

Summary of Nitrogen, Phosphorus, and Suspended-Sediment Loads and Trends Measured at the Chesapeake Bay Nontidal Network Stations for Water Years 2011-2020 (version 2.0)

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The Chesapeake Bay nontidal water-quality network (NTN) currently consists of 123 stations located throughout the Chesapeake Bay watershed. Stations are located near U.S. Geological Survey (USGS) stream-flow gages to permit estimates of nutrient and sediment loadings and trends in the amount of loadings delivered downstream. Routine samples are collected monthly, and 8 additional storm-event samples are also collected to obtain a total of 20 samples per year, representing a range of discharge and loading conditions (Chesapeake Bay Program, 2020). The Chesapeake Bay Program (CBP) partnership uses results from this monitoring network to inform restoration strategies and document response to nutrient and sediment reduction efforts.

Patterns in Loads and Trends Across the Chesapeake Bay Watershed (2011–2020)

Changes in loads for nitrogen, phosphorus, and suspended sediment are provided for 2011 through 2020. The monitoring station locations where loads are lower in the end year than in the start year are classified as having improving conditions; whereas, those where the loads are higher in the end year than in the start year are classified as having degrading conditions. A location is classified as having no trend if there is no discernable difference between the loads in the start year and those in the end year.

Most of the NTN sites whose data were used for the analysis had data collected since 2011 (fig. 1; table 1). The total number of NTN stations analyzed for their total nitrogen, total phosphorus, and suspended-sediment loads and trends varies because of the length of the data-collection record and because of the presence/absence of targeted water-quality samples collected during stormflow conditions.

Patterns in Total Nitrogen Loads

- Average annual total nitrogen loads for 2011 through 2020 range from 1.27 pounds per acre (lb/acre) to 32.6 lb/acre (fig. 2) with a combined average load for this period of 7.5 lb/acre. The average annual loads have been divided into three groups representing the following three categories: low (blue), medium (yellow), and high (red; fig. 2).
- Thirty-eight percent of the NTN stations are improving, whereas 42 percent are degrading, and the remaining 20 percent are showing no trend.
 - 34 of 89 stations (38 percent) have improving trends (fig. 5, green blocks) with load reductions ranging from 0.06 to 2.26 lb/acre.
 - 37 of 89 stations (42 percent) have degrading trends (fig. 5, orange blocks), with load increases ranging from 0.02 to 2.62 lb/acre.
 - 18 of 89 stations (20 percent) show no statistical change (fig. 5, grey blocks).

Patterns in Total Phosphorus Loads

- Average annual total phosphorus loads for 2011 through 2020 range from 0.11 lb/acre to 1.89 lb/acre (fig. 3) with a combined average load for this period of 0.47 lb/acre. The average annual loads for phosphorus also are divided into three categories: low (blue), medium (yellow), and high (red; fig. 3).
- Forty-four percent of the NTN stations are improving, whereas 23 percent are degrading, and 33 percent are showing no trend.
 - 31 of 70 stations (44 percent) have improving trends (fig. 5, green blocks), with load reductions ranging from 0.007 to 0.31 lb/acre.

- 16 of 70 stations (23 percent) have degrading trends (fig. 5, orange blocks), with load increases ranging from 0.009 to 0.82 lb/acre.
- 23 of 70 stations (33 percent) show no statistical change (fig. 5, grey blocks).

Patterns in Suspended-Sediment Loads

- Average annual suspended-sediment loads for 2011 through 2020 range from 23.9 to 1,210 lb/acre (fig. 4) with a combined average load for this period of 331 lb/acre. The average annual loads for suspended-sediments also are divided into three categories: low (blue), medium (yellow), and high (red; fig. 4).
- Eighteen percent of the NTN stations are improving, whereas 46 percent are degrading, and 36 percent are showing no trend.
 - 13 of 70 stations (18 percent) have improving trends (fig. 5, green blocks), with load reductions ranging from 16.7 to 552 lb/acre.
 - 32 of 70 stations (46 percent) have degrading trends (fig. 5, orange blocks), with load increases ranging from 9.11 to 2310 lb/acre.
 - 25 of 70 stations (36 percent) show no statistical change (fig. 5, grey blocks).

Methods

Changes in nitrogen, phosphorus, and suspended-sediment loads in rivers across the Chesapeake Bay watershed have been calculated using monitoring data from 123 NTN stations (Mason and others, 2023). Constituent loads are calculated with at least 5 years of monitoring data, and trends are reported after at least 10 years of data collection. Additional information for each monitoring station is available through the USGS website “Water-Quality Loads and Trends at Nontidal Monitoring Stations in the Chesapeake Bay Watershed” (usgs.gov/CB-wq-loads-trends). This website provides State, Federal, and local partners as well as the general public ready access to a wide range of data for nutrient and sediment conditions across the Chesapeake Bay watershed. In this summary, results are reported for the 10-year period from 2011 through 2020. All annual results are based on a water year, which extends from October 1 through September 30.

The USGS computes load and trend results from the NTN to display (1) the range in loads of nitrogen, phosphorus, and suspended sediment; and (2) the trends in these loads. Loads were computed using Weighted Regression on Time, Discharge and Season (WRTDS) bootstrap models (Chanat and others, 2015), which were then flow-normalized (FN) to produce the published trend estimates. The WRTDS serial error from each daily load model was leveraged using a dynamic auto-correlation Kalman-filter adjustment to produce the published loads. This Kalman method for non-FN loads is new for the 2020 results presented here and was first introduced by Zhang and Hirsch (2019) to illustrate a reduction in error in the daily estimations of concentration and load of sampled constituents. The non-FN loads from each NTN station also were normalized by their respective drainage area to present the results as per-acre loads (also known as yields) to facilitate the comparison of loads and trends between sites. The FN trends in loads at the NTN stations remove the year-to-year variability in river flow; by doing so, changes in nitrogen, phosphorus, and suspended-sediment loads resulting from changing sources, delays associated with storage and transport of historical inputs, and (or) implemented management actions are identified.

The Chesapeake Nontidal Monitoring Network and the Role of the USGS

The NTN is a partnership implemented among the States in the watershed, the U.S. Environmental Protection Agency, the USGS, and the Susquehanna River Basin Commission. A network of monitoring stations has been established and is sampled using standardized protocols and quality-assurance procedures designed to measure nitrogen, phosphorus, and suspended-sediment loads and changes in these loads over time. The initial network formed in about 1985 with coordinated monitoring at the nine River Input Monitoring (RIM) stations (table 1; fig. 5). The RIM information is reported every year (Mason and Soroka, 2022).

In 2004, the Chesapeake Bay Program formalized the NTN, and a period of expansion followed. In 2010 and 2011, the network was further expanded to address the Total Maximum Daily Load (TMDL) requirements. The network currently has 123 sites designed to measure changes in nitrogen, phosphorus, and suspended sediment in the Chesapeake Bay watershed. Through this partnership, nitrogen, phosphorus, and suspended-sediment loads and trends are determined based on (1) continuous streamflow monitoring, (2) extensive water-quality sampling, and (3) advanced statistical analysis. The USGS performs the analysis for computing loads and trends.

References Cited

- Chesapeake Bay Program, 2020, Nontidal Water Quality Monitoring Program: Chesapeake Bay Program website, accessed February 4, 2020, at chesapeakebay.net/what/programs/chesapeake_bay_quality_assurance_program/quality_assurance_nontidal_water_quality_monitoring.
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Additional Information and USGS Contacts

For more information on this topic, visit the “Water-Quality Loads and Trends at Nontidal Monitoring Stations in the Chesapeake Bay Watershed” website at usgs.gov/CB-wq-loads-trends, or contact:

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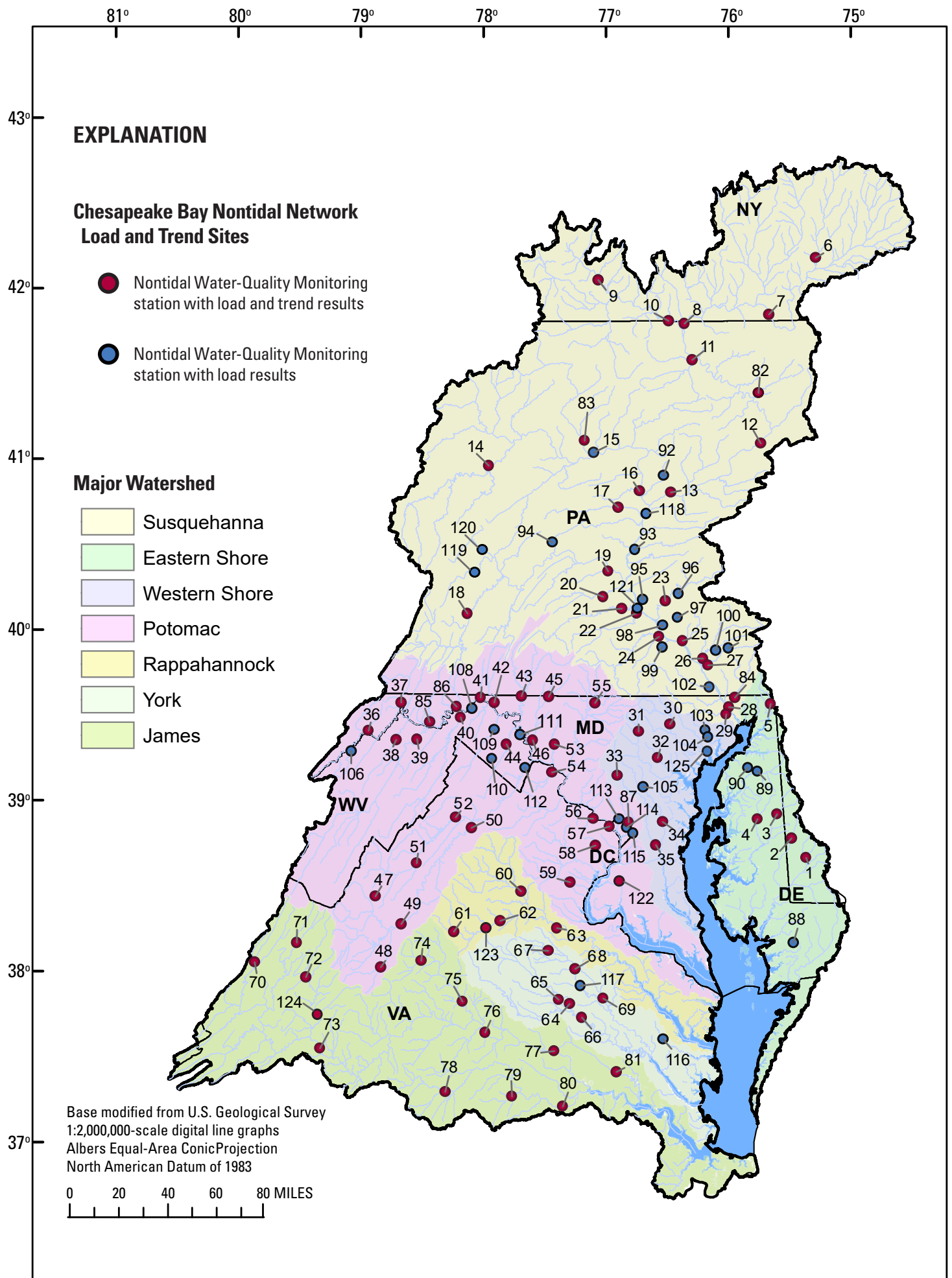


Figure 1. Nontidal network 2020 status. Red stations included in the analysis of loads and trends; blue stations included in the analysis of loads only.

Table 1. Chesapeake Bay nontidal monitoring stations included in the determination of nutrient and suspended sediment loads and trends for the time period 1985 through 2020. Bold colored stations represent the nine River Input Monitoring stations. Stations with monitoring data start date after 2011 will have loads but no trends.

MAP ID	USGS STATION NUMBER	USGS STATION NAME	MAJOR WATERSHED/REGION	Drainage Area (mi ²)	MONITORING DATA	
					START DATE	END DATE
88	01486000	MANOKIN BRANCH NEAR PRINCESS ANNE, MD	Eastern Shore	5	2012	2020
1	01487000	NANTICOKE RIVER NEAR BRIDGEVILLE, DE	Eastern Shore	75	1998	2020
2	01488500	MARSHYHOPE CREEK NEAR ADAMSVILLE, DE	Eastern Shore	47	2005	2020
3	01491000	CHOPTANK RIVER NEAR GREENSBORO, MD	Eastern Shore	113	1985	2020
4	01491500	TUCKAHOE CREEK NEAR RUTHSBURG, MD	Eastern Shore	85	2005	2020
89	01493112	CHESTERVILLE BRANCH NEAR CRUMPTON, MD	Eastern Shore	6	2012	2020
90	01493500	MORGAN CREEK NEAR KENNEDYVILLE, MD	Eastern Shore	13	2012	2020
5	01495000	BIG ELK CREEK AT ELK MILLS, MD	Eastern Shore	52	2005	2020
6	01502500	UNADILLA RIVER AT ROCKDALE NY	Susquehanna	520	2005	2020
7	01503000	SUSQUEHANNA RIVER AT CONKLIN NY	Susquehanna	2,232	2006	2020
8	01515000	SUSQUEHANNA RIVER NEAR WAVERLY NY	Susquehanna	4,773	2005	2020
9	01529500	COHOCTON RIVER NEAR CAMPBELL NY	Susquehanna	470	2006	2020
10	01531000	CHEMUNG RIVER AT CHEMUNG NY	Susquehanna	2,506	2005	2020
11	01531500	SUSQUEHANNA RIVER AT TOWANDA, PA	Susquehanna	7,797	1985	2020
82	01534000	TUNKHANNOCK CREEK NEAR TUNKHANNOCK, PA	Susquehanna	383	2009	2020
12	01536500	SUSQUEHANNA RIVER AT WILKES-BARRE, PA	Susquehanna	9,960	1985	2020
13	01540500	SUSQUEHANNA RIVER AT DANVILLE, PA	Susquehanna	11,220	1985	2020
14	01542500	WB SUSQUEHANNA RIVER AT KARTHAUS, PA	Susquehanna	1,462	2005	2020
83	01549700	PINE CREEK BL L PINE CREEK NEAR WATERVILLE, PA	Susquehanna	944	2007	2020
15	01549760	WB SUSQUEHANNA RIVER AT JERSEY SHORE, PA	Susquehanna	5,225	2015	2020
16	01553500	WEST BRANCH SUSQUEHANNA RIVER AT LEWISBURG, PA	Susquehanna	6,847	1985	2020
92	01553850	CHILLISQUAQUE CREEK NEAR POTTS GROVE, PA	Susquehanna	51	2014	2020
118	01554000	SUSQUEHANNA RIVER AT SUNBURY, PA	Susquehanna	18,300	2012	2020
17	01555000	PENNS CREEK AT PENNS CREEK, PA	Susquehanna	301	2005	2020
93	01555500	EAST MAHANTANGO CREEK NEAR DALMATIA, PA	Susquehanna	162	2012	2020
119	01556000	FRANKSTOWN BR JUNIATA RIVER AT WILLIAMSBURG, PA	Susquehanna	291	2012	2020
120	01558000	LITTLE JUNIATA RIVER AT SPRUCE CREEK, PA	Susquehanna	220	2012	2020
18	01562000	RAYSTOWN BRANCH JUNIATA RIVER AT SAXTON, PA	Susquehanna	756	2005	2020
94	01565000	KISHACOQUILLAS CREEK AT REEDSVILLE, PA	Susquehanna	164	2012	2020
19	01567000	JUNIATA RIVER AT NEWPORT, PA	Susquehanna	3,354	1985	2020
20	01568000	SHERMAN CREEK AT SHERMANS DALE, PA	Susquehanna	207	2005	2020
21	01570000	CONODOGUINET CREEK NEAR HOGESTOWN, PA	Susquehanna	470	2005	2020
121	01570500	SUSQUEHANNA RIVER AT HARRISBURG, PA	Susquehanna	24,100	2012	2020
95	01571005	PAXTON CREEK NEAR GLENNWOOD, PA	Susquehanna	11	2013	2020
22	01571500	YELLOW BREECHES CREEK NEAR CAMP HILL, PA	Susquehanna	213	2005	2020
96	01573160	QUITTAPAHILLA CREEK NEAR BELLEGROVE	Susquehanna	74	2013	2020
23	01573560	SWATARA CREEK NEAR HERSHEY, PA	Susquehanna	483	2005	2020
97	01573695	CONEWAGO CREEK NEAR BELLAIRE, PA	Susquehanna	21	2013	2020
98	01573710	CONEWAGO CREEK NEAR FALMOUTH, PA	Susquehanna	48	2012	2020
24	01574000	WEST CONEWAGO CREEK NEAR MANCHESTER, PA	Susquehanna	510	2005	2020
99	01575585	CODORUS CREEK NEAR PLEASUREVILLE, PA	Susquehanna	267	2013	2020
25	01576000	SUSQUEHANNA RIVER AT MARIETTA, PA	Susquehanna	25,990	1987	2020

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					START DATE	END DATE
100	015765195	BIG SPRING RUN NEAR MYLIN CORNERS, PA	Susquehanna	2	2012	2020
26	01576754	CONESTOGA RIVER AT CONESTOGA, PA	Susquehanna	470	1985	2020
101	01576767	PEQUEA CREEK NEAR RONKS, PA	Susquehanna	70	2013	2020
27	01576787	PEQUEA CREEK AT MARTIC FORGE, PA	Susquehanna	148	2005	2020
102	01577500	MUDDY CREEK AT CASTLE FIN, PA	Susquehanna	133	2015	2020
28	01578310	SUSQUEHANNA RIVER AT CONOWINGO, MD	Susquehanna	27,100	1985	2020
84	01578475	OCTORARO CREEK NEAR RICHARDSMERE, MD	Susquehanna	177	2007	2020
29	01580520	DEER CREEK NEAR DARLINGTON, MD	Susquehanna	164	2006	2020
103	01581752	PLUMTREE RUN NEAR BEL AIR, MD	Western Shore	3	2013	2020
104	0158175320	WHEEL CREEK NEAR ABINGDON, MD	Western Shore	1	2012	2020
30	01582500	GUNPOWDER FALLS AT GLENCOE, MD	Western Shore	160	1985	2020
125	01585075	FOSTER BRANCH NEAR JOPPATOWNE, MD	Western Shore	2	2016	2020
31	01586000	NORTH BRANCH PATAPSCO RIVER AT CEDARHURST, MD	Western Shore	57	1985	2020
32	01589300	GWYNNNS FALLS AT VILLA NOVA, MD	Western Shore	32	2003	2020
33	01591000	PATUXENT RIVER NEAR UNITY, MD	Western Shore	35	1985	2020
105	01593500	LITTLE PATUXENT RIVER AT GUILFORD, MD	Western Shore	38	2012	2020
34	01594440	PATUXENT RIVER NEAR BOWIE, MD	Western Shore	348	1985	2020
35	01594526	WESTERN BRANCH AT UPPER MARLBORO, MD	Western Shore	90	2006	2020
106	01595300	ABRAM CREEK AT OAKMONT, WV	Potomac	43	2013	2020
36	01599000	GEORGES CREEK AT FRANKLIN, MD	Potomac	72	1985	2020
37	01601500	WILLS CREEK NEAR CUMBERLAND, MD	Potomac	247	1985	2020
38	01604500	PATTERSON CREEK NEAR HEADSVILLE, WV	Potomac	221	2006	2020
39	01608500	SOUTH BRANCH POTOMAC RIVER NEAR SPRINGFIELD, WV	Potomac	1,461	2006	2020
85	01609000	TOWN CREEK NEAR OLDTOWN, MD	Potomac	148	2007	2020
86	01610155	SIDELING HILL CREEK NEAR BELLEGROVE, MD	Potomac	102	2007	2020
40	01611500	CACAPON RIVER NEAR GREAT CACAPON, WV	Potomac	675	2006	2020
108	01613030	WARM SPRINGS RUN NEAR BERKELEY SPRINGS, WV	Potomac	7	2012	2020
41	01613095	TONOLOWAY CREEK NEAR HANCOCK, MD	Potomac	111	2006	2020
42	01613525	LICKING CREEK AT PECTONVILLE, MD	Potomac	193	2006	2020
109	01614000	BACK CREEK NEAR JONES SPRINGS, WV	Potomac	235	2012	2020
43	01614500	CONOCOCHIEGUE CREEK AT FAIRVIEW, MD	Potomac	494	1985	2020
110	01616400	MILL CREEK AT BUNKER HILL, WV	Potomac	18	2012	2020
44	01616500	OPEQUON CREEK NEAR MARTINSBURG, WV	Potomac	273	2006	2020
111	01618100	ROCKYMARSH RUN AT SCRABBLE, WV	Potomac	16	2012	2020
45	01619000	ANTIETAM CREEK NEAR WAYNESBORO, PA	Potomac	93	2006	2020
46	01619500	ANTIETAM CREEK NEAR SHARPSBURG, MD	Potomac	281	1985	2020
47	01621050	MUDDY CREEK AT MOUNT CLINTON, VA	Potomac	14	1994	2020
48	01626000	SOUTH RIVER NEAR WAYNESBORO, VA	Potomac	127	1985	2020
49	01628500	S F SHENANDOAH RIVER NEAR LYNNWOOD, VA	Potomac	1,079	1985	2020
50	01631000	S F SHENANDOAH RIVER AT FRONT ROYAL, VA	Potomac	1,634	1985	2020
51	01632900	SMITH CREEK NEAR NEW MARKET, VA	Potomac	94	1985	2020
52	01634000	N F SHENANDOAH RIVER NEAR STRASBURG, VA	Potomac	770	1985	2020

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					START DATE	END DATE
112	01636500	SHENANDOAH RIVER AT MILLVILLE, WV	Potomac	3,041	2013	2020
53	01637500	CATOCTIN CREEK NEAR MIDDLETOWN, MD	Potomac	67	1985	2020
54	01638480	CATOCTIN CREEK AT TAYLORSTOWN, VA	Potomac	89	1985	2020
55	01639000	MONOCACY RIVER AT BRIDGEPORT, MD	Potomac	173	1985	2020
56	01646000	DIFFICULT RUN NEAR GREAT FALLS, VA	Potomac	58	1985	2020
57	01646580	POTOMAC RIVER AT CHAIN BRIDGE, AT WASHINGTON, DC	Potomac	11,570	1985	2020
113	01648010	ROCK CREEK AT JOYCE ROAD, WASHINGTON, DC	Potomac	64	2013	2020
87	01651000	NORTHWEST BR ANACOSTIA RIVER NR HYATTSVILLE, MD	Potomac	49	2007	2020
114	01651770	HICKEY RUN AT NEW YORK AVENUE AT WASHINGTON, DC	Potomac	1	2013	2020
115	01651800	WATTS BRANCH AT WASHINGTON, DC	Potomac	3	2013	2020
58	01654000	ACCOTINK CREEK NEAR ANNANDALE, VA	Potomac	24	1991	2020
122	01658000	MATTAWOMAN CREEK NEAR POMONKEY, MD	Potomac	55	2002	2020
59	01658500	S F QUANTICO CREEK NEAR INDEPENDENT HILL, VA	Potomac	8	1994	2020
60	01664000	RAPPAHANNOCK RIVER AT REMINGTON, VA	Virginia	619	1985	2020
61	01665500	RAPIDAN RIVER NEAR RUCKERSVILLE, VA	Virginia	115	2003	2020
123	01666500	ROBINSON RIVER NEAR LOCUST DALE, VA	Virginia	179	1985	2020
62	01667500	RAPIDAN RIVER NEAR CULPEPER, VA	Virginia	468	2005	2020
63	01668000	RAPPAHANNOCK RIVER NEAR FREDERICKSBURG, VA	Virginia	1,595	1985	2020
116	01669520	DRAGON SWAMP AT MASCOT, VA	Virginia	109	2012	2020
64	01671020	NORTH ANNA RIVER AT HART CORNER NEAR DOSWELL, VA	Virginia	462	1985	2020
65	01671100	LITTLE RIVER NEAR DOSWELL, VA	Virginia	107	2001	2020
66	01673000	PAMUNKEY RIVER NEAR HANOVER, VA	Virginia	1,078	1985	2020
67	01673800	PO RIVER NEAR SPOTSYLVANIA, VA	Virginia	78	1987	2020
68	01674000	MATTAPONI RIVER NEAR BOWLING GREEN, VA	Virginia	256	1985	2020
117	01674182	POLECAT CREEK AT ROUTE 301 NEAR PENOLA, VA	Virginia	49	2014	2020
69	01674500	MATTAPONI RIVER NEAR BEULAHVILLE, VA	Virginia	603	1985	2020
70	02011500	BACK CREEK NEAR MOUNTAIN GROVE, VA	Virginia	134	1985	2020
71	02015700	BULLPASTURE RIVER AT WILLIAMSVILLE, VA	Virginia	110	1985	2020
72	02020500	CALFPASTURE RIVER ABOVE MILL CREEK AT GOSHEN, VA	Virginia	141	1999	2020
124	02024000	MAURY RIVER NEAR BUENA VISTA, VA	Virginia	647	1985	2020
73	02024752	JAMES RIVER AT BLUE RIDGE PKWY NR BIG ISLAND, VA	Virginia	3,076	2006	2020
74	02031000	MECHUMS RIVER NEAR WHITE HALL, VA	Virginia	95	1985	2020
75	02034000	RIVANNA RIVER AT PALMYRA, VA	Virginia	663	1985	2020
76	02035000	JAMES RIVER AT CARTERSVILLE, VA	Virginia	6,252	1985	2020
77	02037500	JAMES RIVER NEAR RICHMOND, VA	Virginia	6,753	1985	2020
78	02039500	APPOMATTOX RIVER AT FARMVILLE, VA	Virginia	302	1985	2020
79	02041000	DEEP CREEK NEAR MANNBORO, VA	Virginia	158	1991	2020
80	02041650	APPOMATTOX RIVER AT MATOACA, VA	Virginia	1,342	1985	2020
81	02042500	CHICKAHOMINY RIVER NEAR PROVIDENCE FORGE, VA	Virginia	251	1985	2020

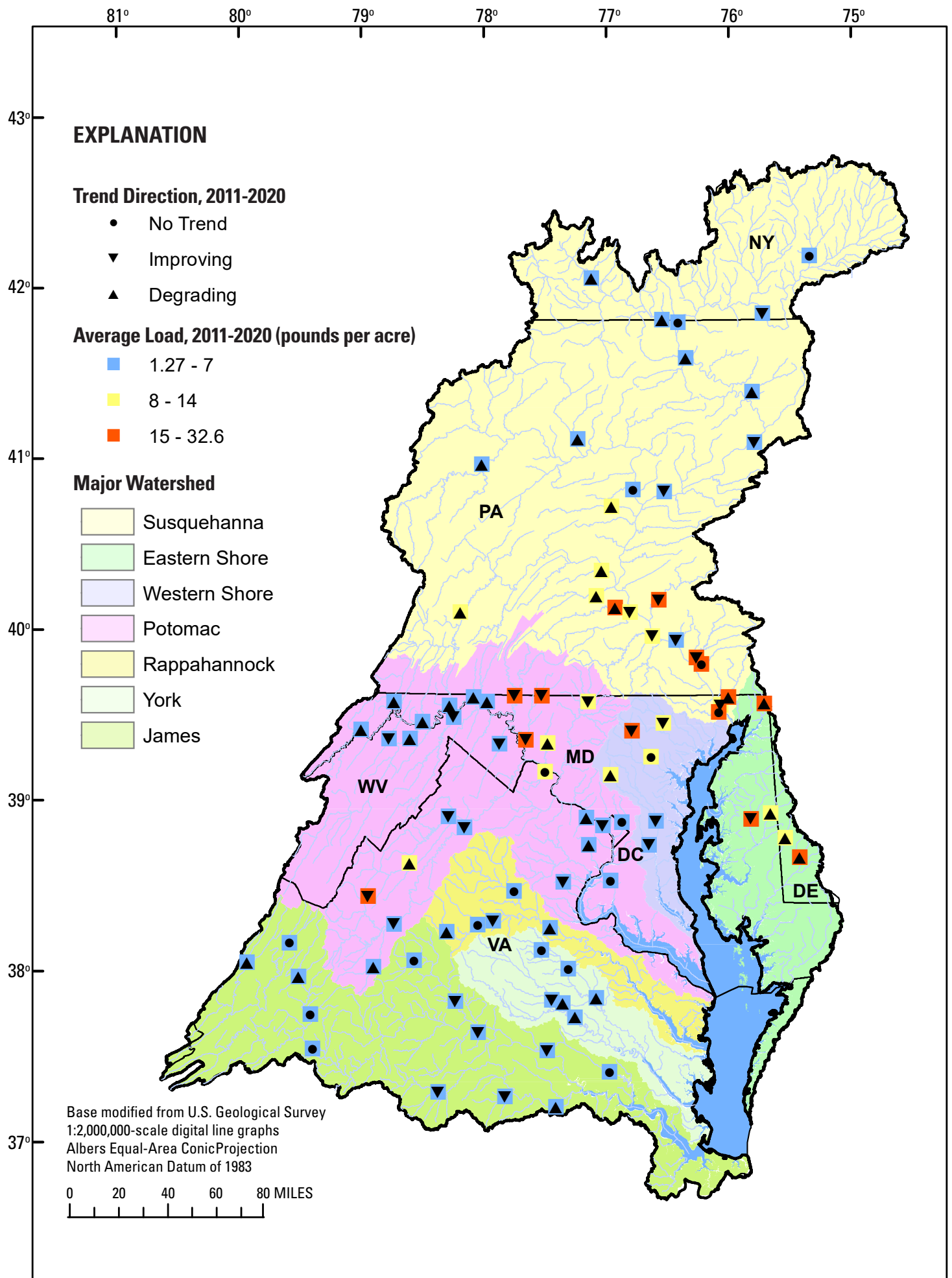


Figure 2. Total nitrogen per acre loads and trends in loads, 2011-20, for selected monitoring stations.

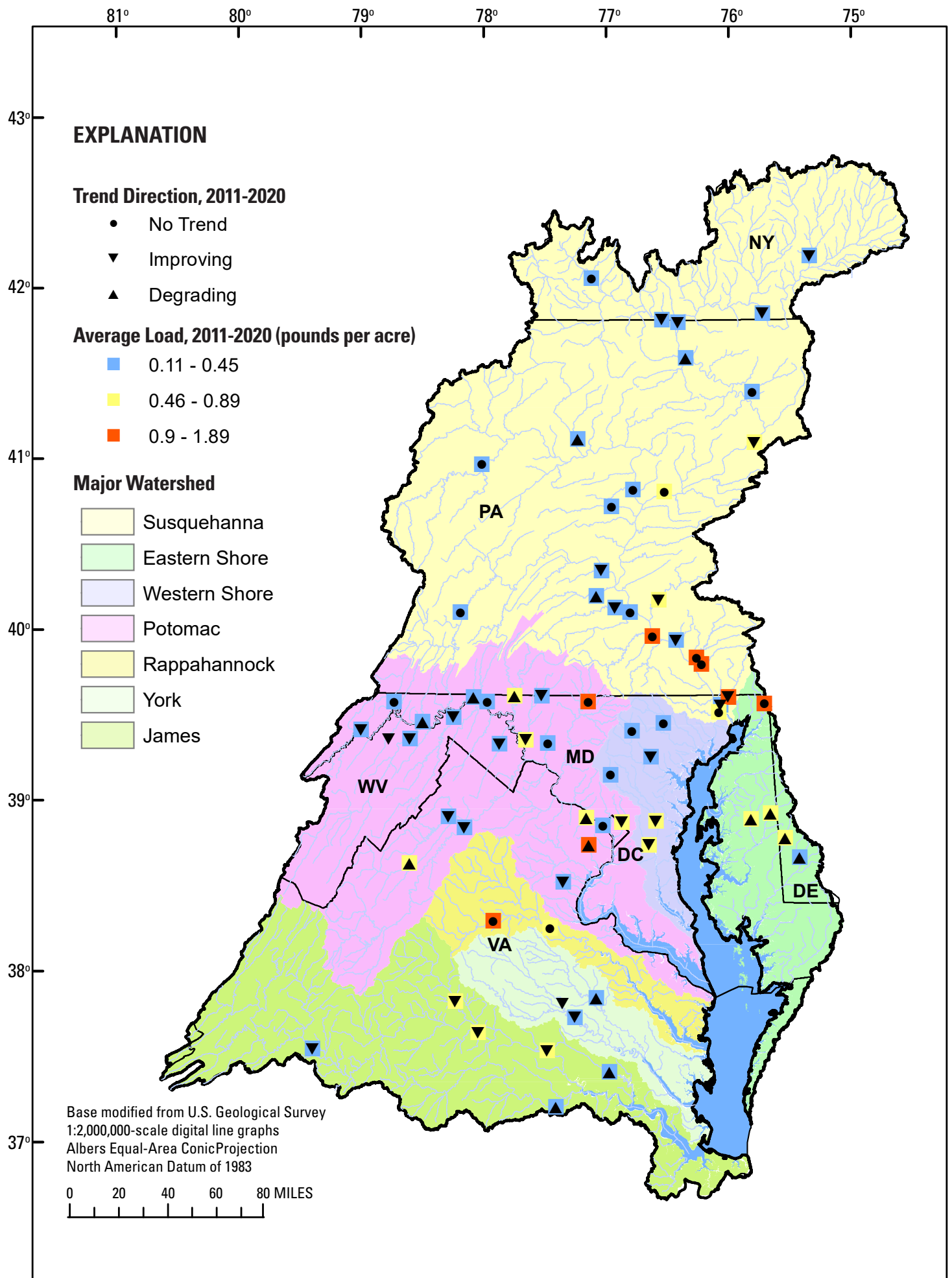


Figure 3. Total phosphorus per acre loads and trends in loads, 2011-20, for selected monitoring stations.

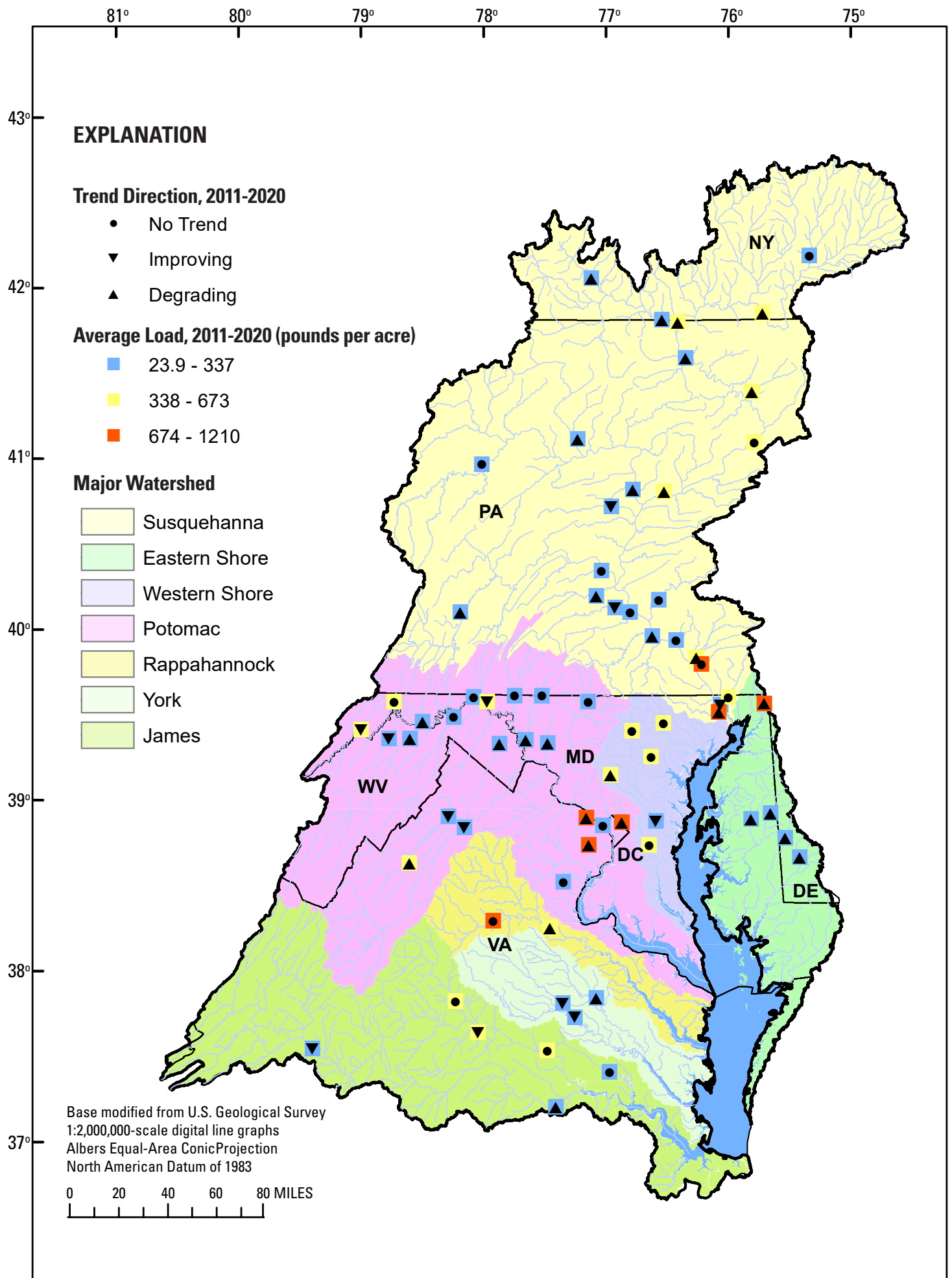


Figure 4. Total suspended sediment per acre loads and trends in loads, 2011-20, for selected monitoring stations.

EXPLANATION

Trend Direction, 2011-2020

	Degrading
	Improving
	No Trend

Note:
Improving/degrading trends classified as likelihood estimates greater than or equal to 67 percent.

► Constituents from left-to-right: TN (total nitrogen), N+N (nitrate plus nitrite), TP (total phosphorus), DIP (orthophosphate), SS (suspended sediment). White space denotes less than ten years of data.

	TN	N+N	TP	DIP	SS		TN	N+N	TP	DIP	SS		
SUSQUEHANNA	01502500	1.97	15.7	-25	-45.3	-1.55	POTOMAC	01599000	3.46	16.3	-23	-42.6	-10.3
	01503000	-2.81	1.31	-2.19	-54.5	98.2		01601500	24.5	33	4.03	-33.1	33
	01515000	2.88	5.13	-16	-41.8	104		01604500	-5.39	-0.852	-53.8	-34.5	-16.4
	01529500	6.16	21	-14.6	-57.2	8.94		01608500	8.52	3.26	-47.2	-83.5	41.5
	01531000	7.38	13.2	-24.8	-60.1	70.8		01609000	23	34.1	58.5		24.8
	01531500	4.05	5.49	25.6	-53.3	90.4		01610155	7.94	36.2			
	01534000	16.8	21.4	22.3	25.7	91.7		01611500	-10.2	-14.2	-33.1		4.36
	01536500	-1.36	5.07	-7.64	-41.7	12.2		01613095	32	41.1	21.7		8.43
	01540500	-4.54	0.516	-0.901	-54	34.6		01613525	20.6	18.4	-6.51	-38.8	-55.7
	01542500	6.1	17.3	-6.02		14.3		01614500	-3.56	-8.07	34.4	-1.34	15.6
	01549700	19.6	43	29.5		72.2		01616500	-9.42	-7.05	-58.2	-78.5	39.5
	01553500	-0.754	5.03	-3.97	-34	25.3		01619000	-11.6	-14.8	-24.9	-43.7	-5.16
	01555000	7.33	11	1.47	12.1	-17.5		01619500	-8.86	-14.1	-10.5	-41.6	67.4
	01562000	15.1	18	12.1	2.08	28.7		01621050	-10.2	-10.5			
	01567000	9.36	15.6	-16.2	-19.7	-1.89		01626000	14	29.7			
	01568000	15.8	15.5	23.1	22.8	32.8		01628500	-4.09	1.67			
	01570000	3.45	2.96	-11.8	-12	-13.9		01631000	-6.26	9.86	-26.2	-23.9	-23.6
	01571500	-5.65	-8.92	10.1	16	31.6		01632900	7.83	8.11	31.7	-22.4	73.9
	01573560	-6.9	-9.61	-13.2	-18.6	-15		01634000	-6.27	10.4	-43.5	-38.4	-49.7
	01574000	-1.97	-7.3	5.67	9.52	16.1		01637500	15.6	21.6	1.33	-13.3	29.6
01576000	-6.01	-1.64	-13.4	-13.2	0.774	01638480	2.49	13.7					
01576754	-7.65	-9.25	-3.17	-13.3	18.7	01639000	-5.49	5.45	-7.23	2.34	-9.79		
01576787	-2.9	-5.45	9.15	-10.4	20	01646000	11.5	21.2	65	43.6	128		
01578310	-3.24	7.64	-25	-14.1	-34.4	01646580	-4.14	3.64	-6.06	-30.6	6		
01578475	0.0561	0.929	-13.2	-23	5.87	01651000	-7.09	12.9	-15.4	-1.26	19.1		
01580520	-0.173	0.773	5.19	-29	40.2	01654000	7.32	-7.64	99.9	37.9	267		
EASTERN SHORE		TN	N+N	TP	DIP	SS	01658000	2.66	-8.19				
	01487000	7.05	8.96	57.6	-11.8	80.8	01658500	-11.7	-6.14	-10.7	27.5	-6.94	
	01488500	22	24	61.7	62.6	63.6							
	01491000	5.98	1.7	37.8	51	24							
	01491500	-4.33	-7.64	32.3	38.9	36.2							
	01495000	5.6	3.98	0.112	-16.8	24.7							
			TN	N+N	TP	DIP	SS						
WESTERN SHORE	01582500	-2.97	-2.46	8.36	-26.1	49.5							
	01586000	-5.62	-4.17	-8.61	-12.8	8.42							
	01589300	-3.4	9.24	-11.6	-27.9	9.72							
	01591000	10.4	9.83	3.26	17.2	33.1							
	01594440	-16.6	-18.8	-26.8	-20.4	-27.4							
	01594526	-5.03	9.34	-9.17	-6.51	-0.887							
		TN	N+N	TP	DIP	SS							
VIRGINIA							01664000	-0.681	7.25				
							01665500	6.08	21.7				
							01666500	6.13	21.8				
							01667500	-10.8	5.15	-2.21	14.2	0.557	
							01668000	5.5	14.8	13.7	6.77	16.1	
							01671020	3.57	48.2	-5.08		-13.1	
							01671100	-15.6	5.19				
							01673000	6.29	22.7	-5.22	-10.3	-16.4	
							01673800	2.36	16.7				
							01674000	1.68	28.3				
							01674500	10.5	45.7	6.24	-0.538	25	
							02011500	16.9	28.1				
							02015700	3.06	17.7				
							02020500	24.8	39.8				
						02024000	1.55	18.5					
						02024752	-2.53	19.4	-10.5	-12.2	-12.6		
						02031000	1.7	22.4					
						02034000	-21	-14.7	-18.8	-19.2	-22.1		
						02035000	-6.17	3.86	-14.2	-11.1	-11		
						02037500	-19.2	6.41	-4.01		4.49		
						02039500	-7.66	23.2					
						02041000	-3.22	12.8					
						02041650	17.1	28.4	24.5	48.3	29.7		
						02042500	-0.175	144	8.75		25.5		

Figure 5. Trend direction (color) and percent change in flow-normalized load (numbers) at the nontidal network, 2011-2020. Bold colored stations represent the nine River Input Monitoring stations. Each region is ordered from top-to-bottom in a downstream direction.