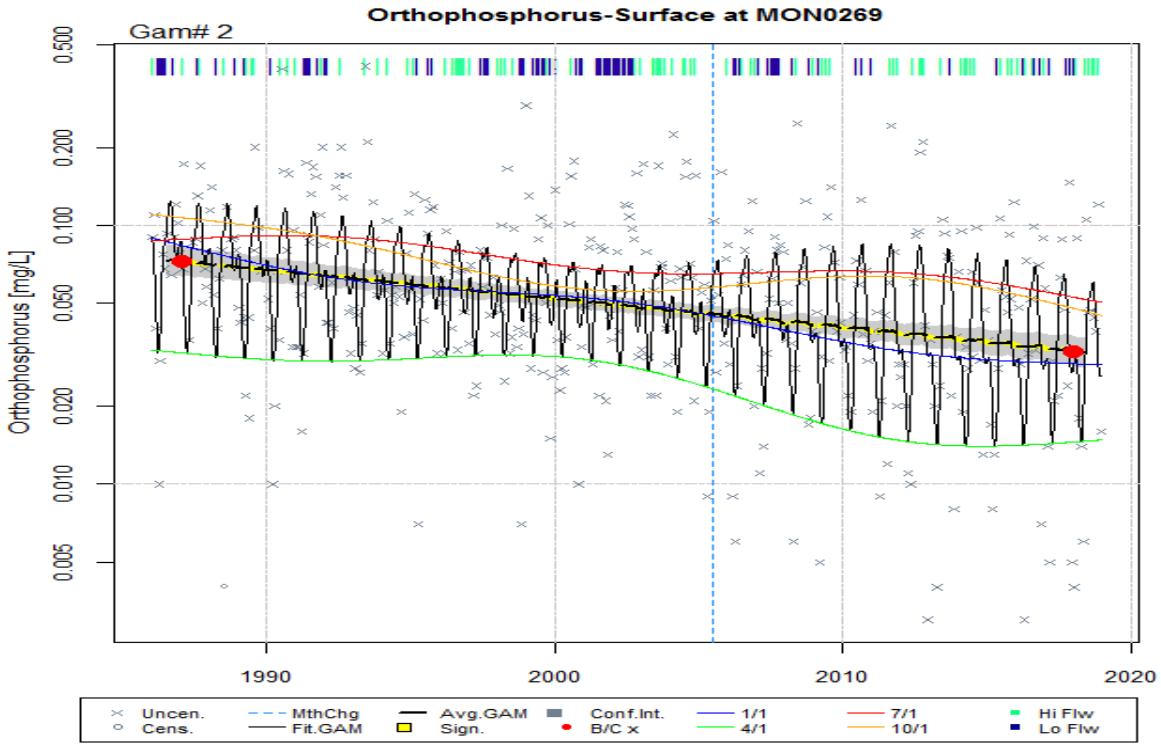
source	estimate	std.error	t.value	p.value
(Intercept)	-3.728765	0.029387	-126.8867	<0.0001
cyear	-0.037592	0.037026	-1.0153	0.3107

Table: GAM Diagnostics. - BPC0035 - S - po4

AIC	RMSE	AdjRsquare
680.33	0.5462	0.6043

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - po4 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-3.3707 (0.0344)
Current ln mean (geometric mean)	-4.1492 (0.0158)
Estimated ln difference	-0.7785
Std. Err. ln difference	0.1495
95% Confidence interval for ln difference	(-1.0716 , -0.4855)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-54.09%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - po4 gam# = 2

type	source	df	F	p.value	Note
parametric terms	cyear	1	50.9655	<0.0001	-
smoothed terms	s(cyear)	0.04	23.956	0.2061	-
" "	s(doy)	6.4	16.034	<0.0001	-
" "	ti(cyear,doy)	5.35	1.3506	0.0021	-

Table: GAM Parameter Coefficients. - MON0269 - S - po4 gam# = 2

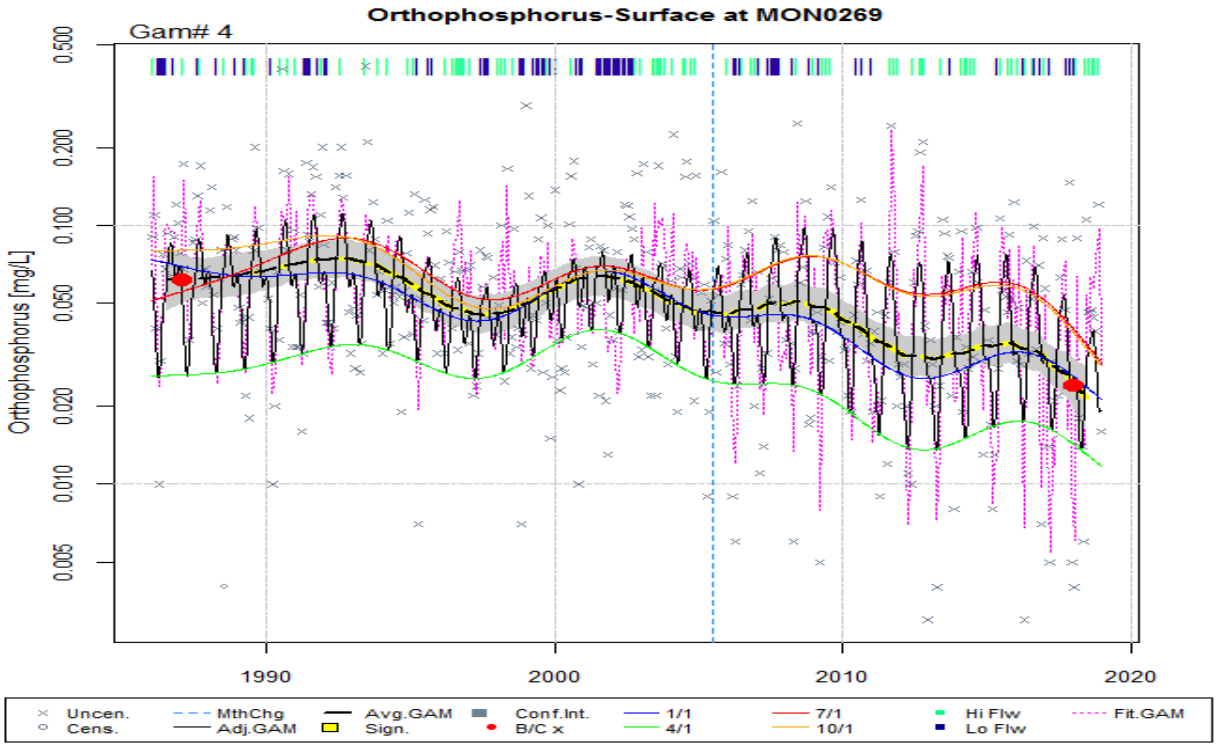
source	estimate	std.error	t.value	p.value
(Intercept)	-3.023087	0.034626	-87.3059	<0.0001
cyear	-0.027272	0.00382	-7.139	<0.0001

Table: GAM Diagnostics. - MON0269 - S - po4

AIC	RMSE	AdjRsquare
837.72	0.6869	0.3243

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - po4 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.6277 (0.0722)
Current ln mean (geometric mean)	-3.4287 (0.0324)
Estimated ln difference	-0.801
Std. Err. ln difference	0.1137
95% Confidence interval for ln difference	(-1.0238 , -0.5782)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-55.11%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - po4 gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	4.7532	0.0299	-
smoothed terms	s(cyear)	8.27	3.1571	0.0010	-
" "	s(doy)	6.21	18.7105	<0.0001	-
" "	ti(cyear,doy)	7.05	2.5635	<0.0001	-
" "	s(flw_sal)	2.69	41.6303	<0.0001	-
" "	ti(flw_sal,doy)	3.66	2.1732	<0.0001	-
" "	ti(flw_sal,cyear)	4.14	5.9832	<0.0001	-
" "	ti(flw_sal,doy,cyear)	0.97	0.0356	0.1334	-

Table: GAM Parameter Coefficients. - MON0269 - S - po4 gam# = 4

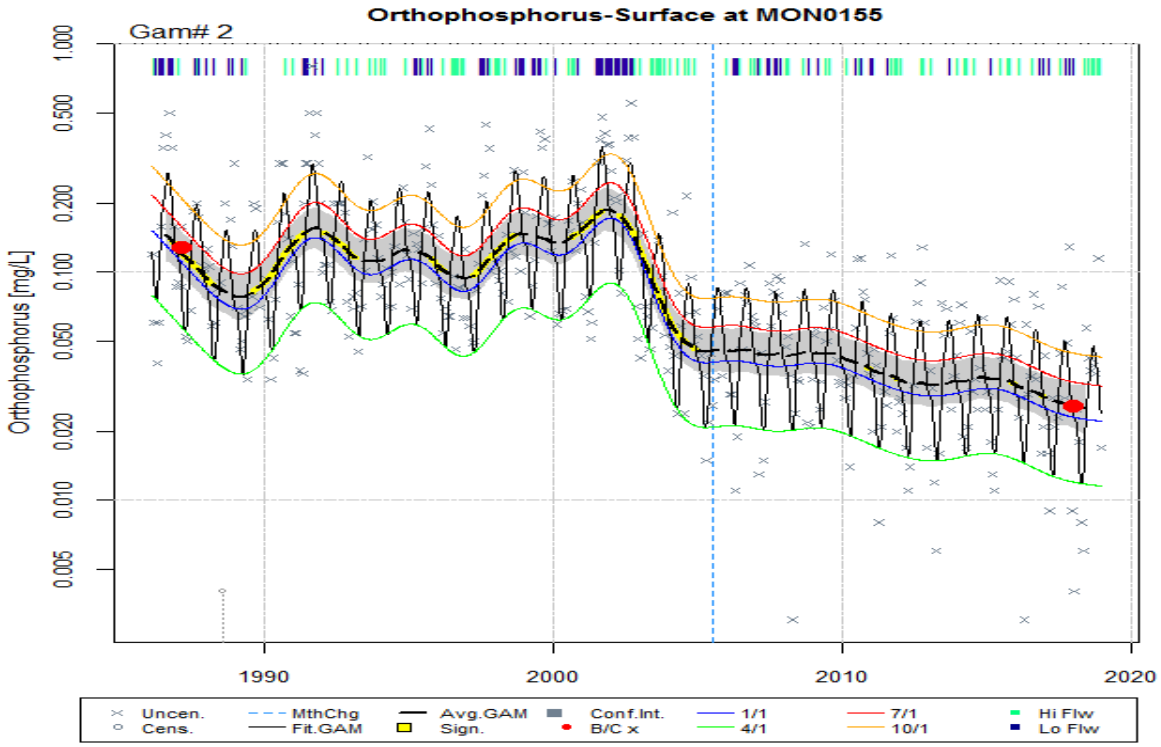
source	estimate	std.error	t.value	p.value
(Intercept)	-3.032773	0.02906	-104.3614	<0.0001
cyear	-0.139175	0.063836	-2.1802	0.0299

Table: GAM Diagnostics. - MON0269 - S - po4

AIC	RMSE	AdjRsquare
697.92	0.561	0.5491

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - po4 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.7827 (0.0619)
Current ln mean (geometric mean)	-3.7245 (0.0241)
Estimated ln difference	-0.9418
Std. Err. ln difference	0.1645
95% Confidence interval for ln difference	(-1.2642 , -0.6194)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-61.01%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - po4 gam# = 2

type	source	df	F	p.value	Note
parametric terms	cyear	1	0.9824	0.3223	-
smoothed terms	s(cyear)	17.26	8.6772	<0.0001	-
" "	s(doy)	6.13	32.5871	<0.0001	-
" "	ti(cyear,doy)	0	0	0.3853	-

Table: GAM Parameter Coefficients. - MON0155 - S - po4 gam# = 2

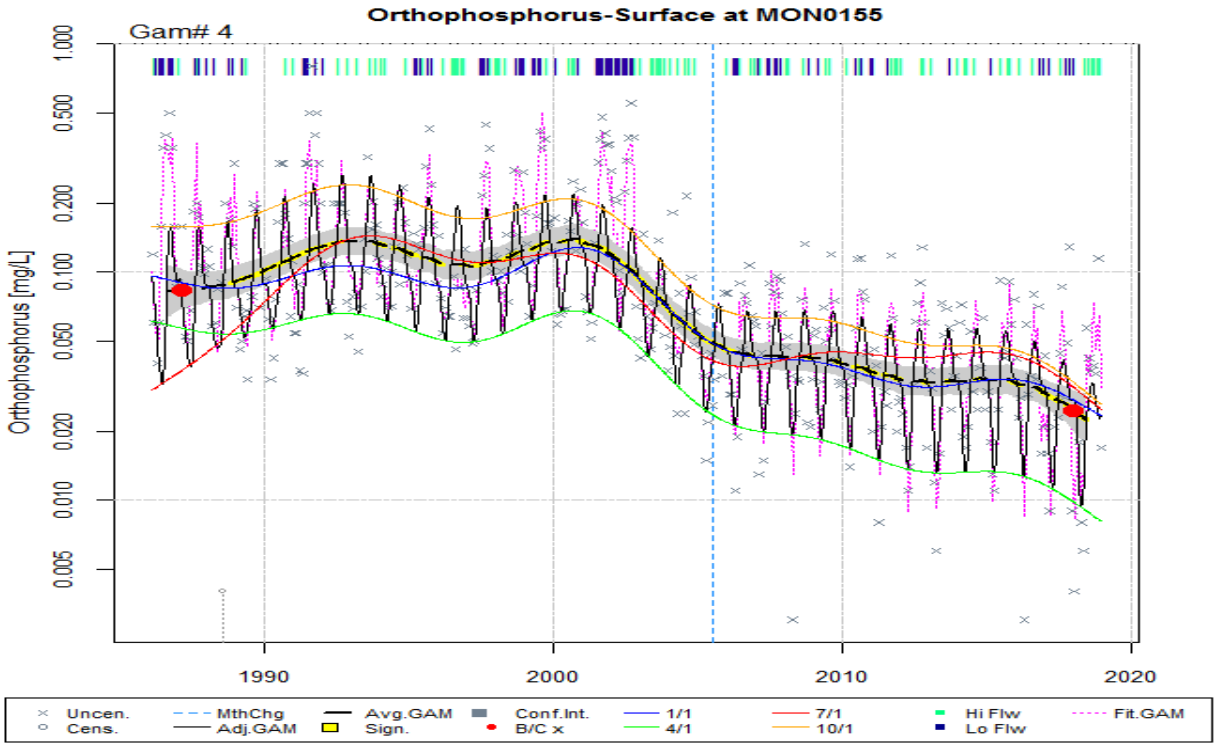
source	estimate	std.error	t.value	p.value
(Intercept)	-2.649266	0.02859	-92.6641	<0.0001
cyear	-0.175382	0.176947	-0.9912	0.3223

Table: GAM Diagnostics. - MON0155 - S - po4

AIC	RMSE	AdjRsquare
655.2	0.5384	0.6676

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - po4 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.0517 (0.1285)
Current ln mean (geometric mean)	-3.6537 (0.0259)
Estimated ln difference	-1.602
Std. Err. ln difference	0.1512
95% Confidence interval for ln difference	(-1.8983 , -1.3057)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-79.85%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - po4 gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	3.1912	0.0749
smoothed terms	s(cyear)	8.07	16.3282	<0.0001
" "	s(doy)	6.15	31.5354	<0.0001
" "	ti(cyear,doy)	9.87	1.8712	0.0066
" "	s(flw_sal)	3.56	6.8762	<0.0001
" "	ti(flw_sal,doy)	8.42	2.9606	<0.0001
" "	ti(flw_sal,cyear)	2.43	14.62	<0.0001
" "	ti(flw_sal,doy,cyear)	15.16	0.4948	0.0367

Table: GAM Parameter Coefficients. - MON0155 - S - po4 gam# = 4

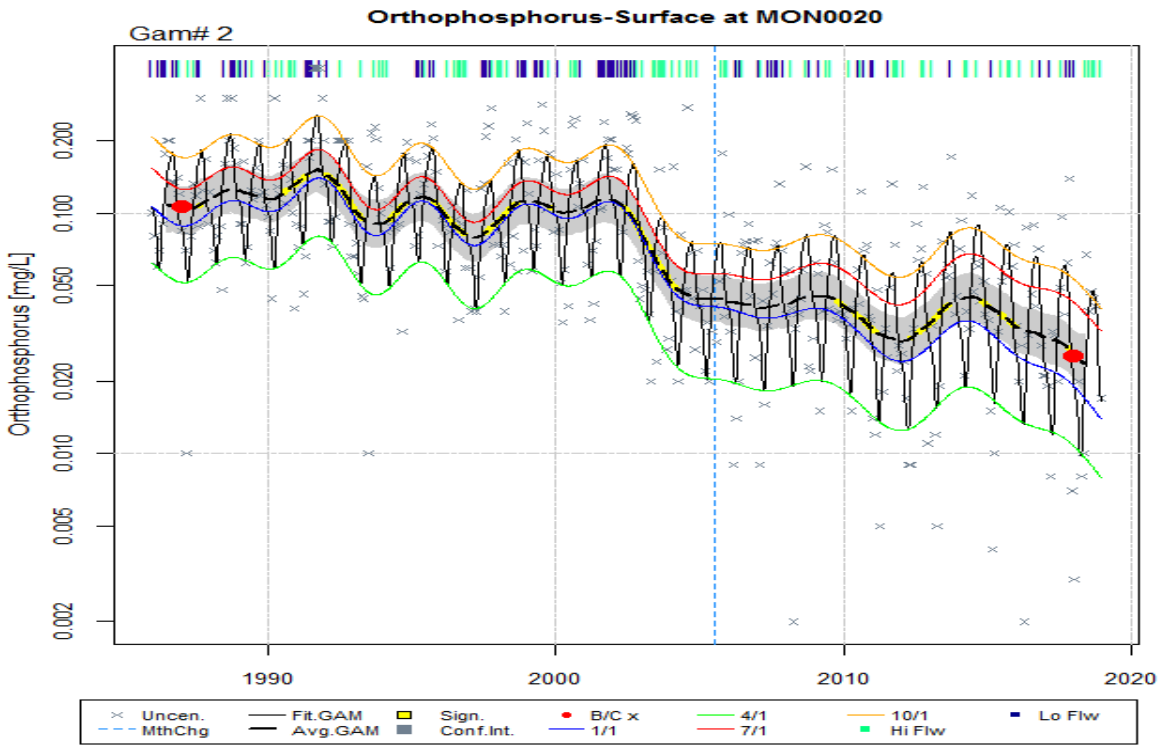
source	estimate	std.error	t.value	p.value
(Intercept)	-2.67865	0.02564	-104.4719	<0.0001
cyear	-0.101228	0.056667	-1.7864	0.0749

Table: GAM Diagnostics. - MON0155 - S - po4

AIC	RMSE	AdjRsquare
558.46	0.4601	0.7572

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - po4 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.4826 (0.0835)
Current ln mean (geometric mean)	-3.705 (0.0246)
Estimated ln difference	-1.2224
Std. Err. ln difference	0.1524
95% Confidence interval for ln difference	(-1.5212 , -0.9236)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-70.55%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - po4 gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	2.1975	0.1391
smoothed terms	s(cyear)	17.8	3.5721	<0.0001
" "	s(doy)	6.32	27.1551	<0.0001
" "	ti(cyear,doy)	3.85	1.0566	0.0033

Table: GAM Parameter Coefficients. - MON0020 - S - po4 gam# = 2

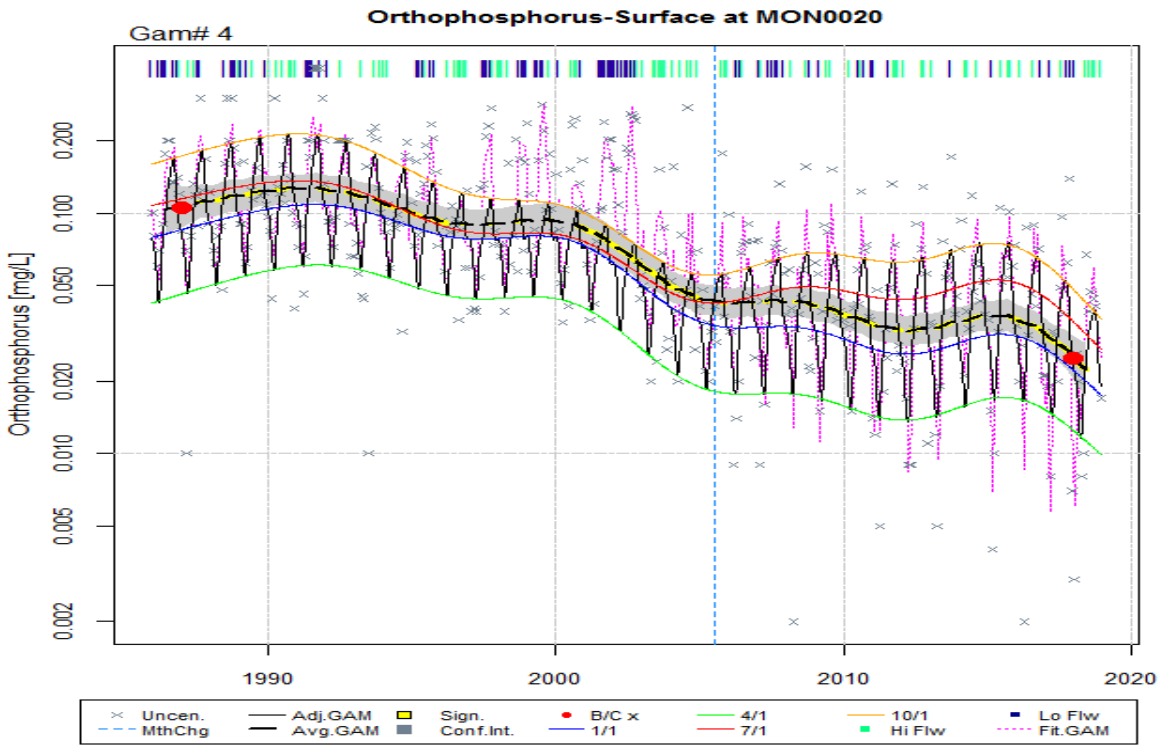
source	estimate	std.error	t.value	p.value
(Intercept)	-2.758845	0.03621	-76.1903	<0.0001
cyear	-0.293062	0.197694	-1.4824	0.1391

Table: GAM Diagnostics. - MON0020 - S - po4

AIC	RMSE	AdjRsquare
687.45	0.5568	0.6054

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - po4 gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.2414 (0.1063)
Current ln mean (geometric mean)	-3.6678 (0.0255)
Estimated ln difference	-1.4263
Std. Err. ln difference	0.1566
95% Confidence interval for ln difference	(-1.7332 , -1.1195)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-75.98%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - po4 gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	3.8009	0.0520
smoothed terms	s(cyear)	8.01	4.5041	<0.0001
" "	s(doy)	6.62	29.2824	<0.0001
" "	ti(cyear,doy)	5.35	2.1448	<0.0001
" "	s(flw_sal)	4.29	1.1852	<0.0001
" "	ti(flw_sal,doy)	4.26	1.3637	0.0004
" "	ti(flw_sal,cyear)	8	5.8234	<0.0001
" "	ti(flw_sal,doy,cyear)	1.44	0.1396	0.0351

Table: GAM Parameter Coefficients. - MON0020 - S - po4 gam# = 4

source	estimate	std.error	t.value	p.value
(Intercept)	-2.771922	0.026407	-104.9697	<0.0001
cyear	-0.108507	0.055657	-1.9496	0.0520

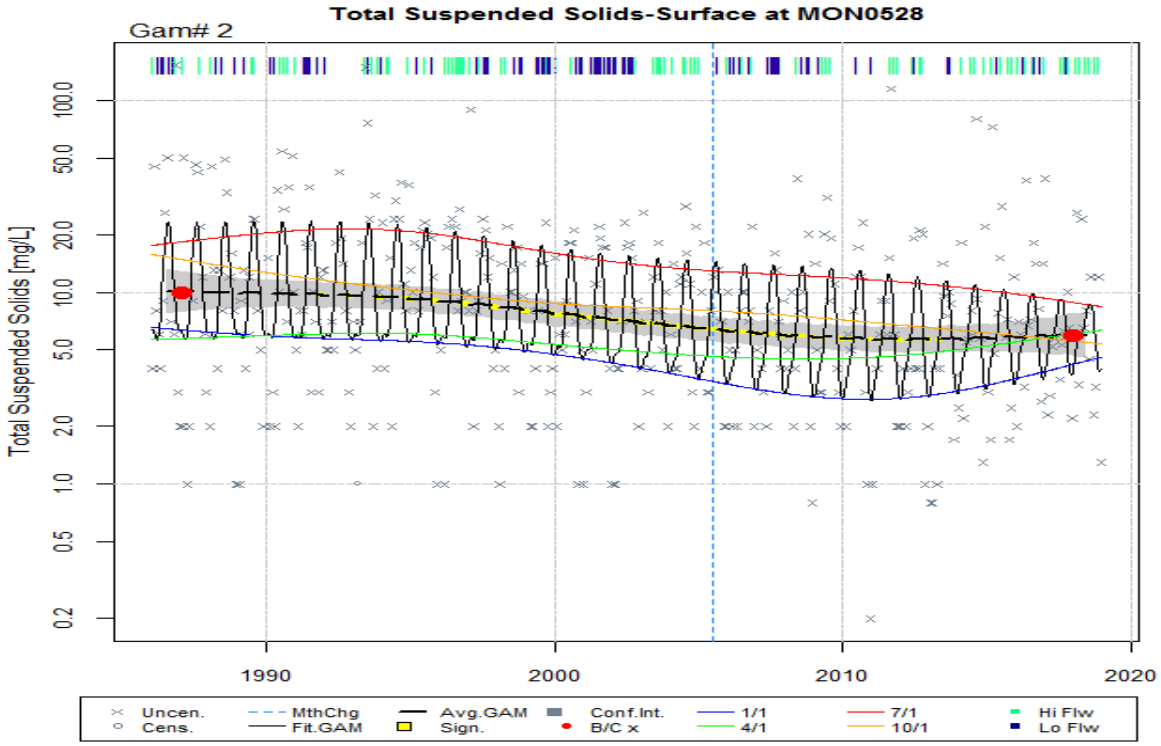
Table: GAM Diagnostics. - MON0020 - S - po4

AIC	RMSE	AdjRsquare
577.69	0.4789	0.7081

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - po4 gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	-2.2488 (0.1055)
Current ln mean (geometric mean)	-3.6955 (0.0248)
Estimated ln difference	-1.4467
Std. Err. ln difference	0.1506
95% Confidence interval for ln difference	(-1.7418 , -1.1516)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-76.47%
Period of Record	1986 - 2018

Total Suspended Solids (TSS)



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - tss gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	0.0044	0.9473
smoothed terms	s(cyear)	2.01	1.0878	0.4445
" "	s(doy)	4.59	15.1067	<0.0001
" "	ti(cyear,doy)	6.55	0.8667	0.1075

Table: GAM Parameter Coefficients. - MON0528 - S - tss gam# = 2

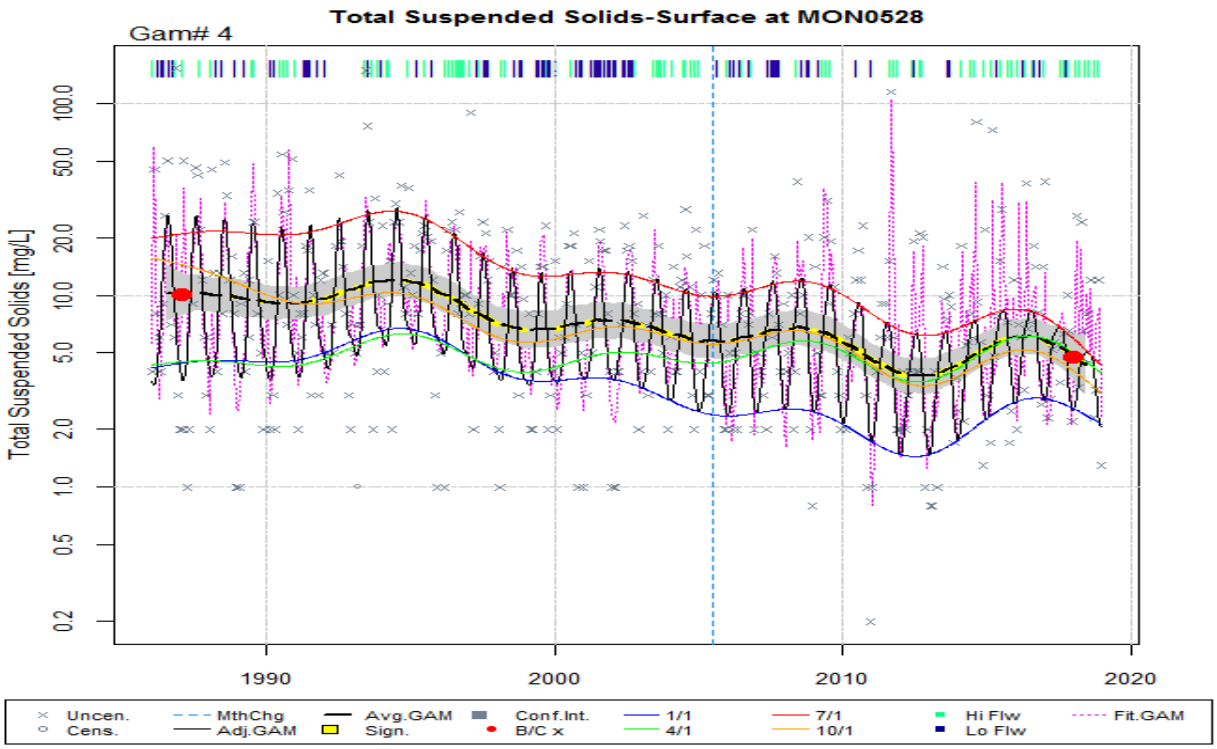
source	estimate	std.error	t.value	p.value
(Intercept)	1.997102	0.04402	45.3684	<0.0001
cyear	-0.001712	0.025895	-0.0661	0.9473

Table: GAM Diagnostics. - MON0528 - S - tss

AIC	RMSE	AdjRsquare
1011.44	0.8661	0.2818

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - tss gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	2.2993 (9.9672)
Current ln mean (geometric mean)	1.7824 (5.9441)
Estimated ln difference	-0.5169
Std. Err. ln difference	0.1799
95% Confidence interval for ln difference	(-0.8694 , -0.1644)
Difference p-value	0.0043
Period of Record Percent Change Estimate (%)	-40.36%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0528 - S - tss gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	2.4391	0.1192
smoothed terms	s(cyear)	8.44	2.4348	0.0110
" "	s(doy)	4.09	24.8793	<0.0001
" "	ti(cyear,doy)	8.22	1.9971	0.0010
" "	s(flw_sal)	3.77	30.4145	<0.0001
" "	ti(flw_sal,doy)	5.57	5.8604	<0.0001
" "	ti(flw_sal,cyear)	3.5	3.1635	0.0099
" "	ti(flw_sal,doy,cyear)	3.6	0.1257	0.0876

Table: GAM Parameter Coefficients. - MON0528 - S - tss gam# = 4

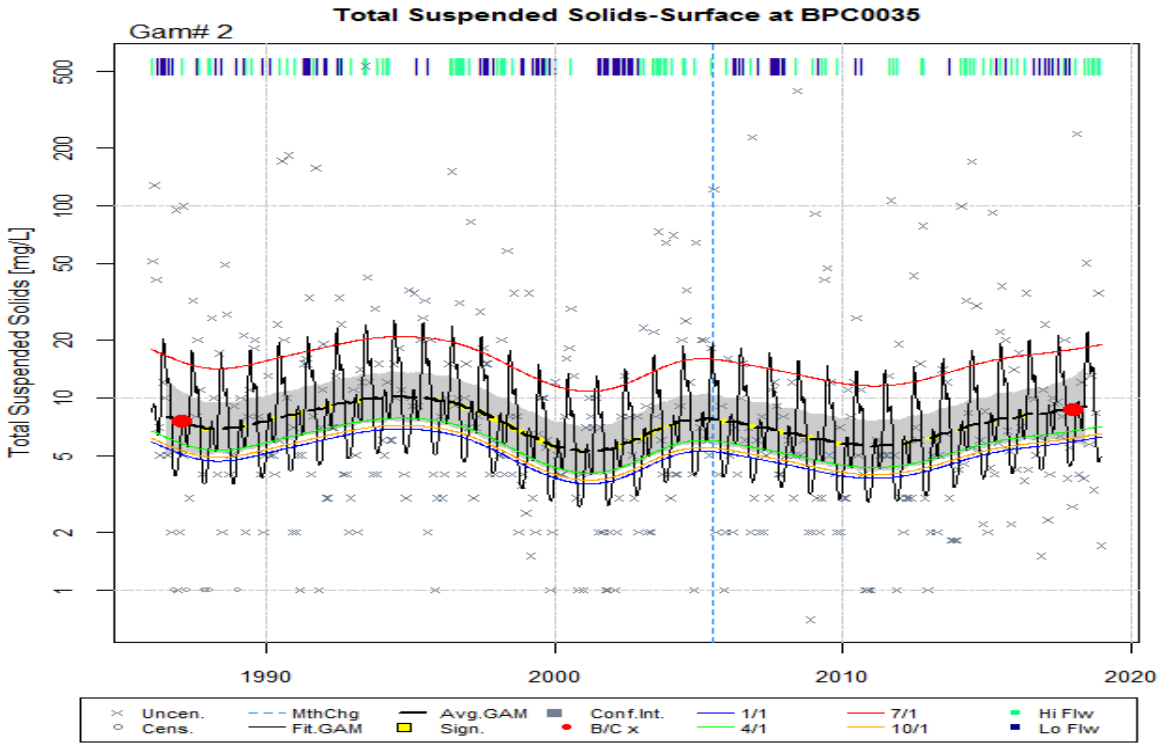
source	estimate	std.error	t.value	p.value
(Intercept)	1.957552	0.038533	50.8023	<0.0001
cyear	-0.124327	0.079606	-1.5618	0.1192

Table: GAM Diagnostics. - MON0528 - S - tss

AIC	RMSE	AdjRsquare
831.79	0.6686	0.5717

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - tss gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	2.3049 (10.023)
Current ln mean (geometric mean)	1.565 (4.7827)
Estimated ln difference	-0.7399
Std. Err. ln difference	0.2043
95% Confidence interval for ln difference	(-1.1402 , -0.3395)
Difference p-value	0.0003
Period of Record Percent Change Estimate (%)	-52.28%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - tss gam# = 2

type	source	df	F	p.value	Note
parametric terms	cyear	1	0.1493	0.6994	-
smoothed terms	s(cyear)	7.14	1.4345	0.1665	-
" "	s(doy)	7.1	9.629	<0.0001	-
" "	ti(cyear,doy)	0	0	0.6177	-

Table: GAM Parameter Coefficients. - BPC0035 - S - tss gam# = 2

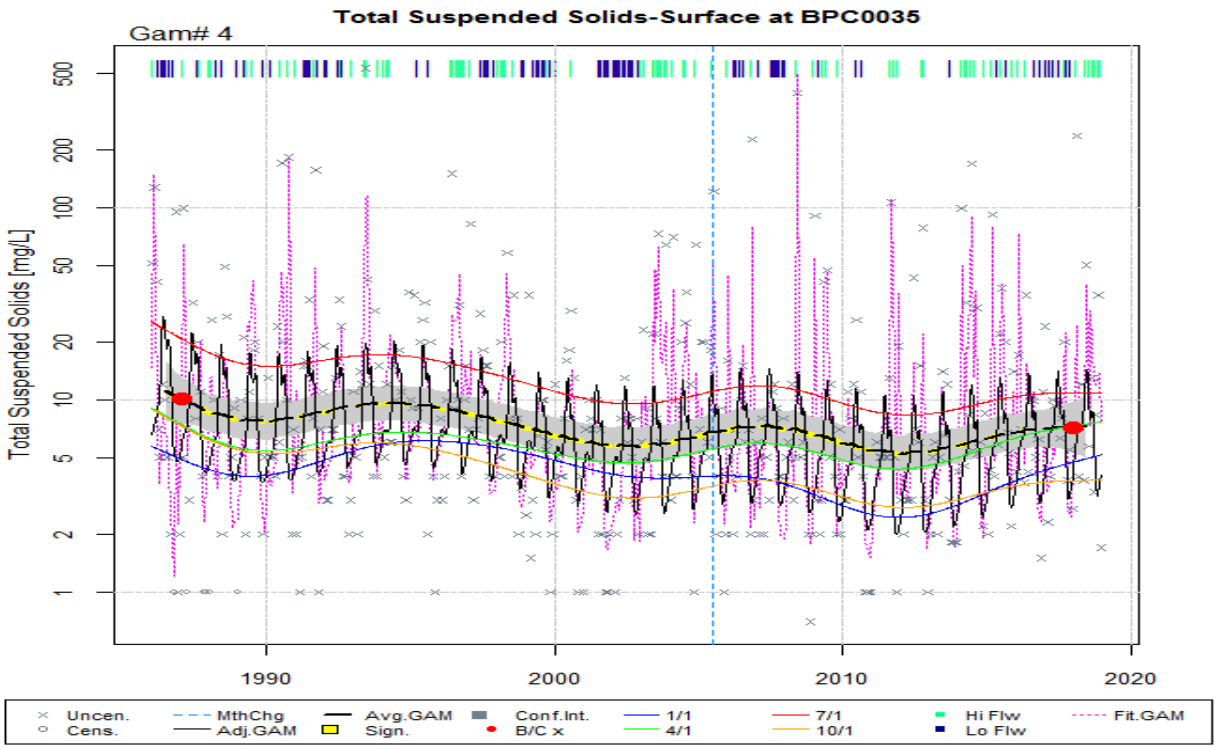
source	estimate	std.error	t.value	p.value
(Intercept)	1.973952	0.057279	34.4623	<0.0001
cyear	-0.049311	0.127607	-0.3864	0.6994

Table: GAM Diagnostics. - BPC0035 - S - tss

AIC	RMSE	AdjRsquare
1185.78	1.0733	0.1768

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - tss gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	2.0272 (7.5925)
Current ln mean (geometric mean)	2.1608 (8.6782)
Estimated ln difference	0.1337
Std. Err. ln difference	0.2823
95% Confidence interval for ln difference	(-0.4197 , 0.687)
Difference p-value	0.6362
Period of Record Percent Change Estimate (%)	14.3%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - BPC0035 - S - tss gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	1.6119	0.2051
smoothed terms	s(cyear)	6.48	1.6868	0.1016
" "	s(doy)	7.41	18.0168	<0.0001
" "	ti(cyear,doy)	6.2	0.838	0.0935
" "	s(flw_sal)	5.77	45.2364	<0.0001
" "	ti(flw_sal,doy)	1.72	0.3604	0.0313
" "	ti(flw_sal,cyear)	7.35	2.5057	0.0083
" "	ti(flw_sal,doy,cyear)	1.23	0.2399	0.0573

Table: GAM Parameter Coefficients. - BPC0035 - S - tss gam# = 4

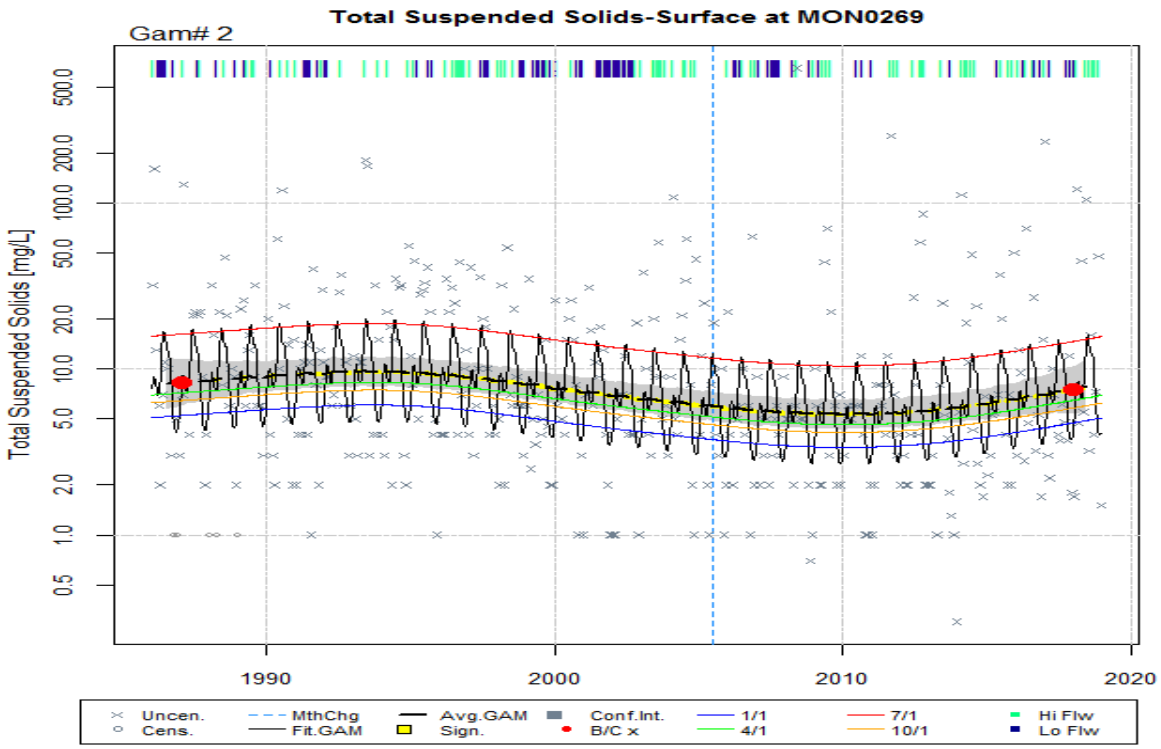
source	estimate	std.error	t.value	p.value
(Intercept)	1.984722	0.041786	47.4978	<0.0001
cyear	-0.090152	0.071008	-1.2696	0.2051

Table: GAM Diagnostics. - BPC0035 - S - tss

AIC	RMSE	AdjRsquare
932.59	0.7572	0.5882

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - tss gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	2.318 (10.1557)
Current ln mean (geometric mean)	1.9644 (7.1303)
Estimated ln difference	-0.3537
Std. Err. ln difference	0.218
95% Confidence interval for ln difference	(-0.781 , 0.0737)
Difference p-value	0.1056
Period of Record Percent Change Estimate (%)	-29.79%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - tss gam# = 2

type	source	df	F	p.value	Note
parametric terms	cyear	1	1.3356	0.2485	-
smoothed terms	s(cyear)	2.56	2.2861	0.0704	-
" "	s(doy)	6.35	8.2234	<0.0001	-
" "	ti(cyear,doy)	0	0	0.7193	-

Table: GAM Parameter Coefficients. - MON0269 - S - tss gam# = 2

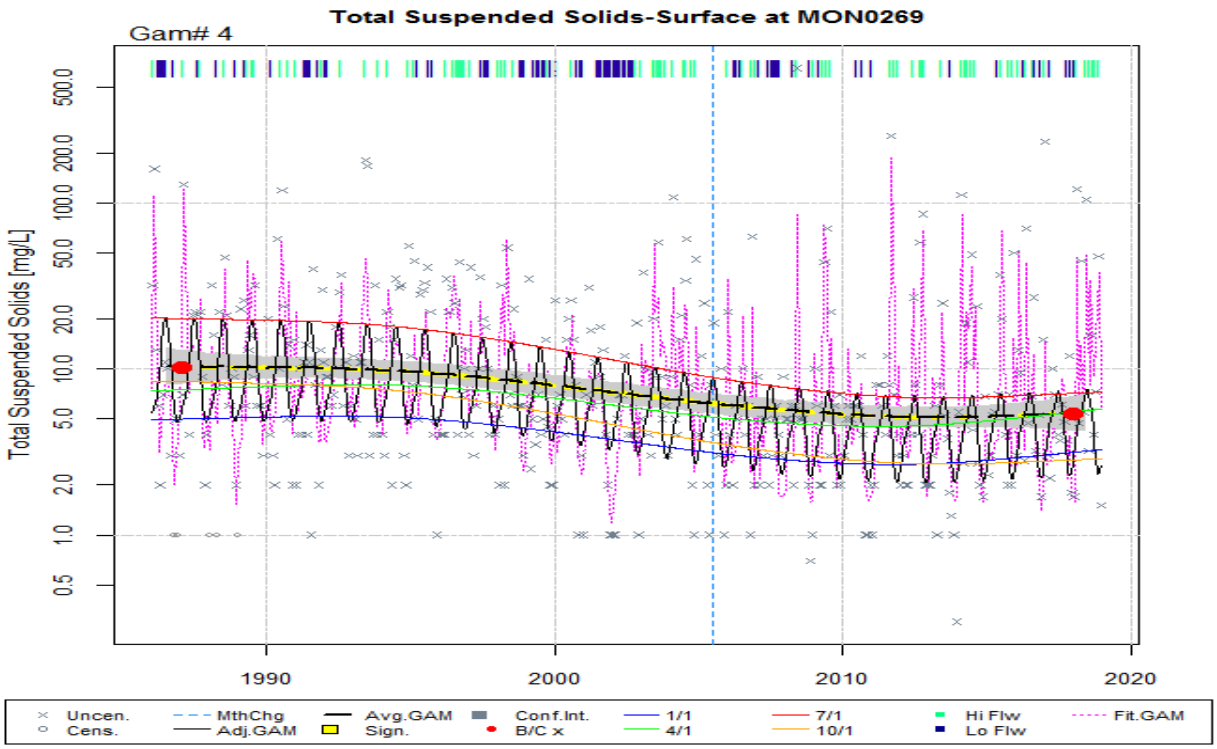
source	estimate	std.error	t.value	p.value
(Intercept)	1.969457	0.054759	35.9661	<0.0001
cyear	0.047408	0.041022	1.1557	0.2485

Table: GAM Diagnostics. - MON0269 - S - tss

AIC	RMSE	AdjRsquare
1200.41	1.0881	0.1663

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - tss gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	2.1129 (8.2724)
Current ln mean (geometric mean)	2.015 (7.5006)
Estimated ln difference	-0.0979
Std. Err. ln difference	0.2384
95% Confidence interval for ln difference	(-0.5651 , 0.3693)
Difference p-value	0.6814
Period of Record Percent Change Estimate (%)	-9.33%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0269 - S - tss gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	0.0452	0.8318
smoothed terms	s(cyear)	2.18	1.354	0.2687
" "	s(doy)	4.49	14.3162	<0.0001
" "	ti(cyear,doy)	1.78	0.959	0.0047
" "	s(flw_sal)	4.7	55.2379	<0.0001
" "	ti(flw_sal,doy)	4.33	1.755	<0.0001
" "	ti(flw_sal,cyear)	6.92	3.106	0.0019
" "	ti(flw_sal,doy,cyear)	1.27	0.1183	0.0942

Table: GAM Parameter Coefficients. - MON0269 - S - tss gam# = 4

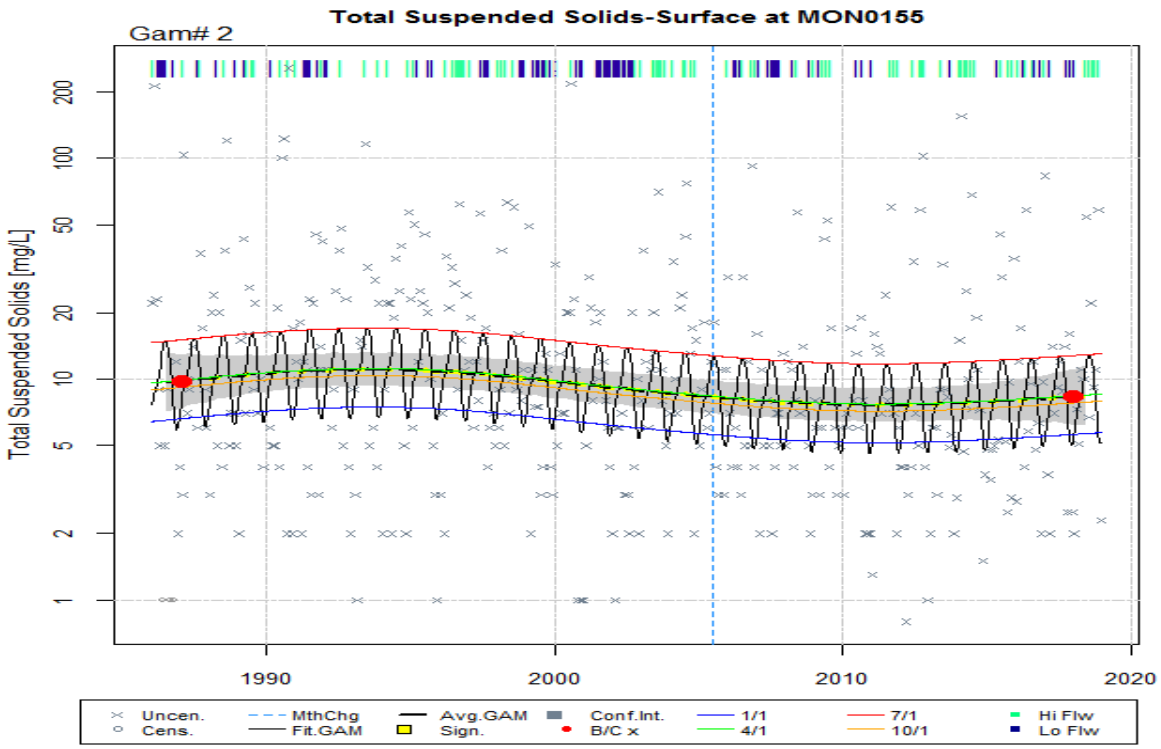
source	estimate	std.error	t.value	p.value
(Intercept)	1.969953	0.040908	48.1561	<0.0001
cyear	0.005113	0.024057	0.2125	0.8318

Table: GAM Diagnostics. - MON0269 - S - tss

AIC	RMSE	AdjRsquare
939.28	0.7663	0.5851

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - tss gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	2.3311 (10.2889)
Current ln mean (geometric mean)	1.6823 (5.3781)
Estimated ln difference	-0.6487
Std. Err. ln difference	0.1737
95% Confidence interval for ln difference	(-0.9891 , -0.3084)
Difference p-value	0.0002
Period of Record Percent Change Estimate (%)	-47.73%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - tss gam# = 2

type	source	df	F	p.value	Note
parametric terms	cyear	1	0.5779	0.4476	-
smoothed terms	s(cyear)	2.01	0.9639	0.3965	-
" "	s(doy)	3.97	5.0264	<0.0001	-
" "	ti(cyear,doy)	0	0	0.8055	-

Table: GAM Parameter Coefficients. - MON0155 - S - tss gam# = 2

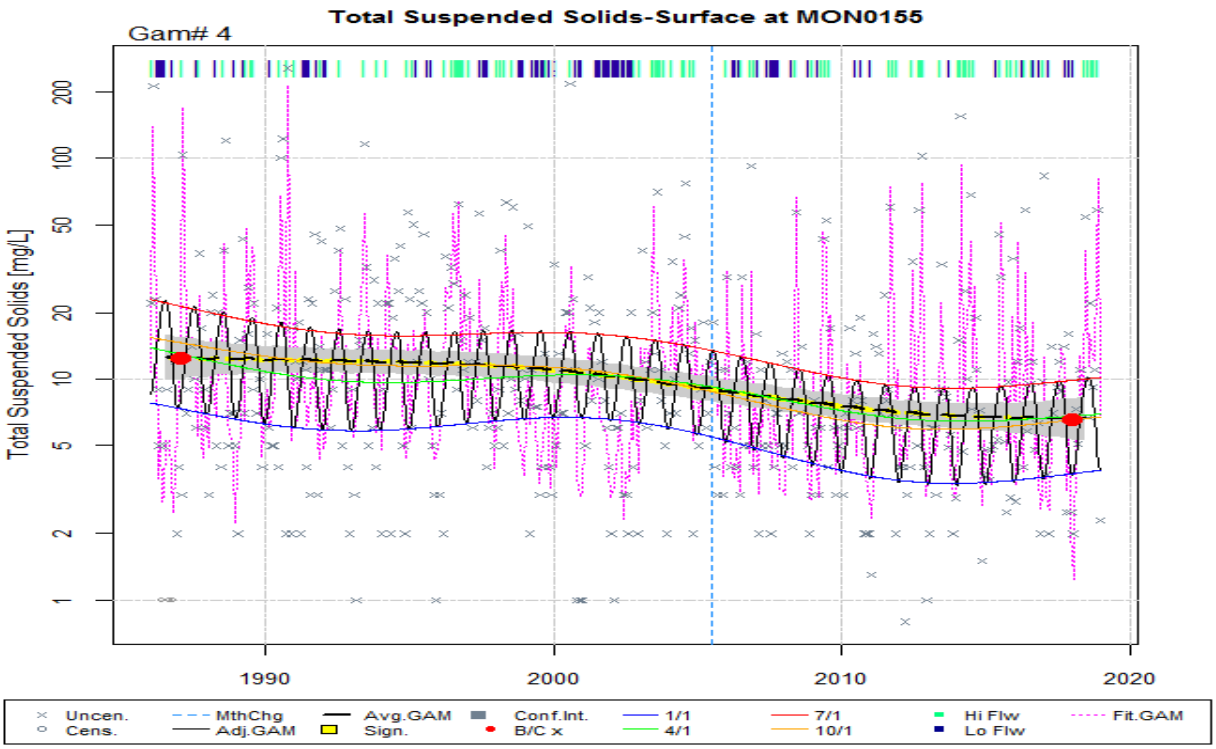
source	estimate	std.error	t.value	p.value
(Intercept)	2.204319	0.050607	43.5578	<0.0001
cyear	0.022639	0.029779	0.7602	0.4476

Table: GAM Diagnostics. - MON0155 - S - tss

AIC	RMSE	AdjRsquare
1138.71	1.0064	0.1059

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - tss gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	2.2775 (9.7523)
Current ln mean (geometric mean)	2.1162 (8.2999)
Estimated ln difference	-0.1613
Std. Err. ln difference	0.2072
95% Confidence interval for ln difference	(-0.5674 , 0.2449)
Difference p-value	0.4369
Period of Record Percent Change Estimate (%)	-14.89%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0155 - S - tss gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	0.0966	0.7562	-
smoothed terms	s(cyear)	1.82	0.8783	0.3062	-
" "	s(doy)	3.27	8.4509	<0.0001	-
" "	ti(cyear,doy)	0	0	0.8607	-
" "	s(flw_sal)	2.52	88.9218	<0.0001	-
" "	ti(flw_sal,doy)	10.97	3.1586	<0.0001	-
" "	ti(flw_sal,cyear)	10.52	1.502	0.1164	-
" "	ti(flw_sal,doy,cyear)	2.49	0.0762	0.1432	-

Table: GAM Parameter Coefficients. - MON0155 - S - tss gam# = 4

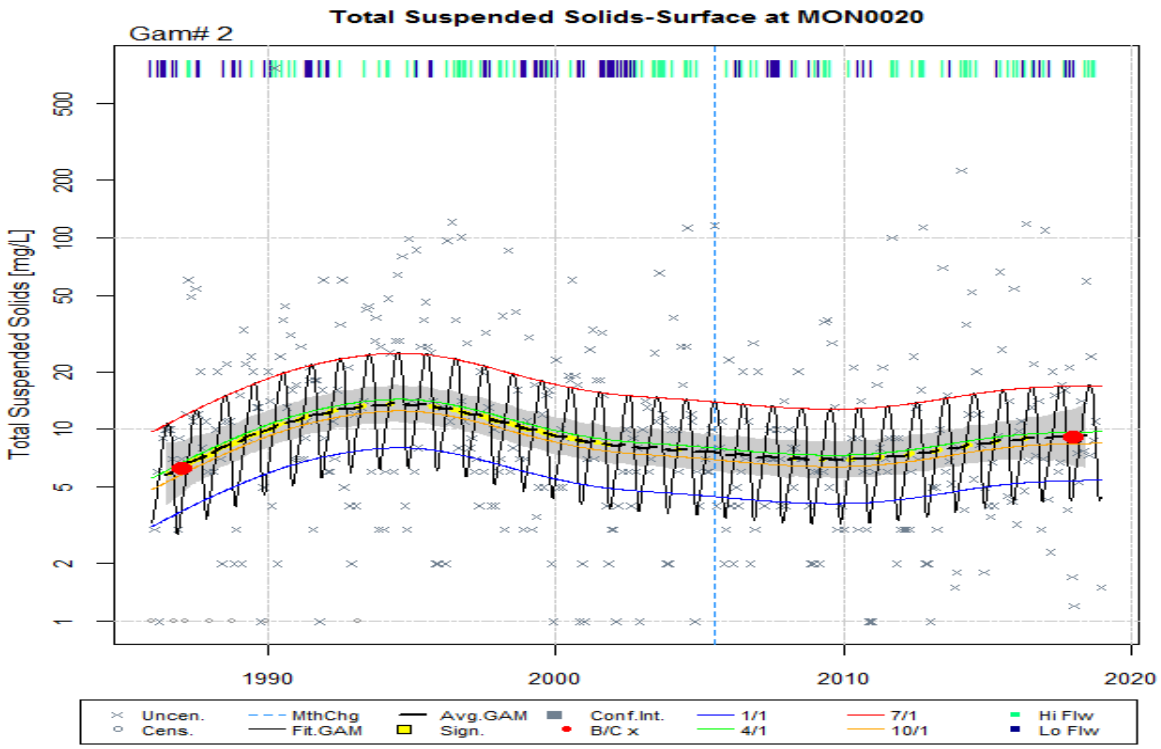
source	estimate	std.error	t.value	p.value
(Intercept)	2.218564	0.038864	57.086	<0.0001
cyear	-0.005891	0.018957	-0.3107	0.7562

Table: GAM Diagnostics. - MON0155 - S - tss

AIC	RMSE	AdjRsquare
880.07	0.7042	0.5617

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - tss gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	2.5235 (12.4716)
Current ln mean (geometric mean)	1.885 (6.5863)
Estimated ln difference	-0.6385
Std. Err. ln difference	0.1562
95% Confidence interval for ln difference	(-0.9447 , -0.3322)
Difference p-value	<0.0001
Period of Record Percent Change Estimate (%)	-47.19%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - tss gam# = 2

type	source	df	F	p.value	Note
parametric terms	cyear	1	1.9449	0.1640	-
smoothed terms	s(cyear)	4.15	3.8093	0.0016	-
" "	s(doy)	4.85	11.5058	<0.0001	-
" "	ti(cyear,doy)	0	0	1.0000	-

Table: GAM Parameter Coefficients. - MON0020 - S - tss gam# = 2

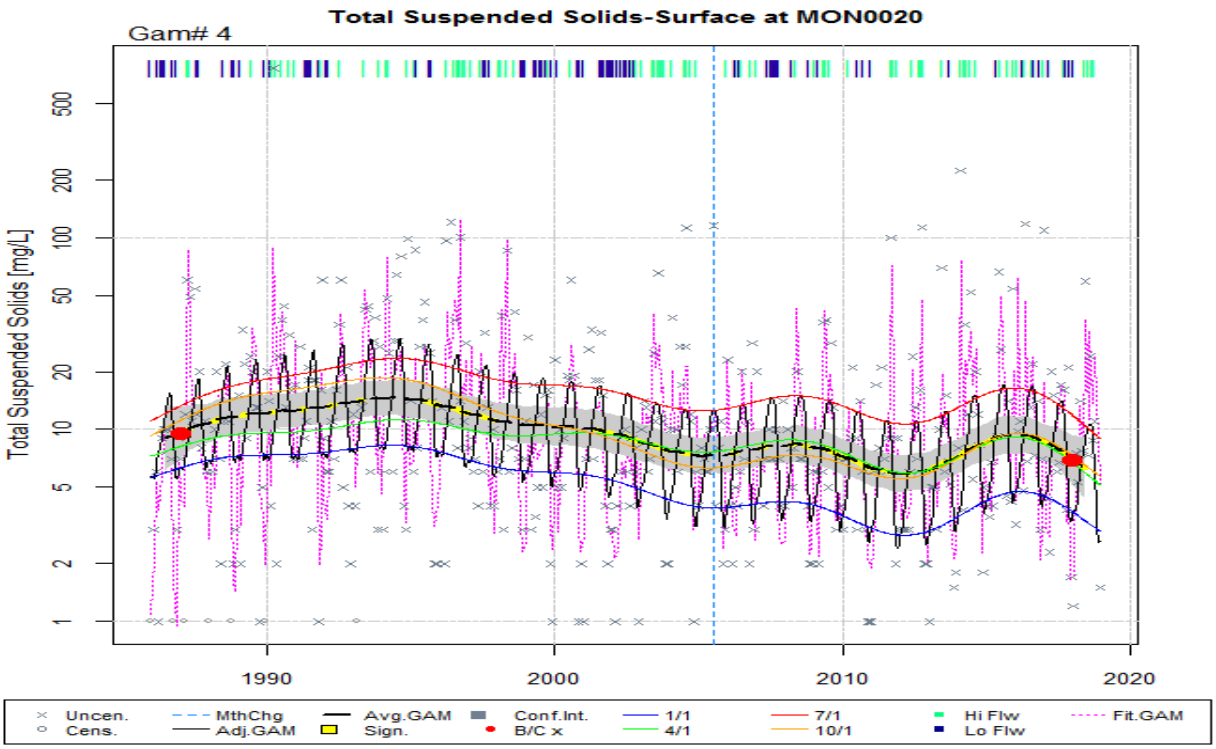
source	estimate	std.error	t.value	p.value
(Intercept)	2.189279	0.050631	43.2401	<0.0001
cyear	0.088007	0.063107	1.3946	0.1640

Table: GAM Diagnostics. - MON0020 - S - tss

AIC	RMSE	AdjRsquare
1114.49	0.9863	0.2248

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - tss gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	1.8363 (6.2735)
Current ln mean (geometric mean)	2.2099 (9.1147)
Estimated ln difference	0.3736
Std. Err. ln difference	0.2395
95% Confidence interval for ln difference	(-0.0958 , 0.8429)
Difference p-value	0.1196
Period of Record Percent Change Estimate (%)	45.29%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = 2005-07-01; step label = Whole-Filter

Table: GAM Analysis of Variance - MON0020 - S - tss gam# = 4

type	source	df	F	p.value	Note
parametric terms	cyear	1	0.6872	0.4077	-
smoothed terms	s(cyear)	7.79	2.4527	0.0080	-
" "	s(doy)	5.91	18.3932	<0.0001	-
" "	ti(cyear,doy)	0	0	0.4085	-
" "	s(flw_sal)	2.43	86.0553	<0.0001	-
" "	ti(flw_sal,doy)	8.44	2.4969	<0.0001	-
" "	ti(flw_sal,cyear)	2.31	1.8217	0.2055	-
" "	ti(flw_sal,doy,cyear)	5.1	0.2625	0.0056	-

Table: GAM Parameter Coefficients. - MON0020 - S - tss gam# = 4

source	estimate	std.error	t.value	p.value
(Intercept)	2.178626	0.040696	53.5339	<0.0001
cyear	-0.065348	0.078831	-0.829	0.4077

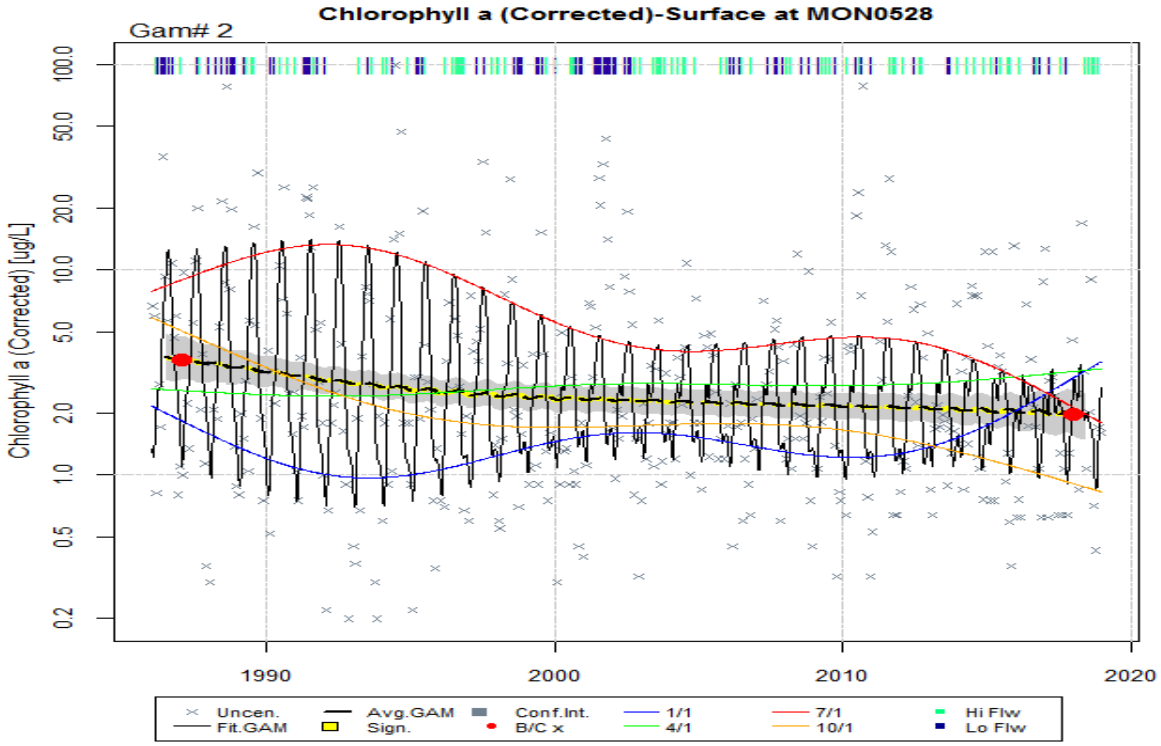
Table: GAM Diagnostics. - MON0020 - S - tss

AIC	RMSE	AdjRsquare
892.1	0.7226	0.5828

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - tss gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	2.2568 (9.5522)
Current ln mean (geometric mean)	1.9405 (6.9623)
Estimated ln difference	-0.3163
Std. Err. ln difference	0.2225
95% Confidence interval for ln difference	(-0.7525 , 0.1199)
Difference p-value	0.1561
Period of Record Percent Change Estimate (%)	-27.11%
Period of Record	1986 - 2018

Chlorophyll-*a* (CHLa)



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0528 - S - chla gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	2.2296	0.1363
smoothed terms	s(cyear)	1.34	0.1329	0.1229
" "	s(doy)	6.96	18.3682	<0.0001
" "	ti(cyear,doy)	9.15	4.1871	<0.0001

Table: GAM Parameter Coefficients. - MON0528 - S - chla gam# = 2

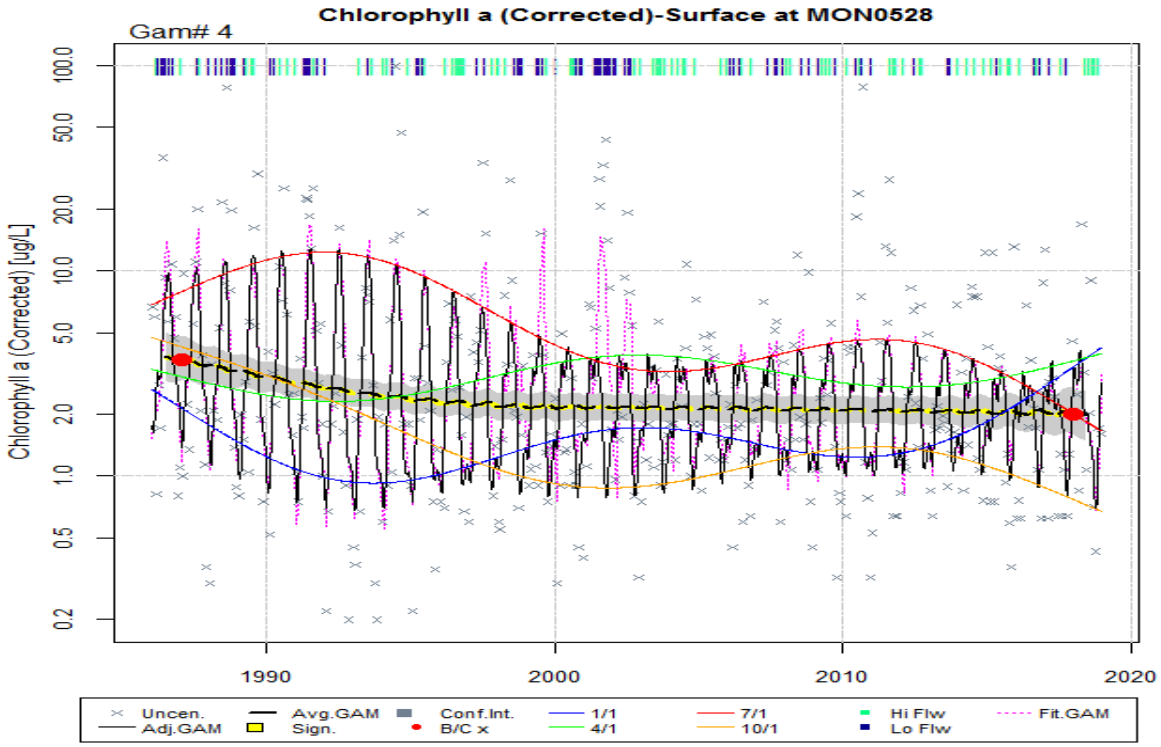
source	estimate	std.error	t.value	p.value
(Intercept)	0.898816	0.047712	18.8385	<0.0001
cyear	-0.031728	0.021248	-1.4932	0.1363

Table: GAM Diagnostics. - MON0528 - S - chla

AIC	RMSE	AdjRsquare
1033.77	0.9238	0.3516

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - chla gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	1.2926 (3.6424)
Current ln mean (geometric mean)	0.6772 (1.9684)
Estimated ln difference	-0.6154
Std. Err. ln difference	0.1774
95% Confidence interval for ln difference	(-0.9631 , -0.2678)
Difference p-value	0.0006
Period of Record Percent Change Estimate (%)	-45.96%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0528 - S - chla gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	0.2956	0.5870
smoothed terms	s(cyear)	1.74	0.7519	0.0104
" "	s(doy)	7.03	18.4554	<0.0001
" "	ti(cyear,doy)	9.55	4.6583	<0.0001
" "	s(flw_sal)	0.71	0.2352	0.0063
" "	ti(flw_sal,doy)	2.56	0.7017	0.0081
" "	ti(flw_sal,cyear)	0.58	0.0395	0.2975
" "	ti(flw_sal,doy,cyear)	8.86	0.4645	0.0015

Table: GAM Parameter Coefficients. - MON0528 - S - chla gam# = 4

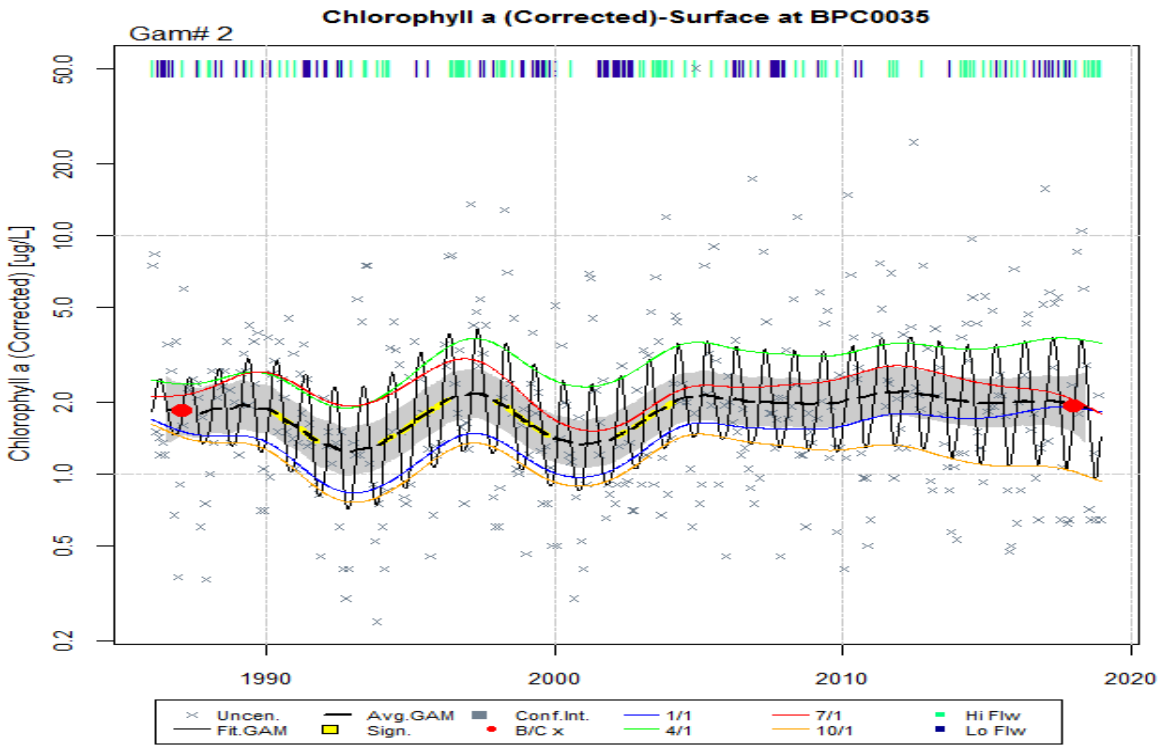
source	estimate	std.error	t.value	p.value
(Intercept)	0.833047	0.048502	17.1756	<0.0001
cyear	-0.034748	0.063906	-0.5437	0.5870

Table: GAM Diagnostics. - MON0528 - S - chla

AIC	RMSE	AdjRsquare
1000.58	0.8696	0.4255

Table: Estimates of Change for - 1986 - 2018 - MON0528 - S - chla gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	1.3036 (3.6826)
Current ln mean (geometric mean)	0.699 (2.0117)
Estimated ln difference	-0.6046
Std. Err. ln difference	0.1823
95% Confidence interval for ln difference	(-0.9619 , -0.2474)
Difference p-value	0.0010
Period of Record Percent Change Estimate (%)	-45.37%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - BPC0035 - S - chla gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	0.3658	0.5457
smoothed terms	s(cyear)	10.18	1.0638	0.0139
" "	s(doy)	3.48	12.8704	<0.0001
" "	ti(cyear,doy)	6.46	0.99	0.0551

Table: GAM Parameter Coefficients. - BPC0035 - S - chla gam# = 2

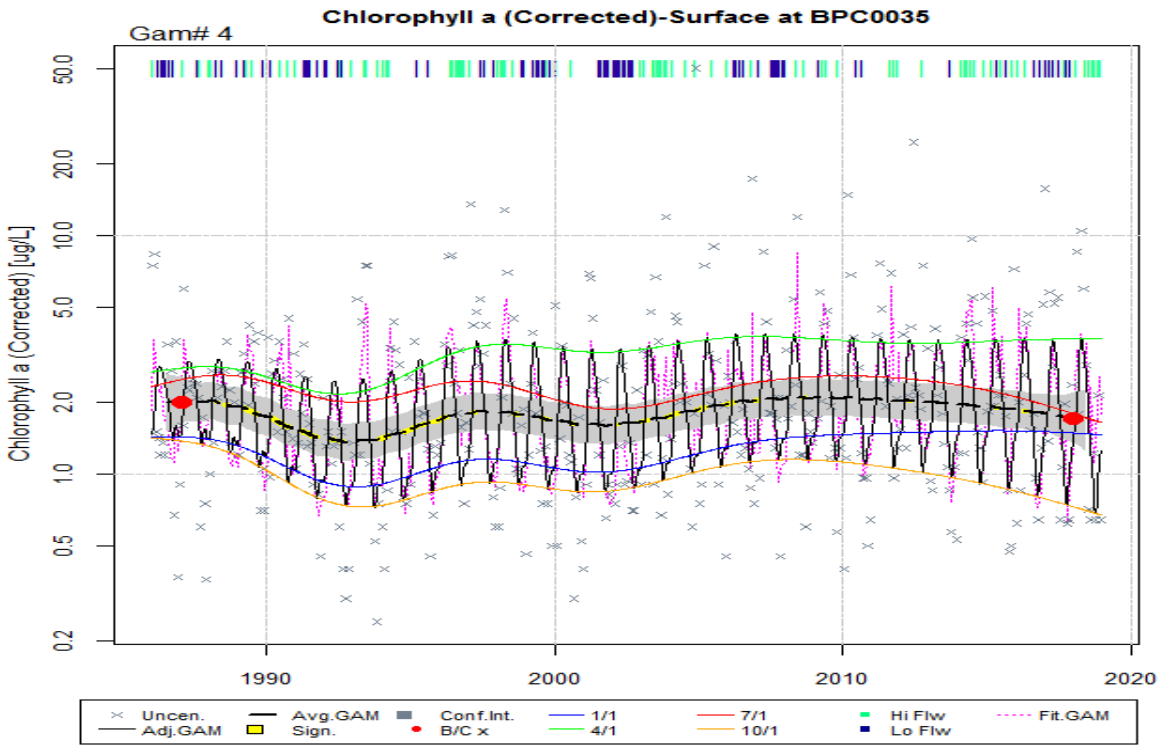
source	estimate	std.error	t.value	p.value
(Intercept)	0.593666	0.037873	15.675	<0.0001
cyear	-0.080067	0.13239	-0.6048	0.5457

Table: GAM Diagnostics. - BPC0035 - S - chla

AIC	RMSE	AdjRsquare
841	0.7115	0.2648

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - chla gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	0.6111 (1.8425)
Current ln mean (geometric mean)	0.6612 (1.9371)
Estimated ln difference	0.05
Std. Err. ln difference	0.1939
95% Confidence interval for ln difference	(-0.33 , 0.43)
Difference p-value	0.7965
Period of Record Percent Change Estimate (%)	5.13%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - BPC0035 - S - chla gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	0.0567	0.8119
smoothed terms	s(cyear)	6.56	1.5344	0.0318
" "	s(doy)	5.91	18.1342	<0.0001
" "	ti(cyear,doy)	6.43	1.1399	0.0223
" "	s(flw_sal)	1.92	3.5211	<0.0001
" "	ti(flw_sal,doy)	3.09	0.3305	0.2197
" "	ti(flw_sal,cyear)	0.12	0.0084	0.2800
" "	ti(flw_sal,doy,cyear)	2.23	0.0795	0.0967

Table: GAM Parameter Coefficients. - BPC0035 - S - chla gam# = 4

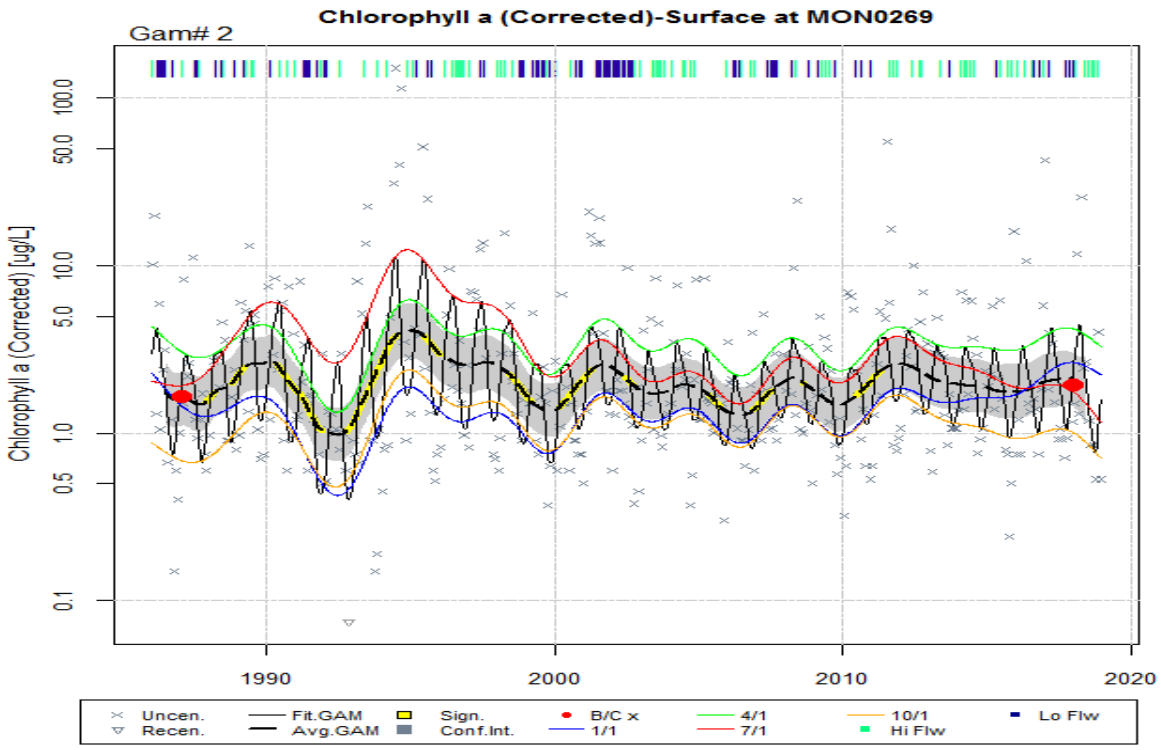
source	estimate	std.error	t.value	p.value
(Intercept)	0.592323	0.033557	17.6513	<0.0001
cyear	-0.014073	0.059099	-0.2381	0.8119

Table: GAM Diagnostics. - BPC0035 - S - chla

AIC	RMSE	AdjRsquare
766.37	0.6399	0.4053

Table: Estimates of Change for - 1986 - 2018 - BPC0035 - S - chla gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	0.6909 (1.9955)
Current ln mean (geometric mean)	0.5326 (1.7033)
Estimated ln difference	-0.1583
Std. Err. ln difference	0.1728
95% Confidence interval for ln difference	(-0.4971 , 0.1804)
Difference p-value	0.3602
Period of Record Percent Change Estimate (%)	-14.64%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0269 - S - chla gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	1.2275	0.2687
smoothed terms	s(cyear)	17.72	2.3177	0.0025
" "	s(doy)	4.71	12.3436	<0.0001
" "	ti(cyear,doy)	8.54	2.6862	<0.0001

Table: GAM Parameter Coefficients. - MON0269 - S - chla gam# = 2

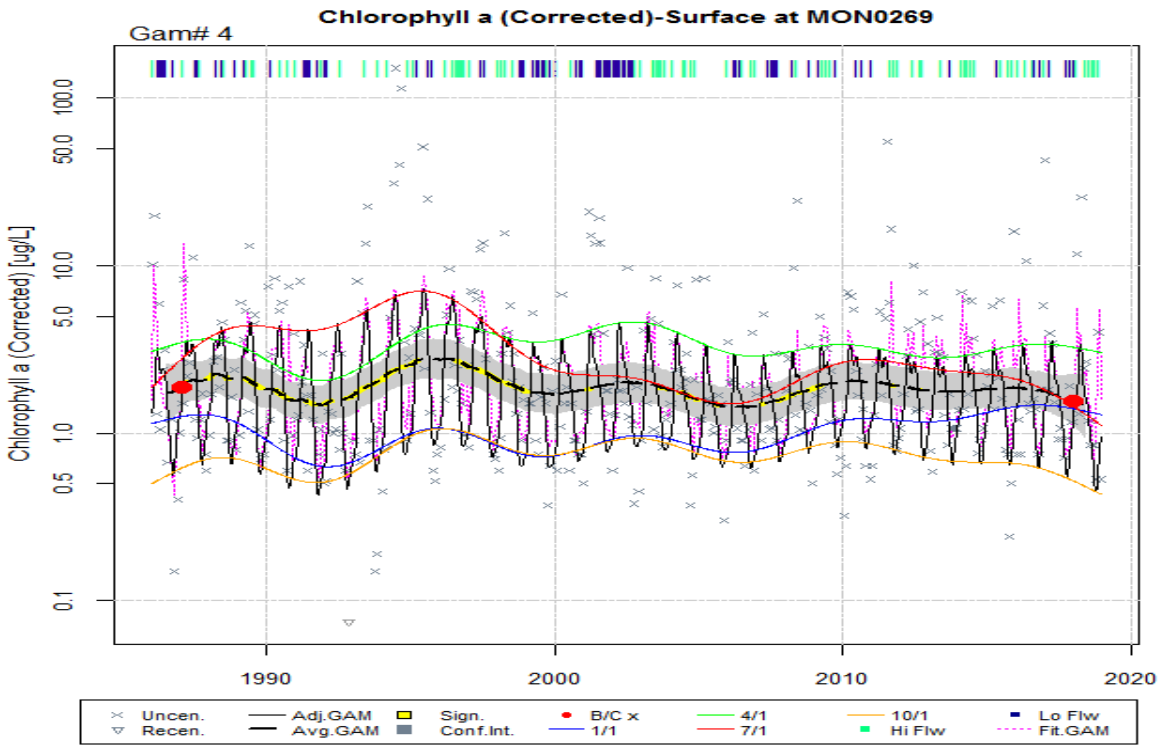
source	estimate	std.error	t.value	p.value
(Intercept)	0.6474	0.047114	13.7412	<0.0001
cyear	-0.339876	0.306771	-1.1079	0.2687

Table: GAM Diagnostics. - MON0269 - S - chla

AIC	RMSE	AdjRsquare
1029.02	0.8846	0.3018

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - chla gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	0.5119 (1.6684)
Current ln mean (geometric mean)	0.6684 (1.951)
Estimated ln difference	0.1565
Std. Err. ln difference	0.246
95% Confidence interval for ln difference	(-0.3257 , 0.6387)
Difference p-value	0.5250
Period of Record Percent Change Estimate (%)	16.94%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0269 - S - chla gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	0.0688	0.7933
smoothed terms	s(cyear)	8.22	1.4754	0.1497
" "	s(doy)	6.59	14.9584	<0.0001
" "	ti(cyear,doy)	7.5	2.2705	<0.0001
" "	s(flw_sal)	5.42	5.3673	<0.0001
" "	ti(flw_sal,doy)	5.49	1.177	0.0064
" "	ti(flw_sal,cyear)	2.84	1.5871	0.1960
" "	ti(flw_sal,doy,cyear)	3.85	0.1644	0.0265

Table: GAM Parameter Coefficients. - MON0269 - S - chla gam# = 4

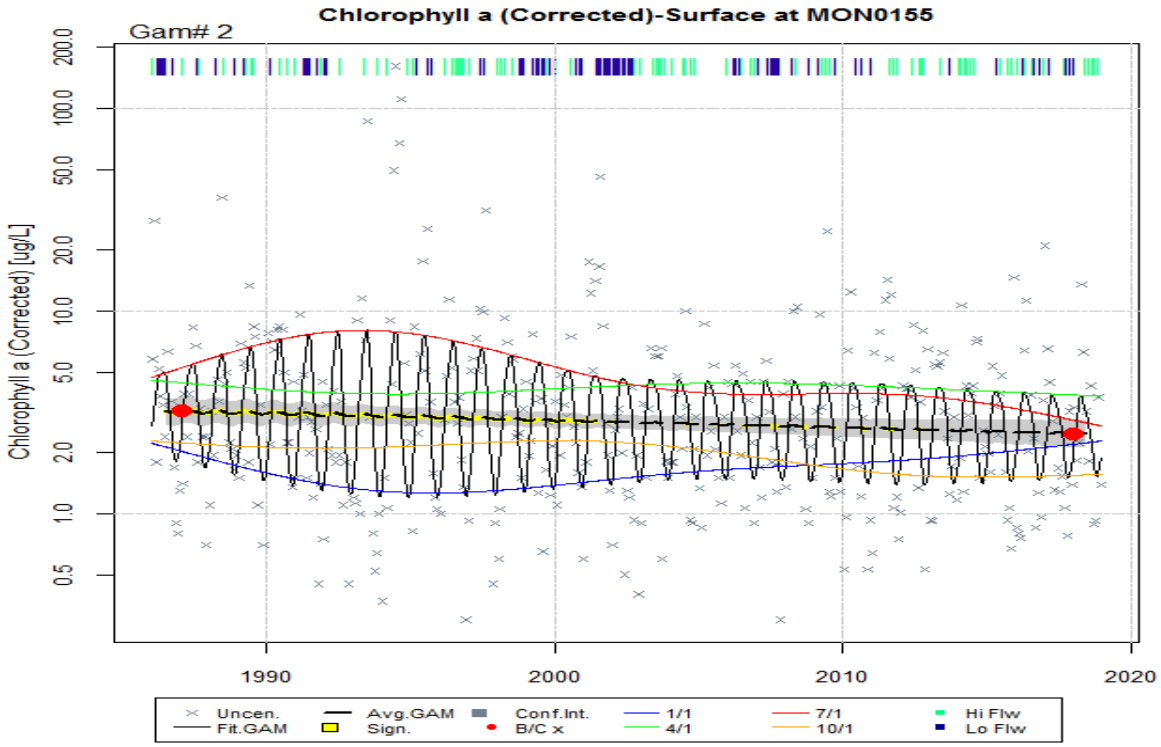
source	estimate	std.error	t.value	p.value
(Intercept)	0.643391	0.045336	14.1915	<0.0001
cyear	0.025568	0.097478	0.2623	0.7933

Table: GAM Diagnostics. - MON0269 - S - chla

AIC	RMSE	AdjRsquare
997.53	0.8403	0.3696

Table: Estimates of Change for - 1986 - 2018 - MON0269 - S - chla gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	0.6315 (1.8805)
Current ln mean (geometric mean)	0.438 (1.5496)
Estimated ln difference	-0.1935
Std. Err. ln difference	0.2491
95% Confidence interval for ln difference	(-0.6818 , 0.2948)
Difference p-value	0.4377
Period of Record Percent Change Estimate (%)	-17.6%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0155 - S - chla gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	0.9398	0.3329
smoothed terms	s(cyear)	0	0	0.9461
" "	s(doy)	3.8	15.5221	<0.0001
" "	ti(cyear,doy)	6.68	1.9555	0.0003

Table: GAM Parameter Coefficients. - MON0155 - S - chla gam# = 2

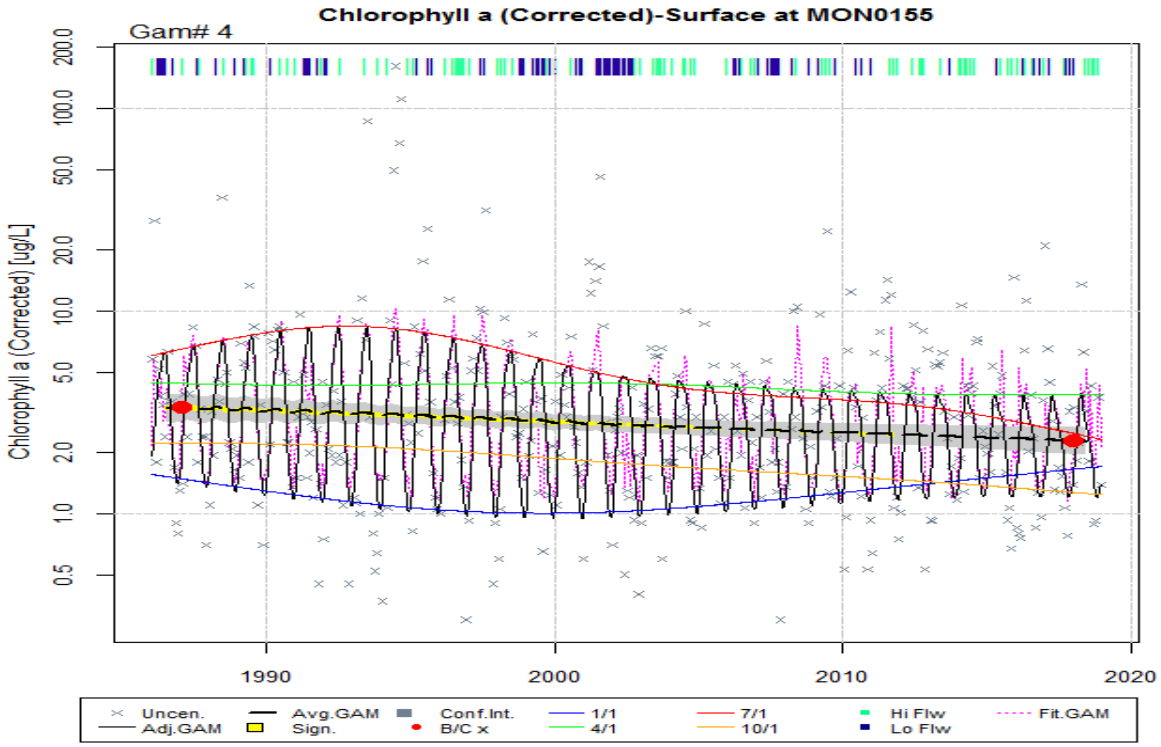
source	estimate	std.error	t.value	p.value
(Intercept)	1.035264	0.041417	24.996	<0.0001
cyear	-0.008195	0.008454	-0.9694	0.3329

Table: GAM Diagnostics. - MON0155 - S - chla

AIC	RMSE	AdjRsquare
956.71	0.8151	0.2837

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - chla gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	1.1652 (3.2066)
Current ln mean (geometric mean)	0.9102 (2.4848)
Estimated ln difference	-0.255
Std. Err. ln difference	0.1341
95% Confidence interval for ln difference	(-0.5178 , 0.0078)
Difference p-value	0.0579
Period of Record Percent Change Estimate (%)	-22.51%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0155 - S - chla gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	8.2628	0.0043
smoothed terms	s(cyear)	0.01	0	<0.0001
" "	s(doy)	4.59	16.8533	<0.0001
" "	ti(cyear,doy)	5.2	2.3724	<0.0001
" "	s(flw_sal)	4.76	0.7488	0.0019
" "	ti(flw_sal,doy)	10.59	2.4309	0.0007
" "	ti(flw_sal,cyear)	4.13	0.4015	0.1260
" "	ti(flw_sal,doy,cyear)	2.68	0.0799	0.1495

Table: GAM Parameter Coefficients. - MON0155 - S - chla gam# = 4

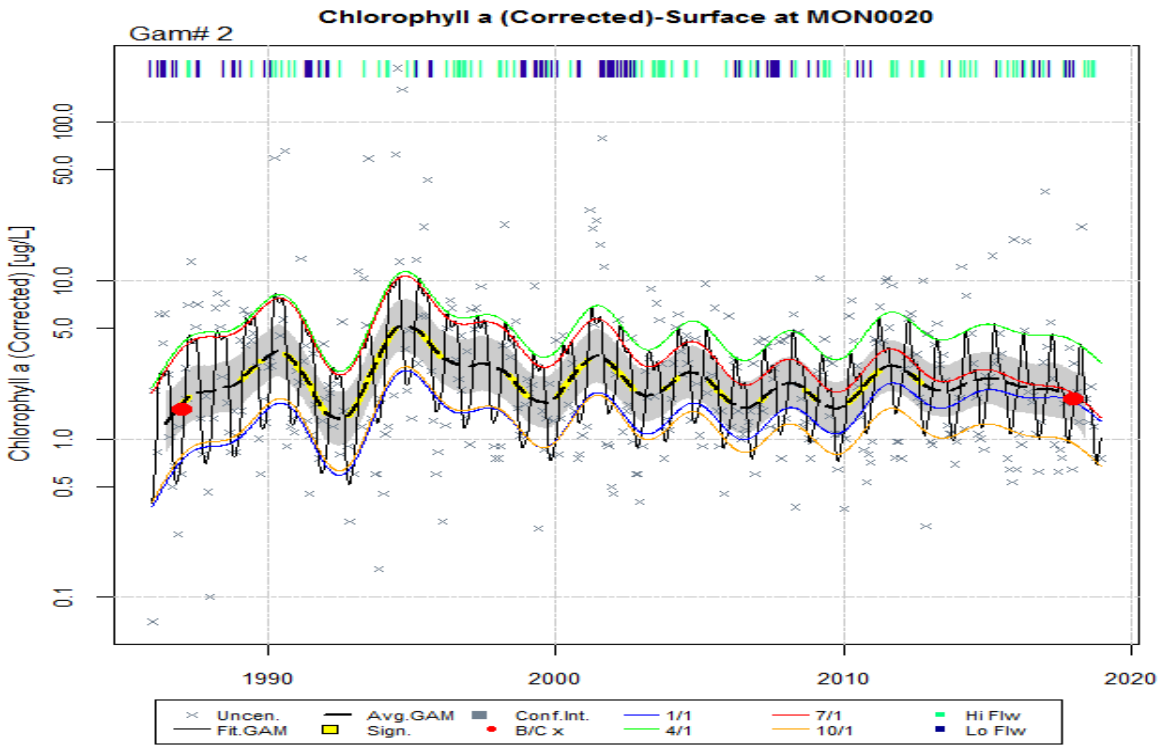
source	estimate	std.error	t.value	p.value
(Intercept)	1.018414	0.041991	24.2532	<0.0001
cyear	-0.012179	0.004237	-2.8745	0.0043

Table: GAM Diagnostics. - MON0155 - S - chla

AIC	RMSE	AdjRsquare
930.27	0.7676	0.3647

Table: Estimates of Change for - 1986 - 2018 - MON0155 - S - chla gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	1.2025 (3.3284)
Current ln mean (geometric mean)	0.8276 (2.2878)
Estimated ln difference	-0.3749
Std. Err. ln difference	0.1331
95% Confidence interval for ln difference	(-0.6358 , -0.1141)
Difference p-value	0.0051
Period of Record Percent Change Estimate (%)	-31.27%
Period of Record	1986 - 2018



gam number = 2
title = Non-linear trend with Seas+Int
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc')+ ti(cyear,doy,bs=c('tp','cc'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0020 - S - chla gam# = 2

type	source	df	F	p.value
parametric terms	cyear	1	0.2571	0.6124
smoothed terms	s(cyear)	18.93	2.486	0.0002
" "	s(doy)	5.83	18.0219	<0.0001
" "	ti(cyear,doy)	2.98	1.5154	<0.0001

Table: GAM Parameter Coefficients. - MON0020 - S - chla gam# = 2

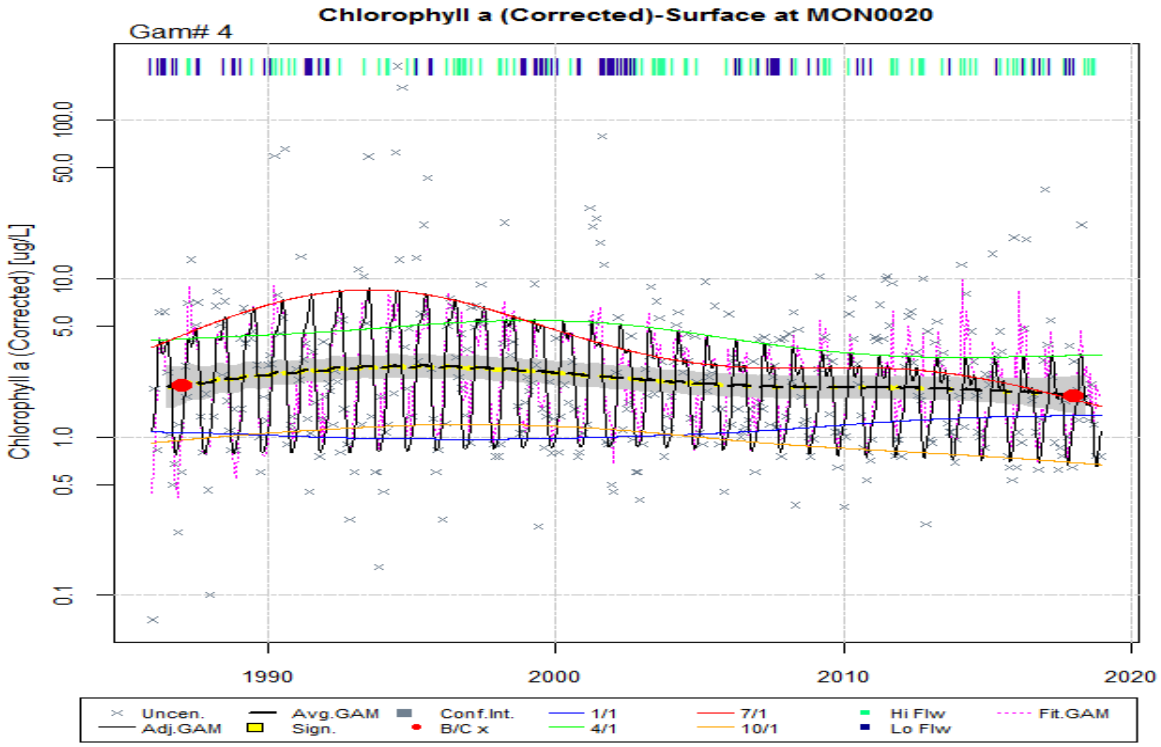
source	estimate	std.error	t.value	p.value
(Intercept)	0.820091	0.047576	17.2374	<0.0001
cyear	0.17205	0.339325	0.507	0.6124

Table: GAM Diagnostics. - MON0020 - S - chla

AIC	RMSE	AdjRsquare
1024.21	0.8915	0.339

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - chla gam# = 2

Calculation	Estimate
Baseline ln mean (geometric mean)	0.4286 (1.5351)
Current ln mean (geometric mean)	0.5757 (1.7783)
Estimated ln difference	0.1471
Std. Err. ln difference	0.2515
95% Confidence interval for ln difference	(-0.3459 , 0.6401)
Difference p-value	0.5591
Period of Record Percent Change Estimate (%)	15.84%
Period of Record	1986 - 2018



gam number = 4
title = Non-linear trend with Seas+Int. & Hydro Adj
model = ~ cyear + s(cyear, k=gamK1) + s(doy,bs='cc') + ti(cyear,doy,bs=c('tp','cc')) + s(flw_sal,k=gamK2) + ti(flw_sal,doy,bs=c('tp','cc')) + ti(flw_sal, cyear,bs=c('tp' ,'tp')) + ti(flw_sal,doy,cyear, bs=c('tp','cc','tp'))
method group = MDCT_DHMH; step date = ; step label =

Table: GAM Analysis of Variance - MON0020 - S - chla gam# = 4

type	source	df	F	p.value
parametric terms	cyear	1	0.2495	0.6178
smoothed terms	s(cyear)	2.43	0.5461	0.0827
" "	s(doy)	6.11	17.4557	<0.0001
" "	ti(cyear,doy)	4.32	1.8886	<0.0001
" "	s(flw_sal)	4.09	0.9753	<0.0001
" "	ti(flw_sal,doy)	9.71	1.9058	0.0044
" "	ti(flw_sal,cyear)	2.01	0.3897	0.0092
" "	ti(flw_sal,doy,cyear)	6.1	0.2158	0.0593

Table: GAM Parameter Coefficients. - MON0020 - S - chla gam# = 4

source	estimate	std.error	t.value	p.value
(Intercept)	0.813947	0.046697	17.4303	<0.0001
cyear	0.015288	0.030609	0.4995	0.6178

Table: GAM Diagnostics. - MON0020 - S - chla

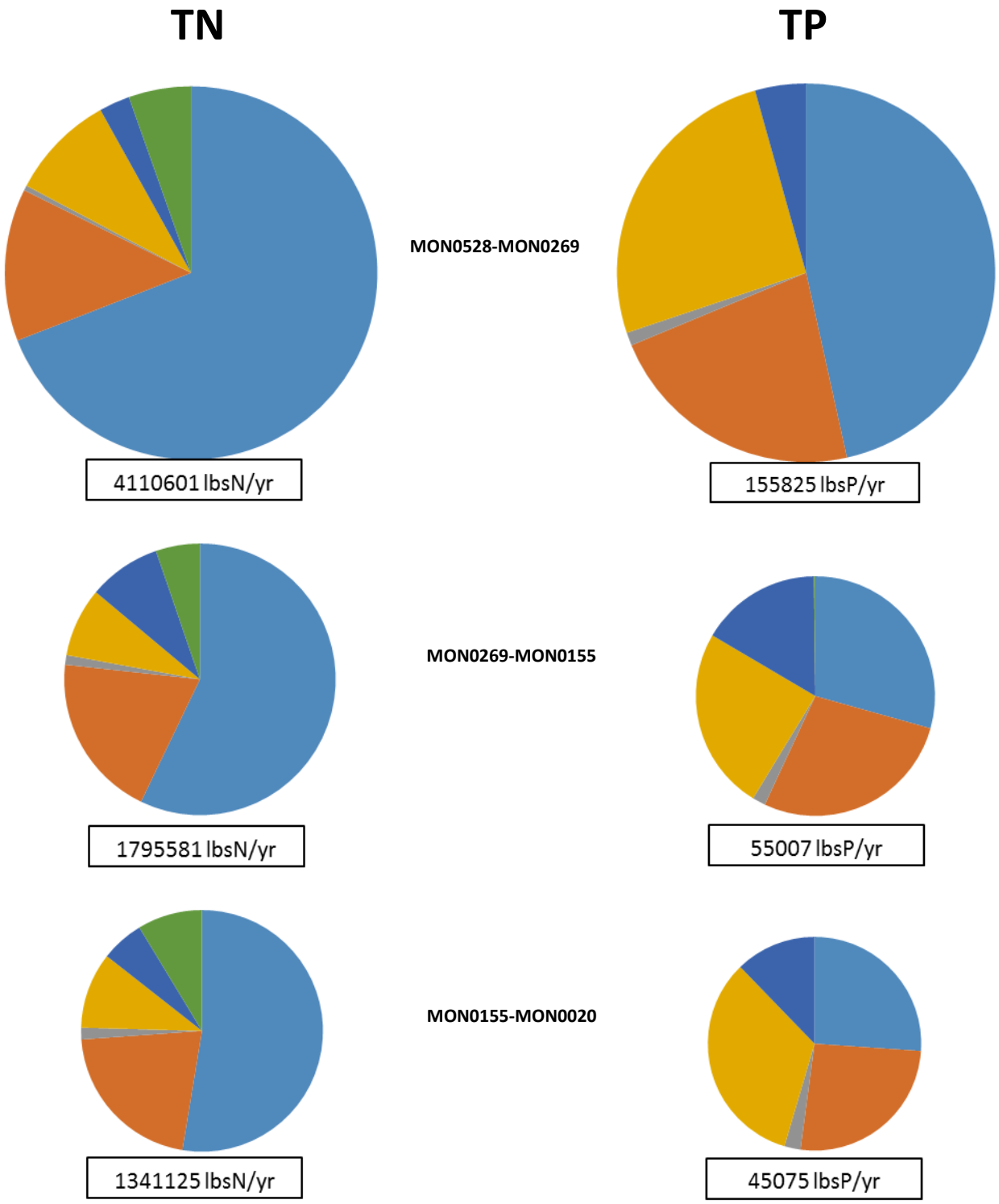
AIC	RMSE	AdjRsquare
997.53	0.8537	0.3939

Table: Estimates of Change for - 1986 - 2018 - MON0020 - S - chla gam# = 4

Calculation	Estimate
Baseline ln mean (geometric mean)	0.7524 (2.122)
Current ln mean (geometric mean)	0.6041 (1.8297)
Estimated ln difference	-0.1482
Std. Err. ln difference	0.2009
95% Confidence interval for ln difference	(-0.542 , 0.2456)
Difference p-value	0.4611
Period of Record Percent Change Estimate (%)	-13.77%
Period of Record	1986 - 2018

Appendix D

TN and TP loads (lbs/year) by sector from the 2018 Chesapeake Bay Program watershed model progress run (data courtesy of G. Shenk, USGS Chesapeake Bay Program).



TN and TP loads (lbs/year) by sector in the 2018 Chesapeake Bay Program watershed model progress run. Colors represent loads from Agriculture●, Regulated Development●, Non-regulated Development●, Natural●, Wastewater●, and Septic● (data courtesy of G. Shenk, USGS Chesapeake Bay Program).

Appendix E

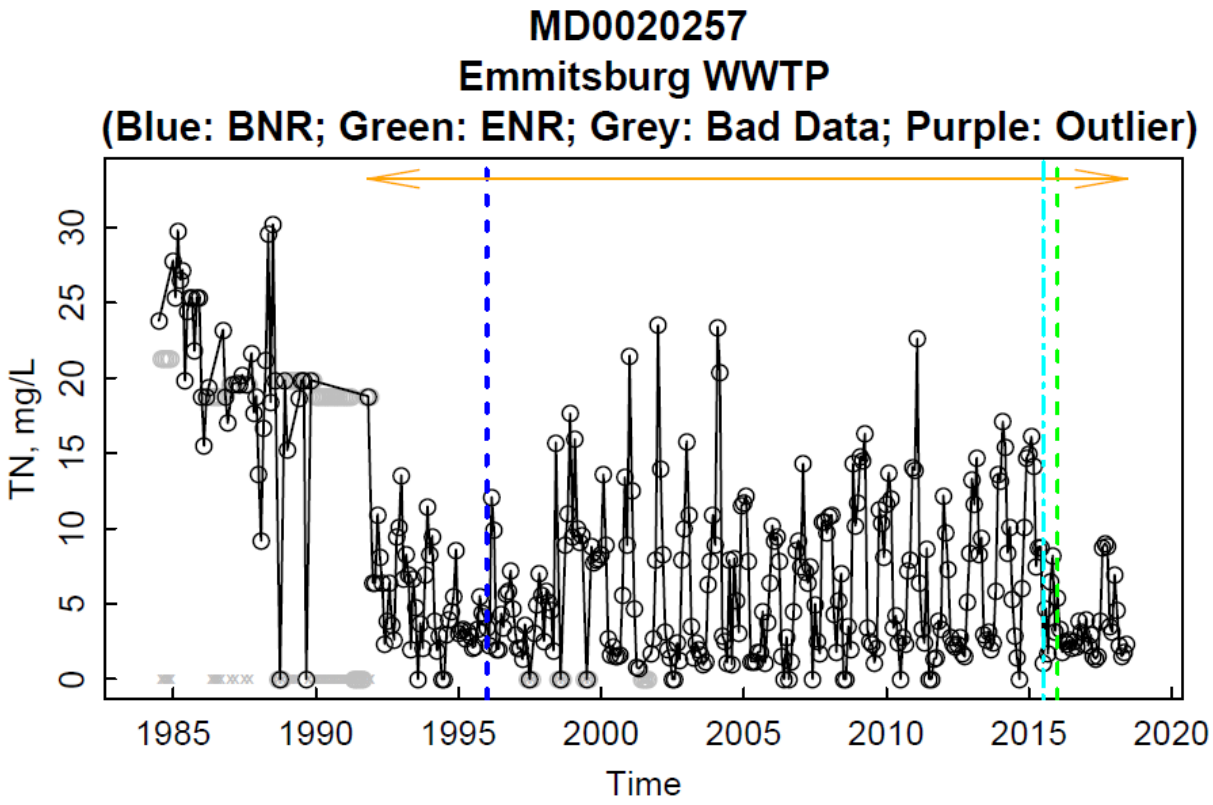
The graphs represent discharge of TN and TP (mg/L) for each of 13 Monocacy River watershed Waste Water Treatment Plants (WWTP) that directly or indirectly enter the river, by segment. Facilities in Emmittsburg, Thurmont, Taneytown, Mt. Saint Mary's University, Lewistown, and Crestview are in the watershed of the MON0528-MON0269 reach, Woodsboro, White Rock, Ft. Detrick Area C, and City of Frederick plants are in the MON0269-MON0155 river reach, and Ballenger-McKinney, Mill Bottom, and Pleasant Branch plants are in the MON0155-MON0020 reach.

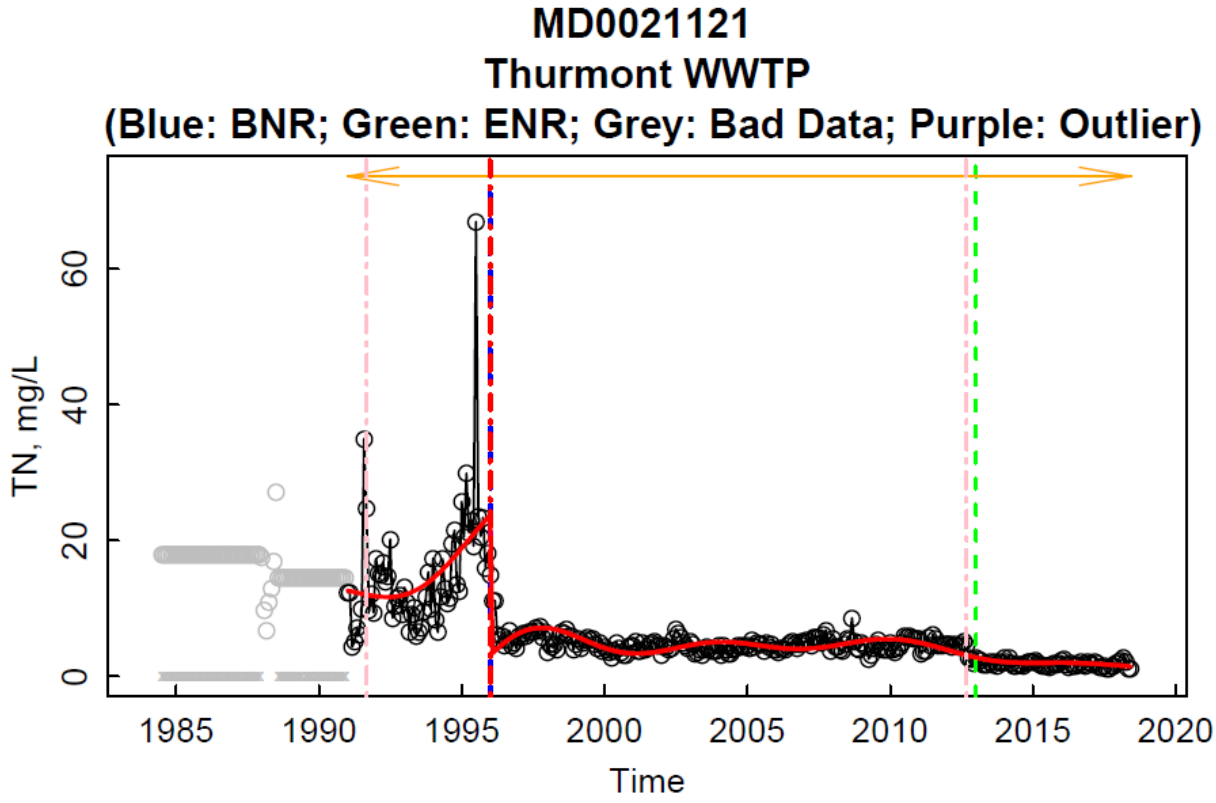
The colored lines represent the following:

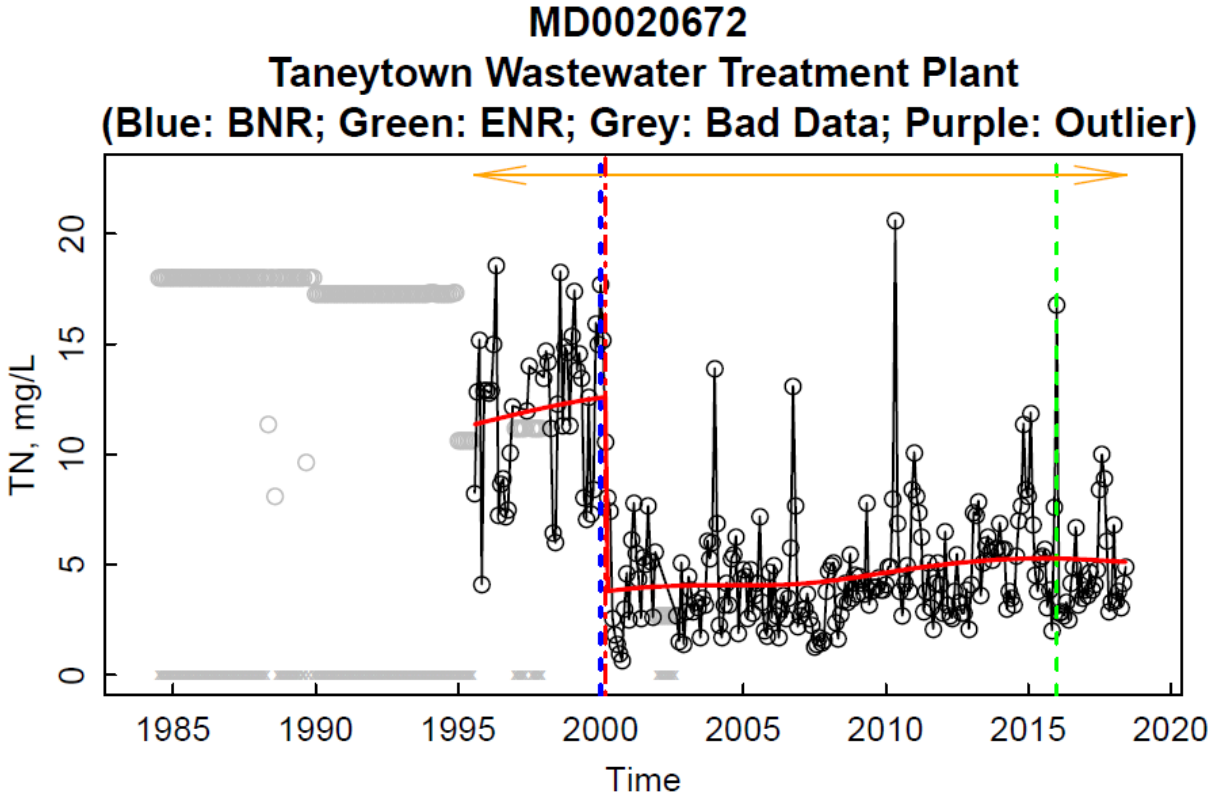
- Gray symbols – 'bad data', sequence of 3+ constant values, removed from analysis
- Horizontal red line – mean concentrations derived from General Additive Models (GAM); GAM analyses requires more than 8 years of continuous data after 1990 as well as continuous records after data gaps of 5+ years
- Horizontal yellow double-headed arrow – time span for GAM analyses
- Vertical blue line – date of installation of biological nutrient removal (BNR)
- Purple points – outliers (10x > than local median) , removed from analysis
- Vertical green line – date of installation of enhanced nutrient removal (ENR).

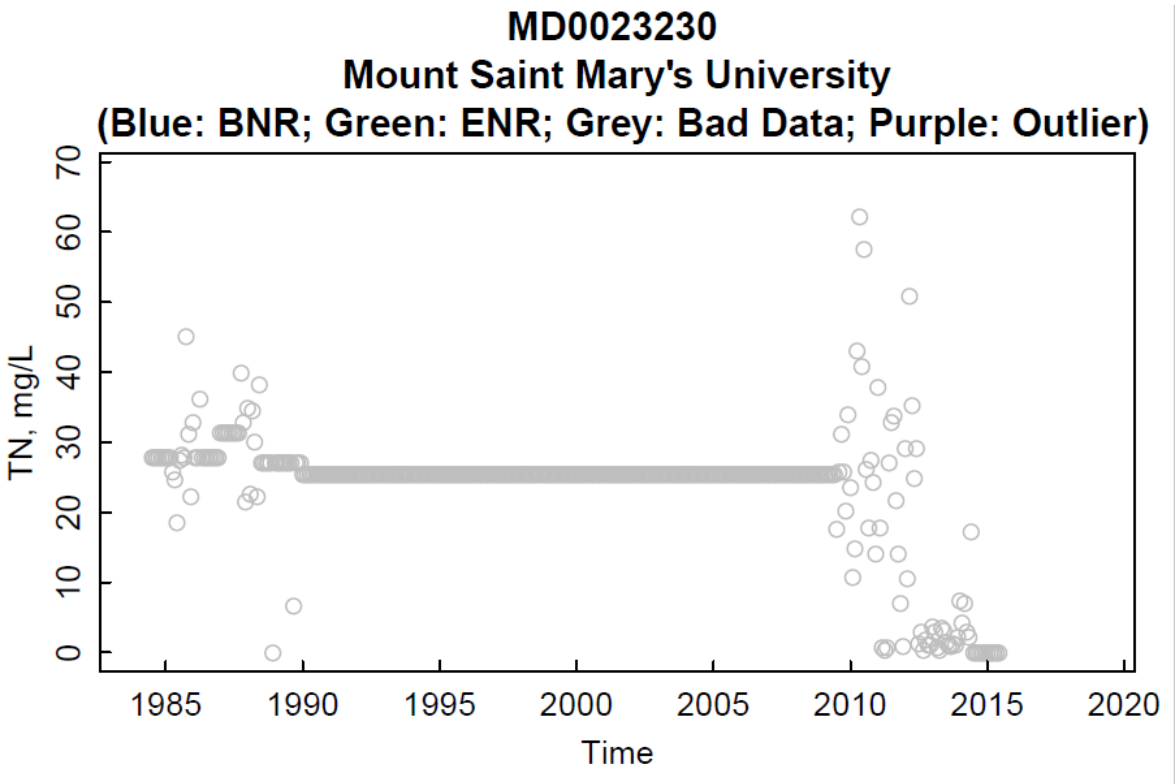
Other vertical lines in the WWTP graphs, presented but not discussed in the report. These lines represent an abrupt change (change point) in some statistical property of a time series, such as a change in the mean, a change in the variance, or a change in the direction of trend.

- Vertical red line – change point (CP1) for the entire time series (excluding bad data and outliers)
- Vertical purple lines – change points (CP2 and CP3), one for the pre-CP1 period and one for the post-CP1 period
- Vertical cyan line – change point (CP4), obtained specifically for the period of post-2005

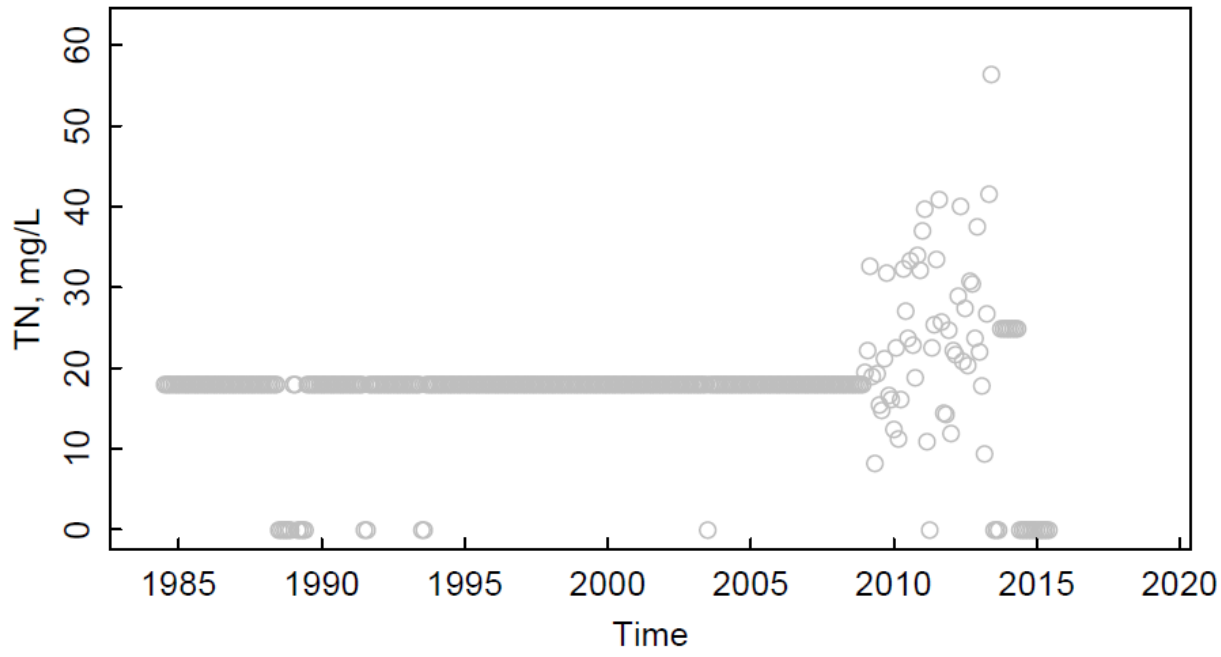

MD0020257
Emmitsburg WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TN, mg/L
0
5
10
15
20
25
30
1985
1990
1995
2000
2005
2010
2015
2020
Time


MD0021121
Thurmont WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TN, mg/L
0
20
40
60
1985
1990
1995
2000
2005
2010
2015
2020
Time

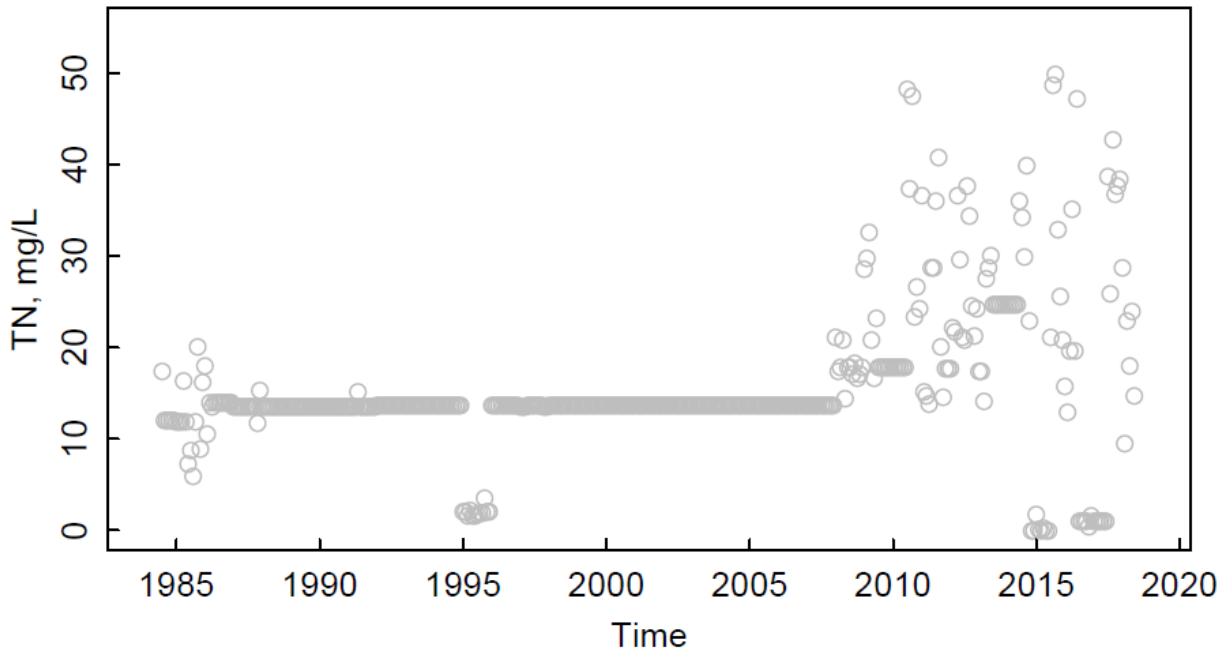

MD0020672
Taneytown Wastewater Treatment Plant
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TN, mg/L
0
5
10
15
20
1985
1990
1995
2000
2005
2010
2015
2020
Time

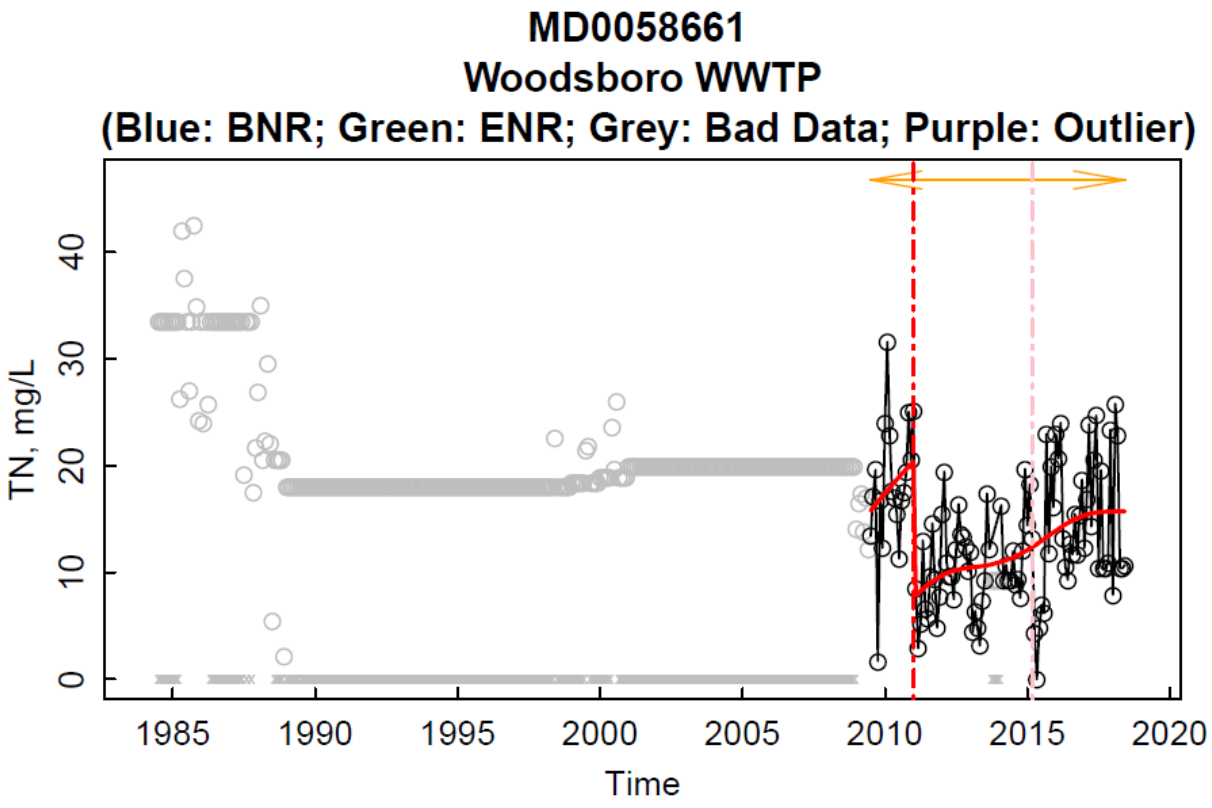

MD0023230
Mount Saint Mary's University
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TN, mg/L
0
10
20
30
40
50
60
70
1985
1990
1995
2000
2005
2010
2015
2020
Time

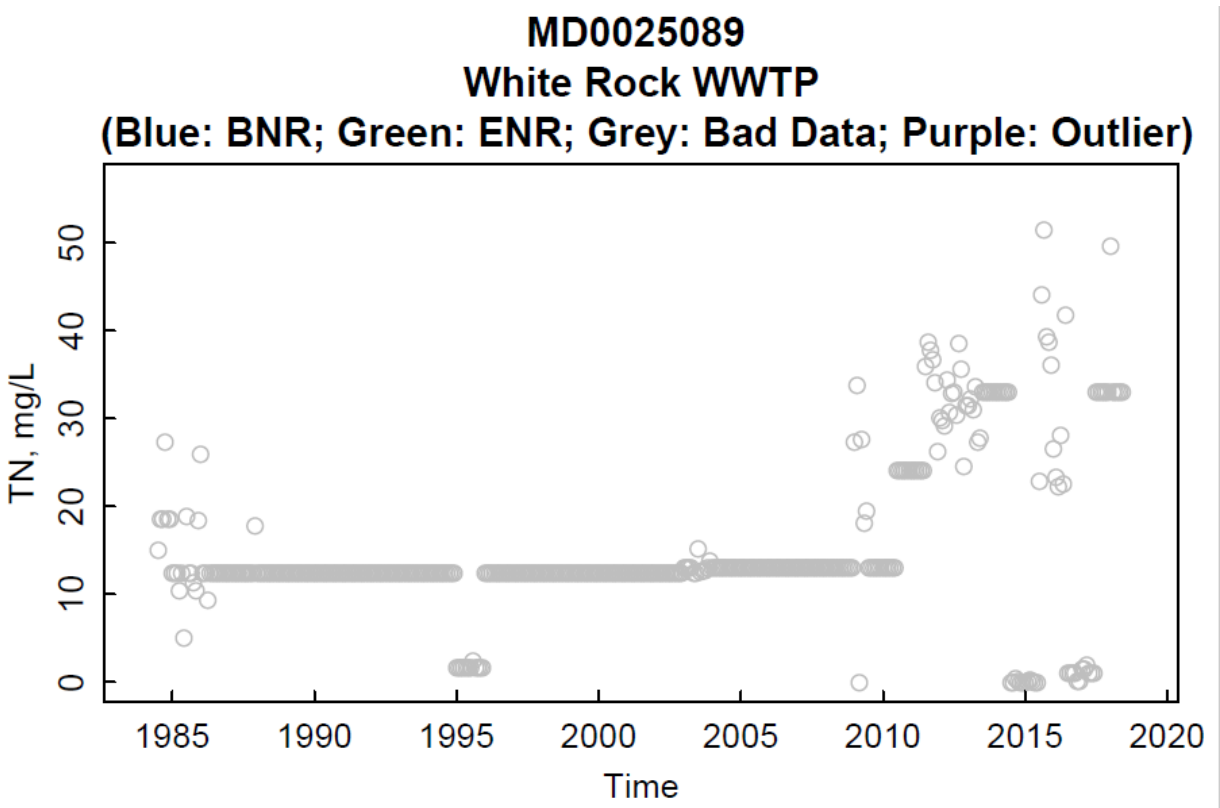
MD0022900
Lewistown Elementary School WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)



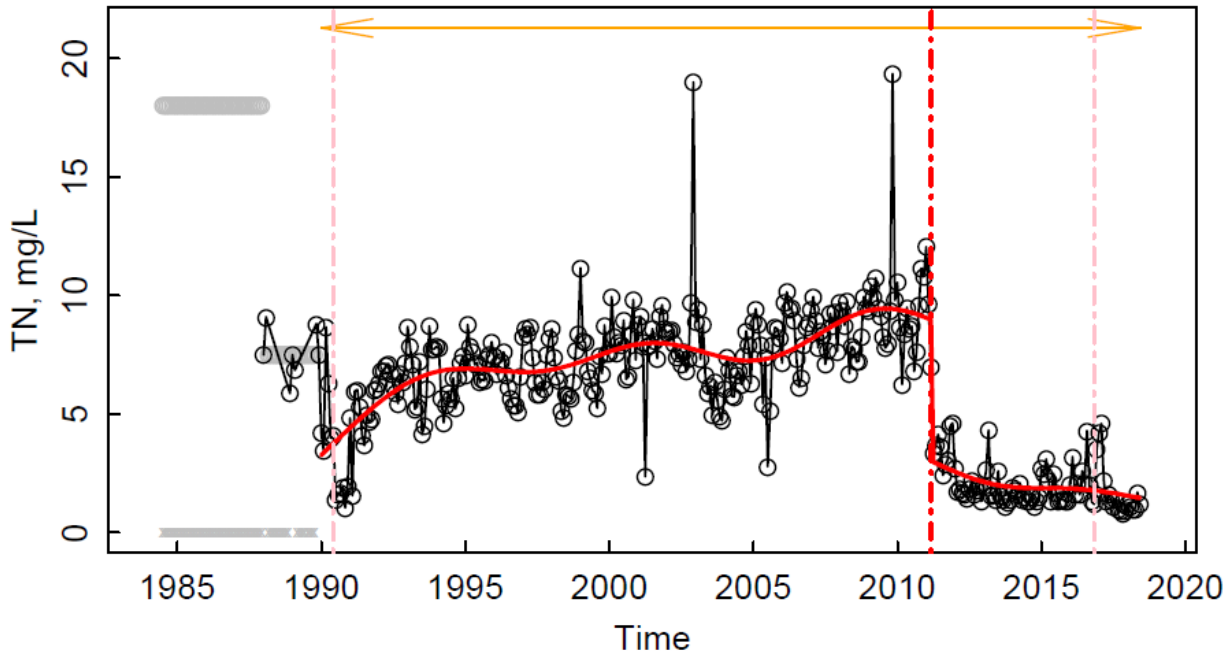
MD0022683
Crestview Estates WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)



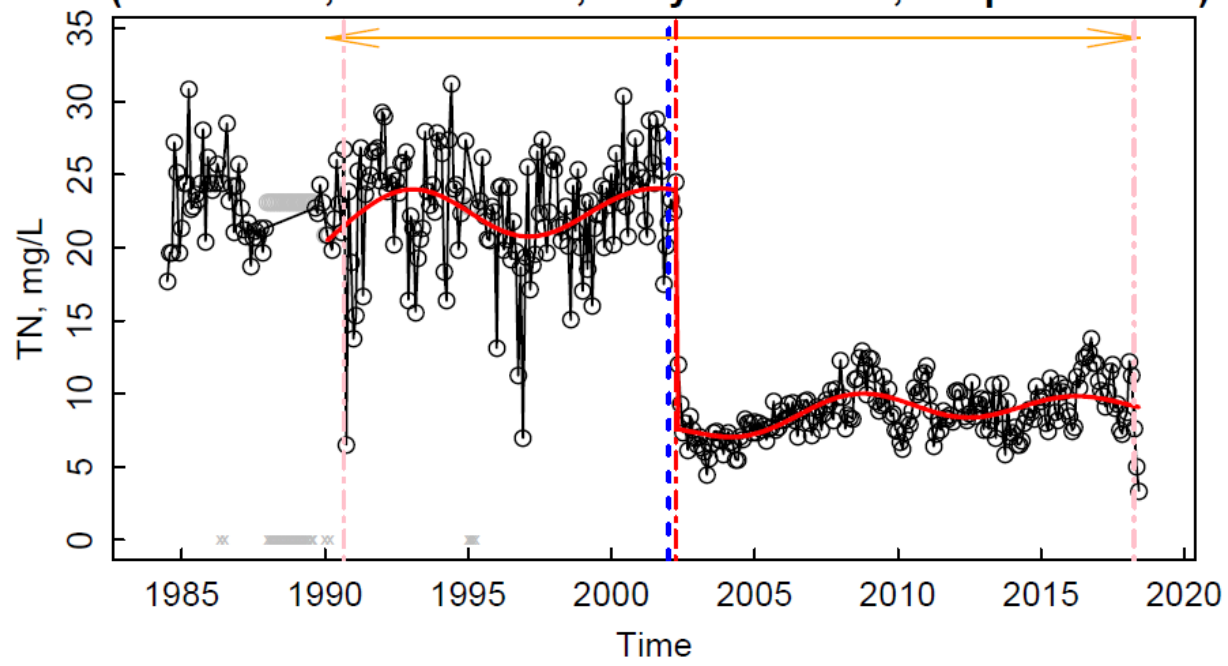

MD0058661
Woodsboro WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TN, mg/L
0
10
20
30
40
1985
1990
1995
2000
2005
2010
2015
2020
Time


MD0025089
White Rock WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TN, mg/L
0
10
20
30
40
50
1985
1990
1995
2000
2005
2010
2015
2020
Time

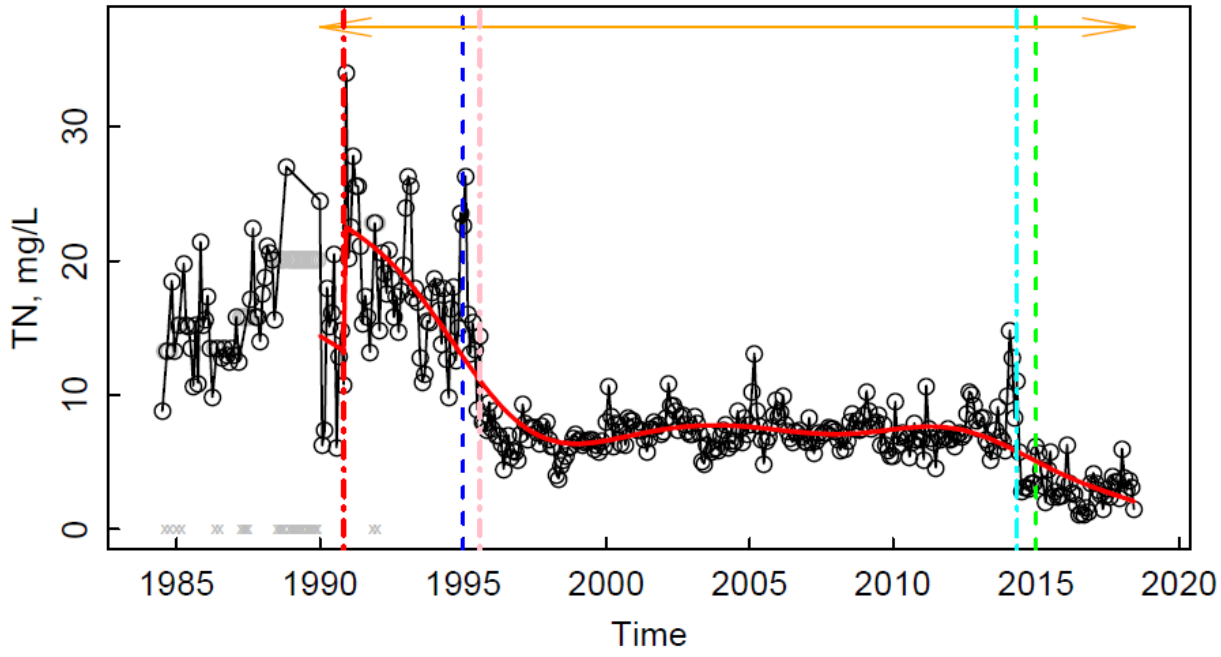
MD0020877
Fort Detrick WWTP, Area C
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)



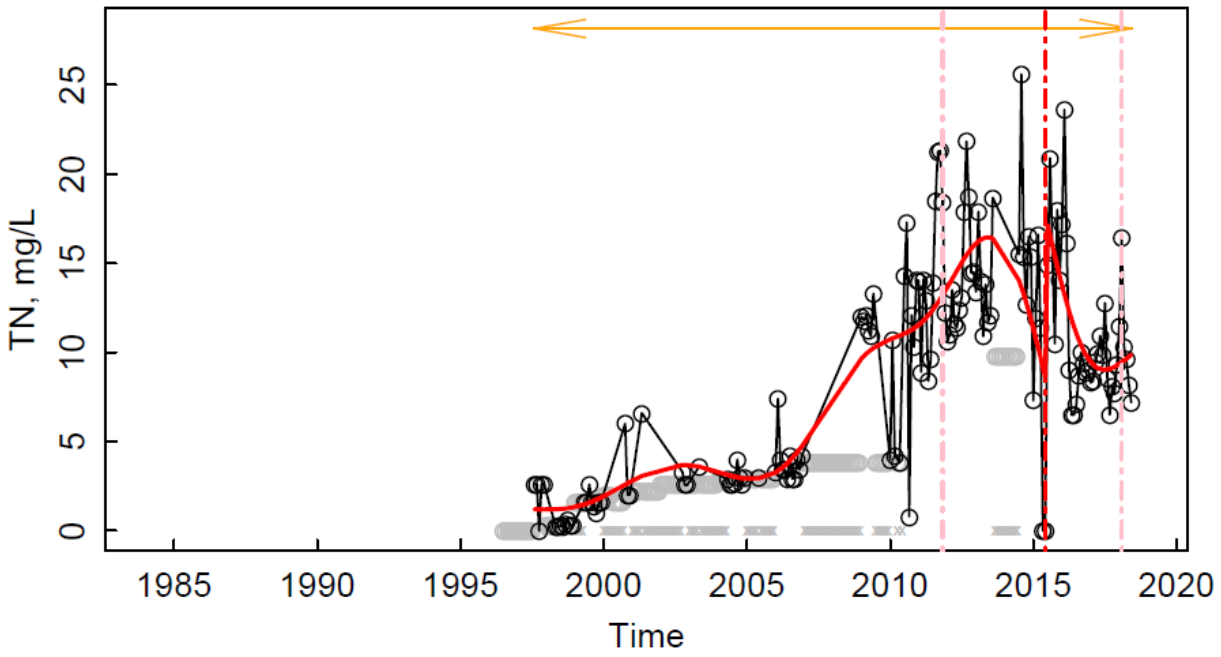
MD0021610
Frederick City WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)

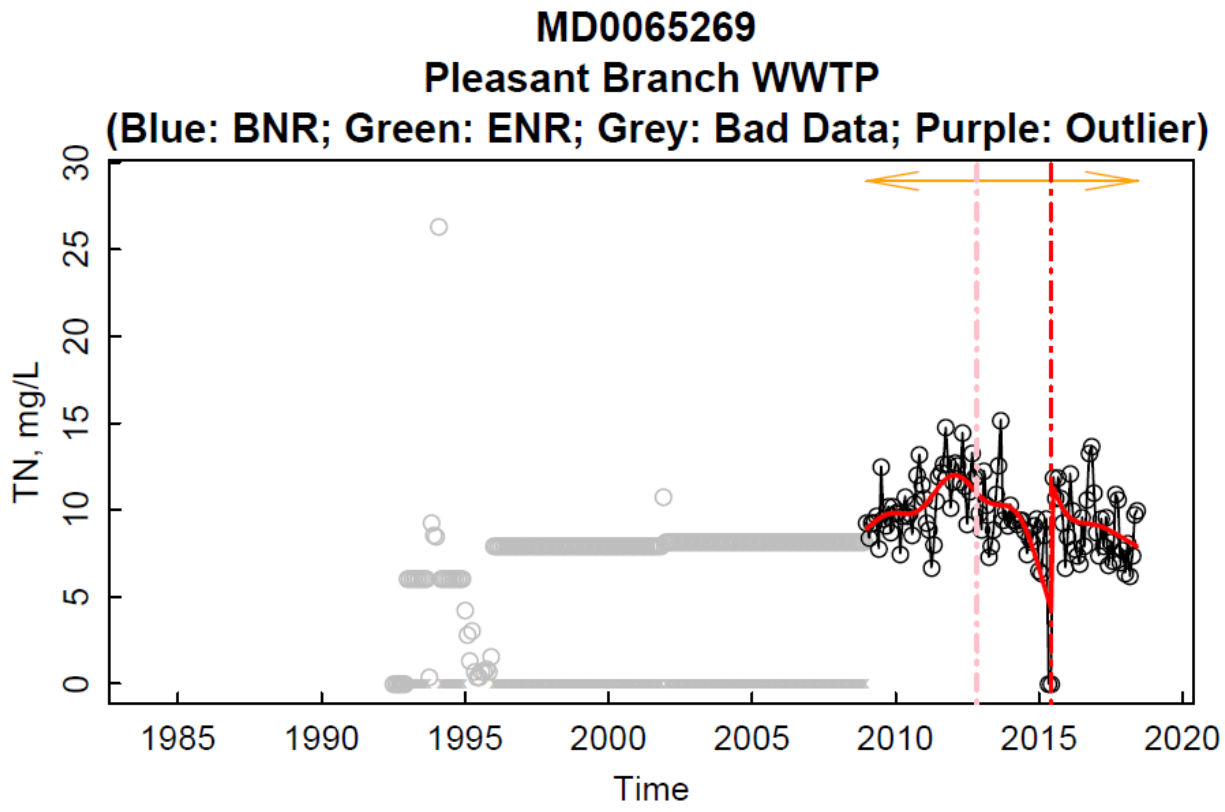


MD0021822
Ballenger−McKinney WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)

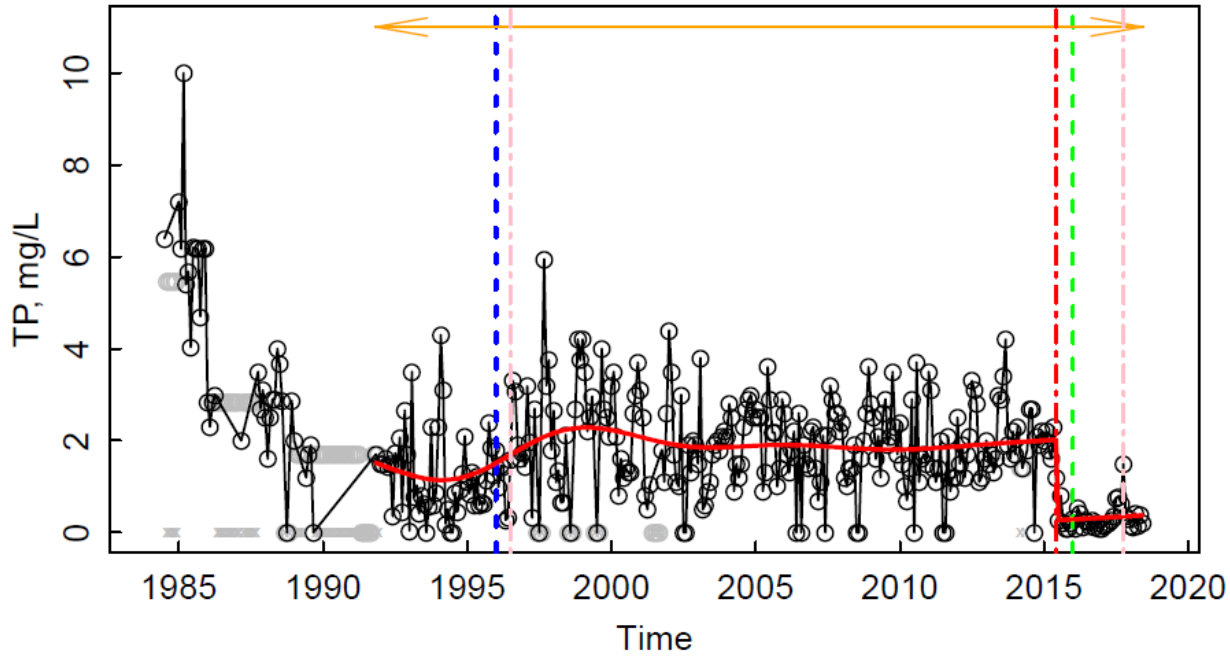


MD0065439
Mill Bottom WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)

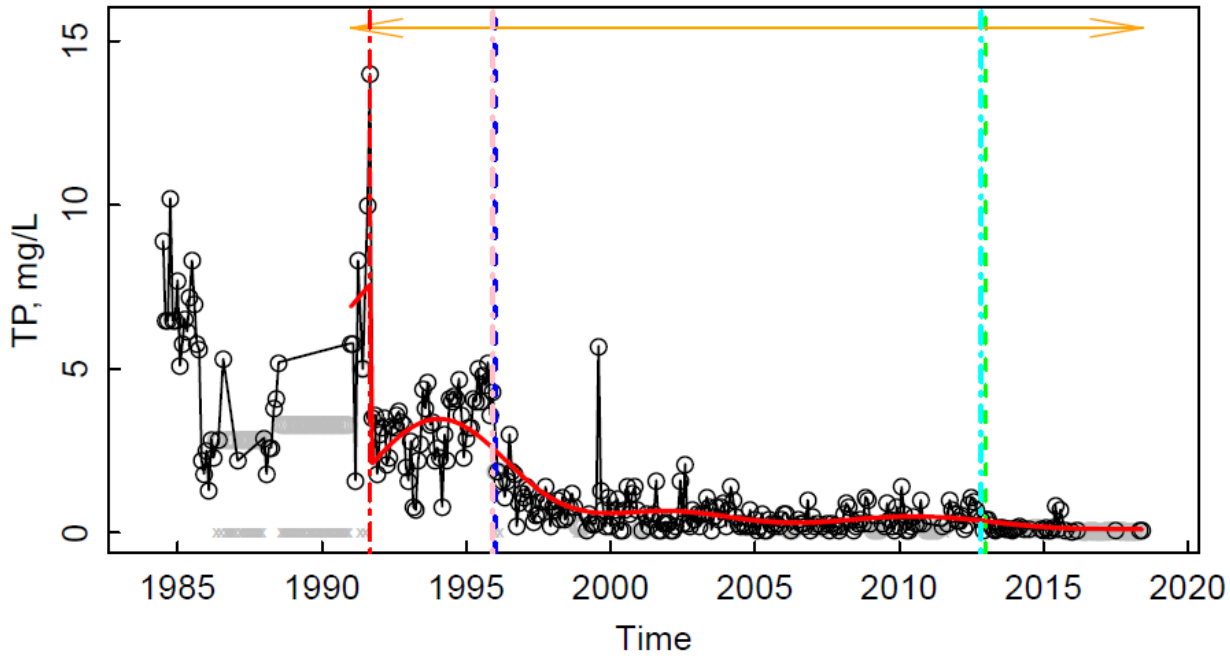


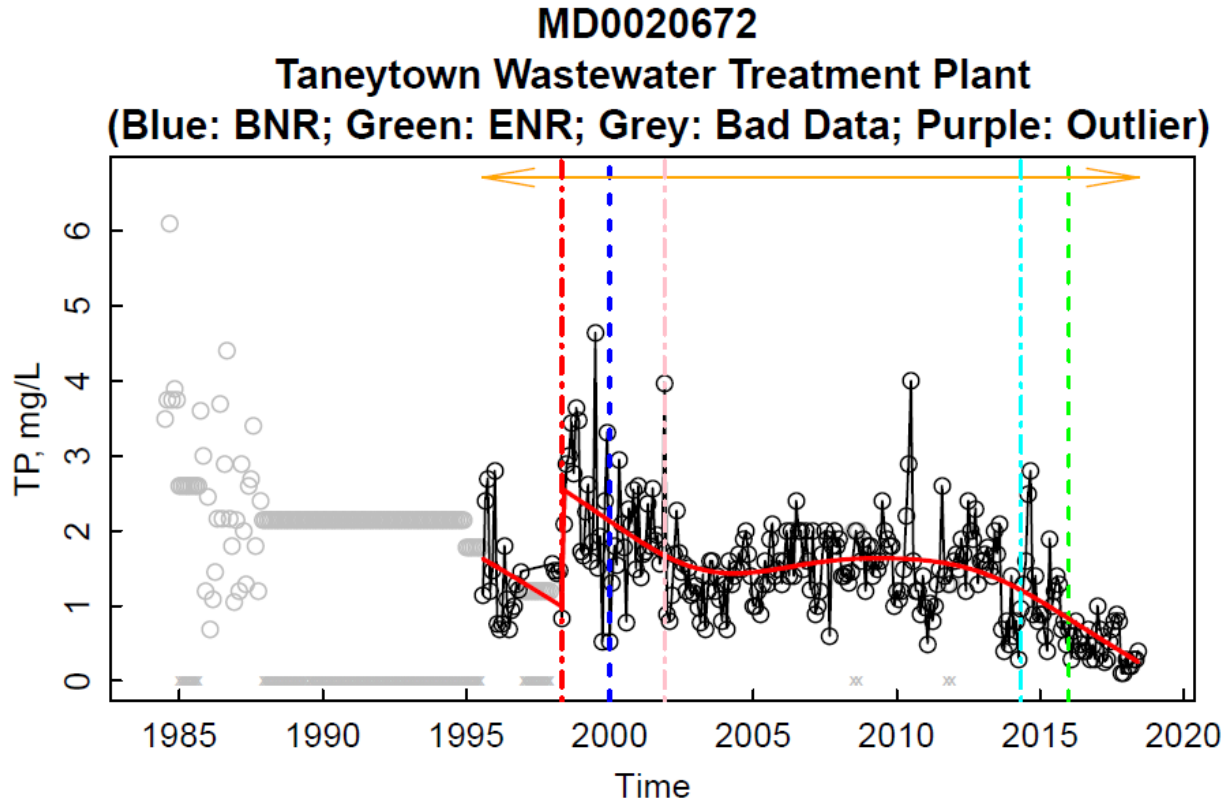

MD0065269
Pleasant Branch WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TN, mg/L
0
5
10
15
20
25
30
1985
1990
1995
2000
2005
2010
2015
2020
Time

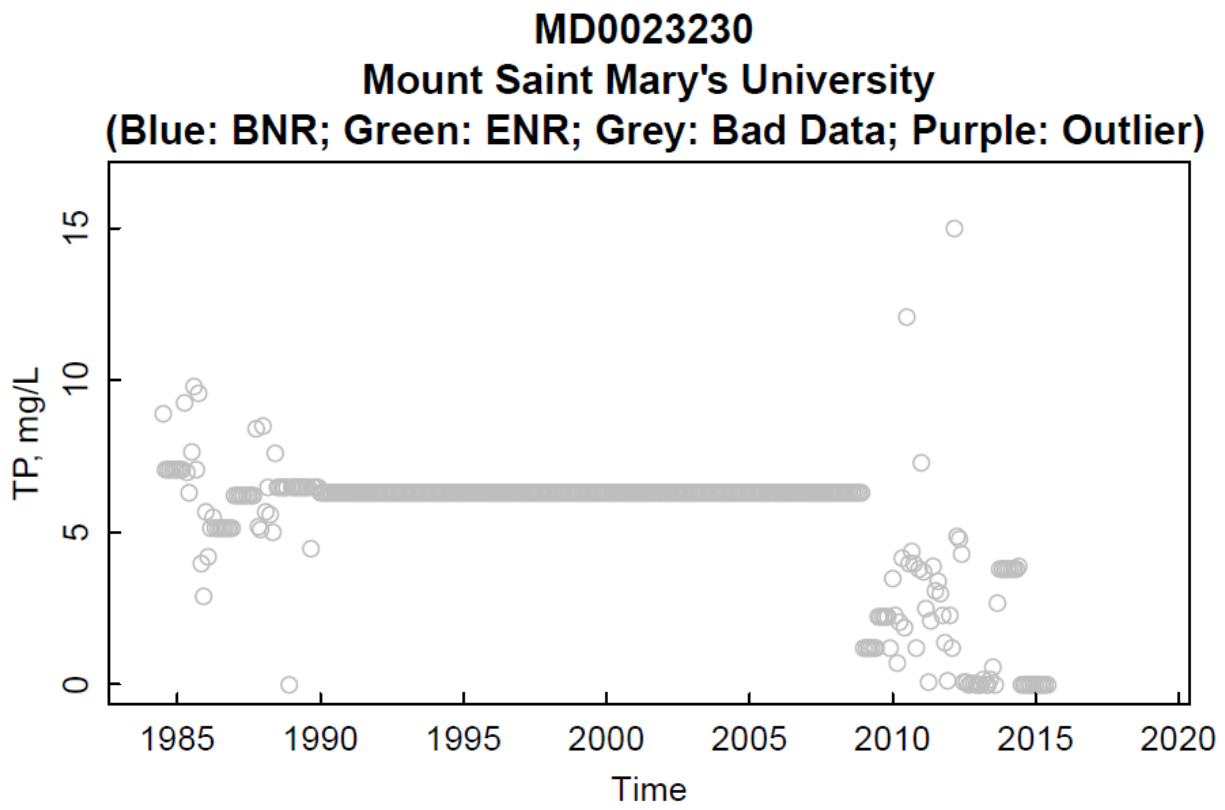
MD0020257
Emmitsburg WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)



MD0021121
Thurmont WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)

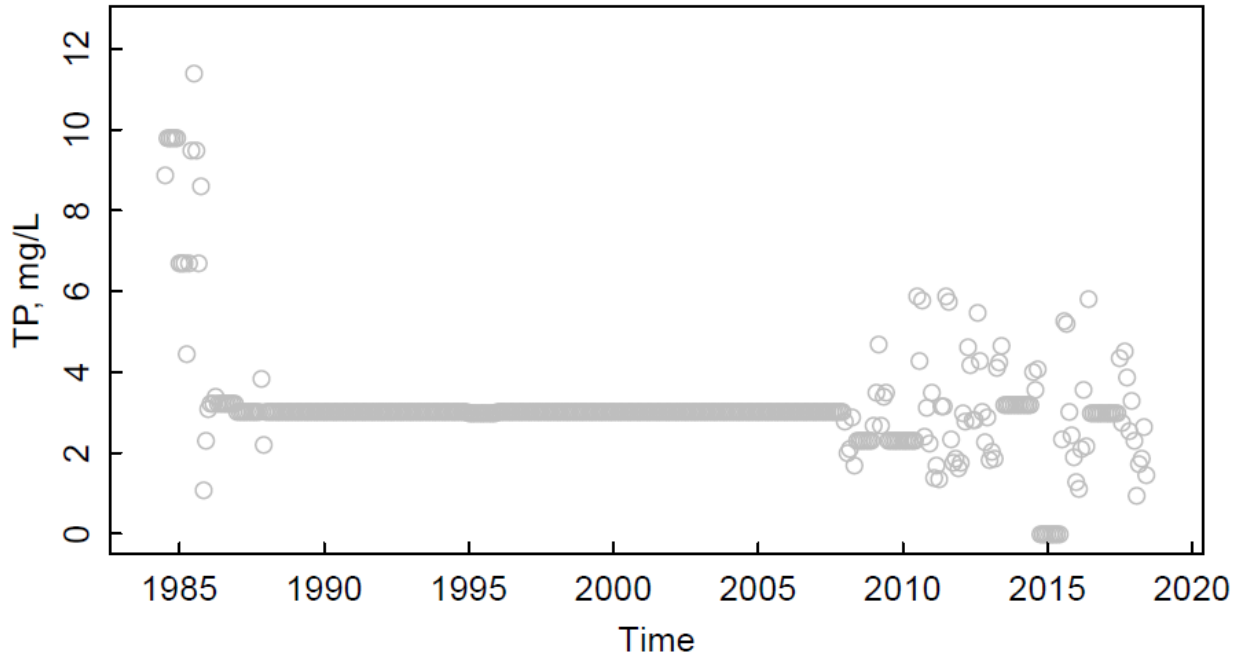


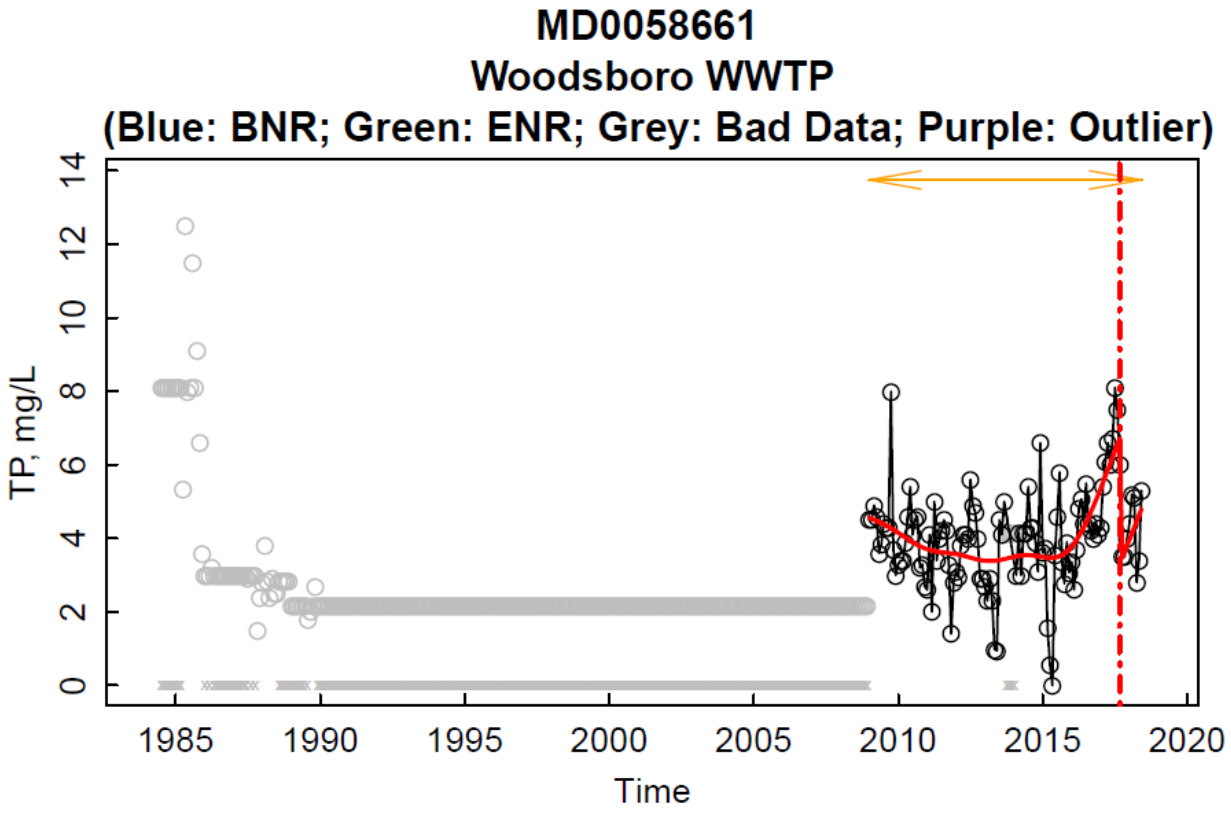

MD0020672
Taneytown Wastewater Treatment Plant
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TP, mg/L
0
1
2
3
4
5
6
1985
1990
1995
2000
2005
2010
2015
2020
Time

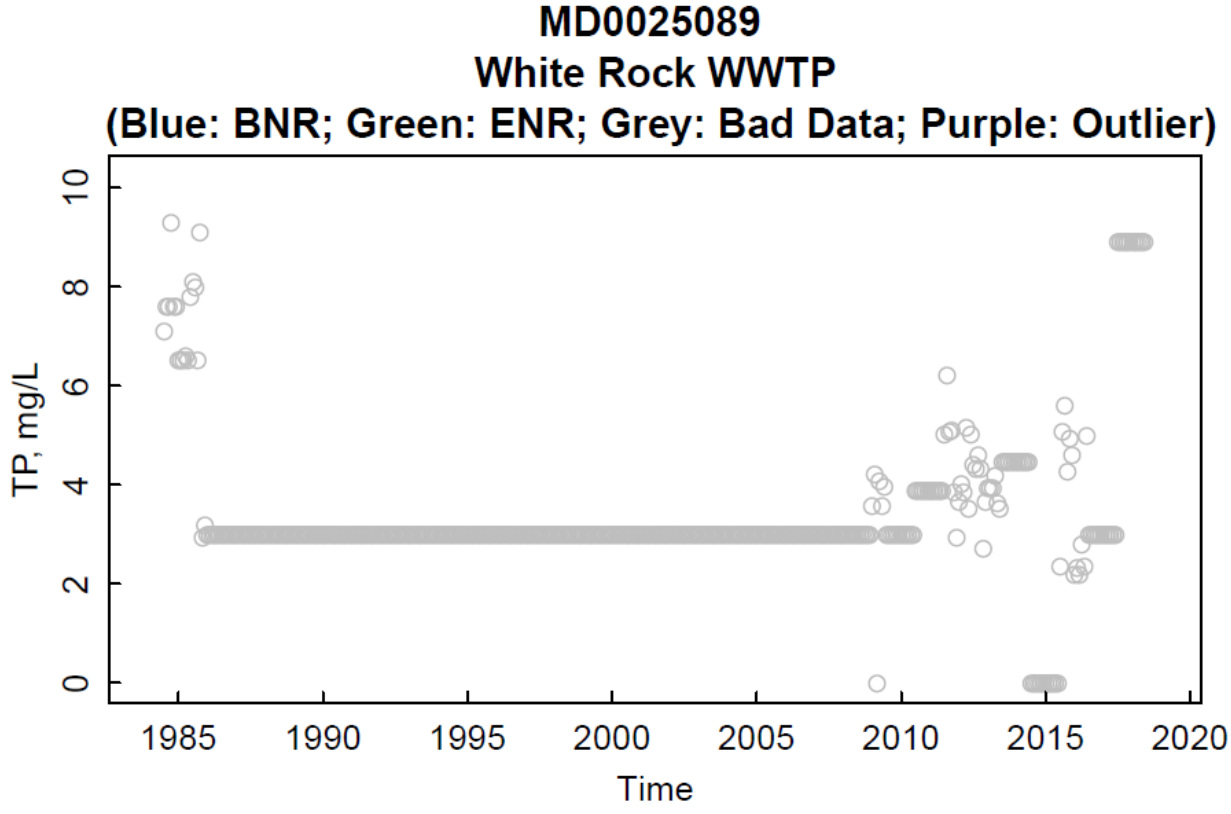

MD0023230
Mount Saint Mary's University
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TP, mg/L
0
5
10
15
1985
1990
1995
2000
2005
2010
2015
2020
Time

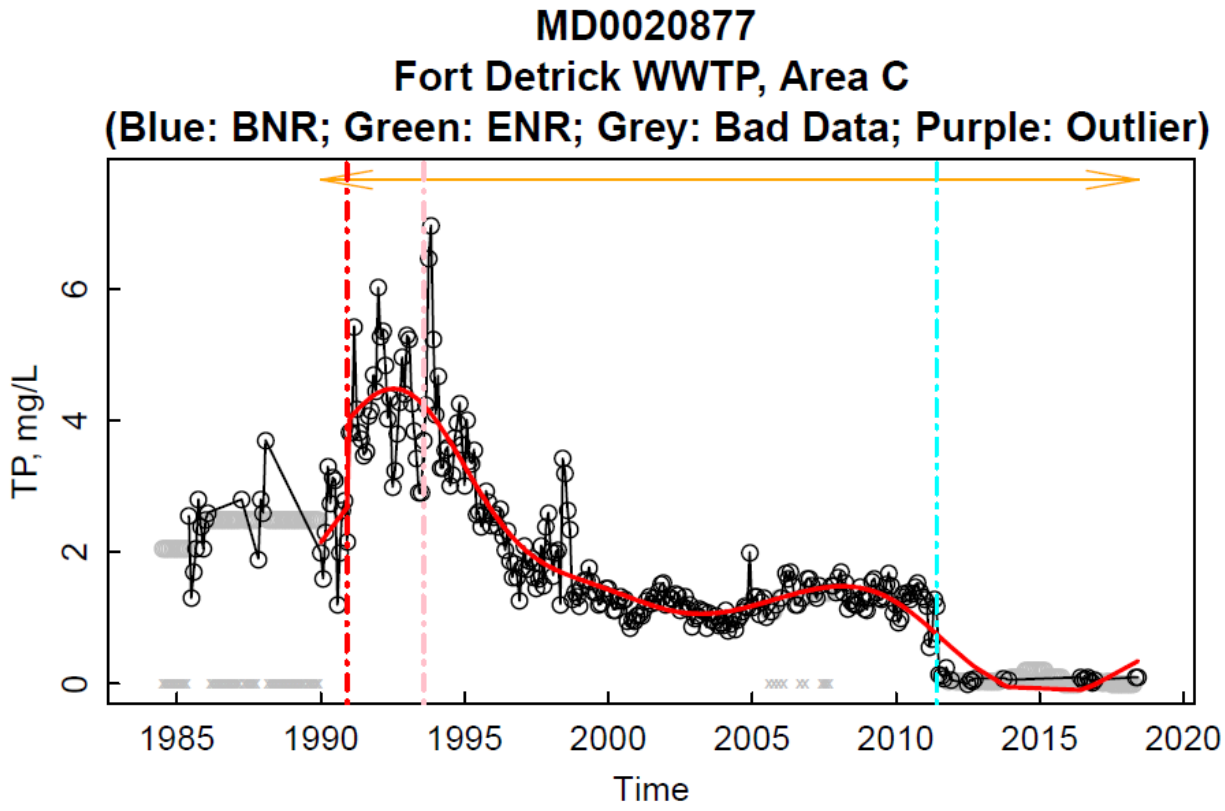
MD0022900
Lewistown Elementary School WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)

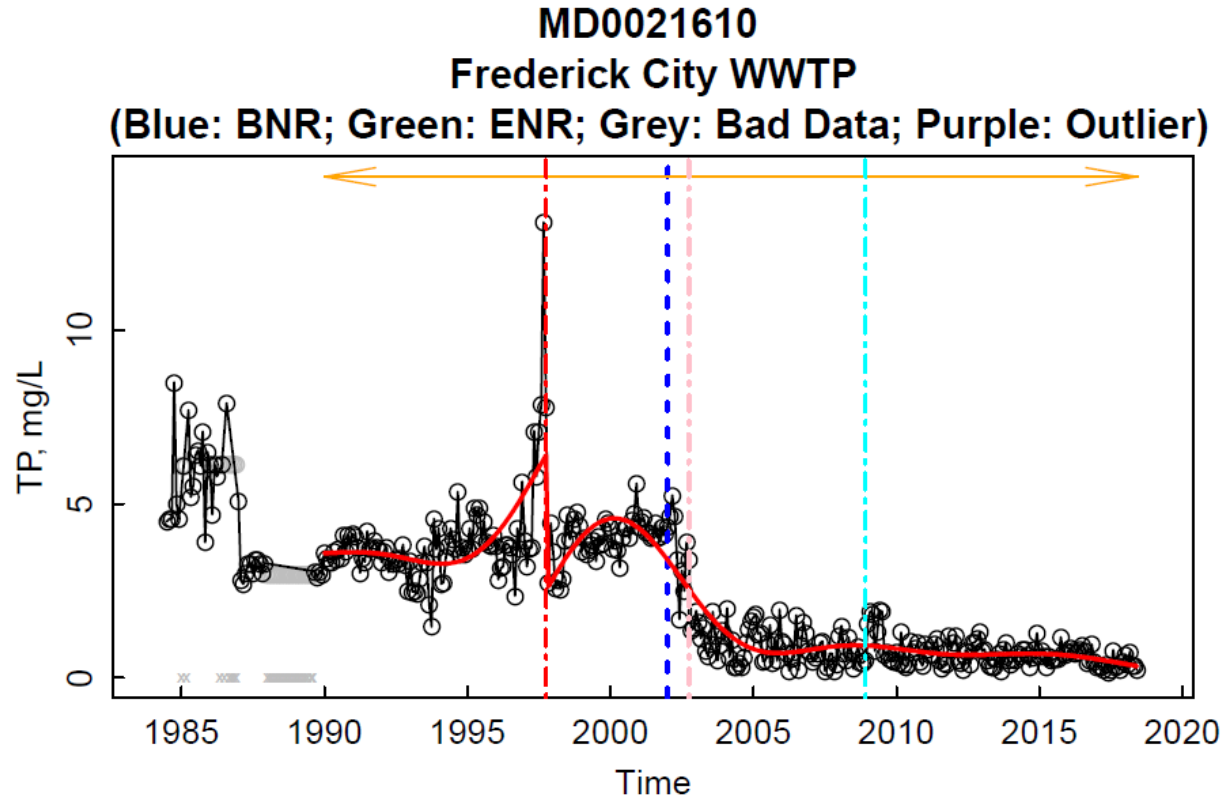
MD0022683
Crestview Estates WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)

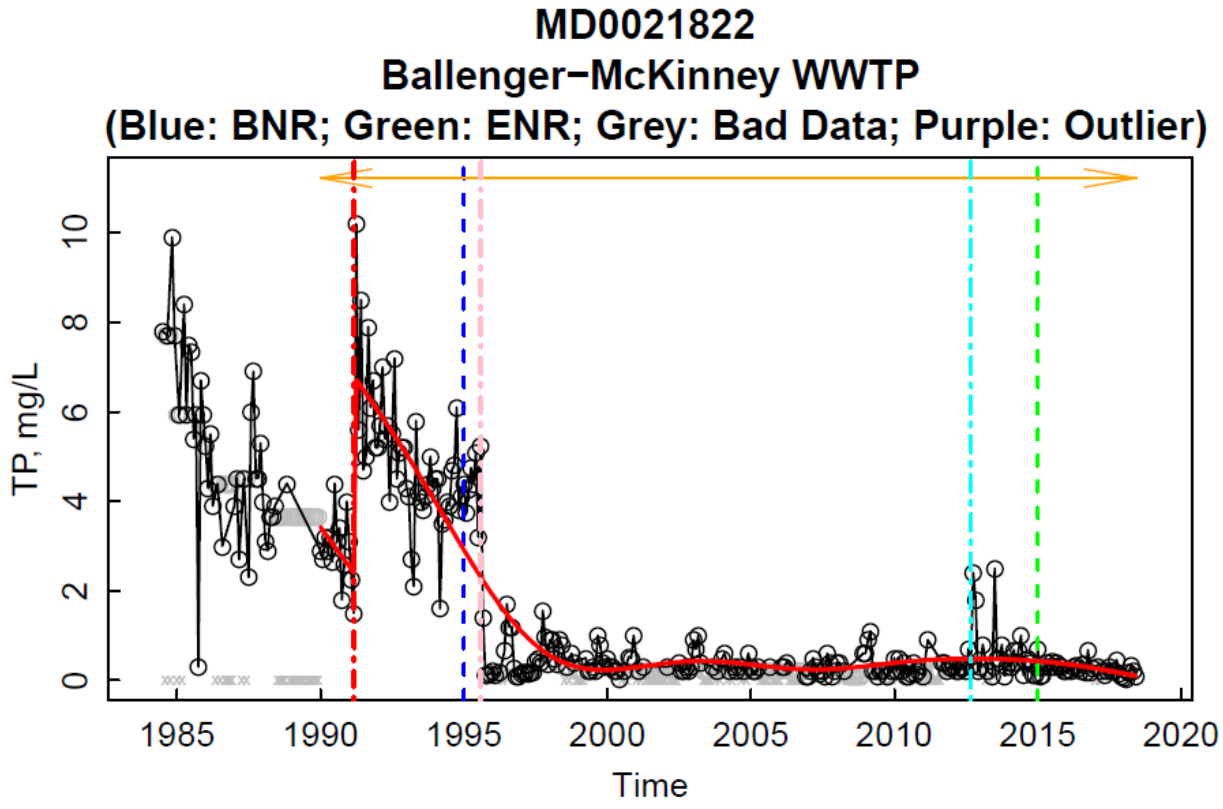


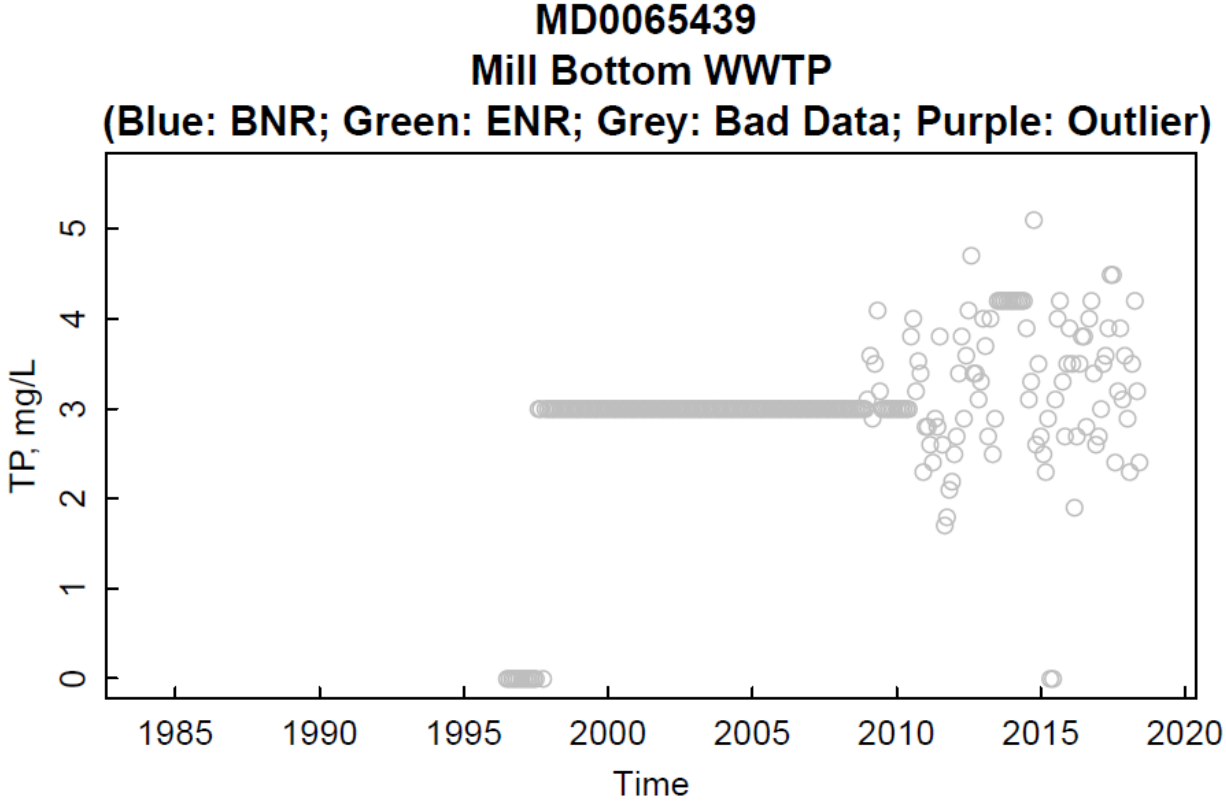

MD0058661
Woodsboro WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TP, mg/L
0
2
4
6
8
10
12
14
1985
1990
1995
2000
2005
2010
2015
2020
Time

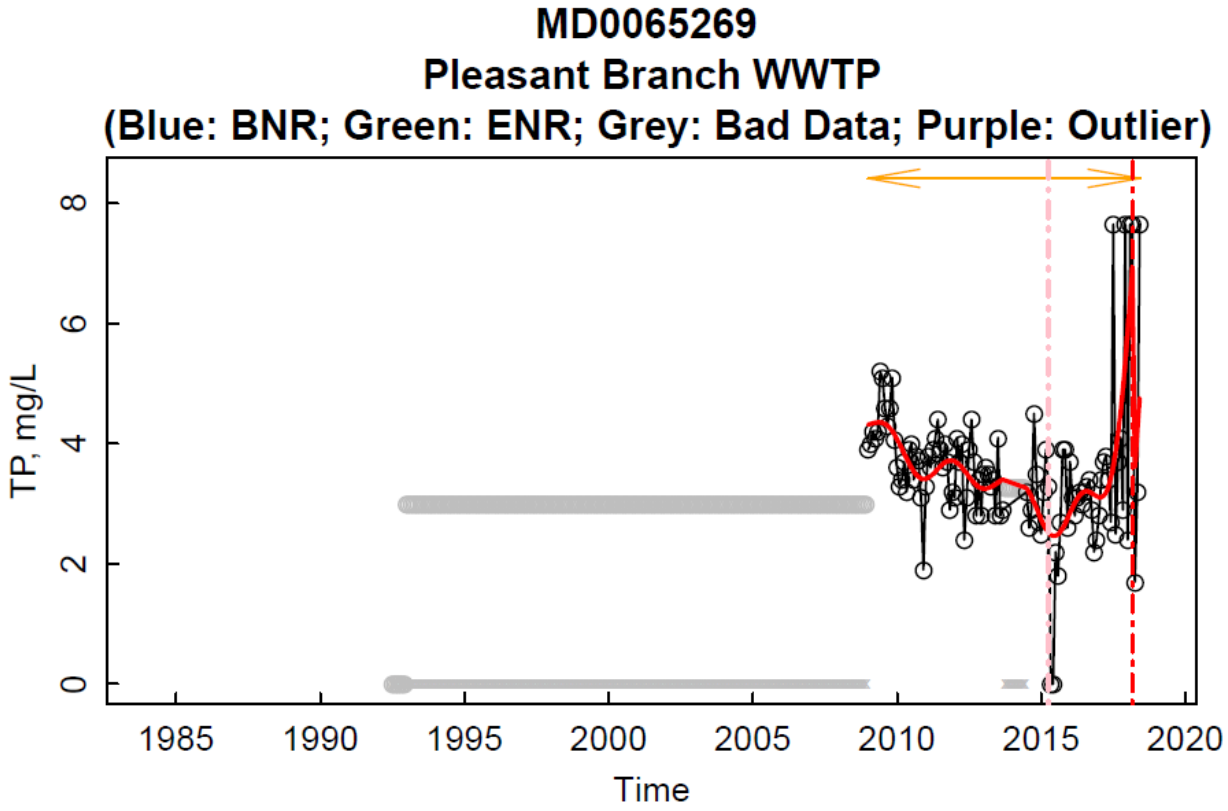

MD0025089
White Rock WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TP, mg/L
0
2
4
6
8
10
1985
1990
1995
2000
2005
2010
2015
2020
Time


MD0020877
Fort Detrick WWTP, Area C
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TP, mg/L
0
2
4
6
1985
1990
1995
2000
2005
2010
2015
2020
Time


MD0021610
Frederick City WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TP, mg/L
0
5
10
1985
1990
1995
2000
2005
2010
2015
2020
Time


MD0021822
Ballenger−McKinney WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TP, mg/L
0
2
4
6
8
10
1985
1990
1995
2000
2005
2010
2015
2020
Time


MD0065439
Mill Bottom WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TP, mg/L
0
1
2
3
4
5
1985
1990
1995
2000
2005
2010
2015
2020
Time


MD0065269
Pleasant Branch WWTP
(Blue: BNR; Green: ENR; Grey: Bad Data; Purple: Outlier)
TP, mg/L
0
2
4
6
8
1985
1990
1995
2000
2005
2010
2015
2020
Time