

Grayson Lake, KY NATTS Network Assessment Review

- Established 2008: Carbonyls, Chromium VI, PAHs, PM₁₀ Metals, and VOCs
 - Chromium VI ended in in 2013
 - Added Ethylene oxide in 2020
- For the NATTS Network Assessment (2008-2022):
 - 17 of 17 Method Quality Objective (MQO) Core HAPs were included in the national trends
 - 224 of 245 pollutant datasets were suitable for trends analysis
 - Annual Average and 3-Year Rolling Average Concentrations were decreasing for benzene, 1,3-butadiene, and naphthalene.
 - 100% Reporting of Datasets
- Method Quality Objectives (MQO): 2008-2022
 - Completeness: Met 85% completeness in 221 of 245 pollutant datasets
 - Method Detection Limits: Met MDL Target Ratio of 1.00 in 242 of 255 pollutant datasets
 - Bias: Met $\pm 25\%$ for 200 of 211 pollutant datasets
 - Overall Method Precision: Met $\leq 15\%$ CV for 101 of 142 pollutant datasets
 - Analytical Method Precision: Met $\leq 15\%$ CV for 148 of 166 pollutant datasets
- Analytical Laboratories for 2022

VOC	Carbonyl	PM ₁₀ Metals	PAHs
ERG	ERG	ERG	ERG

- Equipment Year Deployed

Equipment Type	VOC	Carbonyl	PM ₁₀ Metals	PAHs
Sampler	2017	2017	2020	2008
Analytical	2019	2018	2017	2021
Preconcentrator	2019	NA	NA	NA
Standards Preparation	1985	NA	NA	NA
Canister Cleaning	2010	NA	NA	NA
Extraction	NA	NA	2014	2019

National Summary: NATTS data were collected at 27 locations across the United States, with sites beginning in 2003 or later (Figure 1) for 20 core HAPs. Over 670,000 concentrations (primary, secondary, and replicate) were generated and analyzed for this assessment. Pollutant datasets were scored to assess whether they were suitable for trends analysis. Each pollutant dataset was evaluated against four MQOs: Completeness; Sensitivity; Bias; and Precision. Datasets that were suitable (A- or B-rated) for six consecutive years were used for national trends analysis (Table 1).

National trends were determined by comparing the most recent 3-year blocked averages (e.g., 2017-2019 vs. 2020-2022) to determine if the NATTS Trends DQO was being met:

To be able to detect a 15 percent difference (trend) between the annual mean concentrations of successive 3-year periods within acceptable levels of decision error.

Of the 20 core HAPs, 17 were assessed for the NATTS Trends DQO. Due to sampling and analytical issues, acrolein was not considered for trends analysis (Table 2). Additionally, hexavalent chromium was discontinued as a required pollutant and ethylene oxide became an official MQO pollutant beginning in 2021. The assessment showed that across the network, 11 of those 17 pollutants were decreasing between the 3-year blocks, while four of those pollutants were increasing between the 3-year blocks. Two pollutants did not exhibit a noticeable trend.

Figure 1. NATTS Site and Year Established

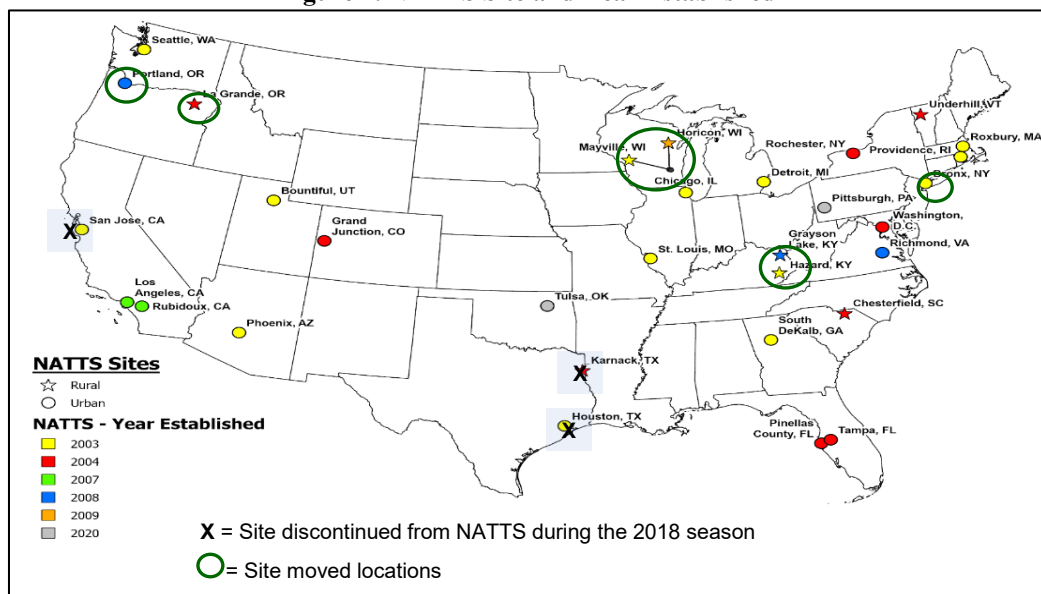


Table 1. NATTS Network Assessment: Count and Percentage of Suitable Datasets by Pollutant Group

Pollutant Group	A-rated		B-rated		Does Not Meet	
	#	%	#	%	#	%
VOCs	1,968	58%	864	25%	572	17%
Carbonyls	668	68%	231	24%	77	8%
PM ₁₀ Metals	1,906	66%	775	27%	217	7%
PAHs	571	77%	144	19%	29	4%
Total = 8,704	5,113	64%	2,014	25%	895	11%

Table 2. Three-Year Block Averages for National Trends

Pollutant ^{a,b,c}	Units	# Sites	Block 1	Block 2	% Difference
Acetaldehyde	µg/m ³	16	1.48	1.34	-9.2%
Arsenic (PM ₁₀)	ng/m ³	18	0.68	0.64	-6.6%
Benzene	µg/m ³	16	0.529	0.525	-0.8%
Benzo(a)pyrene	ng/m ³	18	0.086	0.072	-16.6%
Beryllium (PM ₁₀)	ng/m ³	18	0.008	0.010	15.0%
Butadiene, 1,3-	µg/m ³	15	0.057	0.054	-5.1%
Cadmium (PM ₁₀)	ng/m ³	20	0.087	0.090	3.7%
Carbon Tetrachloride	µg/m ³	15	0.53	0.50	-5.3%
Chloroform	µg/m ³	16	0.173	0.165	-4.8%
Formaldehyde	µg/m ³	15	2.809	2.482	-11.7%
Lead (PM ₁₀)	ng/m ³	20	2.44	2.43	-0.5%
Manganese (PM ₁₀)	ng/m ³	20	6.69	7.31	9.2%
Naphthalene	ng/m ³	17	42.00	35.10	-16.4%
Nickel (PM ₁₀)	ng/m ³	19	0.87	0.83	-3.7%
Tetrachloroethylene	µg/m ³	15	0.12	0.12	1.5%
Trichloroethylene	µg/m ³	14	0.019	0.022	16.3%
Vinyl Chloride	µg/m ³	16	0.004	0.001	-69.0%

^a Acrolein was not assessed due to sampling and analytical issues

^b Sampling for ethylene oxide formally began in 2021 and is not assessed

^c Hexavalent chromium (not assessed) was discontinued in 2013

NATTS Monitoring Site Report: Grayson Lake, KY

Site Information

Region	4
NATTS Site Type	Rural
County	Carter
AQS Site Code	21-043-0500
NATTS Operating Agency	KY Dept. of Env. Protection
Latitude	38.238333
Longitude	-82.988333
AQS Land Use	Residential
AQS Location Setting	Rural
County Population (2023)	26,366

Figure 2. NATTS Site Location



Pollutant Datasets Evaluation: Suitable for Trends (Y=yes; Y(T)=yes, and used for DQO Trends; N=No; "--"=not rated)

Final Pollutant Name	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Acetaldehyde	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Arsenic (PM ₁₀)	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Benzene	N(a)	N(a)	N(b)	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Benzo(a)pyrene	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Beryllium (PM ₁₀)	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Butadiene, 1,3-	N(a)	N(a)	N(b)	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Cadmium (PM ₁₀)	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Carbon tetrachloride	N(a)	N(a)	N(b)	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Chloroform	N(a)	N(a)	N(b)	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Formaldehyde	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Lead (PM ₁₀)	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Manganese (PM ₁₀)	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Naphthalene	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Nickel (PM ₁₀)	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Tetrachloroethylene	N(a)	N(a)	N(b)	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Trichloroethylene	N(a)	N(a)	N(b)	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Vinyl chloride	N(a)	N(a)	N(b)	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)

^a: Pollutant was expected, but were invalidated at this site for this year.

^b: Completeness was less than 75% based on 1-in-6 day sampling

Table 3. NATTS Network Assessment Data (2003-2022) - National Distribution Statistics By Type^a

Analyte	Units	Site Type	# Data Records	% Detections	Arithmetic Mean ^b	Percentile Value ^c						
						5th	10th	25th	50th	75th	90th	95th
Acetaldehyde	µg/m ³	Urban	22,000	100%	1.73 ± 0.02	0.50	0.65	0.95	1.42	2.15	3.19	3.96
	µg/m ³	Rural	6,392	100%	1.17 ± 0.03	0.36	0.45	0.65	0.92	1.35	1.98	2.67
	µg/m ³	All Sites	28,392	100%	1.61 ± 0.02	0.45	0.58	0.85	1.29	1.97	2.99	3.79
Arsenic (PM ₁₀)	ng/m ³	Urban	21,944	95%	0.87 ± 0.03	0.03	0.16	0.32	0.56	0.96	1.65	2.37
	ng/m ³	Rural	6,385	96%	0.49 ± 0.02	0.03	0.08	0.16	0.35	0.58	0.93	1.30
	ng/m ³	All Sites	28,329	96%	0.78 ± 0.02	0.03	0.13	0.27	0.51	0.87	1.51	2.16
Benzene	µg/m ³	Urban	22,246	99%	0.85 ± 0.01	0.23	0.29	0.42	0.64	1.02	1.62	2.20
	µg/m ³	Rural	5,932	90%	0.52 ± 0.01	ND	0.06	0.20	0.38	0.67	1.08	1.51
	µg/m ³	All Sites	28,178	97%	0.78 ± 0.01	0.16	0.23	0.36	0.58	0.95	1.52	2.07
Benzo(a)pyrene	ng/m ³	Urban	17,810	73%	0.10 ± 0.01	ND	ND	ND	0.04	0.10	0.23	0.35
	ng/m ³	Rural	4,735	37%	0.07 ± 0.01	ND	ND	ND	ND	0.02	0.19	0.38
	ng/m ³	All Sites	22,545	65%	0.09 ± 0.01	ND	ND	ND	0.03	0.09	0.22	0.35
Beryllium (PM ₁₀)	ng/m ³	Urban	21,786	77%	0.042 ± 0.004	ND	ND	0.0005	0.005	0.015	0.043	0.098
	ng/m ³	Rural	6,062	49%	0.018 ± 0.002	ND	ND	ND	ND	0.004	0.012	0.041
	ng/m ³	All Sites	27,848	71%	0.037 ± 0.003	ND	ND	ND	0.003	0.011	0.038	0.083
Butadiene, 1,3-	µg/m ³	Urban	22,220	78%	0.092 ± 0.002	ND	ND	0.018	0.051	0.110	0.215	0.317
	µg/m ³	Rural	5,940	29%	0.017 ± 0.001	ND	ND	ND	ND	0.011	0.054	0.104
	µg/m ³	All Sites	28,160	68%	0.076 ± 0.002	ND	ND	ND	0.039	0.092	0.190	0.283
Cadmium (PM ₁₀)	ng/m ³	Urban	21,954	93%	0.184 ± 0.014	ND	0.019	0.043	0.081	0.160	0.354	0.572
	ng/m ³	Rural	6,067	89%	0.092 ± 0.005	ND	ND	0.026	0.055	0.099	0.179	0.270
	ng/m ³	All Sites	28,021	92%	0.164 ± 0.011	ND	0.012	0.039	0.075	0.143	0.300	0.518
Carbon Tetrachloride	µg/m ³	Urban	22,202	98%	0.556 ± 0.002	0.336	0.423	0.486	0.550	0.638	0.725	0.784
	µg/m ³	Rural	5,909	84%	0.494 ± 0.010	ND	ND	0.342	0.533	0.629	0.728	0.807
	µg/m ³	All Sites	28,111	95%	0.543 ± 0.003	ND	0.363	0.475	0.547	0.636	0.726	0.788
Chloroform	µg/m ³	Urban	22,218	88%	0.243 ± 0.016	ND	ND	0.094	0.129	0.205	0.398	0.630
	µg/m ³	Rural	5,942	56%	0.062 ± 0.002	ND	ND	ND	0.049	0.098	0.134	0.228
	µg/m ³	All Sites	28,160	82%	0.205 ± 0.013	ND	ND	0.076	0.110	0.187	0.342	0.543

Table 3. NATTS Network Assessment Data (2003-2022) - National Distribution Statistics By Type^a

Analyte	Units	Site Type	# Data Records	% Detections	Arithmetic Mean ^b	Percentile Value ^c						
						5th	10th	25th	50th	75th	90th	95th
Formaldehyde	µg/m ³	Urban	22,024	100%	3.03 ± 0.04	0.69	1.00	1.57	2.42	3.72	5.47	6.95
	µg/m ³	Rural	6,432	100%	2.16 ± 0.04	0.49	0.64	1.03	1.67	2.69	4.12	5.34
	µg/m ³	All Sites	28,456	100%	2.83 ± 0.03	0.61	0.86	1.42	2.25	3.50	5.22	6.65
Lead (PM ₁₀)	ng/m ³	Urban	21,955	100%	3.97 ± 0.10	0.70	0.95	1.46	2.49	4.34	7.87	11.16
	ng/m ³	Rural	6,066	99%	1.93 ± 0.14	0.34	0.45	0.75	1.27	2.14	3.59	4.96
	ng/m ³	All Sites	28,021	100%	3.53 ± 0.09	0.53	0.75	1.22	2.17	3.88	6.99	10.10
Manganese (PM ₁₀)	ng/m ³	Urban	21,906	100%	9.76 ± 0.25	1.06	1.49	2.53	4.96	10.43	20.40	30.79
	ng/m ³	Rural	6,067	99%	3.79 ± 0.12	0.48	0.74	1.34	2.48	4.49	8.08	11.64
	ng/m ³	All Sites	27,973	100%	8.47 ± 0.20	0.84	1.22	2.16	4.19	8.99	18.13	27.27
Naphthalene	ng/m ³	Urban	17,811	100%	67.25 ± 0.97	13.42	18.03	28.73	49.00	84.13	136.42	180.00
	ng/m ³	Rural	4,732	98%	21.76 ± 1.02	2.79	4.04	6.84	12.47	23.51	45.68	69.01
	ng/m ³	All Sites	22,543	100%	57.70 ± 0.83	5.92	9.77	20.41	40.15	74.11	124.40	167.26
Nickel (PM ₁₀)	ng/m ³	Urban	21,958	98%	1.76 ± 0.05	0.29	0.40	0.62	1.02	1.86	3.32	5.05
	ng/m ³	Rural	5,989	85%	0.56 ± 0.07	ND	ND	0.10	0.26	0.53	0.96	1.63
	ng/m ³	All Sites	27,947	95%	1.50 ± 0.04	0.00	0.17	0.45	0.84	1.59	2.92	4.47
Tetrachloroethylene	µg/m ³	Urban	22,209	84%	0.24 ± 0.05	ND	ND	0.05	0.12	0.22	0.43	0.68
	µg/m ³	Rural	5,936	38%	0.07 ± 0.02	ND	ND	ND	ND	0.04	0.12	0.31
	µg/m ³	All Sites	28,145	75%	0.21 ± 0.04	ND	ND	ND	0.08	0.20	0.38	0.61
Trichloroethylene	µg/m ³	Urban	22,204	43%	0.040 ± 0.008	ND	ND	ND	ND	0.043	0.096	0.152
	µg/m ³	Rural	5,922	19%	0.019 ± 0.003	ND	ND	ND	ND	ND	0.029	0.124
	µg/m ³	All Sites	28,126	38%	0.036 ± 0.006	ND	ND	ND	ND	0.033	0.085	0.148
Vinyl Chloride	µg/m ³	Urban	22,021	18%	0.0046 ± 0.0003	ND	ND	ND	ND	ND	0.0126	0.0251
	µg/m ³	Rural	5,940	13%	0.0070 ± 0.0008	ND	ND	ND	ND	ND	0.0125	0.0304
	µg/m ³	All Sites	27,961	17%	0.0051 ± 0.0003	ND	ND	ND	ND	ND	0.0126	0.0253

^a Statistics presented are from pollutant datasets which were suitable for trends.

^b The arithmetic mean is the average of all samples results which include actual measured values. If no chemical was registered, then a value of zero is used when calculating the mean.

^c ND: No results of this chemical were registered by the laboratory analytical equipment.

Table 4. Summary Statistics for Grayson Lake, KY

Analyte	Units	# Data Records	% Detection	Arithmetic Mean ^a	Percentile Value ^b						
					5th	10th	25th	50th	75th	90th	95th
Acetaldehyde	µg/m ³	861	100%	0.81 ± 0.02	0.41	0.47	0.58	0.74	0.97	1.22	1.49
Arsenic (PM ₁₀)	ng/m ³	853	90%	0.48 ± 0.03	ND	ND	0.23	0.42	0.65	0.91	1.10
Benzene	µg/m ³	750	100%	0.43 ± 0.02	0.19	0.22	0.27	0.37	0.50	0.67	0.78
Benzo(a)pyrene	ng/m ³	855	63%	0.04 ± 0.01	ND	ND	ND	0.01	0.04	0.11	0.18
Beryllium (PM ₁₀)	ng/m ³	847	64%	0.0034 ± 0.0004	ND	ND	ND	0.002	0.005	0.009	0.011
Butadiene, 1,3-	µg/m ³	750	78%	0.030 ± 0.002	ND	ND	0.01	0.03	0.05	0.06	0.07
Cadmium (PM ₁₀)	ng/m ³	853	80%	0.07 ± 0.01	ND	ND	0.03	0.05	0.08	0.14	0.19
Carbon Tetrachloride	µg/m ³	750	100%	0.62 ± 0.01	0.46	0.50	0.56	0.62	0.68	0.74	0.79
Chloroform	µg/m ³	747	69%	0.071 ± 0.004	ND	ND	ND	0.09	0.10	0.12	0.13
Formaldehyde	µg/m ³	861	100%	1.53 ± 0.06	0.45	0.57	0.84	1.29	2.00	2.88	3.30
Lead (PM ₁₀)	ng/m ³	853	100%	1.67 ± 0.10	0.47	0.61	0.88	1.29	1.98	2.97	3.98
Manganese (PM ₁₀)	ng/m ³	853	97%	2.92 ± 0.20	0.48	0.81	1.33	2.11	3.55	5.44	7.30
Naphthalene	ng/m ³	856	100%	15.93 ± 0.91	4.89	5.87	8.09	12.49	19.04	28.30	37.29
Nickel (PM ₁₀)	ng/m ³	853	82%	0.27 ± 0.02	ND	ND	0.14	0.22	0.33	0.51	0.68
Tetrachloroethylene	µg/m ³	750	55%	0.029 ± 0.003	ND	ND	ND	0.02	0.05	0.07	0.08
Trichloroethylene	µg/m ³	740	19%	0.006 ± 0.001	ND	ND	ND	ND	ND	0.03	0.04
Vinyl Chloride	µg/m ³	750	9%	0.0012 ± 0.0003	ND	ND	ND	ND	ND	ND	0.0125

^a: The arithmetic mean is the average of all samples results which included actual measured values. If no chemical was registered, then a value of zero is used.

^b ND: No results of this chemical were registered by the laboratory analytical equipment.

Table 5. Analytical Labs Supporting this Site

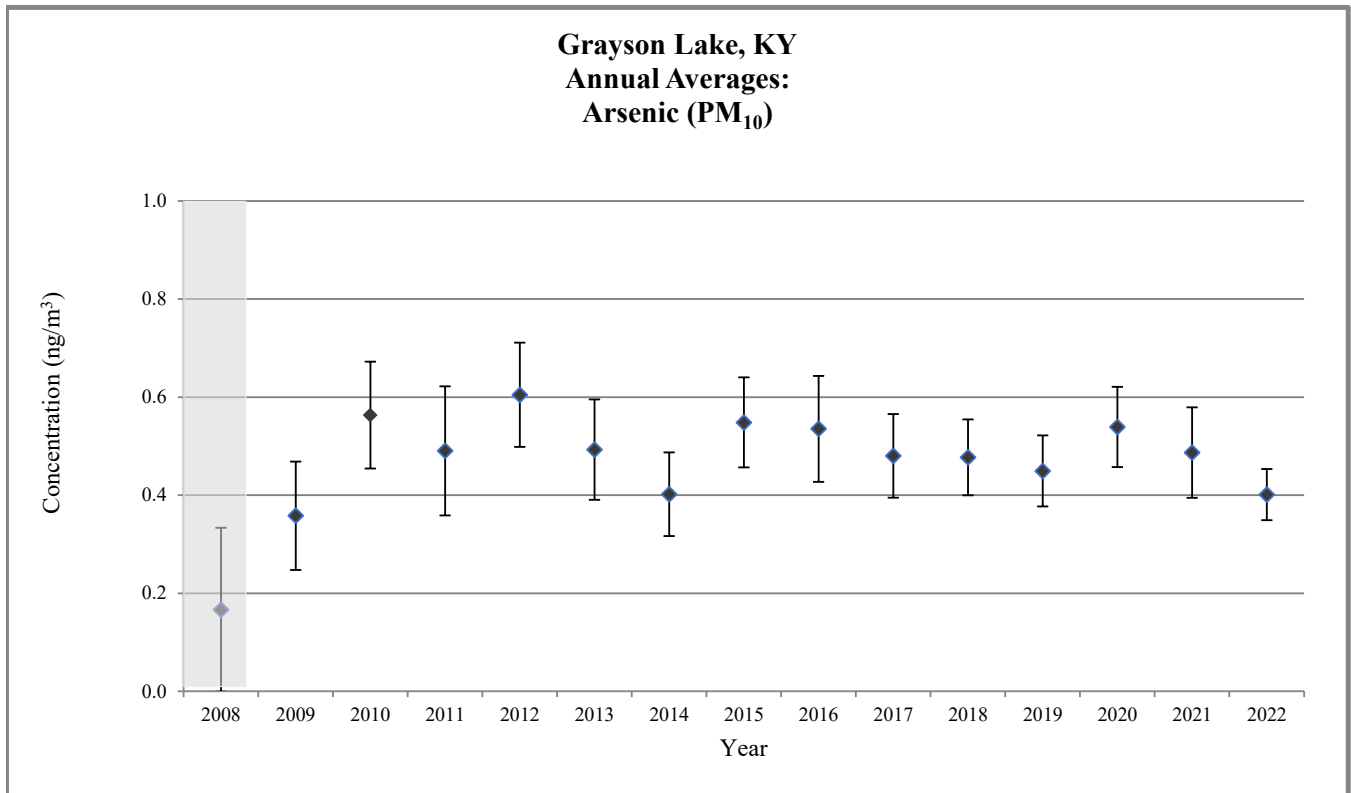
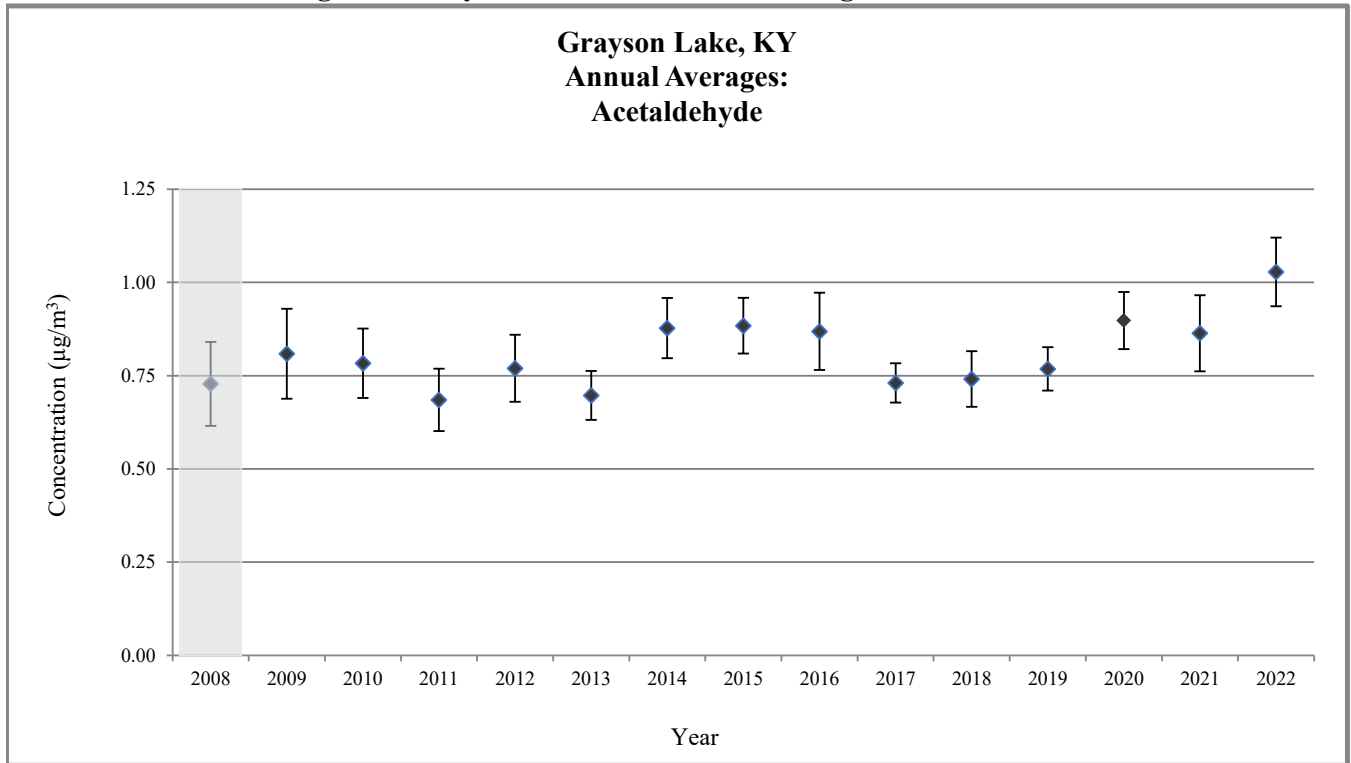
Pollutant Group	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
VOCs	KYDES	KYDES	KYDES/ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Carbonyls	KYDES	KYDES	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
PM ₁₀ Metals	KYDES	KYDES	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG

--: Not Applicable

KYDES: Kentucky Department of Environmental Services

ERG: Eastern Research Group, Inc.

Figure 3. Grayson Lake, KY Annual Average Concentrations





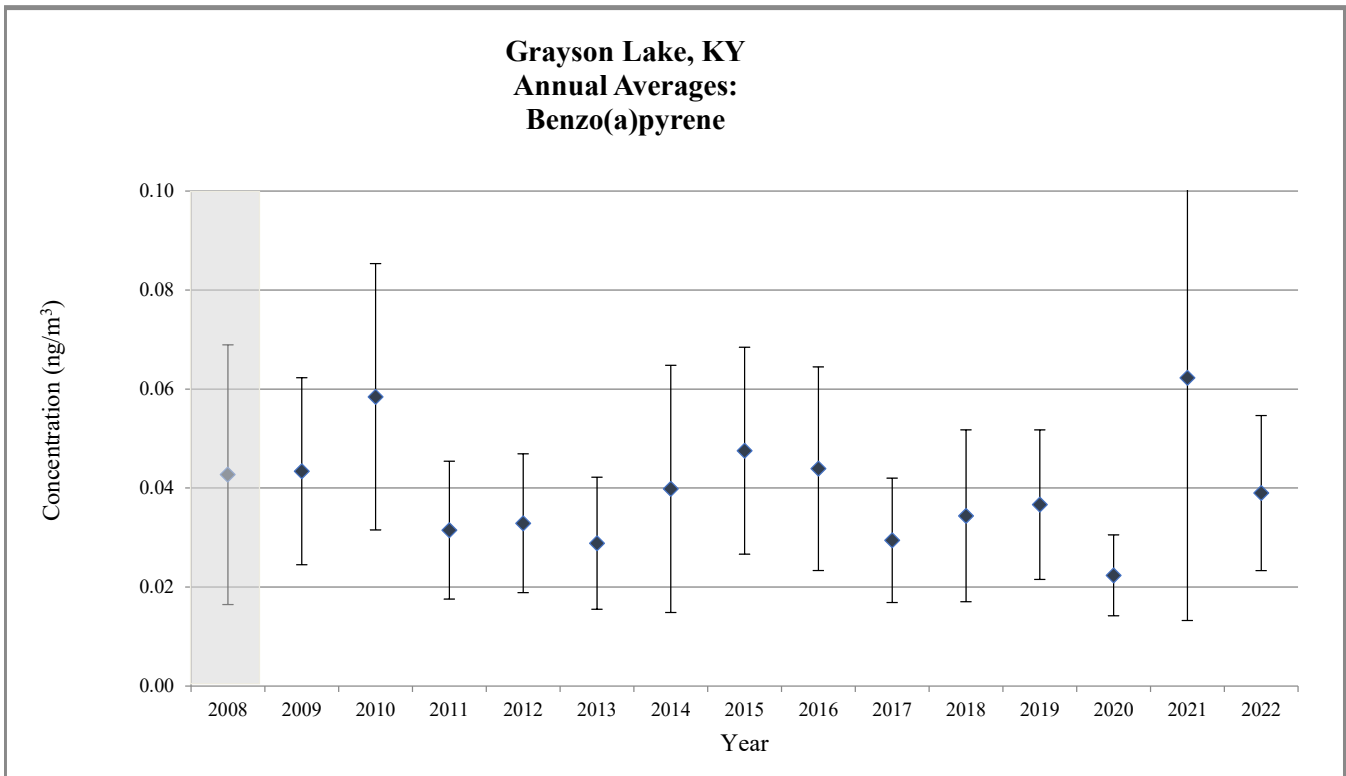
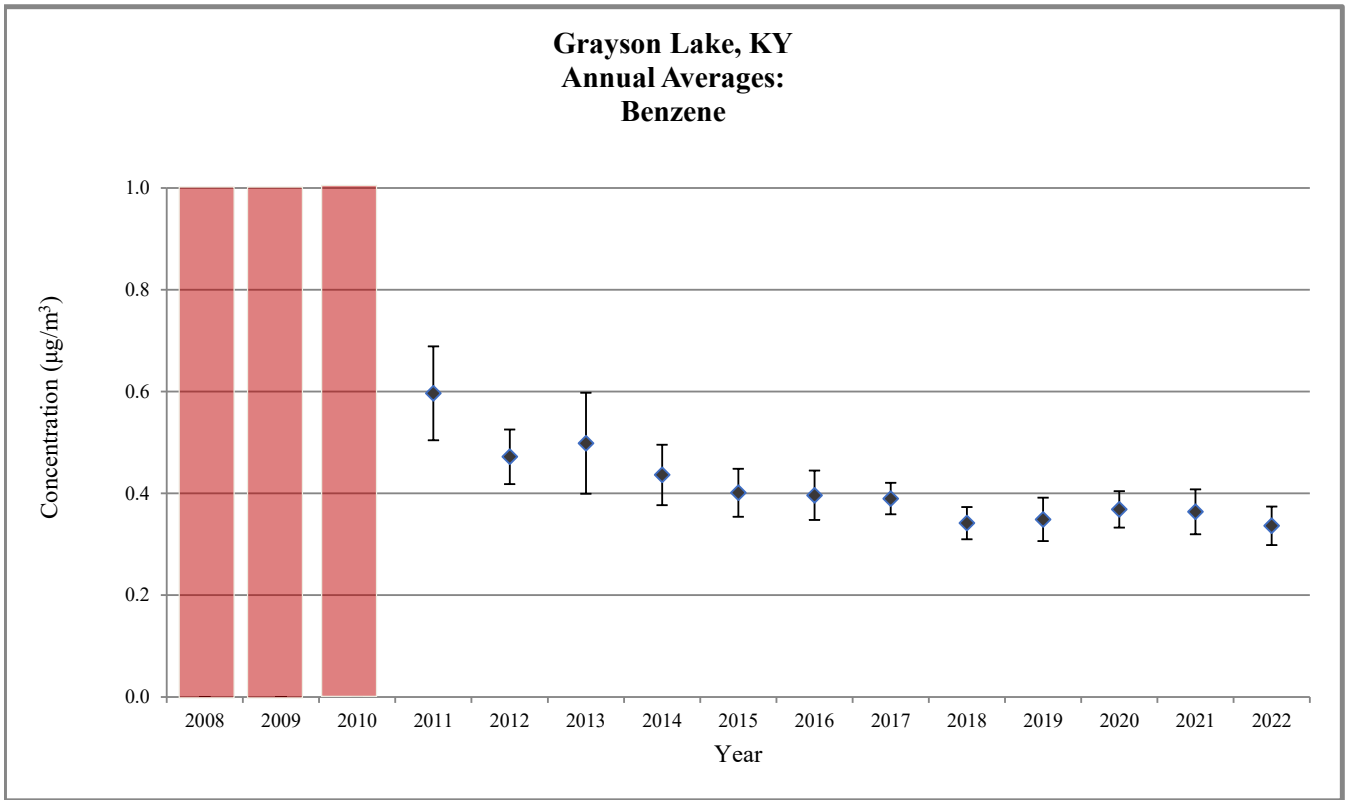
 Sampling began midway through the year.
 Does not meet MQO

Figure 3. Grayson Lake, KY Annual Average Concentrations





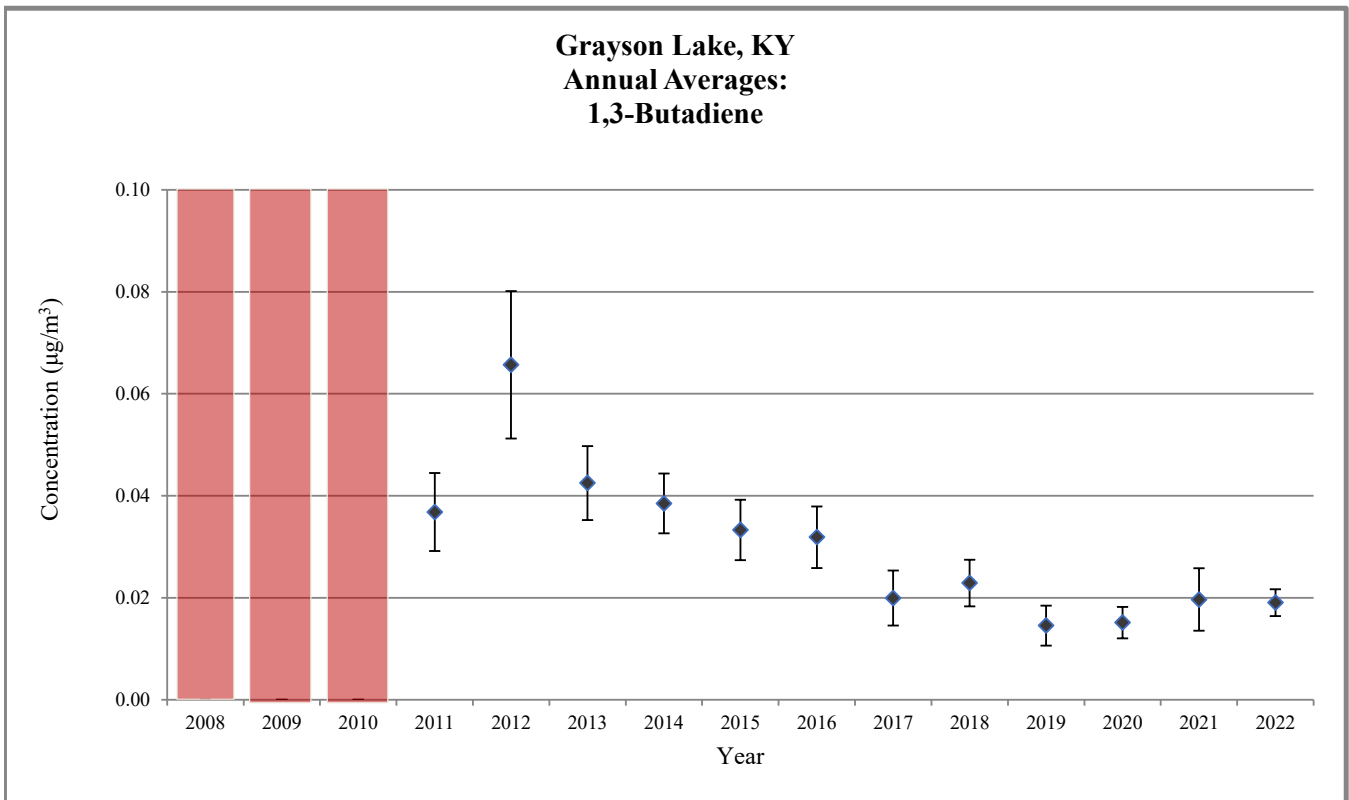
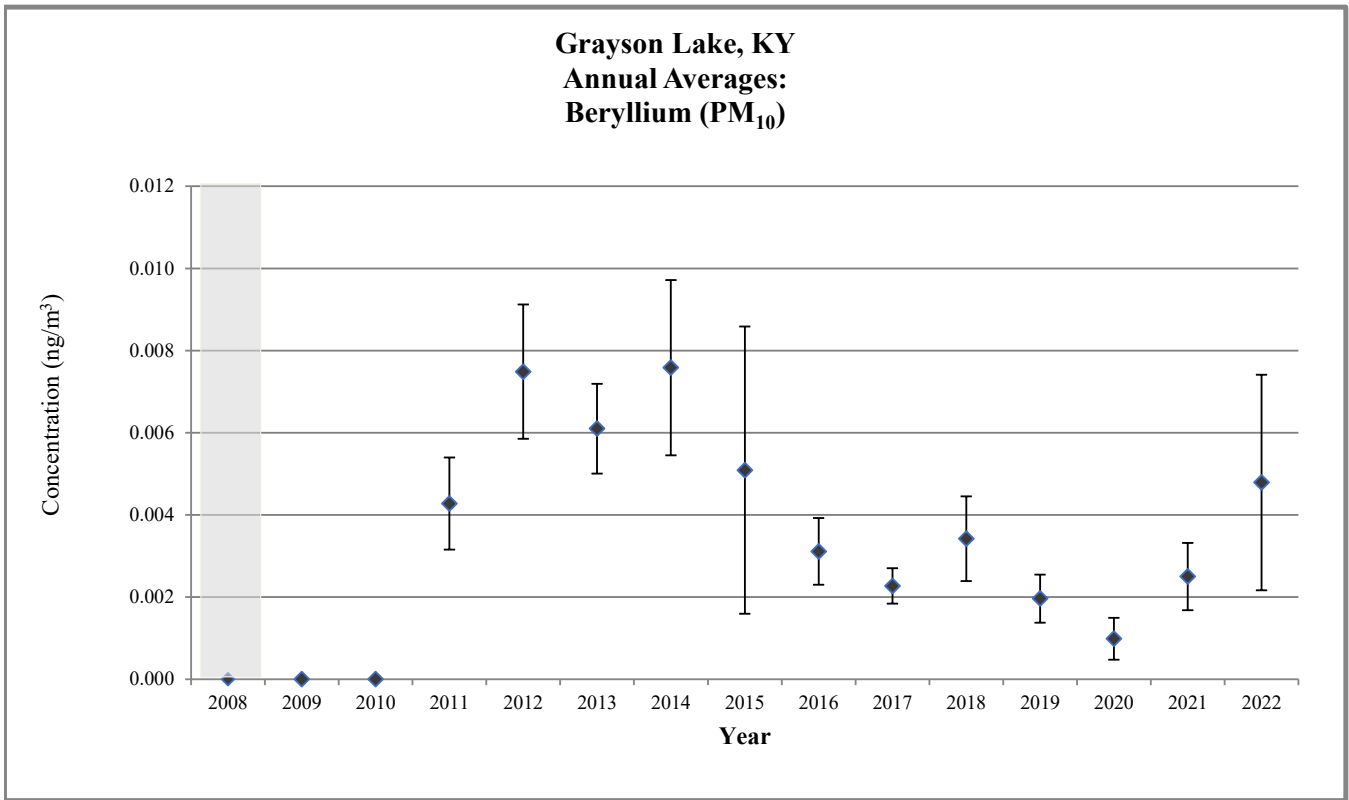
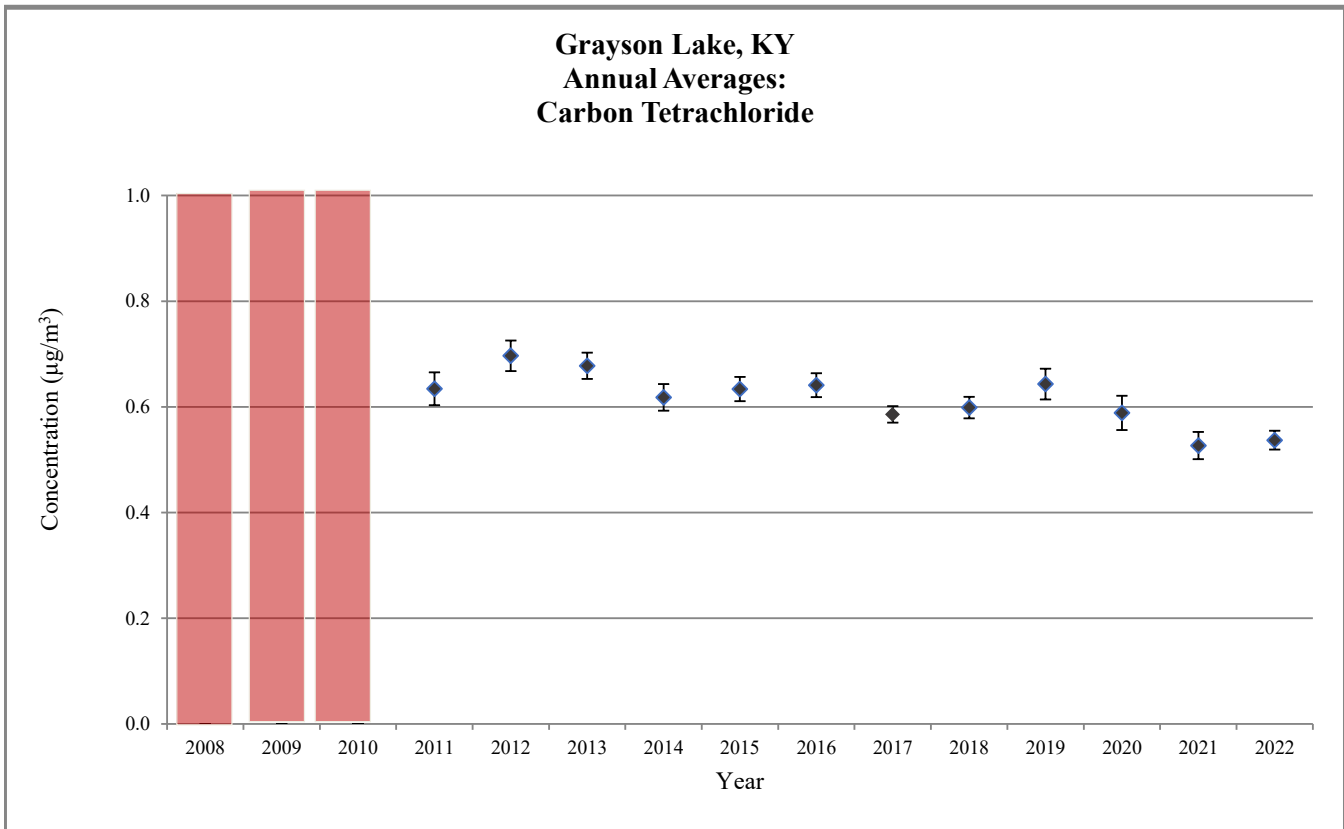
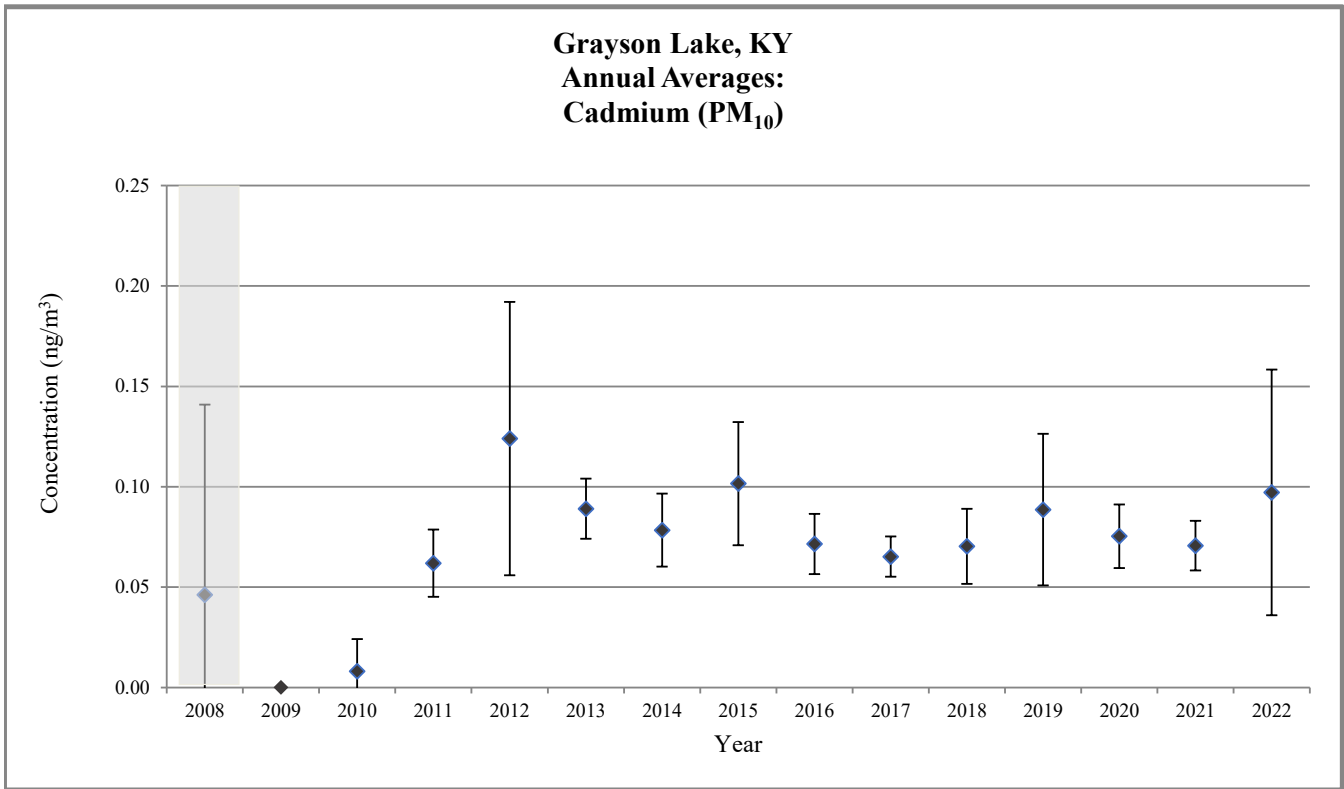
 Sampling began midway through the year.
 Does not meet MQO

Figure 3. Grayson Lake, KY Annual Average Concentrations



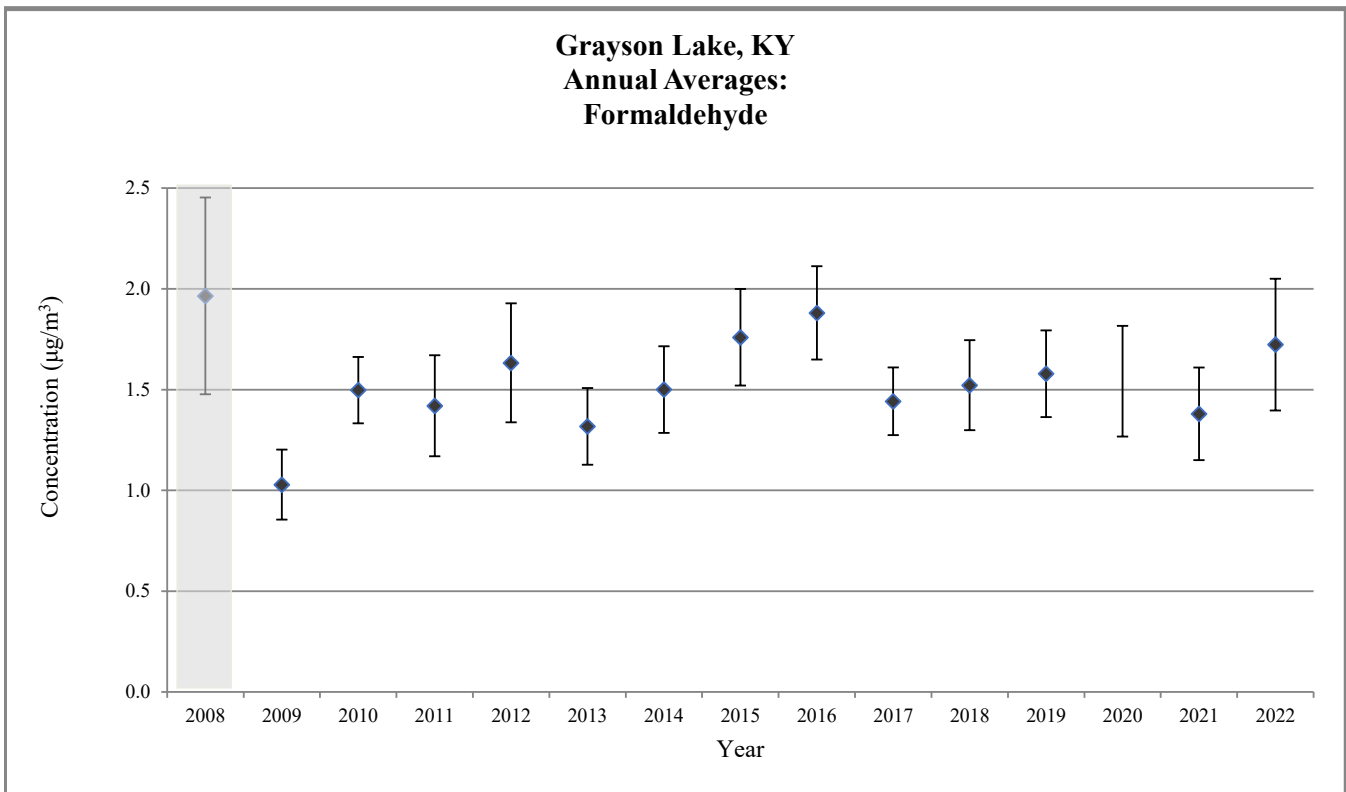
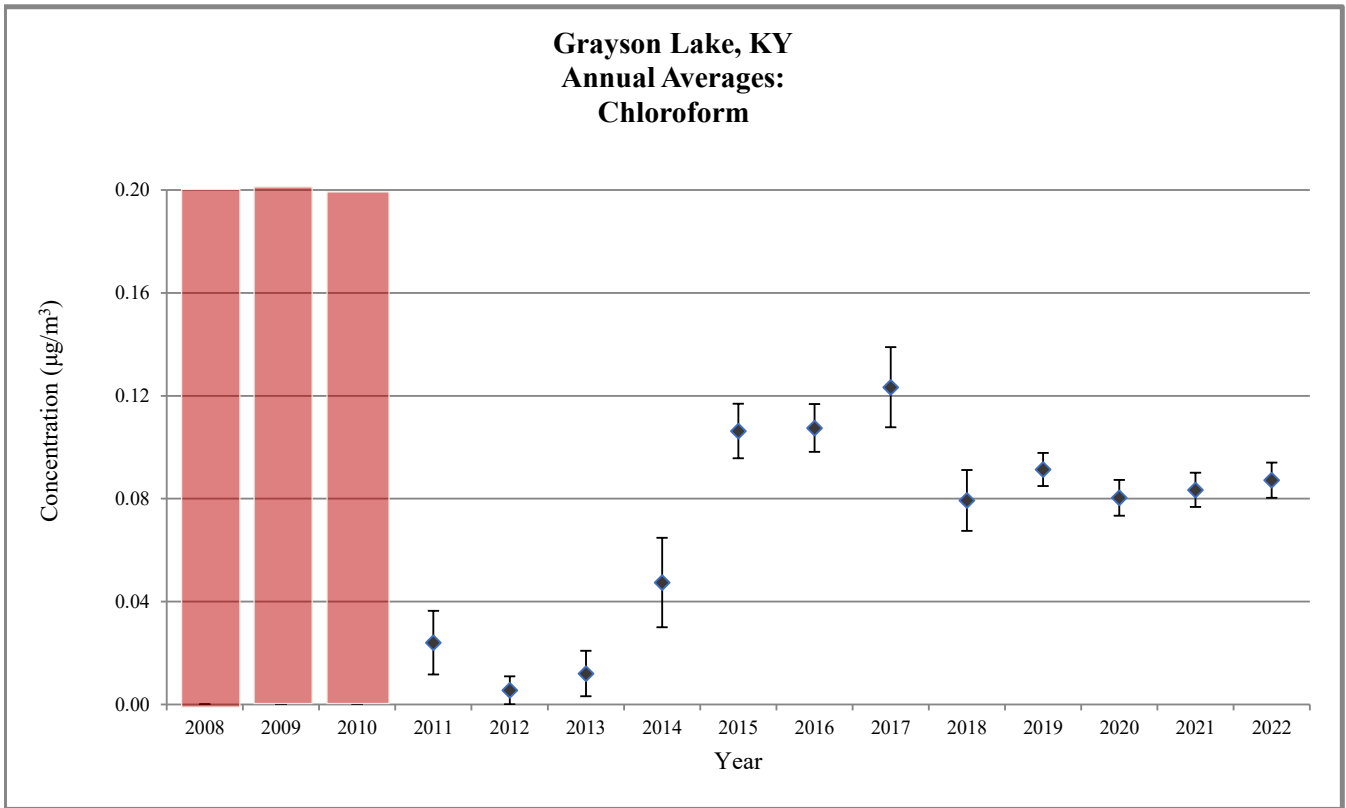
Sampling began midway through the year.
 Does not meet MQO

Figure 3. Grayson Lake, KY Annual Average Concentrations



Sampling began midway through the year.
 Does not meet MQO

Figure 3. Grayson Lake, KY Annual Average Concentrations



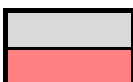
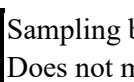
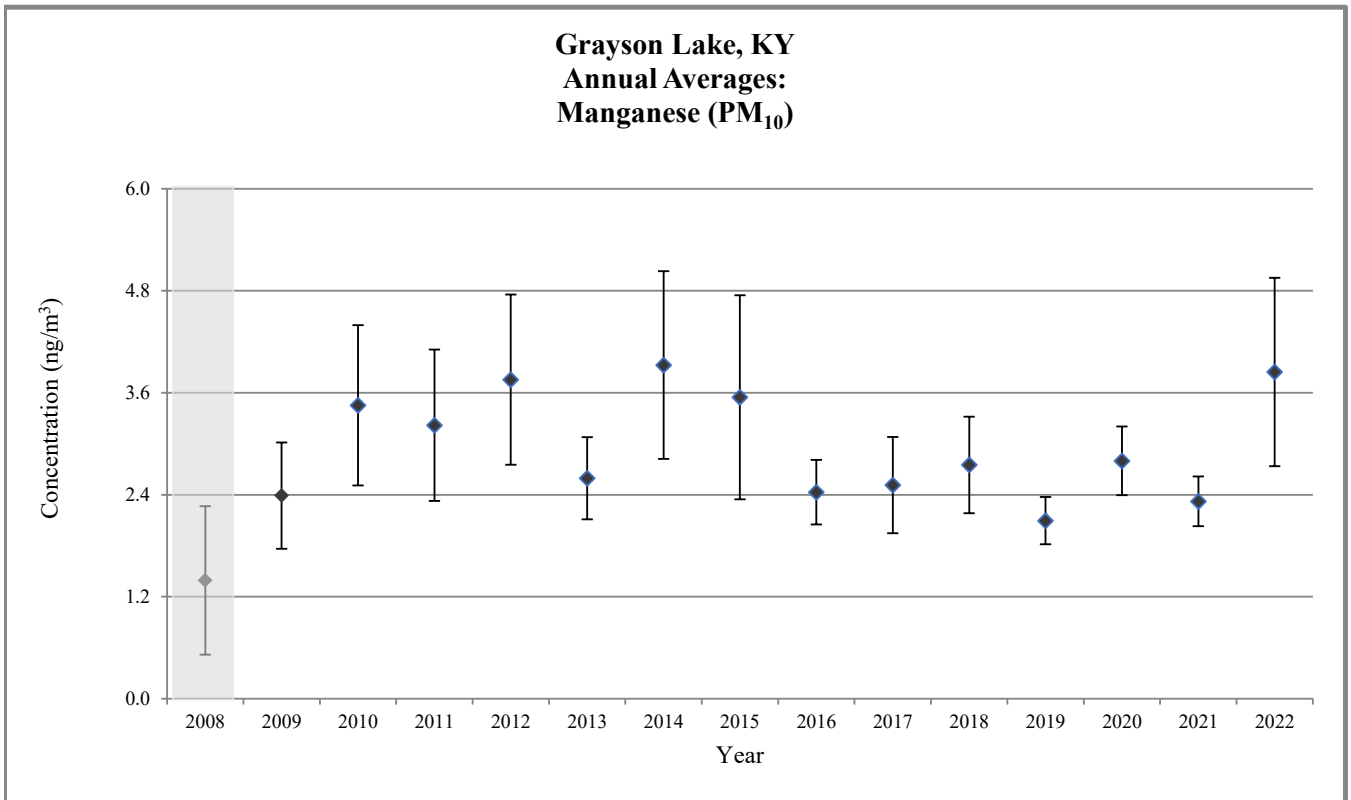
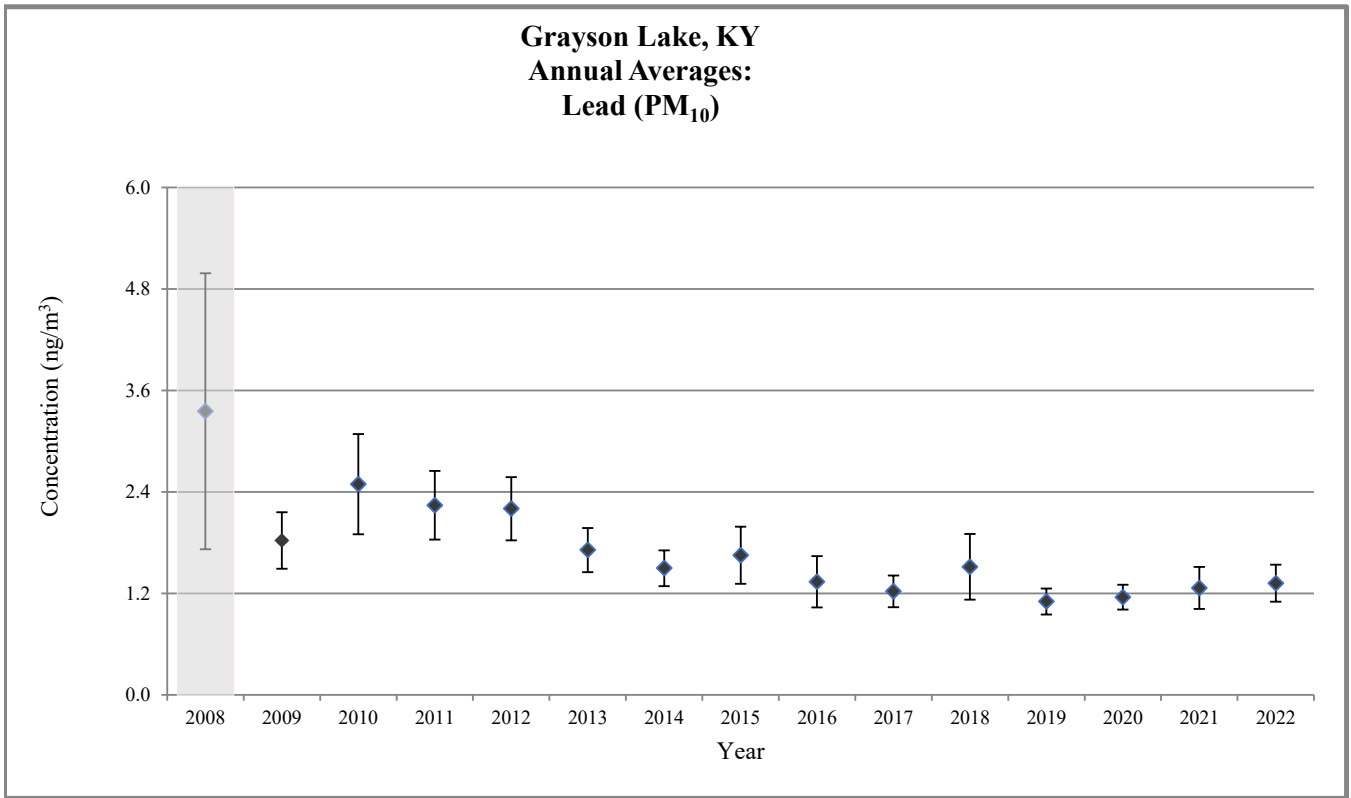
 Sampling began midway through the year.
 Does not meet MQO

Figure 3. Grayson Lake, KY Annual Average Concentrations





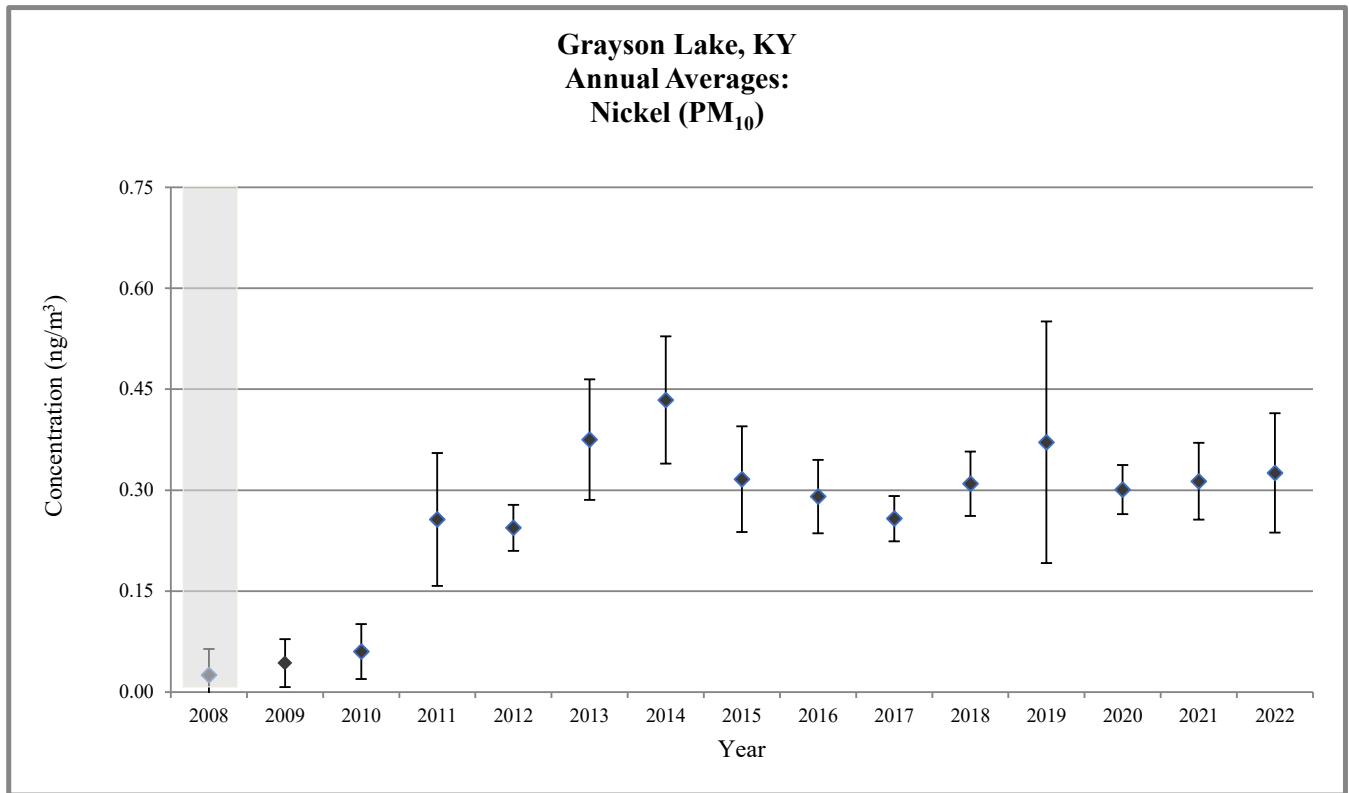
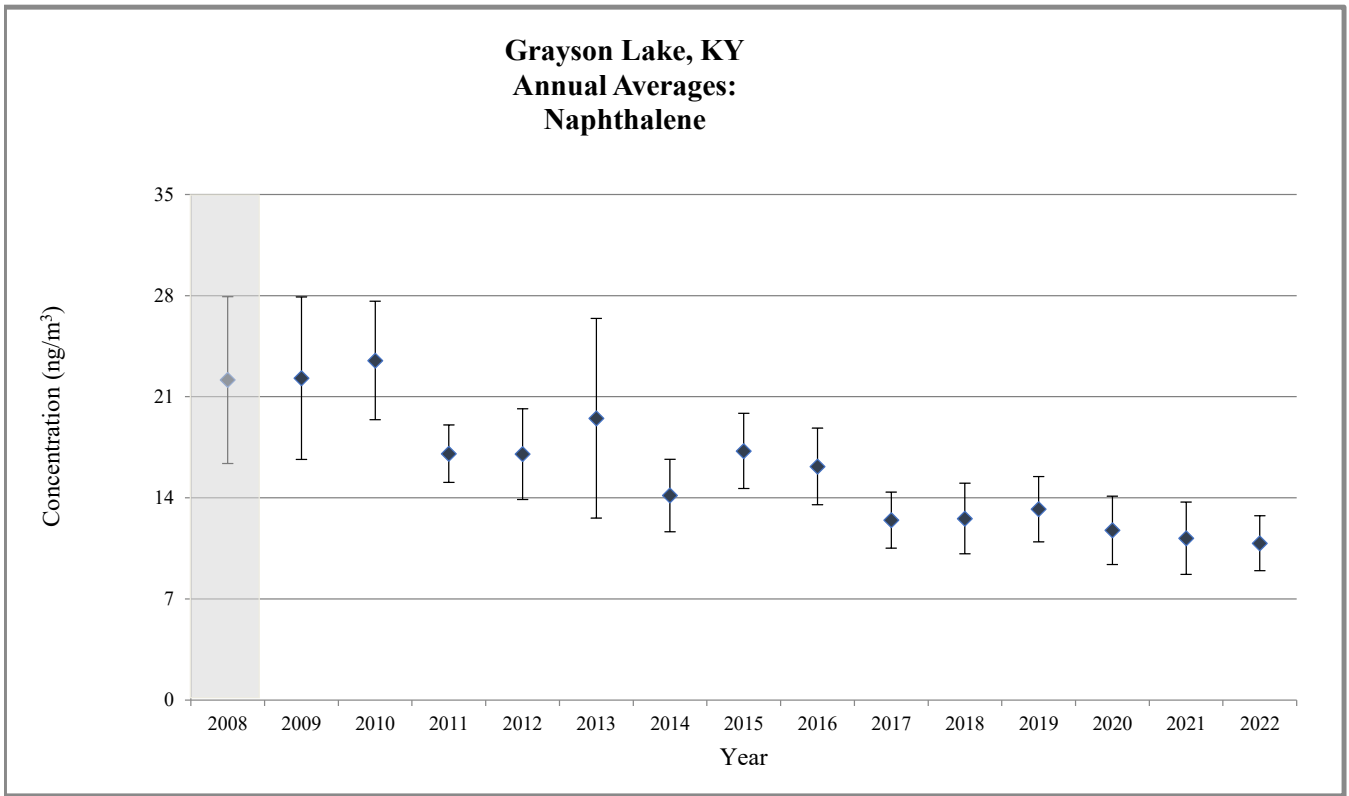
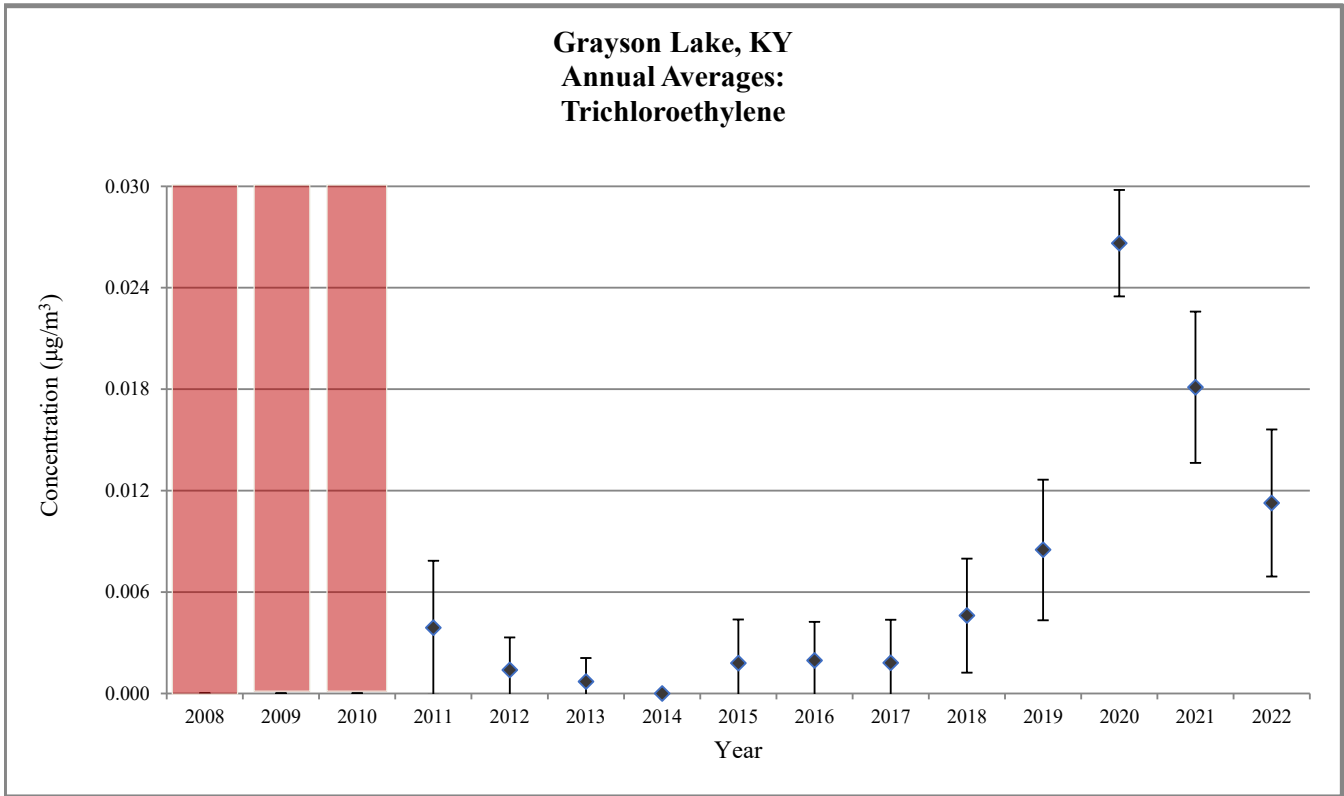
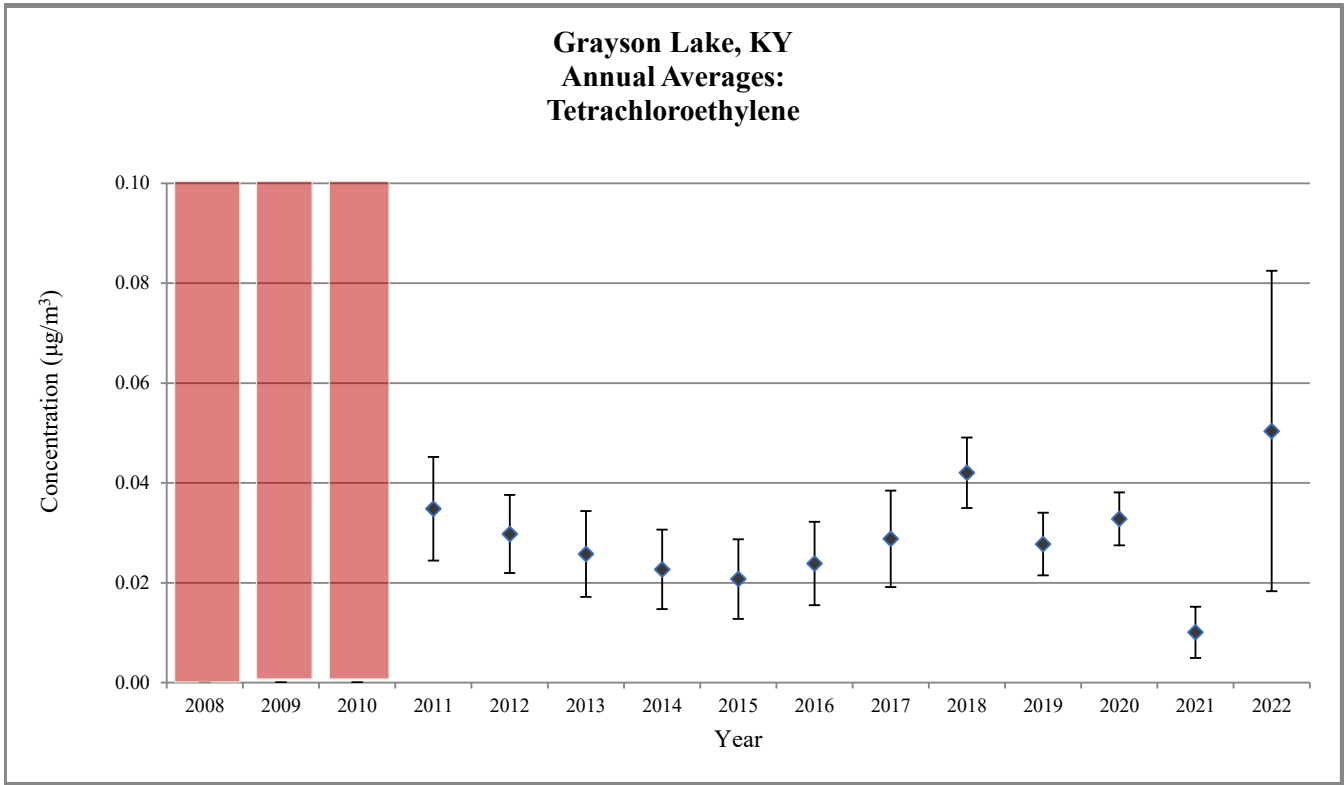
 Sampling began midway through the year.
 Does not meet MQO

Figure 3. Grayson Lake, KY Annual Average Concentrations



Sampling began midway through the year.
 Does not meet MQO

Figure 3. Grayson Lake, KY Annual Average Concentrations




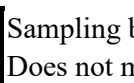
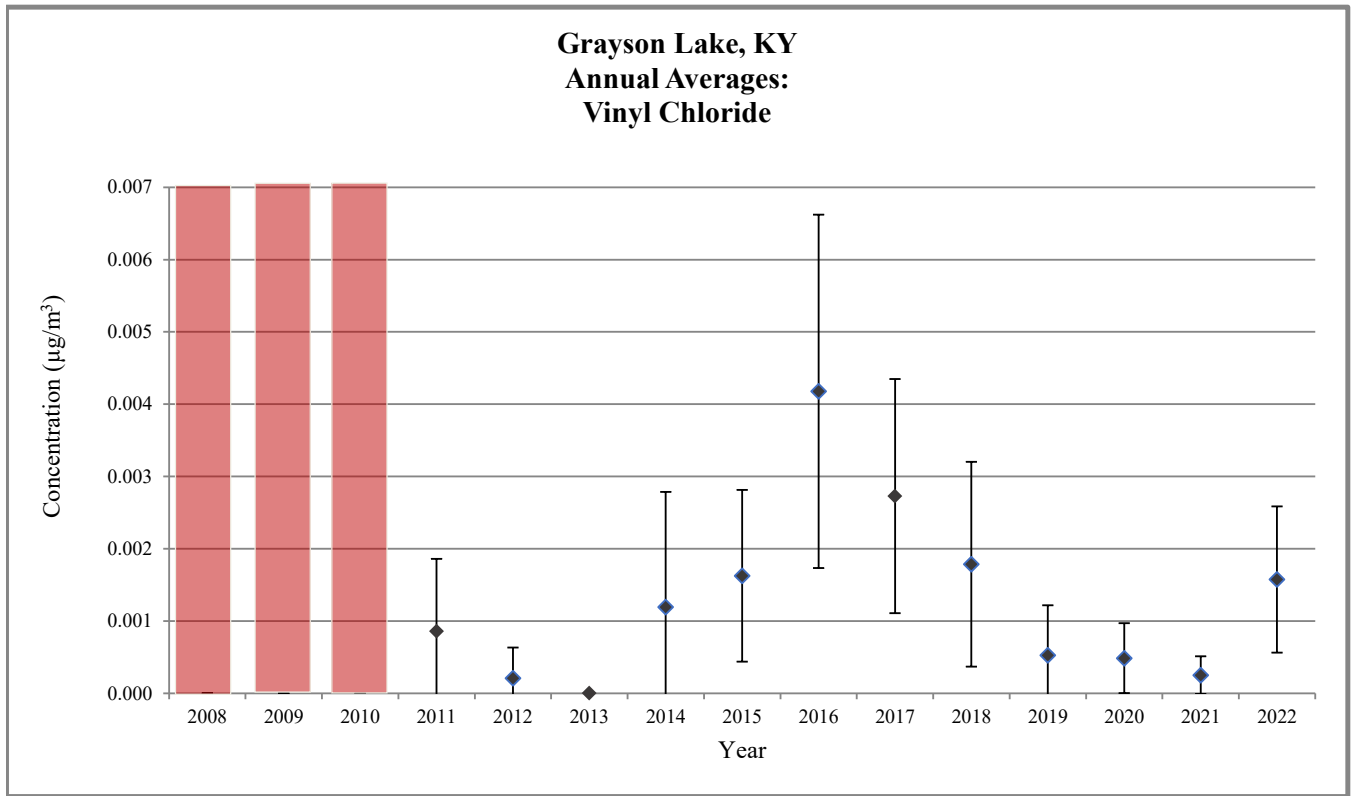
 Sampling began midway through the year.
 Does not meet MQO

Figure 3. Grayson Lake, KY Annual Average Concentrations





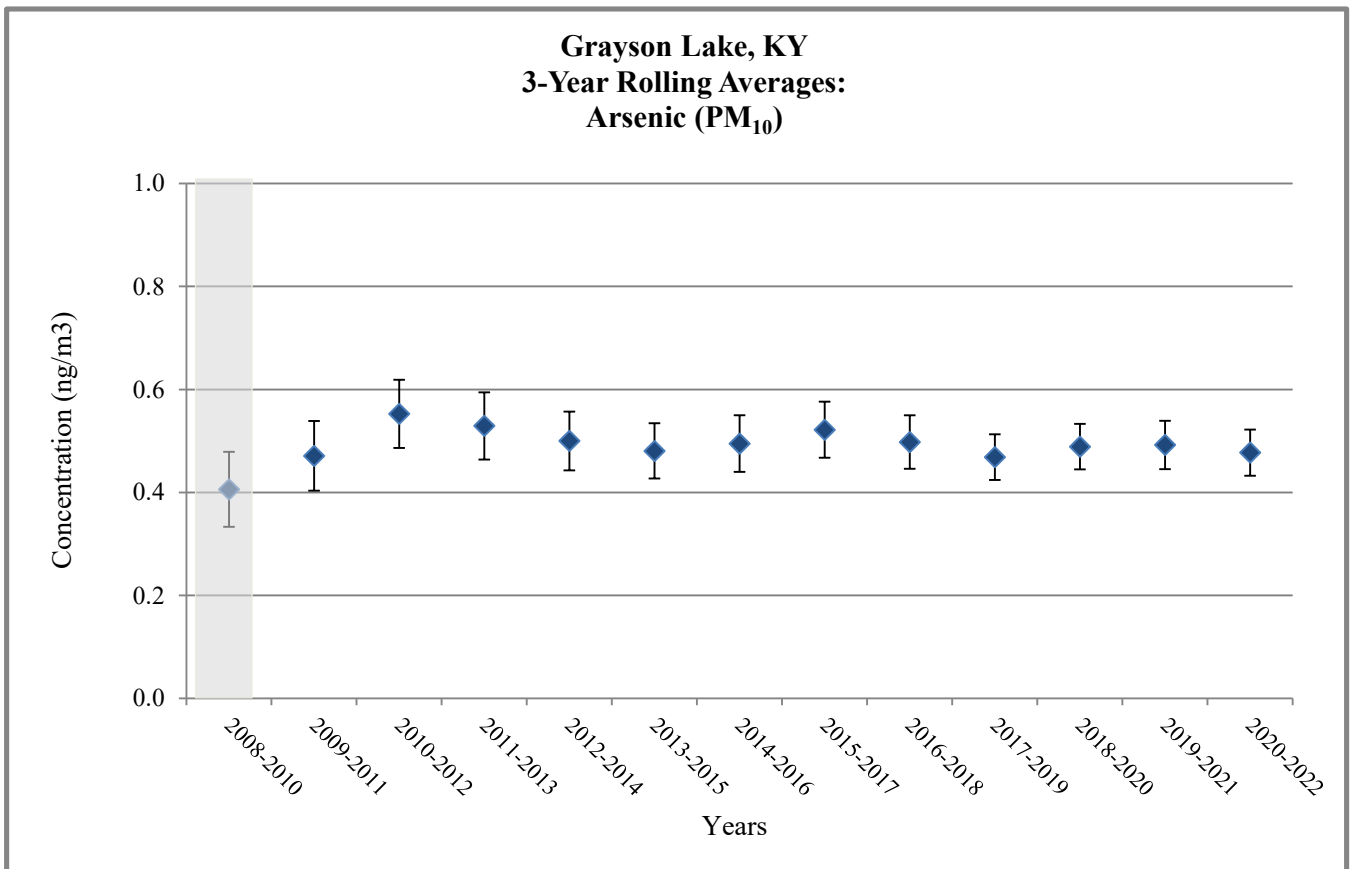
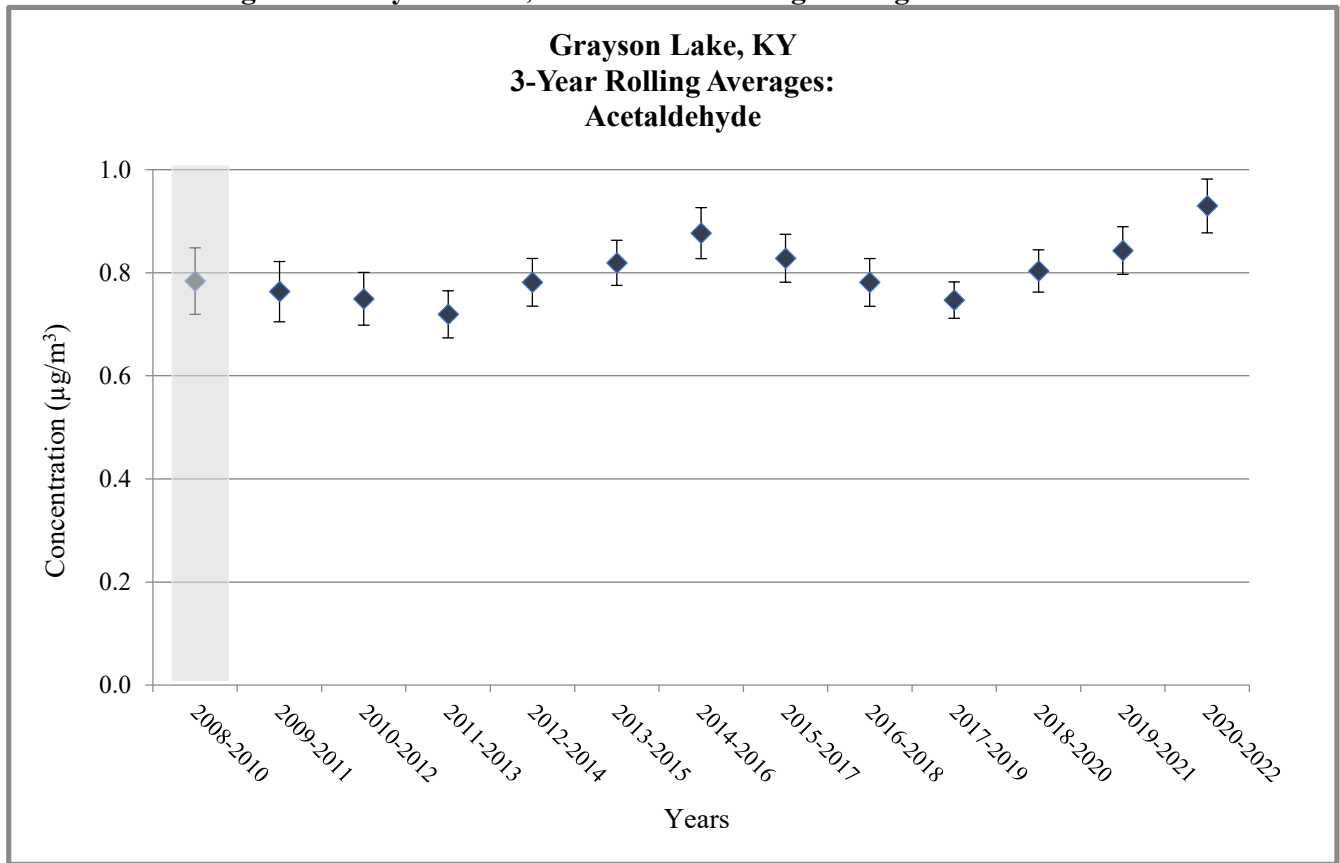
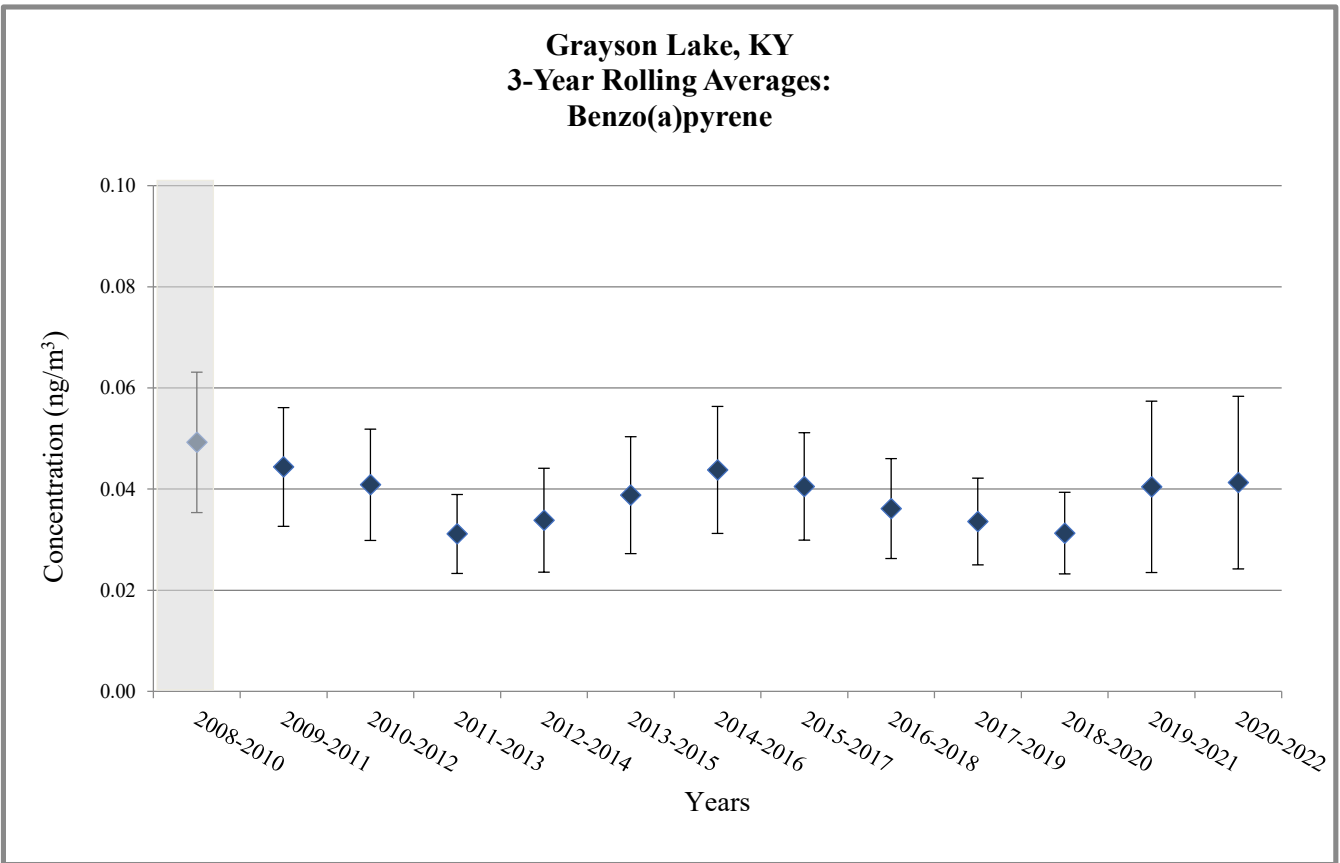
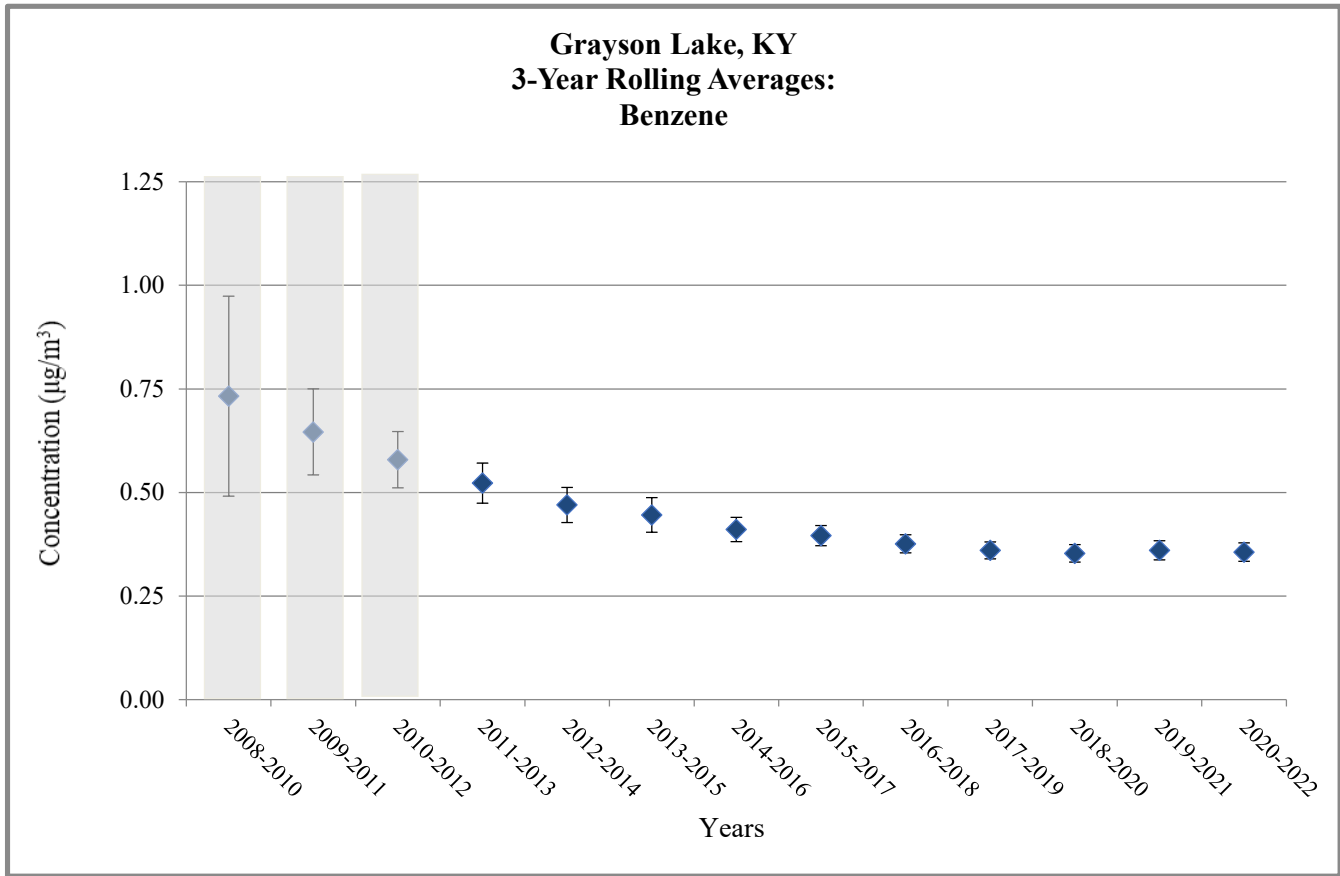
 Sampling began midway through the year.
 Does not meet MQO

Figure 4. Grayson Lake, KY - 3-Year Rolling Average Concentrations



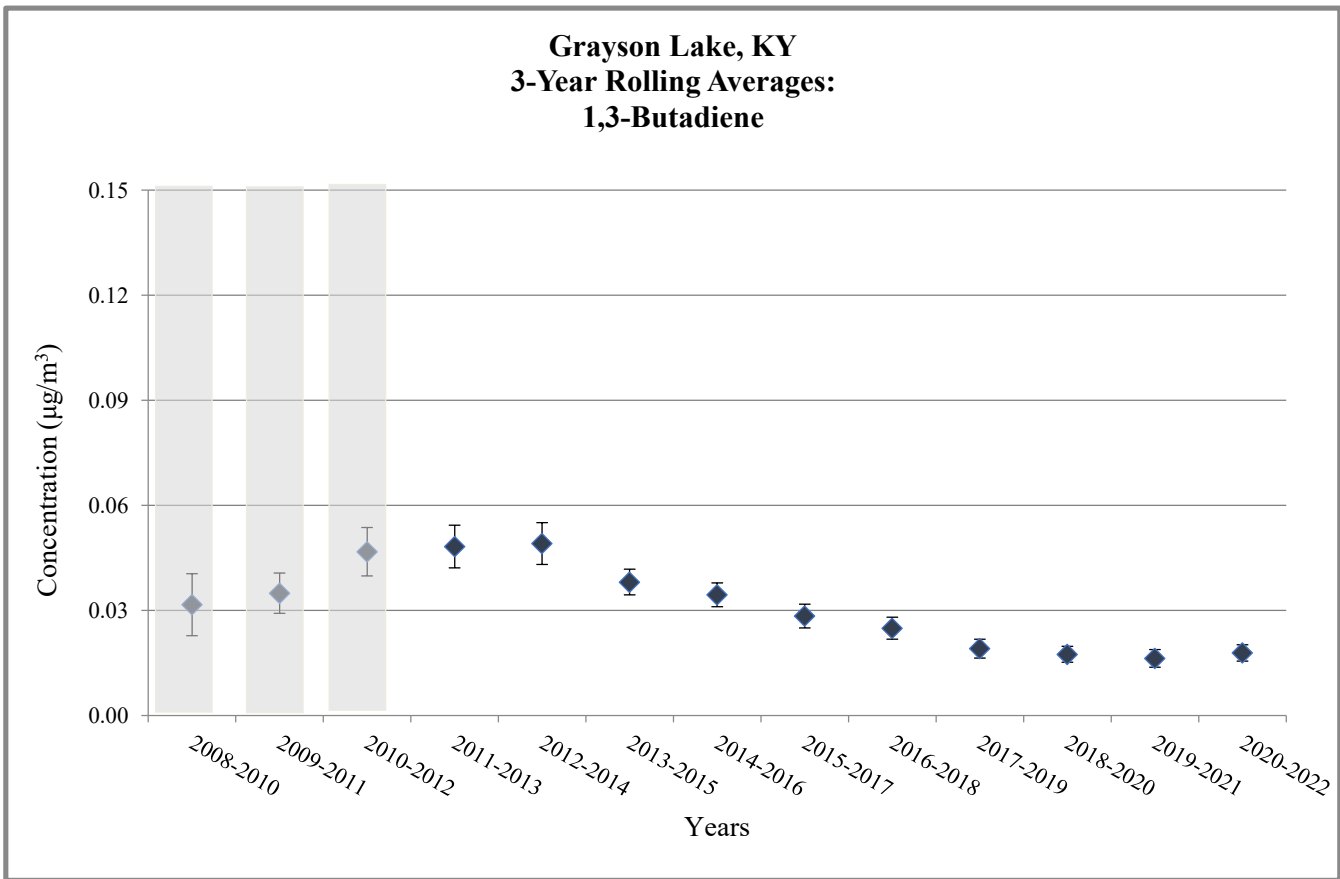
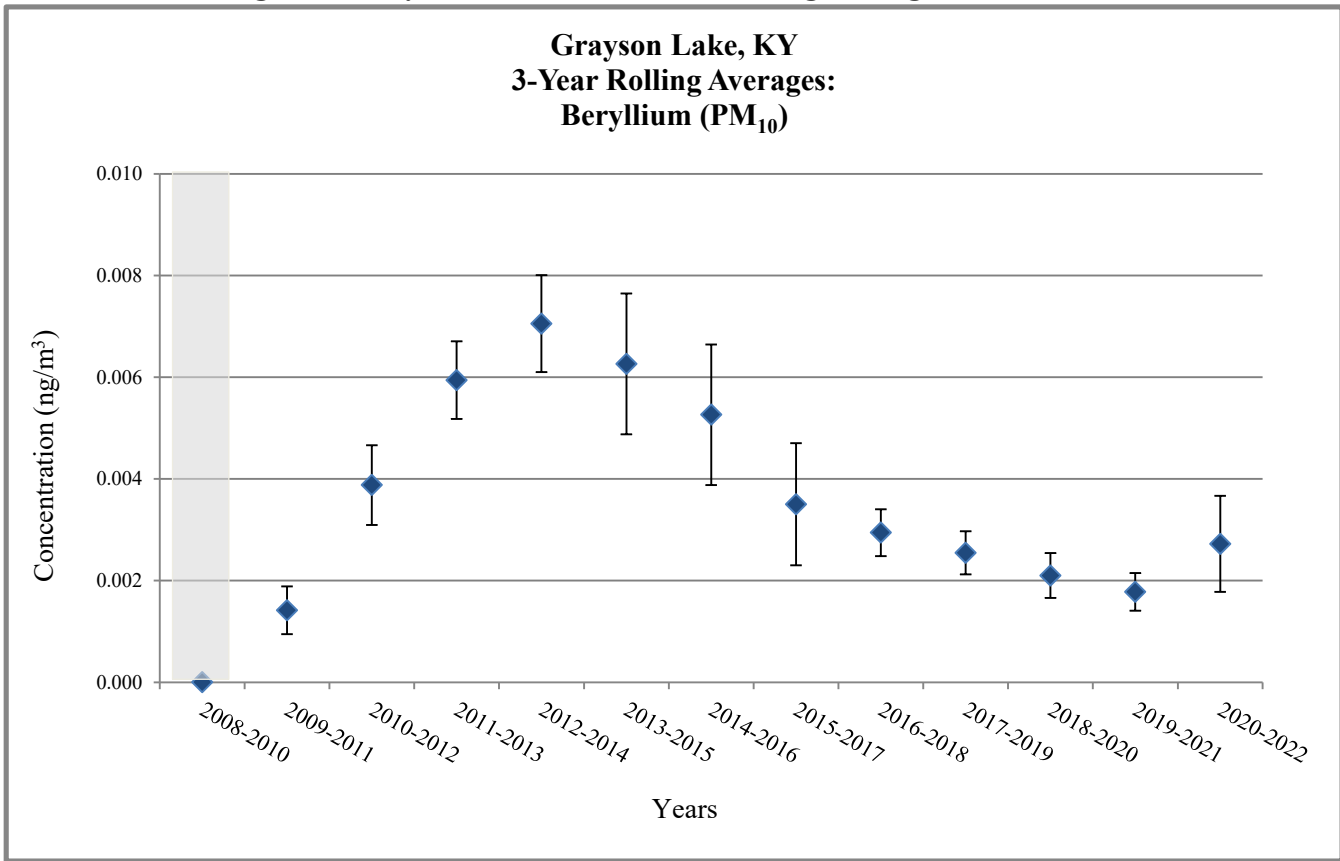
Does not meet MQO or wasn't able to collect enough samples

Figure 4. Grayson Lake, KY - 3-Year Rolling Average Concentrations



Does not meet MQO or wasn't able to collect enough samples

Figure 4. Grayson Lake, KY - 3-Year Rolling Average Concentrations




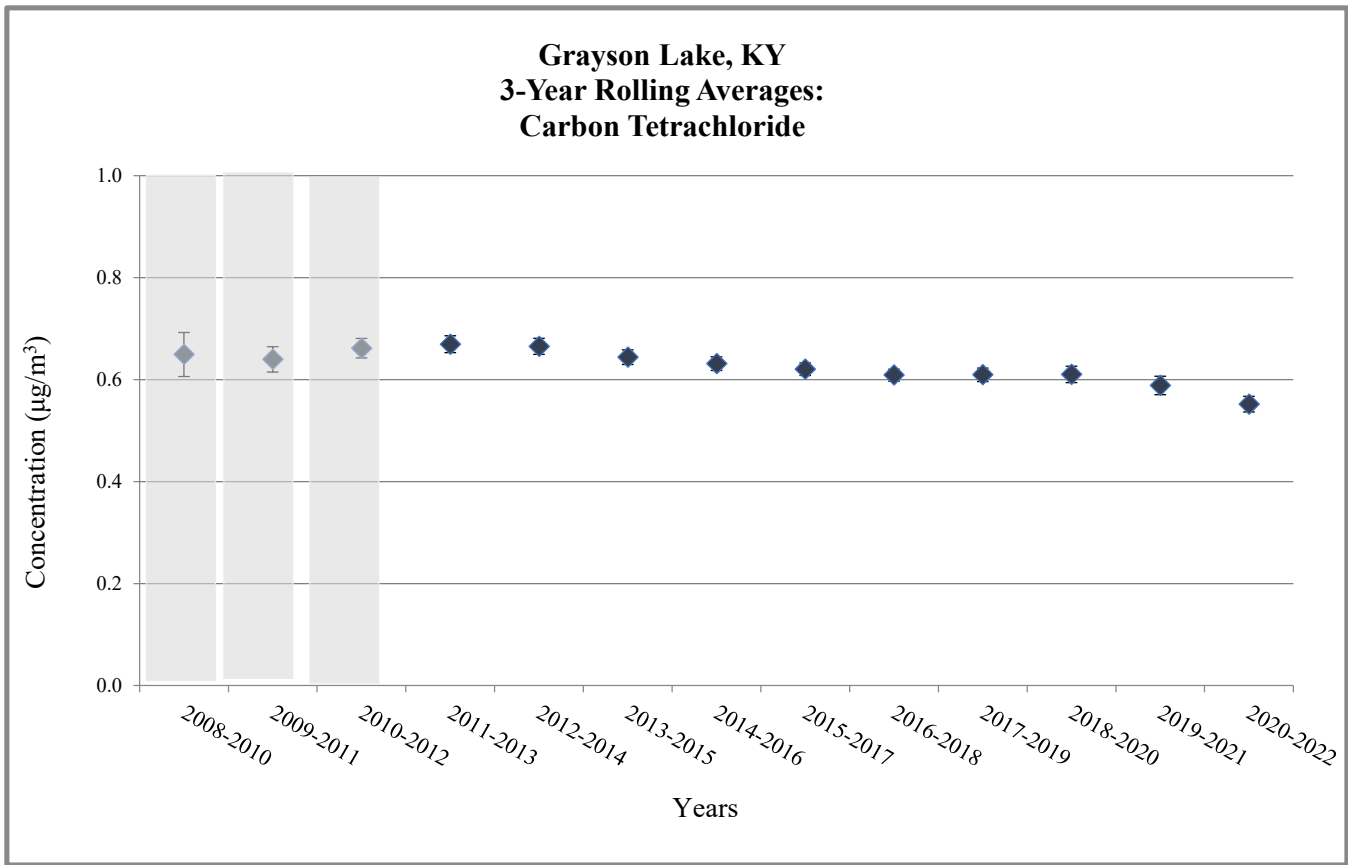
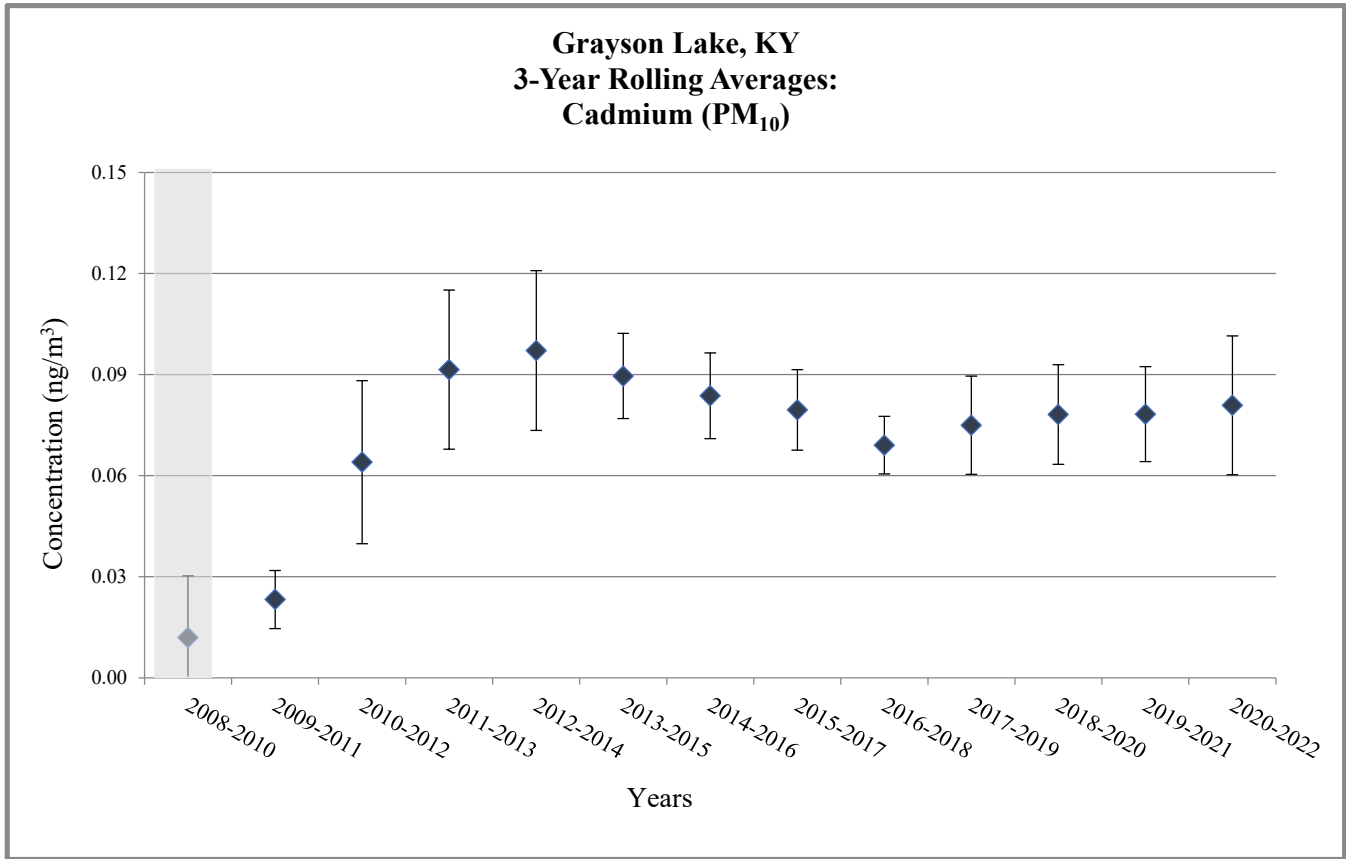
 Does not meet MQO or wasn't able to collect enough samples

Figure 4. Grayson Lake, KY - 3-Year Rolling Average Concentrations




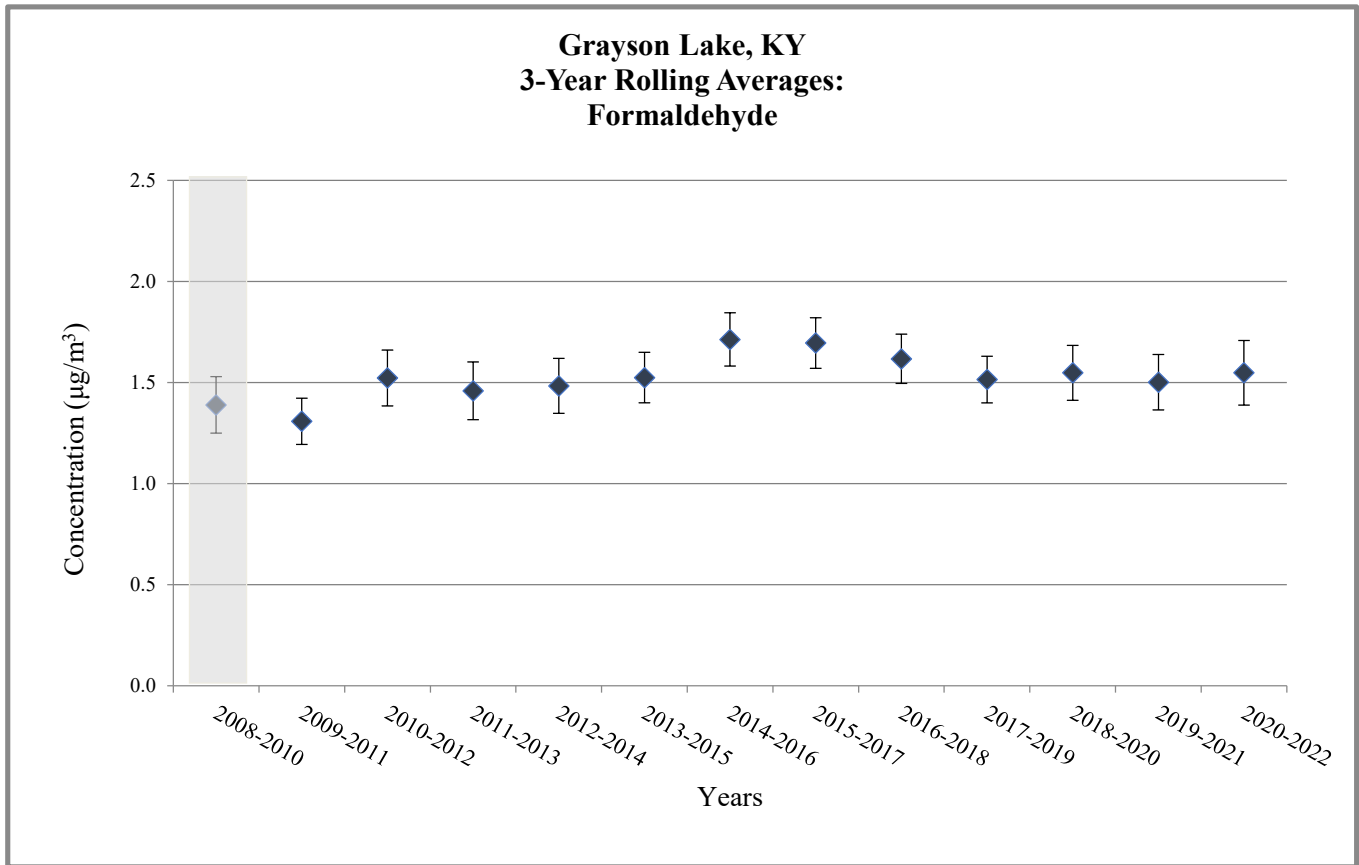
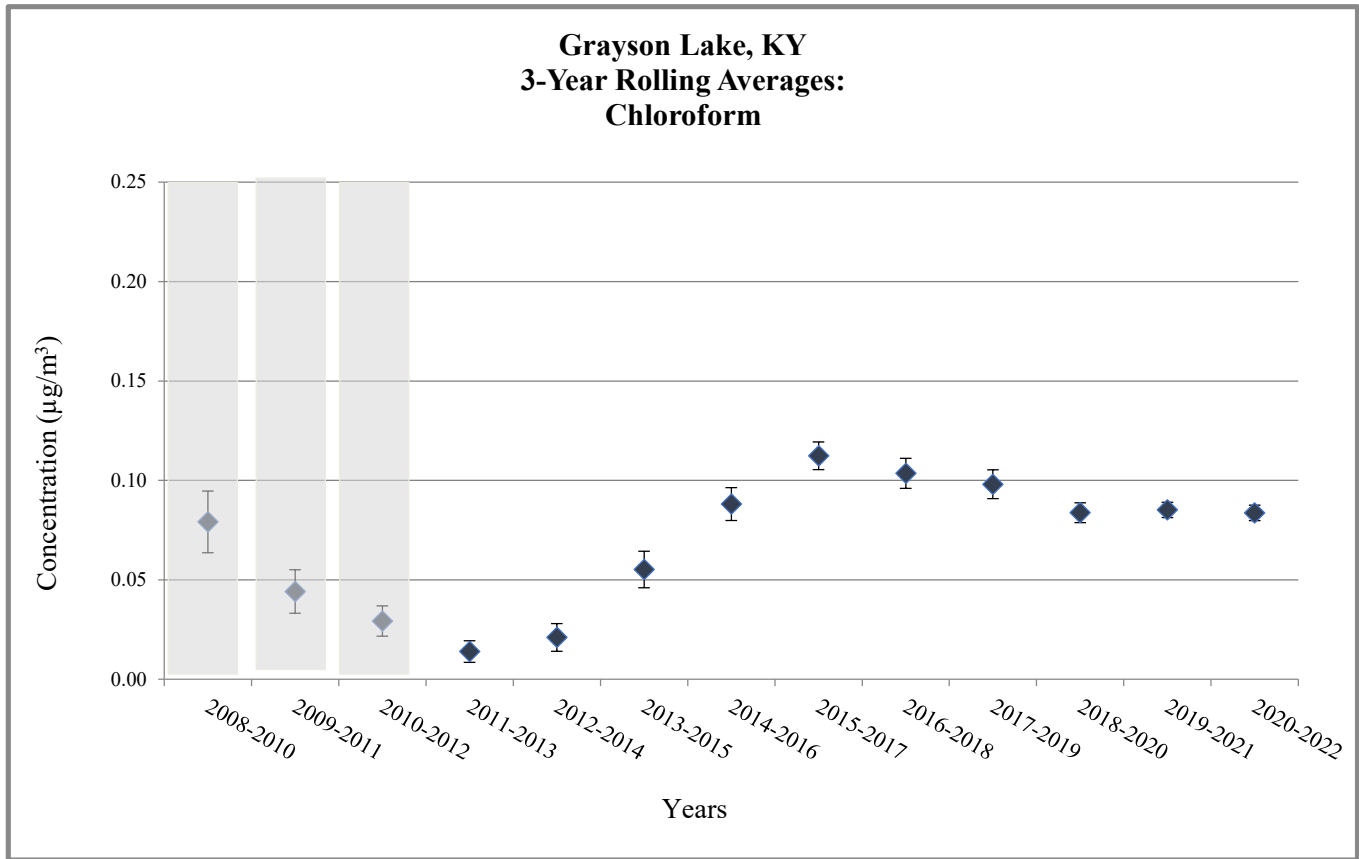
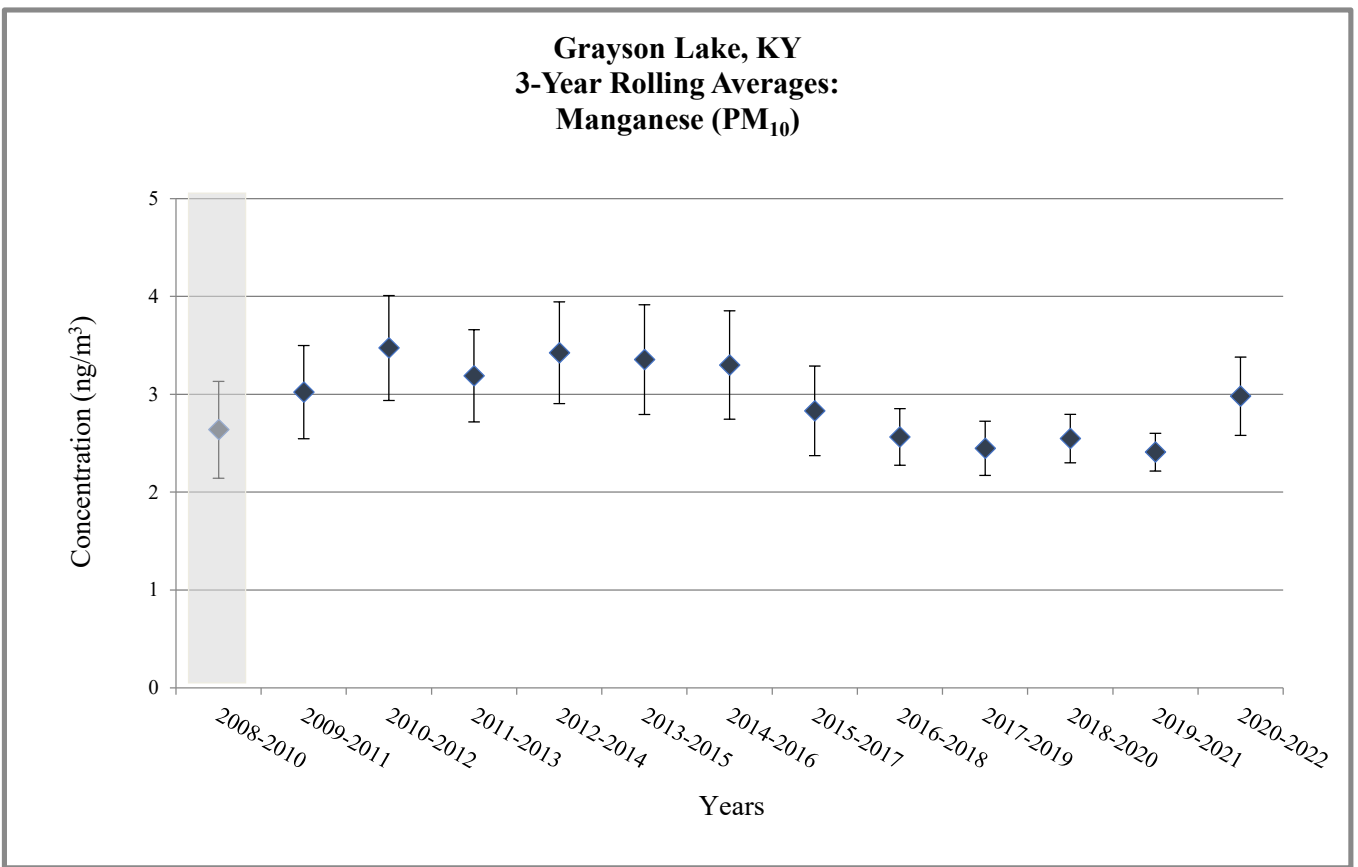
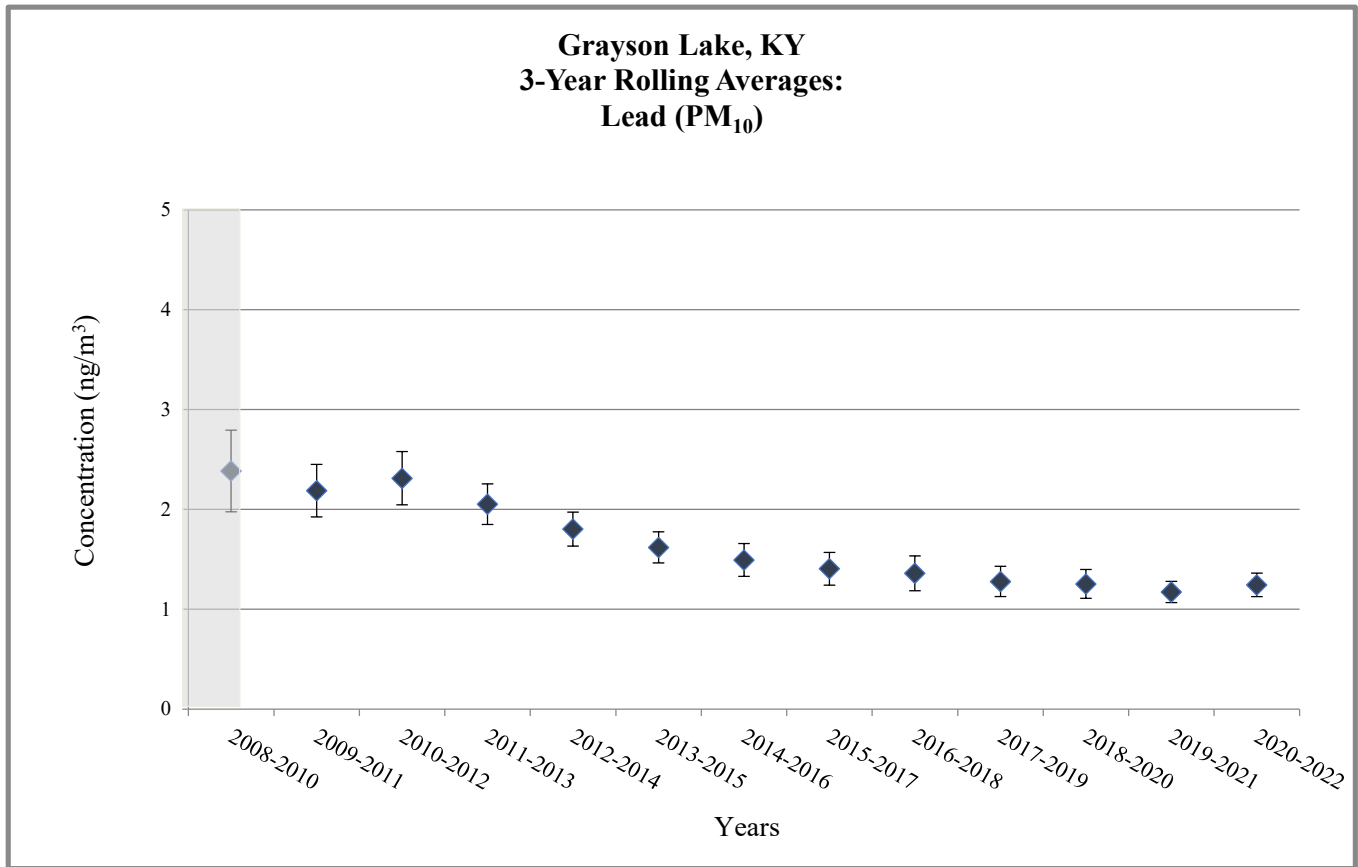
 Does not meet MQO or wasn't able to collect enough samples

Figure 4. Grayson Lake, KY - 3-Year Rolling Average Concentrations



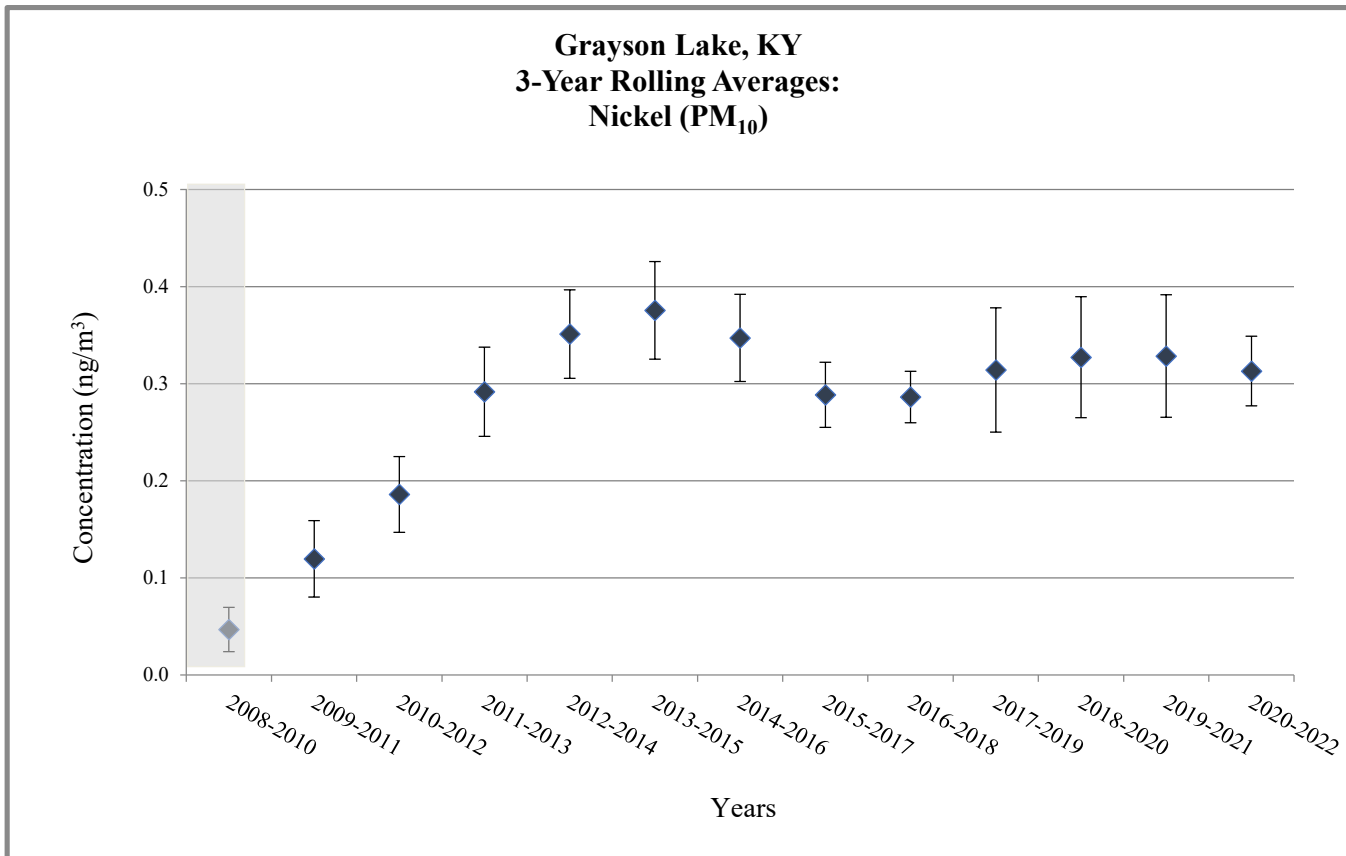
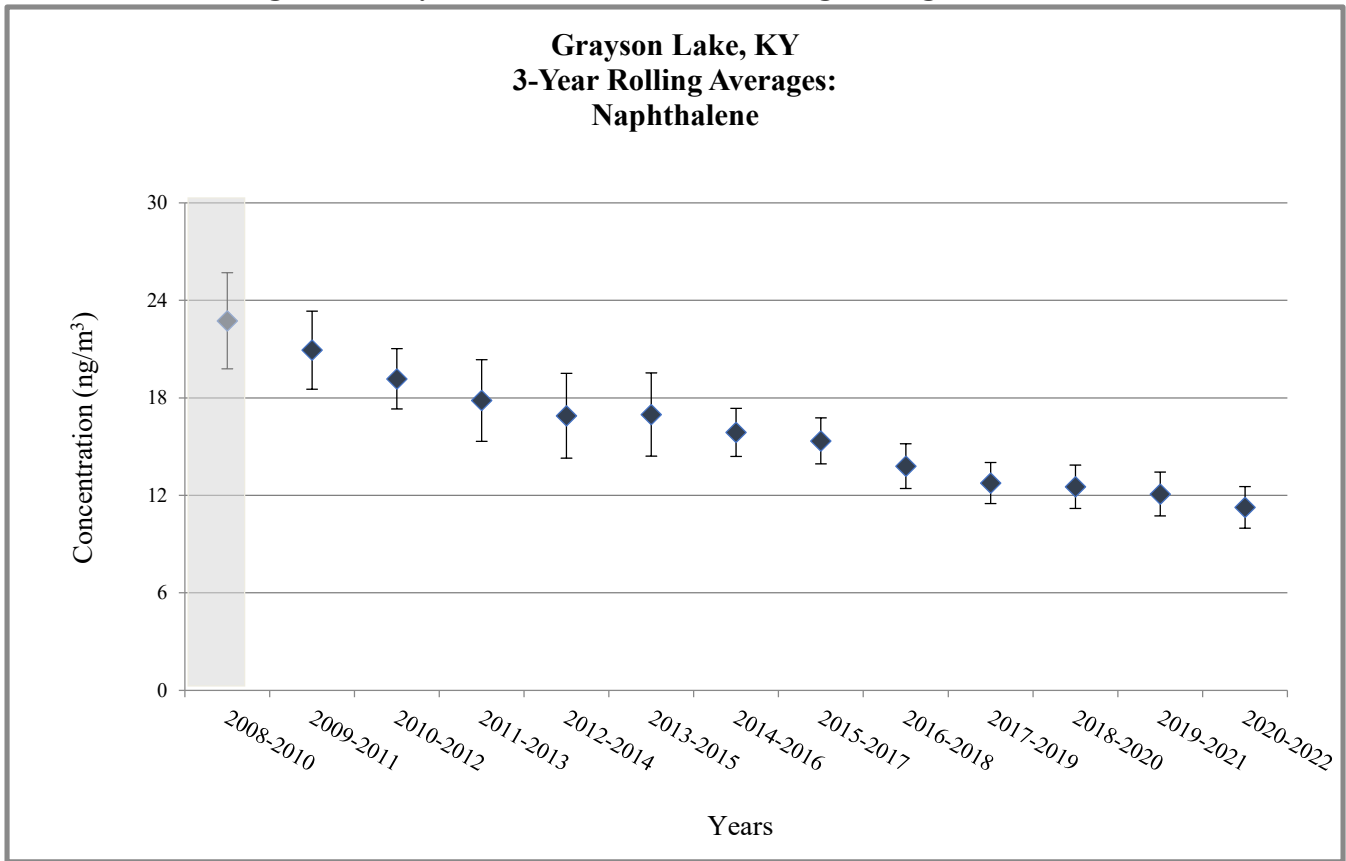
Does not meet MQO or wasn't able to collect enough samples

Figure 4. Grayson Lake, KY - 3-Year Rolling Average Concentrations



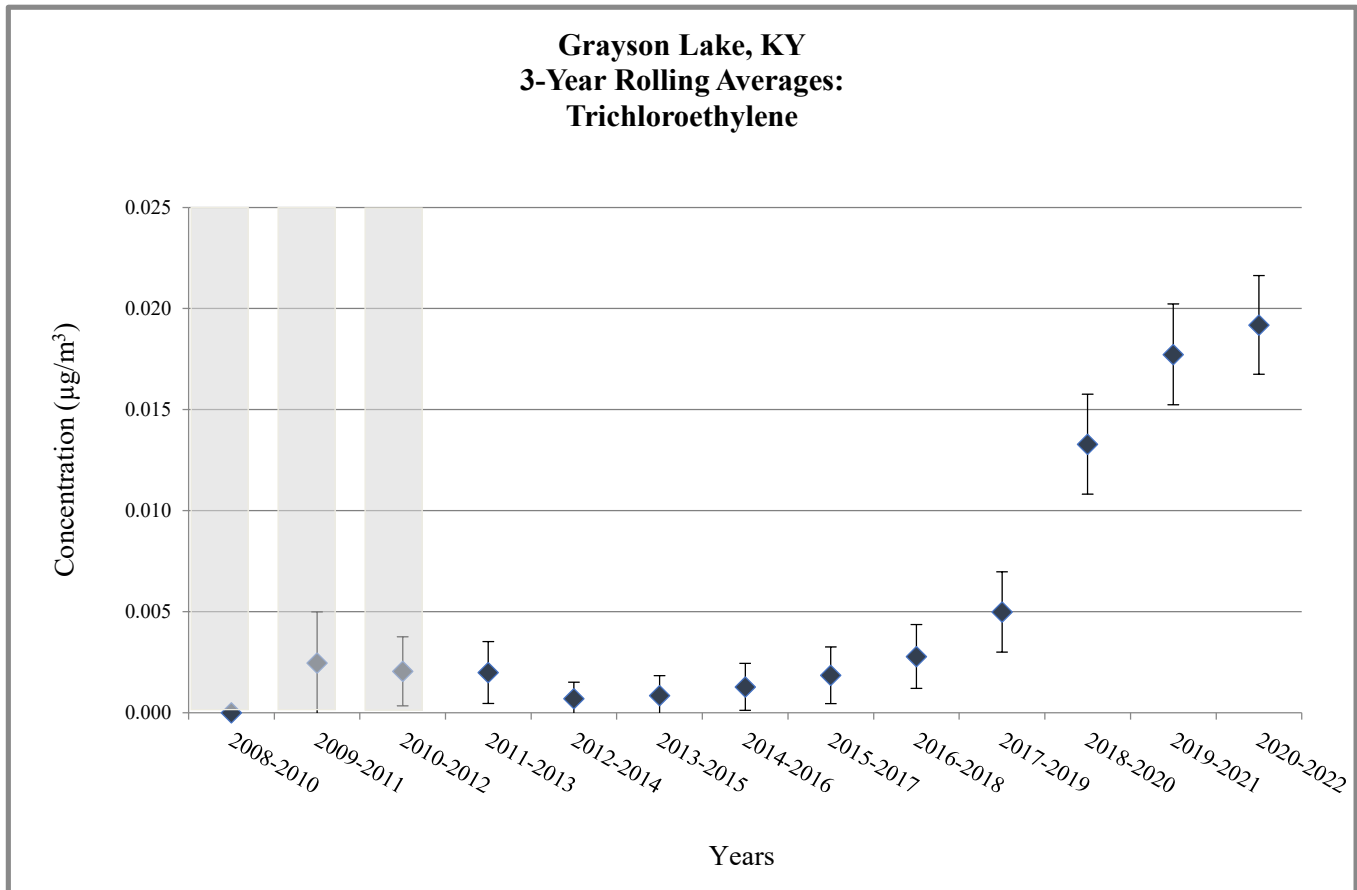
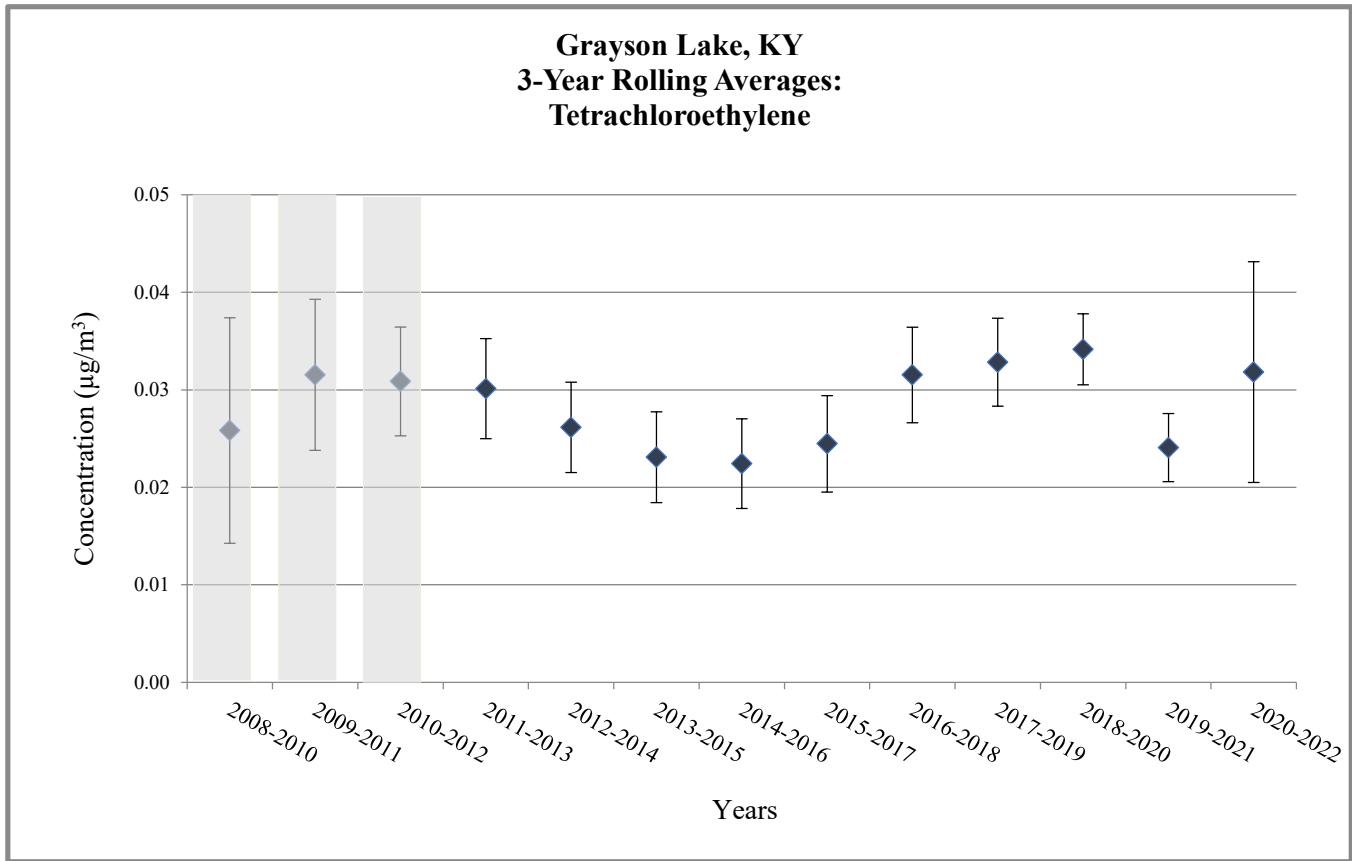
Does not meet MQO or wasn't able to collect enough samples

Figure 4. Grayson Lake, KY - 3-Year Rolling Average Concentrations



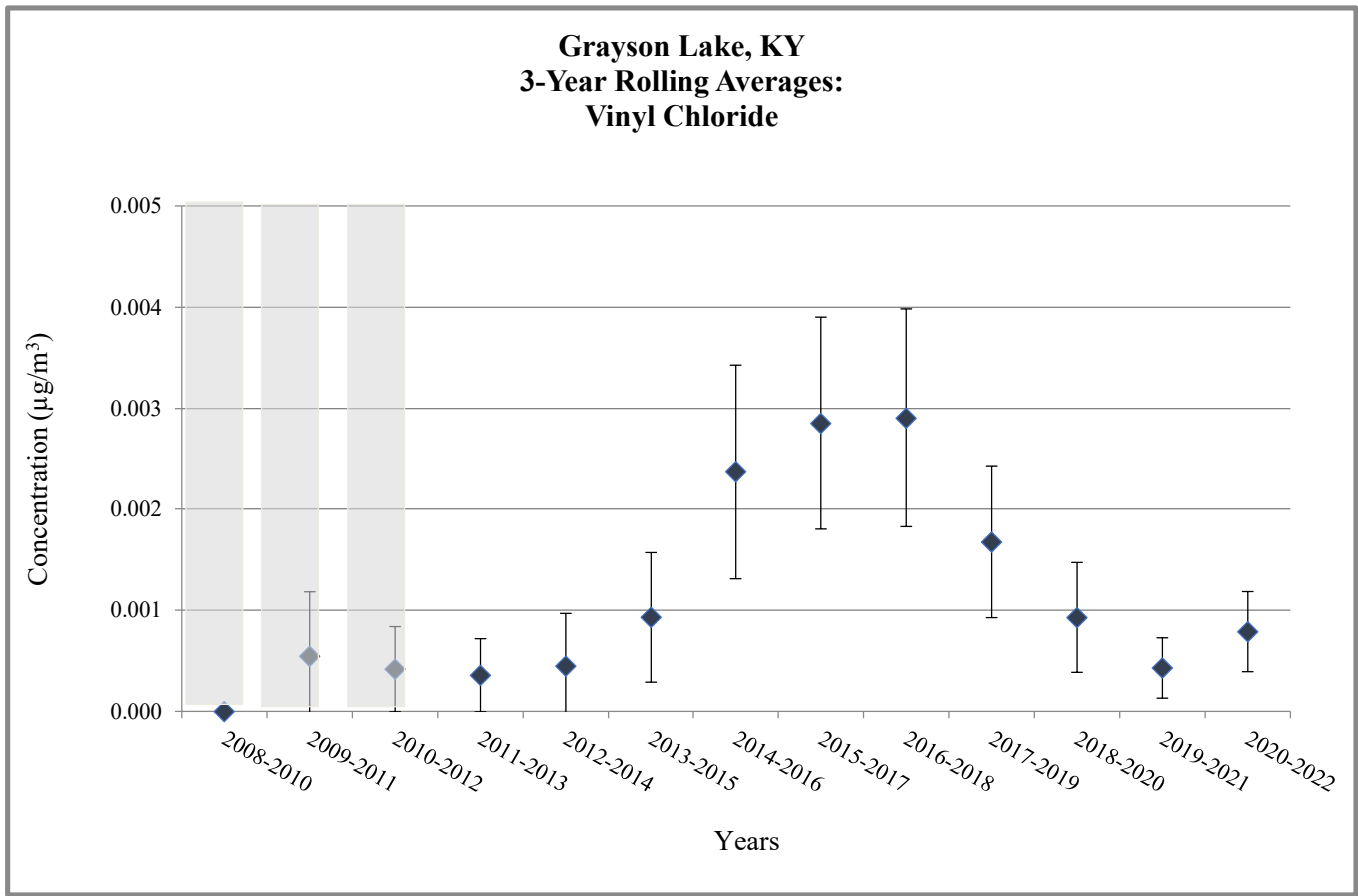
Does not meet MQO or wasn't able to collect enough samples

Figure 4. Grayson Lake, KY - 3-Year Rolling Average Concentrations



Does not meet MQO or wasn't able to collect enough samples

Figure 4. Grayson Lake, KY - 3-Year Rolling Average Concentrations




 Does not meet MQO or wasn't able to collect enough samples

Table 6. NATTS Network Assessment: MQO#1 - Completeness Percentage at Grayson Lake, KY

Year	Benzene	Butadiene, 1,3-	Carbon tetrachlorid	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM10)	Beryllium (PM10)	Cadmium (PM10)	Lead (PM10)	Manganese (PM10)	Nickel (PM10)	Benzo(a)pyrene	Naphthalene
	VOCs							Carbonyls		PM10 Metals						PAHs	
<i>Grayson Lake, KY (AQS Site Code: 21-043-0500)</i>																	
2008	--a,b	--a,b	--a,b	--a,b	--a,b	--a,b	--a,b	--a	--a	--a	--a	--a	--a	--a	--a	--a	--a
2009	--b	--b	--b	--b	--b	--b	--b	100	100	98	98	98	98	98	98	100	100
2010	--c	--c	--c	--c	--c	--c	--c	98	98	100	100	100	100	100	100	98	98
2011	100	100	100	100	100	100	100	84	84	98	98	98	98	98	98	100	100
2012	98	98	98	98	98	98	98	100	100	97	97	97	97	97	97	100	100
2013	100	100	100	100	100	100	100	100	100	97	97	97	97	97	97	95	95
2014	92	92	92	92	92	92	92	100	100	97	97	97	97	97	97	95	95
2015	100	100	100	100	100	100	100	100	100	97	97	97	97	97	97	98	98
2016	100	100	100	100	100	100	100	100	100	97	97	97	97	97	97	100	100
2017	98	98	98	98	98	98	98	98	98	92	92	92	92	92	92	92	92
2018	98	98	98	97	98	98	98	95	95	95	95	95	95	95	95	92	93
2019	100	100	100	100	100	100	100	100	100	98	98	98	98	98	98	100	100
2020	100	100	100	98	100	100	100	100	100	100	100	100	100	100	100	92	92
2021	89	89	89	87	89	89	89	97	97	95	85	95	95	95	95	93	93
2022	98	98	98	98	98	82	98	97	97	93	93	93	93	93	93	98	98

A-rated: ≥85%
B-rated: Between 75% to 85%
Does not meet: ≤75%
-- No data available

^a: Due to site logistical issues, sampling ended at the Hazard, KY site in May 2008. The site relocated to Grayson Lake, KY and sampling resumed in October 2008.

^b: Pollutant was expected, but results were invalidated at this site for this year.

^c: Analysis of VOCs were switched to the National Monitoring Program lab in summer 2010. As such, there were not enough samples that were valid.

Table 7. NATTS Network Assessment: MQO#2 - Reported Method Detection Limits (MDLs) at Grayson Lake, KY

	Benzene	Butadiene, 1,3-	Carbon tetrachlorid	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM10)	Beryllium (PM10)	Cadmium (PM10)	Lead (PM10)	Manganese (PM10)	Nickel (PM10)	Benzo(a)pyrene	Naphthalene
Year	VOCs							Carbonyls		PM10 Metals						PAHs	
<i>Grayson Lake, KY (AQS Site Code: 21-043-0500)</i>																	
2008	--a	--a	--a	--a	--a	--a	--a	0.18	0.03	0.45	0.26	0.17	0.01	0.02	0.05	0.07	0.01
2009	--a	--a	--a	0.20	--a	0.22	--a	0.04	0.01	0.45	0.20	0.17	0.01	0.02	0.05	0.06	0.01
2010	0.47	0.22	0.89	0.17	0.44	0.18	0.30	0.04	0.01	0.557	0.195	0.193	0.01	0.02	0.08	0.03	0.01
2011	0.71	0.15	0.89	0.09	0.72	0.27	0.19	0.02	0.01	0.68	0.02	0.02	0.001	0.03	0.08	0.04	0.003
2012	1.50	0.24	0.89	0.14	0.80	0.24	0.26	0.02	0.01	0.74	0.05	0.02	0.00	0.06	0.19	0.05	0.004
2013	0.47	0.24	0.59	0.15	0.56	0.43	0.26	0.02	0.12	0.87	0.05	0.02	0.01	0.03	0.12	0.05	0.01
2014	0.37	0.29	0.63	0.14	0.52	0.46	0.28	0.01	0.11	0.96	0.05	0.02	0.003	0.03	0.09	0.03	0.01
2015	0.96	0.31	0.37	0.16	0.56	0.46	0.19	0.02	0.12	0.06	0.00	0.01	0.002	0.02	0.11	0.13	0.01
2016	0.52	0.58	0.59	0.12	0.64	0.43	0.74	0.02	0.11	0.17	0.00	0.00	0.002	0.02	0.10	0.06	0.02
2017	0.64	0.44	0.85	0.19	1.24	0.94	0.40	0.06	0.54	0.16	0.00	0.00	0.002	0.02	0.11	0.02	0.06
2018	0.36	0.43	0.49	0.13	0.58	0.40	0.30	0.06	0.54	0.15	0.00	0.01	0.004	0.04	0.56	0.01	0.06
2019	0.24	0.24	0.40	0.08	0.35	0.33	0.24	0.05	0.46	0.14	0.006	0.024	0.004	0.06	0.30	0.01	0.04
2020	0.24	0.24	0.40	0.08	0.49	0.24	0.24	0.05	0.42	0.13	0.006	0.008	0.004	0.06	0.29	0.01	0.03
2021	0.25	0.26	0.41	0.07	0.49	0.24	0.20	0.05	0.44	0.13	0.009	0.008	0.004	0.06	0.28	0.01	0.03
2022	0.25	0.37	0.41	0.07	0.73	0.33	0.18	0.06	0.44	0.09	0.008	0.012	0.004	0.07	0.13	0.01	0.03

- A-rated: MDL to Target MDL ratio ≤ 1
- B-rated" MDL to Target MDL ratio between 1 and 2
- Does Not Meet MDL to Target MDL ratio>2
- No data available

^a: Pollutant was expected, but results were invalidated at this site for this year.

Table 8. NATTS Network Assessment: MQO#3 - Bias Percent Difference at Grayson Lake, KY

Year	Benzene	Butadiene, 1,3-	Carbon tetrachlorid	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM10)	Beryllium (PM10)	Cadmium (PM10)	Lead (PM10)	Manganese (PM10)	Nickel (PM10)	Benzo(a)pyrene	Naphthalene
	VOCs							Carbonyls		PM10 Metals						PAHs	
<i>Grayson Lake, KY (AQS Site Code: 21-043-0500)</i>																	
2008	--a	--a	--a	--a	--a	--a	--a	2.9	9.6	7.6	2.5	4.3	-3.7	1.9	29.4	--b	--b
2009	--a	--a	--a	--a	--a	--a	--a	-20.0	-13.7	12.0	32.0	17.2	-6.2	-4.8	4.9	-1.7	-7.7
2010	-13.2	-3.7	31.6	1.0	-16.1	-6.4	-14.1	0.7	-2.8	7.3	11.2	4.9	-3.5	0.6	4.7	-2.3	-17.1
2011	10.2	10.9	25.4	-9.7	0.8	-8.3	0.3	3.0	-3.4	1.4	-8.2	-5.7	-6.3	-3.8	-6.8	-2.1	-13.9
2012	--b	--b	--b	--b	--b	--b	--b	--b	--b	15.7	17.5	16.6	19.9	21.5	11.4	25.2	21.4
2013	-3.3	0.6	13.3	-2.4	-9.5	3.0	-8.1	0.1	-0.5	-3.0	-2.0	1.4	0.1	-6.2	-1.2	-5.7	25.5
2014	18.1	-8.1	24.2	8.5	-1.8	-0.3	10.0	-4.3	-2.2	1.9	--c	--c	2.2	13.2	--d	-16.3	0.7
2015	-5.3	-22.0	40.2	10.3	-14.6	-10.0	-7.1	--b	--b	--b	--b	--b	--b	--b	--b	-14.2	-11.4
2016	5.2	-10.1	53.5	8.1	-5.5	-9.5	1.5	-5.4	-19.1	-2.3	-0.4	3.9	-1.6	3.9	26.5	-10.5	-9.5
2017	14.6	3.9	26.5	9.2	13.0	9.6	-3.3	3.6	-5.3	-1.4	3.7	2.8	-0.4	1.3	21.2	-22.4	-11.6
2018	-11.8	-6.6	0.0	-7.5	-3.8	-14.6	-2.7	-8.7	-3.7	-3.4	0.5	3.0	-1.9	2.6	10.6	-14.8	-20.7
2019	18.5	2.2	23.8	11.2	13.5	8.4	3.5	-3.1	-5.8	3.4	6.9	4.6	3.2	6.5	1.6	29.3	18.5
2020	-1.6	-11.6	16.4	4.9	6.8	-4.9	-3.7	1.6	-1.9	4.4	-0.2	4.6	-3.5	2.2	5.1	13.1	15.8
2021	1.5	1.2	12.1	9.0	10.3	5.9	6.7	-9.5	-11.2	6.8	2.7	7.7	0.0	5.8	3.1	0.1	-2.0
2022	9.7	-19.3	6.9	2.0	5.6	-1.0	-8.6	-1.5	-1.0	--b	--b	--b	--b	--b	--b	--b	--b

	A-rated:±25%
	B-rated: Between 25% to 35% or between -25% to -35%
	Does not meet:>35% or <35%
	-- No data available

^a: Pollutant was expected, but results were invalidated at this site for this year.

^b: No Proficiency Test samples were sent for this pollutant and year.

^c: The Proficiency Test sample for this pollutant was 0; the site reported a concentration as "<MDL", rather than 0. EPA accepted this result.

^d: Although a Proficiency Test sample was sent to the lab supporting this site and year, the results were nullified by EPA due to QA issues.

Table 9. NATTS Network Assessment: MQO#4 - Overall Method Precision %CV at Grayson Lake, KY

Year	Benzene	Butadiene, 1,3-	Carbon tetrachlorid	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM10)	Beryllium (PM10)	Cadmium (PM10)	Lead (PM10)	Manganese (PM10)	Nickel (PM10)	Benzo(a)pyrene	Naphthalene
	VOCs							Carbonyls		PM10 Metals						PAHs	
<i>Grayson Lake, KY (AQS Site Code: 21-043-0500)</i>																	
2008	--	--	--	--	--	--	--	5.8	4.2	6.9	--a	--a	28.4	60.5	--a	--	--
2009	--	--	--	--	--	--	--	15.2	15.4	6.6	--a	--a	6.8	43.7	44.9	--	--
2010	66.7	16.8	33.9	0.0	--a	--a	--a	11.7	12.8	10.7	--a	--a	5.5	49.4	6.9	--	--
2011	6.1	20.1	4.3	4.8	--a	--a	--a	6.5	6.6	20.3	0.0	20.6	15.1	26.7	35.6	--	--
2012	10.5	8.2	7.2	21.1	--a	--a	--a	1.6	2.1	16.9	--a	29.6	4.1	3.4	1.2	--	--
2013	6.6	7.4	7.2	--	--a	--	--	1.1	2.3	13.4	--a	35.7	18.5	17.7	27.0	--	--
2014	6.4	15.8	22.3	3.0	--a	--a	--a	1.1	0.6	17.3	0.0	27.4	23.5	12.6	37.8	--	--
2015	--	--	--	--	--	--	--	--	--	15.8	18.0	15.9	13.4	9.0	25.3	--	--
2016	--	--	--	--	--	--	--a	--	--	8.0	30.3	7.5	8.3	6.1	22.3	--	--
2017	13.2	--a	4.4	38.6	--a	--a	--a	1.0	1.2	4.1	15.9	3.4	2.4	3.7	8.8	--	--
2018	6.7	--a	5.1	8.9	--a	--a	--a	0.9	1.0	3.3	14.5	2.8	1.5	5.0	--a	--	--
2019	8.6	3.8	36.1	6.9	--a	--a	--a	0.7	1.0	6.6	2.2	3.8	6.2	4.1	--a	--	--
2020	5.8	--a	3.2	4.1	0.0	--a	--a	0.7	2.7	2.5	20.3	2.9	2.9	1.9	--a	--	--
2021	4.4	--a	6.1	2.1	--a	--a	--a	1.5	2.0	3.4	9.7	2.4	2.2	7.3	--a	--	--
2022	6.3	--a	5.9	4.3	--a	--a	--a	52.8	53.5	2.9	2.3	3.4	1.6	10.9	14.9	--	--

Green = precision ≤ 15%
 Yellow = precision > 15% to ≤ 25%
 Red = precision > 25%
 Gray = dataset was not rated

^a: The primary and/or replicate value were less than the MDL, so no calculation could be made.

Table 10. NATTS Network Assessment: MQO#4 - Analytical Method Precision %CV at Grayson Lake, KY

Year	Benzene	Butadiene, 1,3-	Carbon tetrachlorid	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM10)	Beryllium (PM10)	Cadmium (PM10)	Lead (PM10)	Manganese (PM10)	Nickel (PM10)	Benzo(a)pyrene	Naphthalene
	VOCs							Carbonyls		PM10 Metals						PAHs	
<i>Grayson Lake, KY (AQS Site Code: 21-043-0500)</i>																	
2008	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2009	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2010	4.5	6.7	1.9	3.0	--a	--	--	--	--	--	--	--	--	--	--	--	--
2011	8.3	6.7	5.8	7.4	--a	--	20.2	0.4	0.9	7.5	0.0	5.1	0.9	0.4	46.7	--	--
2012	6.5	6.8	7.4	17.2	--a	--a	--a	0.7	1.0	12.7	0.0	12.0	0.8	1.4	1.7	2.0	2.7
2013	4.6	5.7	6.1	--b	--a	--b	--b	1.4	1.3	18.1	0.0	10.4	1.8	1.3	18.9	6.0	2.1
2014	4.8	12.0	1.2	5.1	--a	--b	--b	0.7	1.0	15.3	24.6	10.9	1.6	1.0	22.2	6.9	2.6
2015	29.6	--a	6.7	14.5	--a	--a	--a	3.0	1.2	8.8	12.1	12.7	1.3	2.3	7.6	--a	4.5
2016	30.6	0.0	4.9	19.5	--a	--a	--a	0.7	0.5	2.9	24.2	3.6	1.3	2.8	7.3	1.7	0.5
2017	5.5	--a	11.1	7.5	--a	--a	--a	0.8	0.8	2.7	14.2	1.6	0.9	0.9	0.9	2.0	1.2
2018	5.2	9.8	5.6	9.5	--a	--a	--a	1.6	1.6	2.1	12.7	2.3	0.3	1.2	--a	3.0	0.8
2019	5.8	5.1	3.7	5.1	12.1	--a	--a	0.5	0.3	2.0	6.0	2.5	0.8	1.3	--a	2.0	1.1
2020	1.4	--a	1.5	3.2	5.1	--a	--a	0.8	0.8	2.7	1.1	2.9	1.0	1.4	--a	5.4	1.9
2021	3.6	--a	3.1	3.6	--a	--a	--a	0.3	0.5	3.7	9.1	2.2	0.7	1.2	--a	2.4	0.2
2022	5.6	--a	0.9	3.7	--a	--a	--a	4.1	0.6	2.6	16.5	3.0	0.9	0.9	--a	4.1	0.4

	A-rated: ≤ 15% CV
	B-rated: Between 15%CV to 25% CV
	Does Not Meet: >25% CV or did not report Precision (required in the NATTS Workplan Template since 2012)
	-- No data available

^a: The primary and/or replicate value were less than the MDL, so no calculation could be made.
^b: Per the NATTS Workplan template, analytical replicates were required to be reported to AQS for this sampling year.

Appendix A. Equipment Inventory

Method	Year(s)	Manufacturer/Model, Extraction Type, and Year
<i>Sampling Equipment</i>		
Carbonyls	2008-2010	ATEC 2200 Toxic Air Sampler (Year Deployed: 2008)
	2011	ATEC 2200 Toxic Air Sampler (2 units) (Year Deployed: 2008)
	2012-2016	ATEC 2200 Toxic Air Sampler (2 units) (Year Deployed: 2012)
	2017-2022	ATEC 2200 Toxic Air Sampler (2 units) (Year Deployed: 2012/2017)
PAHs	2008-2022	Tisch Environmental TE-1000 PUF Sampler (Year Deployed: 2008)
PM ₁₀ Metals	2008-2010	Thermo R&P Parisol-FRM 2000 Air Sampler (Year Deployed: 2000)
	2011-2019	Thermo R&P Parisol-FRM 2000 Air Sampler (2 units) (Year Deployed: 2010)
	2020-2022	Thermo R&P Parisol-FRM 2000 Air Sampler (2 units) (Year Deployed: 2020)
VOCs	2008-2011	ATEC 2200 Toxic Air Sampler (Year Deployed: 2008)
	2012-2016	ATEC 2200 Toxic Air Sampler (Year Deployed: 2012)
	2017-2022	ATEC 2200 Toxic Air Sampler (Year Deployed: 2012/2017)
<i>Analytical Equipment</i>		
Carbonyls	2008-2017	Waters Alliance 2695 HPLC /model 2487 Dual Absorbance (Year Deployed: 2003)
	2018-2022	Waters Alliance e2695 HPLC /model 2489 Dual Absorbance (Year Deployed: 2018)
PAHs	2008-2014	HP/Agilent 5890/5971 GC/MS (Year Deployed: 2008)
	2015-2020	HP/Agilent 7890B/5975C GC/MS (Year Deployed: 2015)
	2021-2022	HP/Agilent 7890B/5975C GC/MS (Year Deployed: 2015); HP/Agilent 6890/5973 GC/MS (Year Deployed: 2021)
PM ₁₀ Metals	2008-2014	PE ELAN 9000 ICP-MS (Year Deployed: 2003)
	2015-2018	Thermo iCAP Q ICP-MS (Year Deployed: 2015)
	2019-2022	Thermo iCAP Q ICP-MS (Year Deployed: 2015); Thermo iCAP rQ ICP-MS (Year Deployed: 2017)
VOCs	2008-2009	HP/Agilent 6890/5973 GC/MS (Year Deployed: 2005)
	2010	HP/Agilent 5890/5971 GC/MS (Year Deployed: 2008)
	2011-2019	HP/Agilent 6890/5975 GC/MS (Year Deployed: 2010)
	2020-2022	HP/Agilent 8890/5977B GC/MS (Year Deployed: 2019)
<i>Preconcentrator Equipment</i>		
VOCs	2008-2019	Entech 7100A (Year Deployed: 2007)
	2020-2022	Entech 7100A (Year Deployed: 2009); Entech 7200A (Year Deployed: 2019)
<i>Standards Preparation Equipment</i>		
VOCs	2008-2022	Custom-built (dynamic dilution) (Year Deployed: 1985)
<i>Canister Cleaning Equipment</i>		
VOCs	2008-2010	Custom-built (Cold) (Year Deployed: 2003)
	2011-2022	Wasson-ECE TO Clean (Hot) (Year Deployed: 2010)
<i>PM₁₀ Extraction Equipment</i>		
PM ₁₀ Metals	2003	Branson 8510 (Sonicator) (Year Deployed: unknown)
	2004-2013	Branson 8510 (Sonicator) (Year Deployed: 2004)
	2014-2022	Environmental Express (Hotblock) (Year Deployed: 2014)
<i>PAHs Extraction Equipment</i>		
PAHs	2008-2018	Dionex -300 (ASE) (Year Deployed: 2004)
	2019-2022	Dionex -350 (ASE) (Year Deployed: 2019)