MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

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Non-tidal long-term monitoring program trends results through 2024

September 2025

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The Maryland Department of Natural Resources regularly monitors non-tidal waters at 51 long-term non-tidal monitoring program stations. Historically, 53 sites have been sampled; however, station POT1472 was not sampled in 2021 or 2022 because of a land dispute that shut down the ferry and was discontinued officially in 2022. Likewise, bridge construction made station MON0020 unsafe to sample in 2022 and this station was also discontinued. Monitoring data provide information on the past and present concentrations of pollutants in our waterways. Monitoring data cannot, however, identify the sources of the pollutants nor predict future pollutant loads resulting from planned pollutant reduction efforts, the impacts of climate change, growth, etc.; for that information, we must depend on models and additional information.

This document consists only of a description of temporal trend analysis results from long-term non-tidal monitoring program concentration data. It does not employ other models or incorporate other information or data to interpret results. However, knowledge of trends in water quality conditions is useful for understanding and reporting on the water quality condition of Maryland's waters.

Water quality trends are calculated according to a generalized additive model (GAM), applied using the Baytrends R package which was developed by the Chesapeake Bay Program (Murphy et al. 2019). Each station and parameter is analyzed separately, and a GAM is derived from all the data for that station from 1986-2024. The trend significance and amount of change are determined using the two-year means for the start and end of the trend period of interest, 1999/2000 and 2023/2024. Each mean is calculated from the 24 values predicted by the GAM for the 15th of each month within each two-year time period. This method ensures that 24 values are always available for the calculation, as data are drawn from the predictive model rather than from the raw dataset that may be impacted by missing samples or irregular sampling intervals. Although data from 1986 to the present are included in the analysis, trends are summarized here for the 1999 to the present time period to remain consistent with tidal trends reporting for public audiences, including the Joint Chairman's Report and the Integrated Assessment (reporting by Maryland Dept of the Environment), and funding is not available for further analysis.

Trends are determined using a flow-adjustment method. The flow-adjusted method uses daily flow data from the closest USGS gage with a measurement for the entire 1986-2024 period for each station to include the impact of changes in river flow on the nutrients and sediment levels; higher nutrients and sediments are associated with high river flows. Changes in the levels of nutrients and sediments are flow-adjusted by using flow as one of the factors that determine the differences in concentrations between years. The flow-adjusted method is much more robust for determining the changes in water quality concentrations over a long-time period. A more detailed analysis method description is available on the Eyes on the Bay website (https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/MDNR106draftQAPP_1920.pdf).

Statistical analysis of monitoring data collected at long-term non-tidal stations from 1999 through 2024 demonstrated significant reductions in nitrogen concentrations at 76% of non-tidal stations (Figure 1), phosphorus concentrations at 55% of non-tidal stations (Figure 2), and sediment concentrations at 24% of non-tidal stations (Figure 3) , dissolved inorganic nitrogen concentrations at 61% of non-tidal stations (Figure 4), orthophosphate concentrations at 49% of non-tidal stations (Figure 5), water temperature at 0% of non-tidal stations (Figure 6), conductivity at 27% of non-tidal stations (Figure 7), and dissolved oxygen concentration at 49% of non-tidal stations (Figure 8).

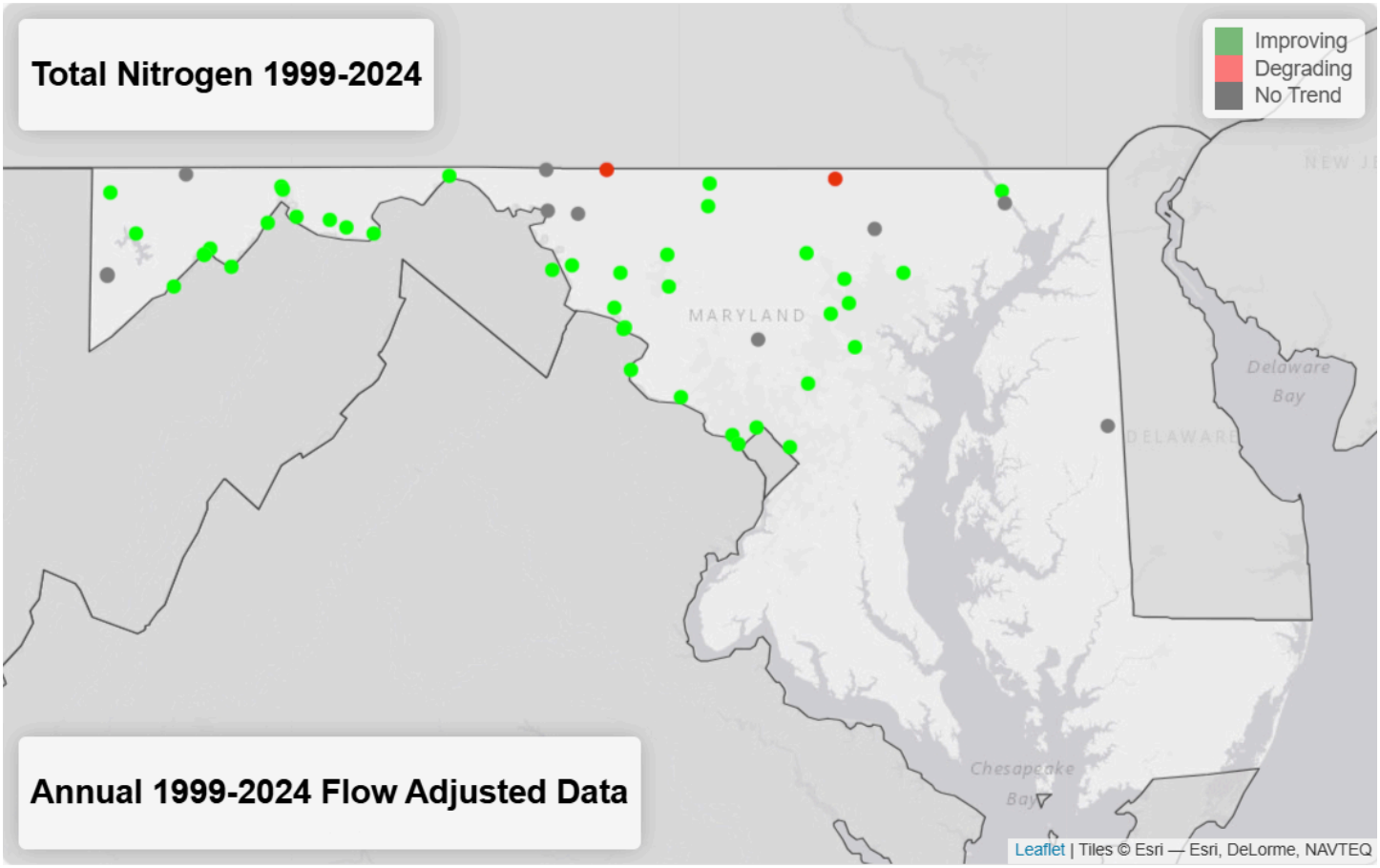

Figure 1. Trends in flow-adjusted total nitrogen concentrations 1999–2024

- 76% of stations (39 of 51) have improved total nitrogen levels compared to 1999
- 4% of stations (2 of 51) have degraded total nitrogen levels compared to 1999
- 20% of stations (10 of 51) do not have total nitrogen levels that are significantly different from 1999

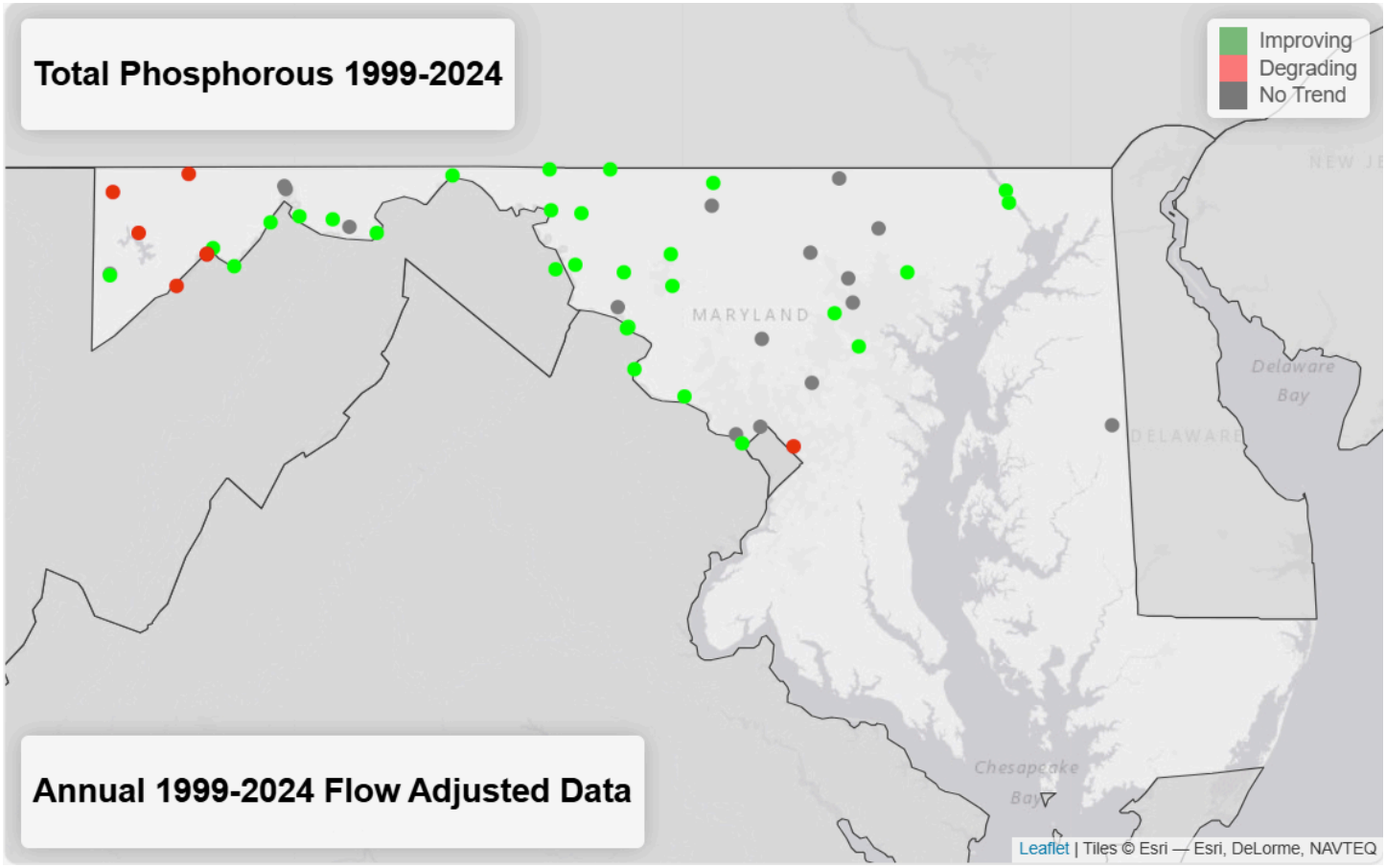

Figure 2. Trends in flow-adjusted total phosphorus concentrations 1999–2024

- 55% of stations (28 of 51) have improved total phosphorus levels compared to 1999
- 14% of stations (7 of 51) have degraded total phosphorus levels compared to 1999
- 31% of stations (16 of 51) do not have total phosphorus levels that are significantly different from 1999

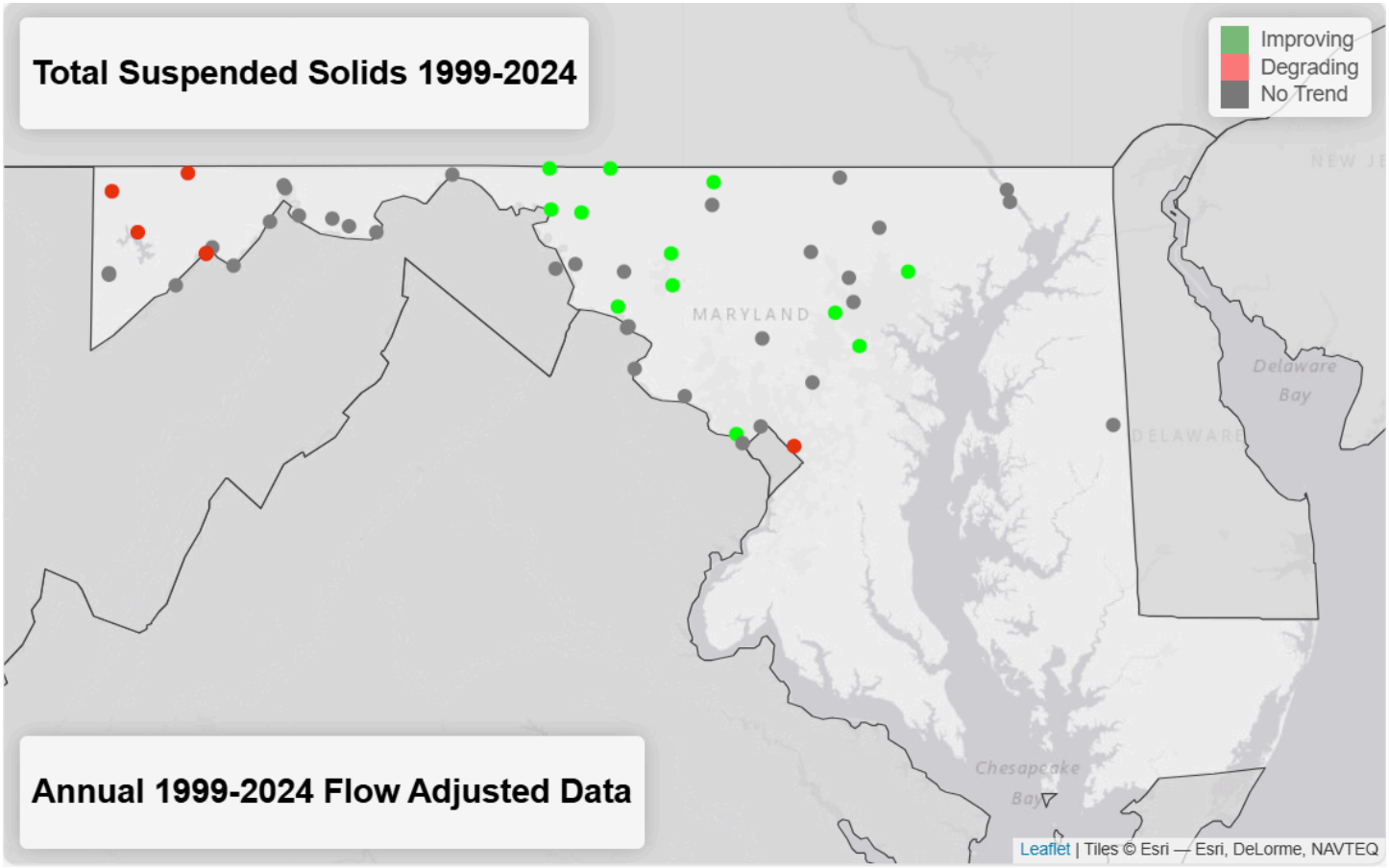

Figure 3. Trends in flow-adjusted total suspended solids concentrations 1999–2024

- 24% of stations (12 of 51) have improved total suspended solids levels compared to 1999
- 12% of stations (6 of 51) have degraded total suspended solids levels compared to 1999
- 64% of stations (33 of 51) do not have total suspended solids levels that are significantly different from 1999

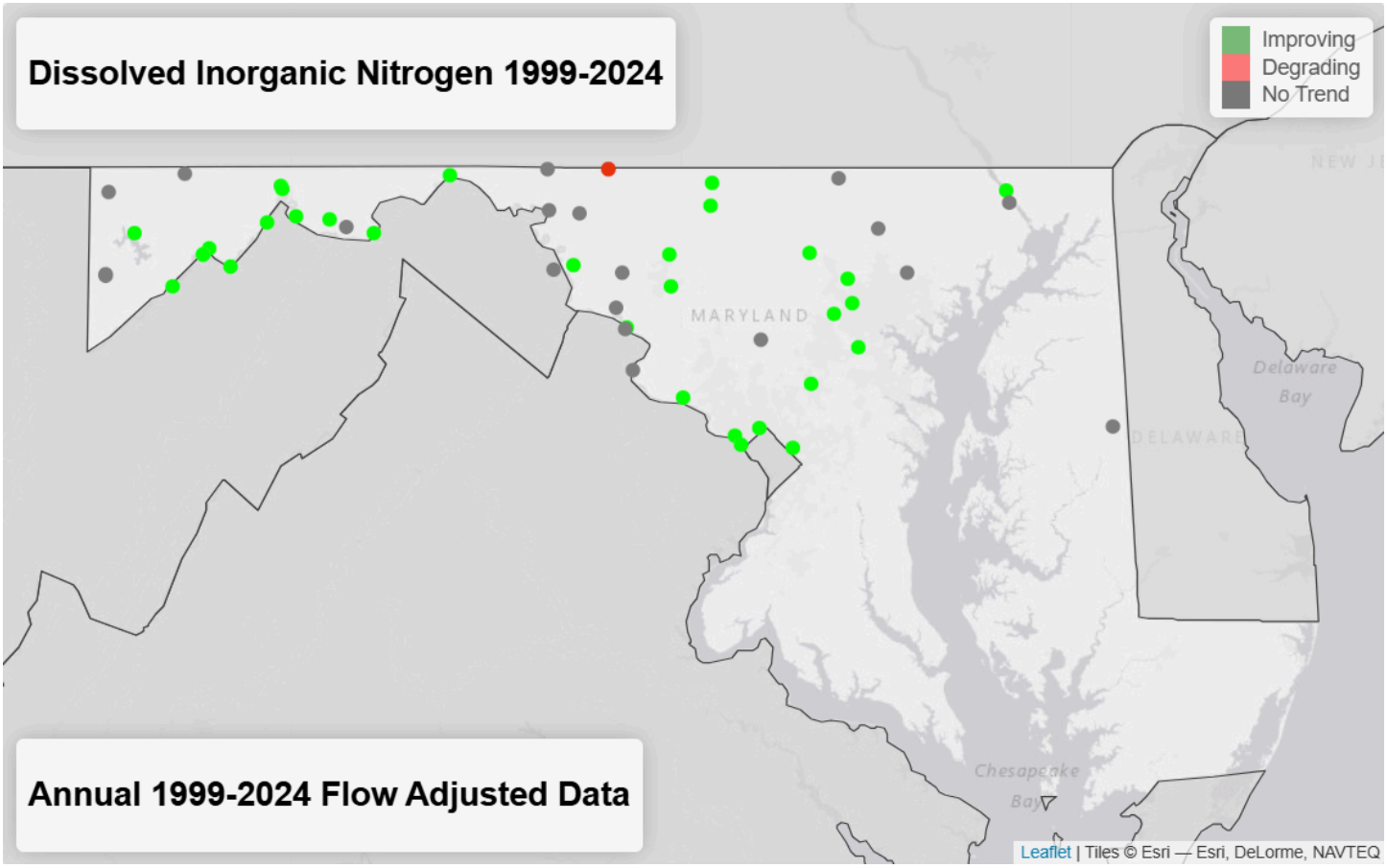

Figure 4. Trends in flow-adjusted dissolved inorganic nitrogen concentrations 1999–2024

- 61% of stations (31 of 51) have improved dissolved inorganic nitrogen levels compared to 1999
- 2% of stations (1 of 51) have degraded dissolved inorganic nitrogen levels compared to 1999
- 37% of stations (19 of 51) do not have dissolved inorganic nitrogen levels that are significantly different from 1999

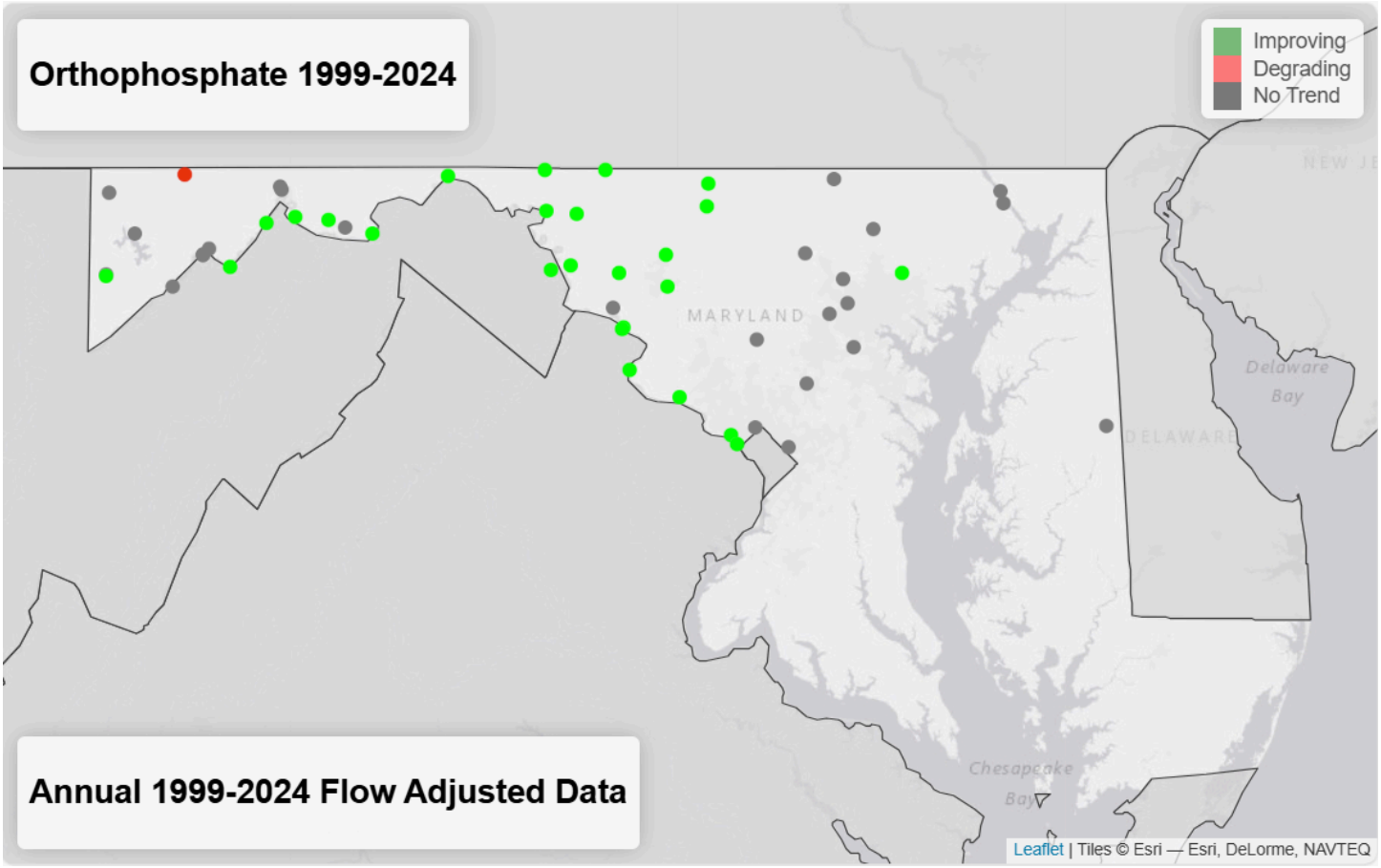

Figure 5. Trends in flow-adjusted orthophosphate concentrations 1999–2024

- 49% of stations (25 of 51) have improved orthophosphate levels compared to 1999
- 2% of stations (1 of 51) have degraded orthophosphate levels compared to 1999
- 49% of stations (25 of 51) do not have orthophosphate levels that are significantly different from 1999

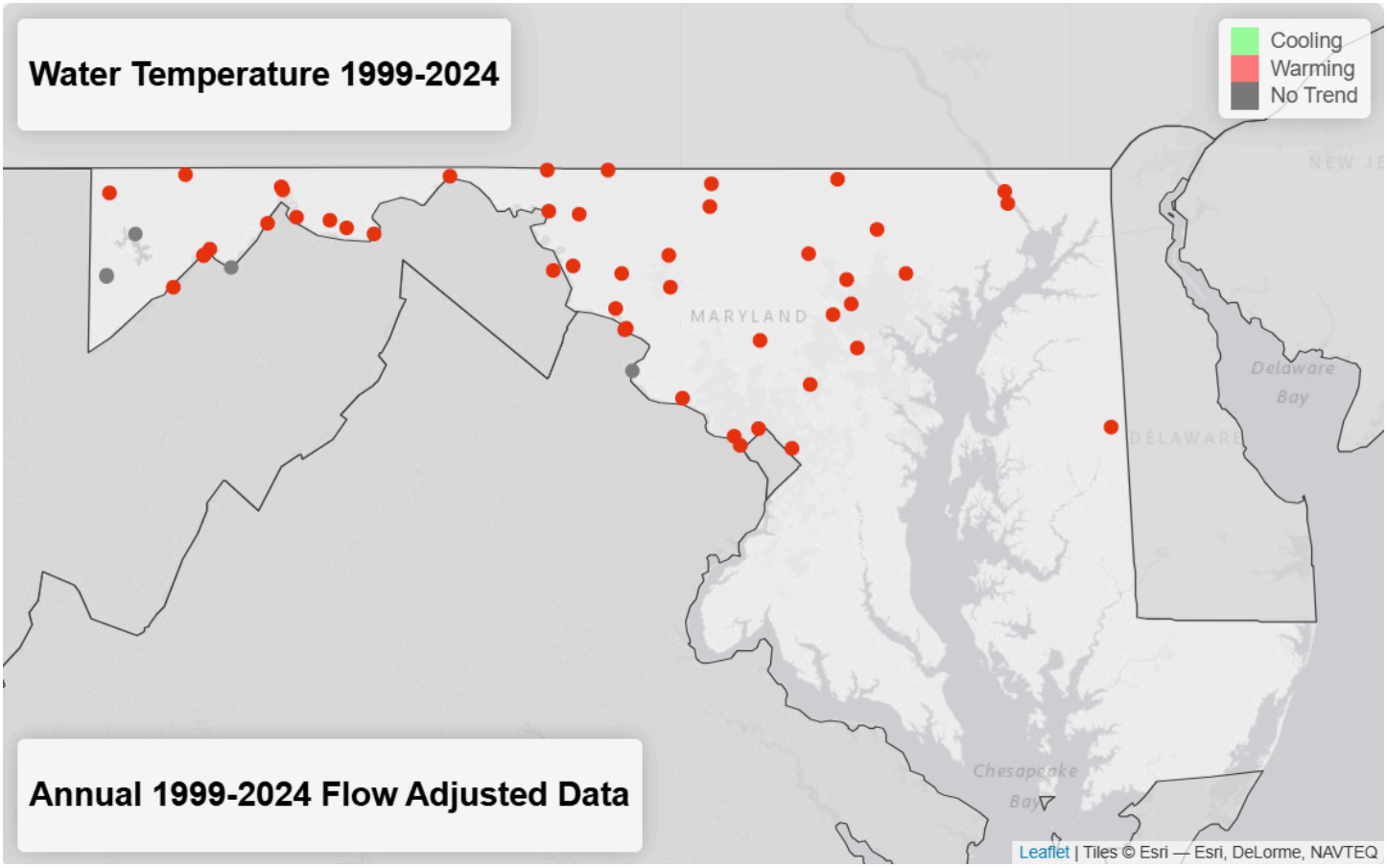

Figure 6. Trends in flow-adjusted water temperatures 1999–2024

- 0% of stations (0 of 51) have cooling water temperature levels compared to 1999
- 90% of stations (46 of 51) have warming water temperature levels compared to 1999
- 10% of stations (4 of 51) do not have water temperature levels that are significantly different from 1999

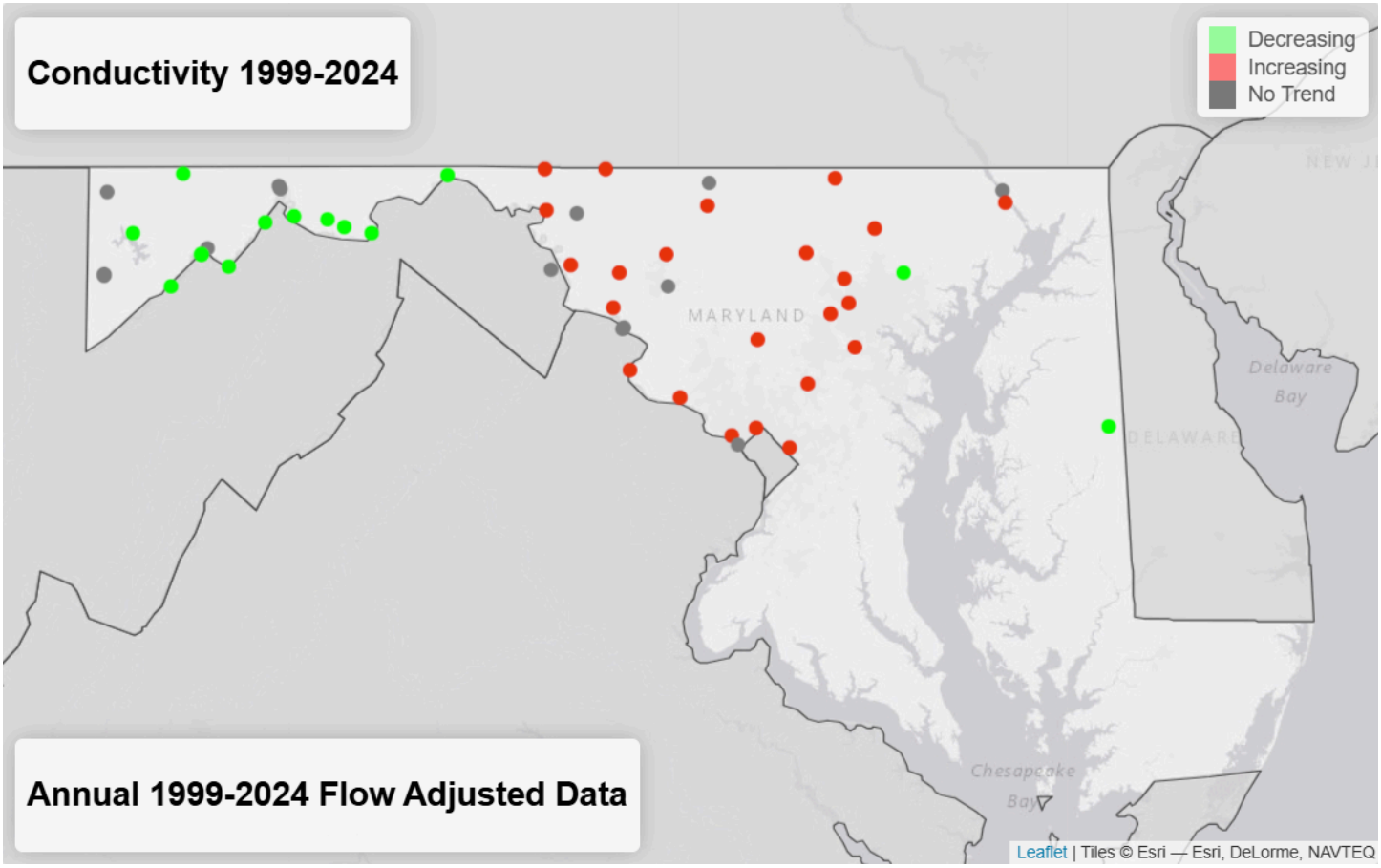

Figure 7. Trends in flow-adjusted conductivity concentrations 1999–2024

- 27% of stations (14 of 51) have decreased conductivity levels compared to 1999
- 45% of stations (23 of 51) have increased conductivity levels compared to 1999
- 27% of stations (14 of 51) do not have conductivity levels that are significantly different from 1999

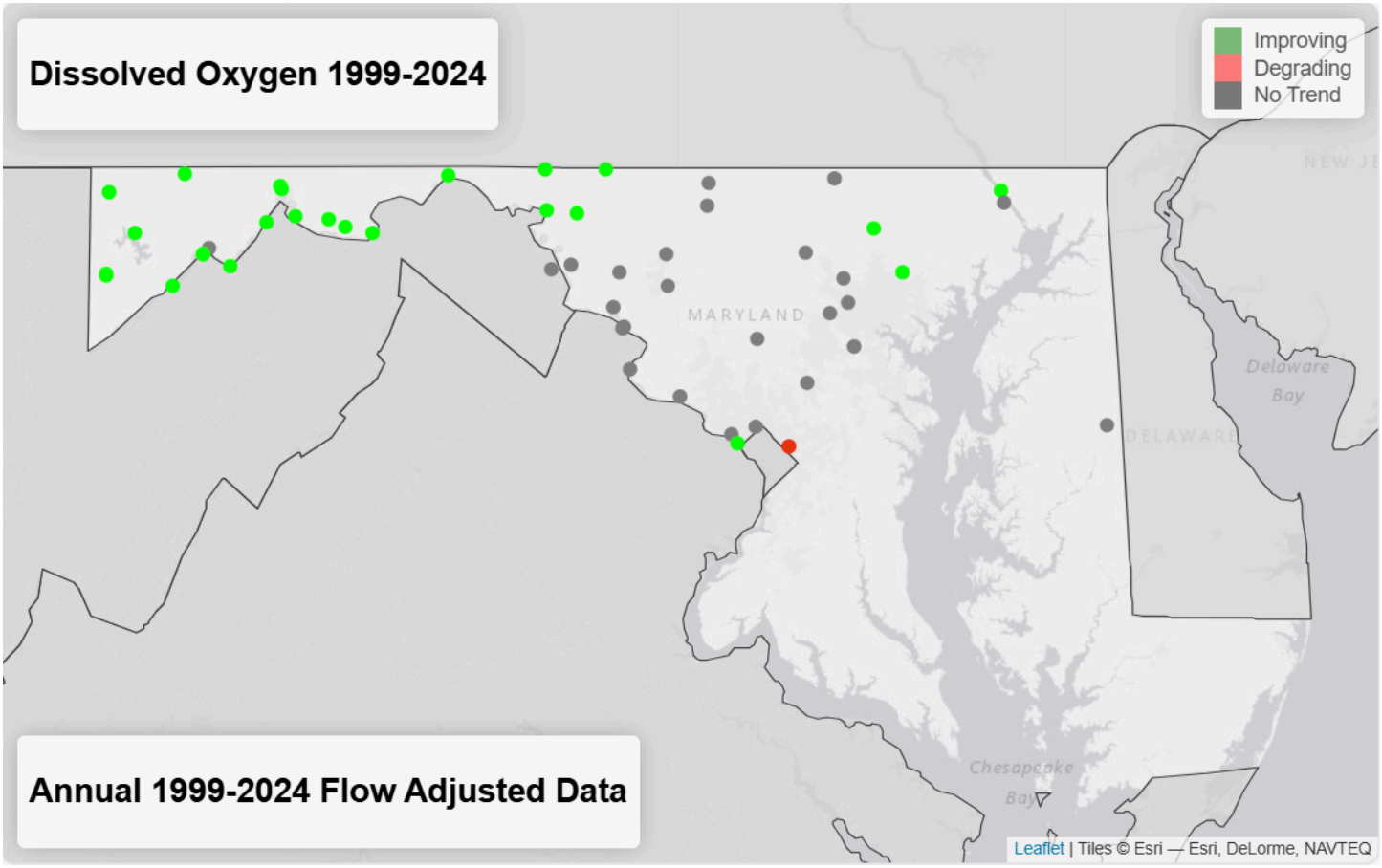

Figure 8. Trends in flow-adjusted dissolved oxygen concentrations 1999–2024

- 49% of stations (25 of 51) have improved dissolved oxygen levels compared to 1999
- 2% of stations (1 of 51) have degraded dissolved oxygen levels compared to 1999
- 49% of stations (25 of 51) do not have dissolved oxygen levels that are significantly different from 1999

Table 1. Trends in nutrients and total suspended solids at long-term non-tidal stations for the period 1999-2024. Highlighted values change by more than 50%, bolded values change by more than 20%, red indicates degrading (increasing) trends, green indicates improving (decreasing) trends, and empty cells indicate a not significant trend. Trends are significant at p <= 0.05.

			Total Nitrogen	Total Phosphorus	Total Suspended Solids	Dissolved Inorganic Nitrogen	Orthophosphate
Order	System	Station	Flow Adjusted	Flow Adjusted	Flow Adjusted	Flow Adjusted	Flow Adjusted
1	Western Maryland	LYO0004		imp >20%			imp >20%
2	Western Maryland	YOU1139					
3	Western Maryland	YOU0925	imp.	deg >20%	deg >50%		
4	Western Maryland	CCR0001	imp >20%	deg >20%	deg >50%	imp >50%	
5	Western Maryland	CAS0479		deg >20%	deg >50%		deg >50%
6	West. Upp. Potomac	NBP0689	imp >20%	deg >20%		imp >20%	
7	West. Upp. Potomac	NBP0534	imp >20%	deg >50%	deg >50%	imp >20%	
8	West. Upp. Potomac	SAV0000	imp >20%	deg >20%	deg >50%	imp >20%	
9	West. Upp. Potomac	GEO0009	imp >50%	imp >20%		imp >50%	
10	West. Upp. Potomac	NBP0461	imp >20%	imp >50%		imp >20%	imp >50%
11	West. Upp. Potomac	NBP0326	imp >20%	imp >50%		imp.	imp >50%
12	West. Upp. Potomac	BDK0000	imp >20%			imp >20%	
13	West. Upp. Potomac	WIL0013	imp >20%			imp >20%	

			Total Nitrogen	Total Phosphorus	Total Suspended Solids	Dissolved Inorganic Nitrogen	Orthophosphate
Order	System	Station	Flow Adjusted	Flow Adjusted	Flow Adjusted	Flow Adjusted	Flow Adjusted
14	West. Upp. Potomac	NBP0103	imp >20%	imp >50%		imp >20%	imp >50%
15	West. Upp. Potomac	NBP0023	imp >20%	imp >50%		imp >20%	imp >50%
16	West. Upp. Potomac	TOW0030	imp.				
17	West. Upp. Potomac	POT2766	imp >20%	imp >20%		imp >20%	imp >50%
18	West. Upp. Potomac	POT2386	imp >20%	imp >20%		imp >20%	imp >50%
19	East. Upp. Potomac	CON0180		imp >20%	imp >20%		imp >50%
20	East. Upp. Potomac	CON0005		imp >50%	imp >50%		imp >50%
21	East. Upp. Potomac	POT1830	imp.	imp >20%			imp >50%
22	East. Upp. Potomac	ANT0366	deg	imp >20%	imp >50%	deg	imp >20%
23	East. Upp. Potomac	ANT0203		imp >50%	imp >50%		imp >50%
24	East. Upp. Potomac	ANT0044	imp.	imp >50%		imp.	imp >50%
25	East. Upp. Potomac	CAC0148	imp.	imp >20%			imp >50%
26	East. Upp. Potomac	CAC0031	imp.		imp >20%		
27	East. Upp. Potomac	POT1596	imp.	imp >20%			imp >50%
28	East. Upp. Potomac	POT1595	imp.	imp >20%		imp.	imp >50%
29	Monocacy	MON0528	imp >20%	imp.	imp >20%	imp >20%	imp >20%
30	Monocacy	BPC0035	imp.			imp.	imp >20%
31	Monocacy	MON0269	imp >20%	imp >20%	imp >20%	imp >20%	imp >20%

			Total Nitrogen	Total Phosphorus	Total Suspended Solids	Dissolved Inorganic Nitrogen	Orthophosphate
Order	System	Station	Flow Adjusted	Flow Adjusted	Flow Adjusted	Flow Adjusted	Flow Adjusted
32	Monocacy	MON0155	imp >20%	imp >50%	imp >20%	imp >20%	imp >50%
33	Middle Potomac	POT1471	imp.	imp >20%			imp >50%
34	Middle Potomac	SEN0008	imp >20%	imp >50%		imp >20%	imp >50%
35	Middle Potomac	CJB0005	imp.		imp >20%	imp >20%	imp >20%
36	Middle Potomac	RCM0111	imp >20%			imp >20%	
37	Middle Potomac	POT1184	imp >20%	imp >50%		imp >20%	imp >50%
38	Middle Potomac	ANA0082	imp >20%	deg >20%	deg >20%	imp >20%	
39	Gunpowder	GUN0476	deg				
40	Gunpowder	GUN0258					
41	Gunpowder	GUN0125	imp.	imp >20%	imp >50%		imp >20%
42	Susquehanna	DER0015		imp >20%			
43	Susquehanna	CB1.0	imp.	imp.		imp >20%	
44	Patapsco	NPA0165	imp.			imp.	
45	Patapsco	PAT0285	imp >20%	imp >20%	imp >20%	imp >20%	
46	Patapsco	PAT0176	imp >20%	imp >20%	imp >20%	imp >20%	
47	Patapsco	JON0184	imp.			imp.	
48	Patapsco	GWN0115	imp >20%			imp >20%	
49	Patuxent	PXT0972					
50	Patuxent	PXT0809	imp.			imp.	
51	Choptank	ET5.0					

Table 2. Mean start, end, and difference in mean parameter value for period 1999-2024. Highlighted values change by more than 50%, bolded values change by more than 20%, red indicates degrading (increasing) flow-adjusted trends, green indicates improving (decreasing) flow-adjusted trends, and black text indicates a not significant flow-adjusted trend (see Table 1).

		Total Nitrogen (mg/L)			Total Phosphorous (mg/L)			Total Suspended Solids (mg/L)			Dissolved Inorganic Nitrogen (mg/L)			Orthophosphate (mg/L)		
Order	Station	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change
1	LYO0004	1.56	1.55	-0.01	0.074	0.056	-0.018	8.23	7.23	-1.00	1.01	1.05	0.04	0.019	0.013	-0.006
2	YOU1139	1.13	1.05	-0.08	0.042	0.037	-0.005	5.65	6.91	1.26	0.79	0.75	-0.04	0.005	0.005	0.000
3	YOU0925	0.76	0.69	-0.07	0.018	0.025	0.007	2.24	4.44	2.21	0.48	0.47	-0.01	0.003	0.003	0.000
4	CCR0001	0.56	0.43	-0.13	0.013	0.018	0.005	1.63	2.67	1.04	0.20	0.09	-0.11	0.003	0.004	0.001
5	CAS0479	0.84	0.80	-0.04	0.025	0.037	0.012	2.17	3.95	1.78	0.54	0.57	0.02	0.004	0.012	0.007
6	NBP0689	1.21	0.69	-0.51	0.009	0.014	0.004	1.18	2.21	1.03	1.00	0.58	-0.42	0.003	0.002	0.000
7	NBP0534	1.07	0.72	-0.35	0.009	0.016	0.006	1.07	2.54	1.47	0.87	0.58	-0.30	0.002	0.002	0.001
8	SAV0000	0.84	0.66	-0.18	0.010	0.015	0.005	0.69	2.83	2.14	0.62	0.47	-0.15	0.003	0.004	0.001
9	GEO0009	1.26	0.59	-0.66	0.033	0.020	-0.013	5.86	7.48	1.63	0.94	0.39	-0.54	0.003	0.003	0.000
10	NBP0461	1.11	0.70	-0.41	0.047	0.015	-0.032	4.67	2.70	-1.97	0.74	0.57	-0.17	0.006	0.002	-0.004
11	NBP0326	1.11	0.71	-0.40	0.045	0.019	-0.026	4.88	3.11	-1.77	0.67	0.55	-0.12	0.007	0.003	-0.004
12	BDK0000	0.69	0.44	-0.24	0.017	0.018	0.001	6.71	3.94	-2.77	0.47	0.34	-0.13	0.003	0.004	0.001
13	WIL0013	0.84	0.58	-0.26	0.015	0.019	0.004	2.18	2.61	0.43	0.54	0.36	-0.18	0.003	0.003	0.000
14	NBP0103	1.28	0.74	-0.54	0.060	0.027	-0.033	3.21	3.11	-0.11	0.84	0.59	-0.25	0.016	0.006	-0.010
15	NBP0023	1.16	0.78	-0.38	0.061	0.027	-0.034	4.16	3.57	-0.59	0.75	0.58	-0.17	0.012	0.005	-0.006
16	TOW0030	0.57	0.47	-0.10	0.015	0.014	0.000	1.39	2.20	0.81	0.21	0.21	0.00	0.003	0.004	0.001

		Total Nitrogen (mg/L)			Total Phosphorous (mg/L)			Total Suspended Solids (mg/L)			Dissolved Inorganic Nitrogen (mg/L)			Orthophosphate (mg/L)		
Order	Station	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change
17	POT2766	0.94	0.65	-0.29	0.031	0.024	-0.008	2.92	3.83	0.91	0.62	0.37	-0.25	0.009	0.004	-0.004
18	POT2386	0.90	0.65	-0.25	0.030	0.021	-0.009	5.41	4.18	-1.23	0.49	0.35	-0.13	0.015	0.006	-0.009
19	CON0180	3.94	3.95	0.02	0.096	0.049	-0.047	9.22	4.98	-4.24	3.40	3.51	0.11	0.057	0.021	-0.035
20	CON0005	3.84	3.75	-0.09	0.082	0.041	-0.041	11.33	4.69	-6.64	3.33	3.33	0.00	0.044	0.016	-0.028
21	POT1830	1.58	1.34	-0.24	0.042	0.024	-0.017	4.61	4.66	0.05	1.10	1.00	-0.10	0.022	0.007	-0.015
22	ANT0366	3.99	4.49	0.50	0.146	0.082	-0.064	13.58	6.25	-7.33	3.39	4.01	0.62	0.083	0.048	-0.035
23	ANT0203	4.78	4.48	-0.31	0.240	0.076	-0.164	15.09	6.96	-8.13	4.18	4.04	-0.14	0.154	0.040	-0.113
24	ANT0044	4.41	4.09	-0.32	0.162	0.068	-0.094	9.00	9.55	0.55	3.91	3.48	-0.43	0.095	0.035	-0.061
25	CAC0148	1.53	1.30	-0.23	0.078	0.044	-0.034	4.36	4.12	-0.24	1.02	0.88	-0.14	0.050	0.024	-0.026
26	CAC0031	1.93	1.70	-0.23	0.089	0.090	0.001	6.14	4.53	-1.61	1.38	1.26	-0.12	0.055	0.057	0.002
27	POT1596	1.46	1.17	-0.29	0.069	0.051	-0.019	6.18	8.19	2.01	0.82	0.70	-0.12	0.039	0.015	-0.024
28	POT1595	1.78	1.44	-0.34	0.052	0.037	-0.014	7.75	6.61	-1.14	1.28	1.08	-0.20	0.026	0.013	-0.013
29	MON0528	1.97	1.27	-0.69	0.100	0.081	-0.020	7.28	4.68	-2.60	0.98	0.57	-0.42	0.065	0.043	-0.022
30	BPC0035	3.67	3.19	-0.48	0.046	0.039	-0.007	6.31	5.61	-0.70	3.13	2.75	-0.38	0.027	0.020	-0.007
31	MON0269	2.75	2.00	-0.76	0.096	0.059	-0.036	7.39	3.96	-3.43	2.12	1.46	-0.66	0.052	0.027	-0.026
32	MON0155	3.38	1.98	-1.41	0.185	0.055	-0.130	10.18	6.09	-4.10	2.67	1.54	-1.12	0.131	0.027	-0.103
33	POT1471	2.01	1.81	-0.21	0.075	0.054	-0.021	8.36	6.57	-1.79	1.48	1.34	-0.14	0.042	0.019	-0.023
34	SEN0008	2.84	1.73	-1.11	0.124	0.038	-0.086	5.53	5.01	-0.51	2.36	1.29	-1.07	0.083	0.012	-0.070
35	CJB0005	1.36	1.11	-0.24	0.028	0.028	0.000	3.02	2.04	-0.99	0.90	0.63	-0.27	0.014	0.009	-0.004

		Total Nitrogen (mg/L)			Total Phosphorous (mg/L)			Total Suspended Solids (mg/L)			Dissolved Inorganic Nitrogen (mg/L)			Orthophosphate (mg/L)		
Order	Station	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change
36	RCM0111	1.58	1.18	-0.41	0.053	0.063	0.010	6.73	5.72	-1.01	0.95	0.67	-0.28	0.014	0.013	-0.001
37	POT1184	1.73	1.38	-0.35	0.074	0.035	-0.039	9.45	8.35	-1.10	1.12	0.79	-0.34	0.037	0.007	-0.030
38	ANA0082	1.47	1.17	-0.30	0.044	0.055	0.011	5.61	7.99	2.38	0.86	0.53	-0.33	0.009	0.007	-0.002
39	GUN0476	3.22	3.48	0.26	0.032	0.028	-0.004	5.96	4.76	-1.21	2.82	3.02	0.20	0.011	0.008	-0.003
40	GUN0258	2.42	2.35	-0.07	0.020	0.024	0.003	5.36	5.16	-0.20	2.07	2.05	-0.02	0.006	0.005	-0.001
41	GUN0125	1.45	1.27	-0.18	0.037	0.020	-0.017	12.35	2.98	-9.37	0.99	0.97	-0.02	0.007	0.004	-0.003
42	DER0015	3.40	3.52	0.11	0.037	0.029	-0.008	4.92	4.04	-0.87	2.91	3.08	0.16	0.014	0.012	-0.002
43	CB1.0	1.52	1.24	-0.28	0.042	0.037	-0.005	8.05	8.05	0.00	1.12	0.89	-0.23	0.006	0.007	0.001
44	NPA0165	4.22	3.75	-0.47	0.019	0.020	0.000	3.87	3.52	-0.35	3.81	3.39	-0.42	0.005	0.006	0.001
45	PAT0285	2.56	1.92	-0.64	0.047	0.024	-0.023	5.84	3.02	-2.82	2.13	1.63	-0.50	0.010	0.009	-0.001
46	PAT0176	2.22	1.73	-0.49	0.048	0.029	-0.019	5.75	3.93	-1.82	1.73	1.35	-0.38	0.012	0.009	-0.003
47	JON0184	1.92	1.69	-0.23	0.021	0.021	0.000	3.95	3.17	-0.79	1.60	1.40	-0.19	0.007	0.009	0.002
48	GWN0115	1.78	1.24	-0.54	0.029	0.025	-0.004	4.20	3.54	-0.67	1.33	0.93	-0.40	0.006	0.009	0.002
49	PXT0972	2.84	2.84	0.00	0.023	0.029	0.006	5.82	7.80	1.98	2.49	2.42	-0.07	0.006	0.007	0.001
50	PXT0809	1.61	1.36	-0.25	0.029	0.032	0.003	5.96	5.89	-0.07	1.19	0.99	-0.20	0.004	0.004	0.000
51	ET5.0	1.86	1.77	-0.08	0.068	0.080	0.012	3.17	3.18	0.01	1.33	1.28	-0.05	0.026	0.028	0.003

Table 3. Trends in water temperature, conductivity and dissolved oxygen at long-term non-tidal stations for the period 1999-2024. Highlighted values change by more than 50%, bolded values change by more than 20%, red indicates degrading or increasing trends, green indicates improving or decreasing trends, and empty cells indicate a not significant trend, except in the case of dissolved oxygen, where an increasing trend is improving and colored green, and a decreasing trend is degrading and colored red. Trends are significant at p <= 0.05.

			Water Temperature	Conductivity	Dissolved Oxygen
Order	System	Station	Flow Adjusted	Flow Adjusted	Flow Adjusted
1	Western Maryland	LYO0004			imp.
2	Western Maryland	YOU1139			imp.
3	Western Maryland	YOU0925	deg		imp.
4	Western Maryland	CCR0001		**imp >20%**	imp.
5	Western Maryland	CAS0479	deg	imp.	imp.
6	West. Upp. Potomac	NBP0689	deg	imp.	imp.
7	West. Upp. Potomac	NBP0534	deg	**imp >20%**	imp.
8	West. Upp. Potomac	SAV0000	**deg >20%**	**imp >20%**	imp.
9	West. Upp. Potomac	GEO0009	deg		
10	West. Upp. Potomac	NBP0461		**imp >20%**	imp.
11	West. Upp. Potomac	NBP0326	deg	**imp >20%**	imp.
12	West. Upp. Potomac	BDK0000	**deg >20%**		imp.
13	West. Upp. Potomac	WIL0013	**deg >20%**		imp.
14	West. Upp. Potomac	NBP0103	deg	**imp >20%**	imp.
15	West. Upp. Potomac	NBP0023	deg	**imp >20%**	imp.
16	West. Upp. Potomac	TOW0030	deg	imp.	imp.
17	West. Upp. Potomac	POT2766	deg	**imp >20%**	imp.
18	West. Upp. Potomac	POT2386	deg	imp.	imp.

			Water Temperature	Conductivity	Dissolved Oxygen
Order	System	Station	Flow Adjusted	Flow Adjusted	Flow Adjusted
19	East. Upp. Potomac	CON0180	deg	deg	**imp >20%**
20	East. Upp. Potomac	CON0005	deg	deg	**imp >20%**
21	East. Upp. Potomac	POT1830	deg		
22	East. Upp. Potomac	ANT0366	deg	deg	imp.
23	East. Upp. Potomac	ANT0203	deg		imp.
24	East. Upp. Potomac	ANT0044	deg	deg	
25	East. Upp. Potomac	CAC0148	deg	deg	
26	East. Upp. Potomac	CAC0031	deg	deg	
27	East. Upp. Potomac	POT1596	deg		
28	East. Upp. Potomac	POT1595	deg		
29	Monocacy	MON0528	deg		
30	Monocacy	BPC0035	deg	deg	
31	Monocacy	MON0269	deg	deg	
32	Monocacy	MON0155	deg		
33	Middle Potomac	POT1471		deg	
34	Middle Potomac	SEN0008	deg	**deg >50%**	
35	Middle Potomac	CJB0005	deg	**deg >20%**	
36	Middle Potomac	RCM0111	deg	**deg >20%**	
37	Middle Potomac	POT1184	deg		imp.
38	Middle Potomac	ANA0082	deg	**deg >20%**	deg.
39	Gunpowder	GUN0476	deg	**deg >20%**	

			Water Temperature	Conductivity	Dissolved Oxygen
Order	System	Station	Flow Adjusted	Flow Adjusted	Flow Adjusted
40	Gunpowder	GUN0258	deg	**deg >20%**	imp.
41	Gunpowder	GUN0125	deg	imp.	imp.
42	Susquehanna	DER0015	deg	deg	
43	Susquehanna	CB1.0	deg		imp.
44	Patapsco	NPA0165	deg	**deg >20%**	
45	Patapsco	PAT0285	deg	**deg >20%**	
46	Patapsco	PAT0176	deg	deg	
47	Patapsco	JON0184	**deg >20%**	deg	
48	Patapsco	GWN0115	**deg >20%**	**deg >20%**	
49	Patuxent	PXT0972	deg	deg	
50	Patuxent	PXT0809	deg	**deg >20%**	
51	Choptank	ET5.0	deg	imp.	

Table 4. Mean start, end, and difference in mean parameter value for period 1999-2024. Highlighted values change by more than 50%, bolded values change by more than 20%, red indicates degrading or increasing flow-adjusted trends, green indicates improving or decreasing flow-adjusted trends, and black text indicates a not significant flow-adjusted trend (see Table 3) except in the case of dissolved oxygen, where an increasing trend is improving and colored green, and a decreasing trend is degrading and colored red.

		Water Temperature (°C)			Conductivity (µmhos/cm at 25°C)			Dissolved Oxygen (mg/L)		
Order	Station	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change
1	LYO0004	10.0	10.9	0.9	175	192	18	9.1	9.6	0.5
2	YOU1139	10.2	11.3	1.1	126	112	-14	9.3	10.0	0.7
3	YOU0925	9.9	11.3	1.4	101	96	-5	10.2	10.9	0.7
4	CCR0001	8.6	9.5	0.9	**124**	**77**	**-47**	9.9	10.6	0.7
5	CAS0479	8.9	10.5	1.7	189	153	-37	10.0	11.2	1.2
6	NBP0689	10.4	12.0	1.6	484	402	-82	10.1	10.7	0.5
7	NBP0534	9.7	11.5	1.8	**381**	**291**	**-90**	10.5	10.9	0.5
8	SAV0000	**9.0**	**11.7**	**2.8**	**129**	**103**	**-26**	10.7	11.0	0.3
9	GEO0009	10.6	12.3	1.8	850	923	74	10.6	10.8	0.2
10	NBP0461	11.4	11.8	0.4	**490**	**320**	**-170**	9.6	11.3	1.7
11	NBP0326	11.8	13.1	1.3	**455**	**324**	**-131**	9.3	11.0	1.7
12	BDK0000	**9.1**	**11.6**	**2.5**	953	1,019	67	10.5	10.9	0.4
13	WIL0013	**9.9**	**12.0**	**2.1**	287	284	-3	10.2	11.3	1.1
14	NBP0103	12.2	13.4	1.2	**425**	**328**	**-97**	9.5	11.0	1.5
15	NBP0023	12.4	13.5	1.1	**408**	**308**	**-100**	9.4	10.7	1.3
16	TOW0030	11.9	14.0	2.1	186	162	-24	10.2	11.2	1.0
17	POT2766	13.4	14.7	1.3	**302**	**235**	**-67**	9.7	10.7	1.0

		Water Temperature (℃)			Conductivity (µmhos/cm at 25℃)			Dissolved Oxygen (mg/L)		
Order	Station	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change
18	POT2386	13.9	14.4	0.5	301	270	-30	9.8	10.4	0.6
19	CON0180	12.3	14.7	2.4	387	424	37	**9.5**	**11.6**	**2.2**
20	CON0005	13.2	15.5	2.3	388	431	44	**9.8**	**11.8**	**2.0**
21	POT1830	14.5	16.2	1.7	311	320	8	9.7	10.1	0.4
22	ANT0366	11.5	13.1	1.5	376	406	30	9.9	11.1	1.3
23	ANT0203	12.8	14.0	1.2	508	530	22	9.4	10.2	0.8
24	ANT0044	12.8	14.7	1.9	519	557	38	10.2	10.2	0.0
25	CAC0148	12.1	13.6	1.6	218	246	28	10.6	10.6	0.0
26	CAC0031	12.1	13.8	1.8	244	281	37	10.0	10.0	0.0
27	POT1596	13.9	14.9	0.9	284	266	-18	9.7	9.4	-0.3
28	POT1595	13.7	15.1	1.3	322	323	1	9.6	9.6	0.0
29	MON0528	12.6	14.6	2.0	282	289	7	9.0	9.2	0.2
30	BPC0035	12.0	13.4	1.5	241	254	13	9.9	9.7	-0.2
31	MON0269	13.0	15.1	2.1	271	295	25	9.4	9.5	0.2
32	MON0155	13.0	14.7	1.7	300	309	9	9.1	9.0	-0.2
33	POT1471	15.6	15.5	-0.1	311	338	27	9.5	9.3	-0.3
34	SEN0008	13.1	15.4	2.3	**253**	**414**	**160**	10.6	10.6	0.0
35	CJB0005	13.1	14.5	1.4	**382**	**534**	**152**	10.8	10.6	-0.2
36	RCM0111	13.4	15.3	1.8	**333**	**470**	**137**	9.1	9.6	0.5
37	POT1184	15.5	16.3	0.8	282	301	19	9.6	10.0	0.4

		Water Temperature (℃)			Conductivity (µmhos/cm at 25℃)			Dissolved Oxygen (mg/L)		
Order	Station	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change	1999/ 2000 Mean Value	2023/ 2024 Mean Value	Change
38	ANA0082	15.2	17.1	1.9	**303**	**417**	**115**	10.5	9.3	-1.2
39	GUN0476	11.5	12.9	1.4	**159**	**197**	**39**	10.9	10.9	0.0
40	GUN0258	11.5	12.4	1.0	**171**	**206**	**34**	10.7	11.1	0.4
41	GUN0125	13.7	15.4	1.7	422	360	-62	9.1	10.6	1.5
42	DER0015	12.1	13.7	1.6	169	188	19	10.4	10.3	0.0
43	CB1.0	15.3	16.8	1.4	239	247	8	9.7	10.3	0.6
44	NPA0165	11.0	13.1	2.1	**223**	**275**	**52**	10.5	10.3	-0.2
45	PAT0285	12.4	14.0	1.5	**232**	**286**	**55**	10.0	9.8	-0.2
46	PAT0176	12.5	14.1	1.6	270	318	48	10.0	9.8	-0.1
47	JON0184	**11.5**	**13.9**	**2.3**	389	449	60	10.7	10.6	-0.1
48	GWN0115	**11.6**	**14.0**	**2.3**	**323**	**473**	**150**	10.3	10.3	0.0
49	PXT0972	11.5	12.9	1.4	135	160	24	10.2	10.1	-0.1
50	PXT0809	13.6	14.7	1.1	**148**	**186**	**38**	9.3	9.6	0.2
51	ET5.0	14.0	14.8	0.8	149	140	-9	8.7	8.7	-0.1

Works Cited

Murphy, R. R., E. Perry, J. Harcum, and J. Keisman. 2019. A Generalized Additive Model approach to evaluating water quality: Chesapeake Bay case study. Environmental Modeling & Software 118:1-13.