

Locations of Monitoring Stations in the Mercury Trends Network

Three sets of geographic criteria were used to determine the locations for the regionally representative MTN monitoring stations: ecoregion, hydrologic unit, and existing atmospheric monitoring networks. Locations were intended to include most of the Level II ecoregions (Bailey, 1995) and hydrologic units (U.S. Geological Survey, 2005) in the United States. These map units (figs. 1 and 2) are expected to include important ecological receptors and hydrologic pathways for atmospheric mercury wet and dry deposition to enter aquatic ecosystems. Existing atmospheric monitoring networks will be included. Locations for the monitoring stations will be at existing MDN sites when possible (fig. 3) because mercury wet deposition data are needed for the MTN. Preference will be given to locations that also have existing CASTNET sites (fig. 4) for monitoring dry deposition of atmospheric nutrients, acidity, and base cations (U.S. Environmental Protection Agency, 2005) because CASTNET has weather stations and data loggers collecting data needed for the MTN. Other monitoring networks that may be included are the NADP National Trends Network (fig. 5) for weekly monitoring wet deposition of atmospheric nutrients acidity, and base cations; the (AIRMoN) Atmospheric Integrated Research Monitoring Network (fig. 6) for daily monitoring of wet deposition of atmospheric nutrients acidity, and base cations (National Atmospheric Deposition Program, 2005); and the IMPROVE network (fig. 7) for interagency monitoring of protected visual environments (National Park Service, 2005). In selecting locations, preference will be given to existing monitoring stations already providing concurrent mercury wet deposition data, other atmospheric deposition data, and continuous meteorological data.

Three sets of criteria were used to determine the locations in the MTN in areas with high levels of mercury emissions and mercury deposition: annual mercury emissions from coal-fired power plants, based on relevant inventories (U.S. Environmental Protection Agency, 2005); annual mercury wet deposition in 2003 and 2004, based on NADP-MDN data (National Atmospheric Deposition Program, 2005); and existing monitoring networks (figs. 3-6).

An overlay of the ecoregions, hydrologic units, MDN sites, CASTNET sites, NTN sites, and AIRMoN sites was used to develop a list of 24 regionally representative locations for the MTN. This list (appendix, table 1) documents that the criteria and overlay map were valid. These 24 potential locations include 10 of 14 ecoregions and 13 of 18 hydrologic units (appendix, table 2), along with 13 MDN sites, 23 CASTNET sites, 23 NTN sites, 5 AIRMoN sites, and __ IMPROVE sites.

Purposefully, not all locations will be in remote areas and will include regions known to have high levels of mercury emissions and mercury wet deposition. The list of regionally representative locations for MTN was evaluated for the level of annual mercury emissions and wet deposition (table 3). Additional candidate locations were needed, so all of the existing network sites (figs. 3-6) were plotted on maps of annual mercury emissions (fig. 8) and annual mercury wet deposition in 2003 and 2004 (figs. 9a and 9b). Six more existing network sites in areas of high mercury emissions and high mercury wet deposition were added (appendix, table 3).

As a result, 30 candidate locations for the MTN are included in this proposal (fig. 10 with list). The locations in the MTN for the startup operation beginning in 2006 will be those that have participation by site sponsors and advantages of infrastructure and logistics. Other locations will be added to the MTN after the startup operation has been accomplished. The NADP Steering Committee will review the candidate locations and prospective site sponsors and participants when expanding the MTN in the future.

Illustrations

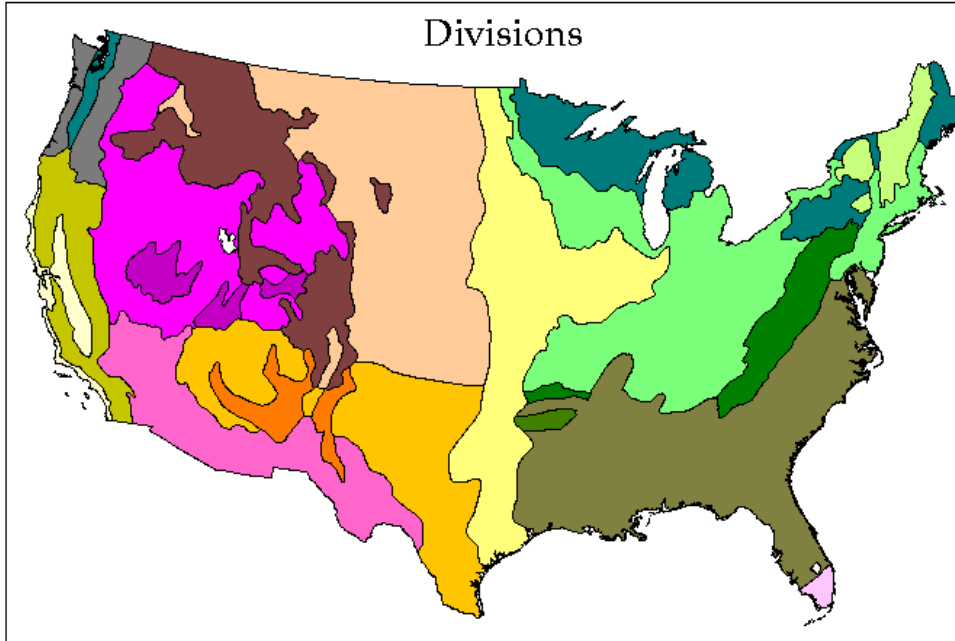


Figure 1. Ecoregions of the United States (from Bailey, 1995).

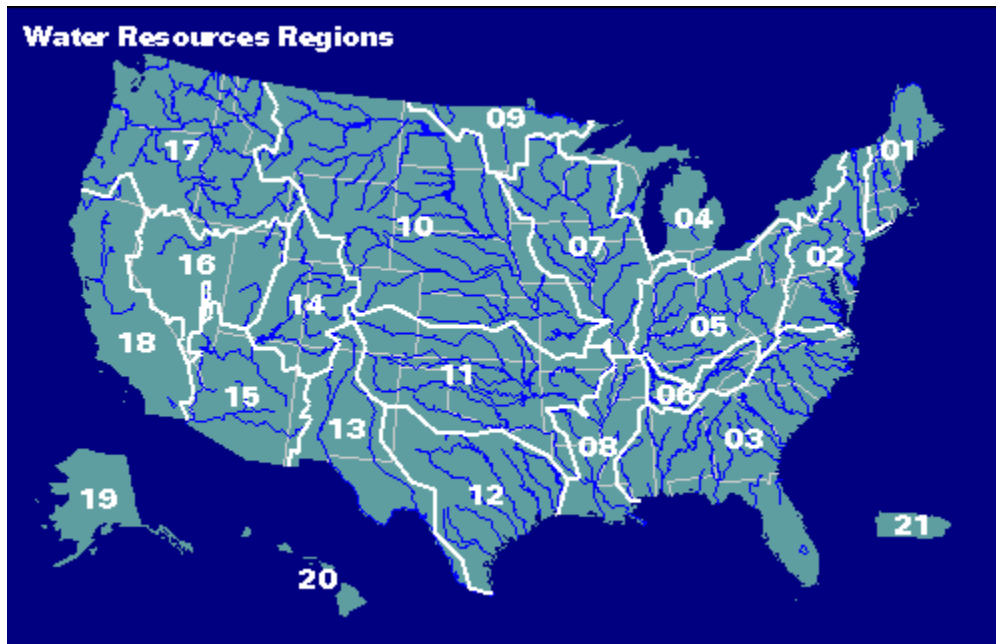


Figure 2. Hydrologic units of the United States (U.S. Geological Survey, 2005).

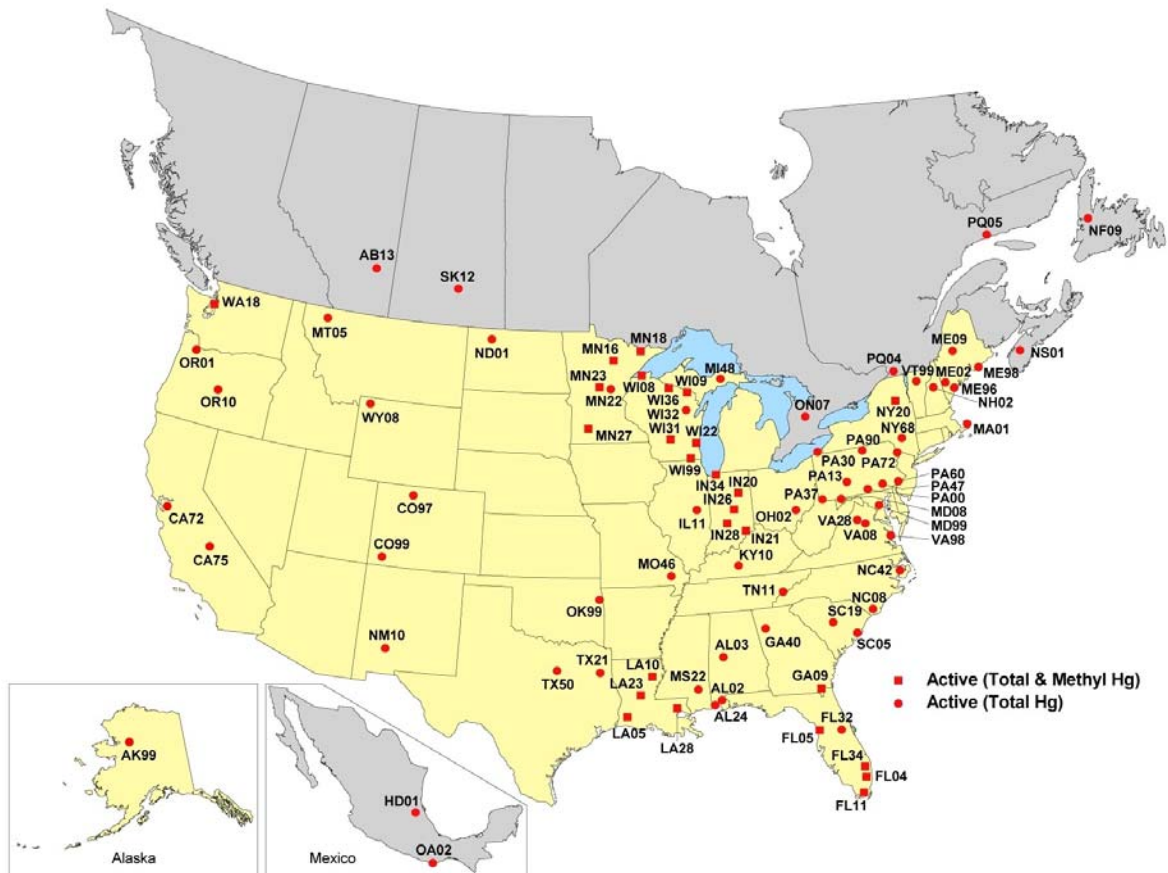


Figure 3. Mercury Deposition Network stations in North America (National Atmospheric Deposition Program, 2005).

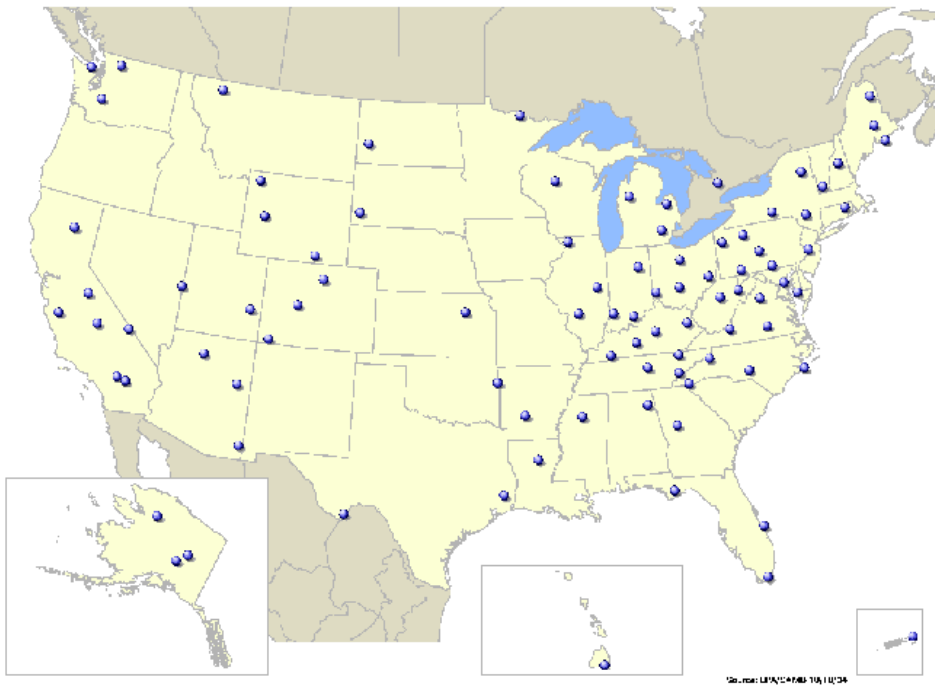


Figure 4. CASTNET stations in the United States (U.S. Environmental Protection Agency, 2005).

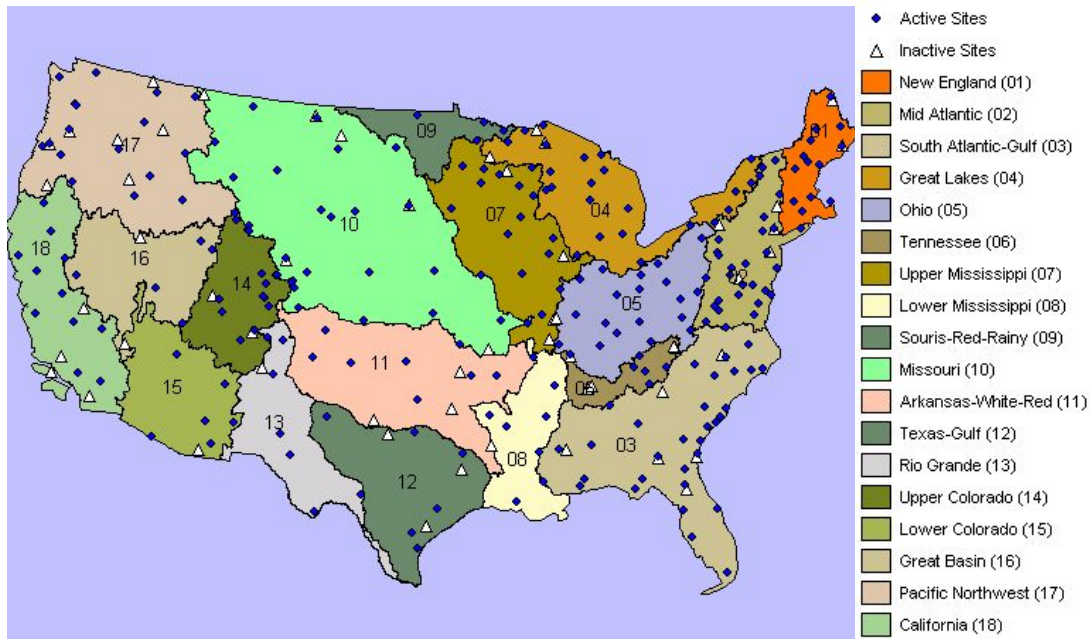


Figure 5. National Trends Network stations and hydrologic units of the United States (National Atmospheric Deposition Program, 2005).

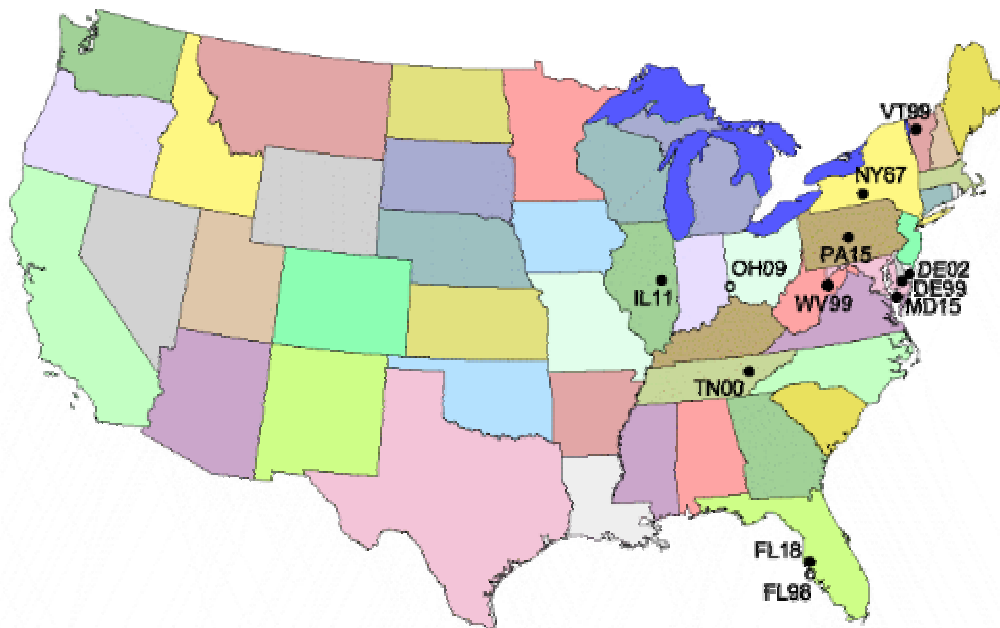


Figure 6. AIRMoN stations in the United States (National Atmospheric Deposition Program, 2005).

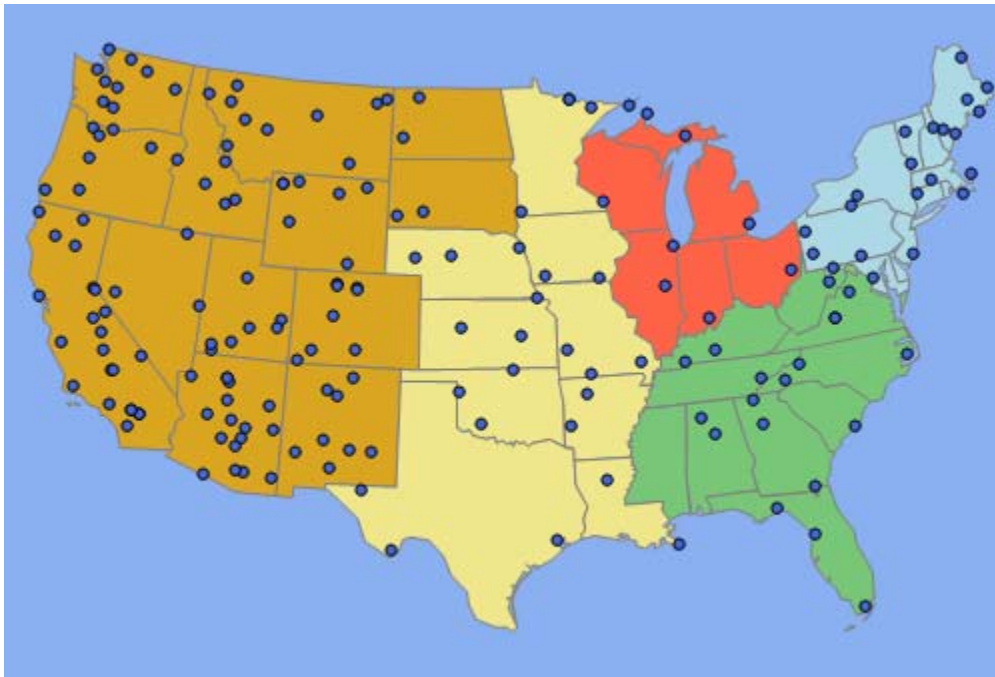


Figure 7. IMPROVE sites in the United States (National Park Service, 2005)

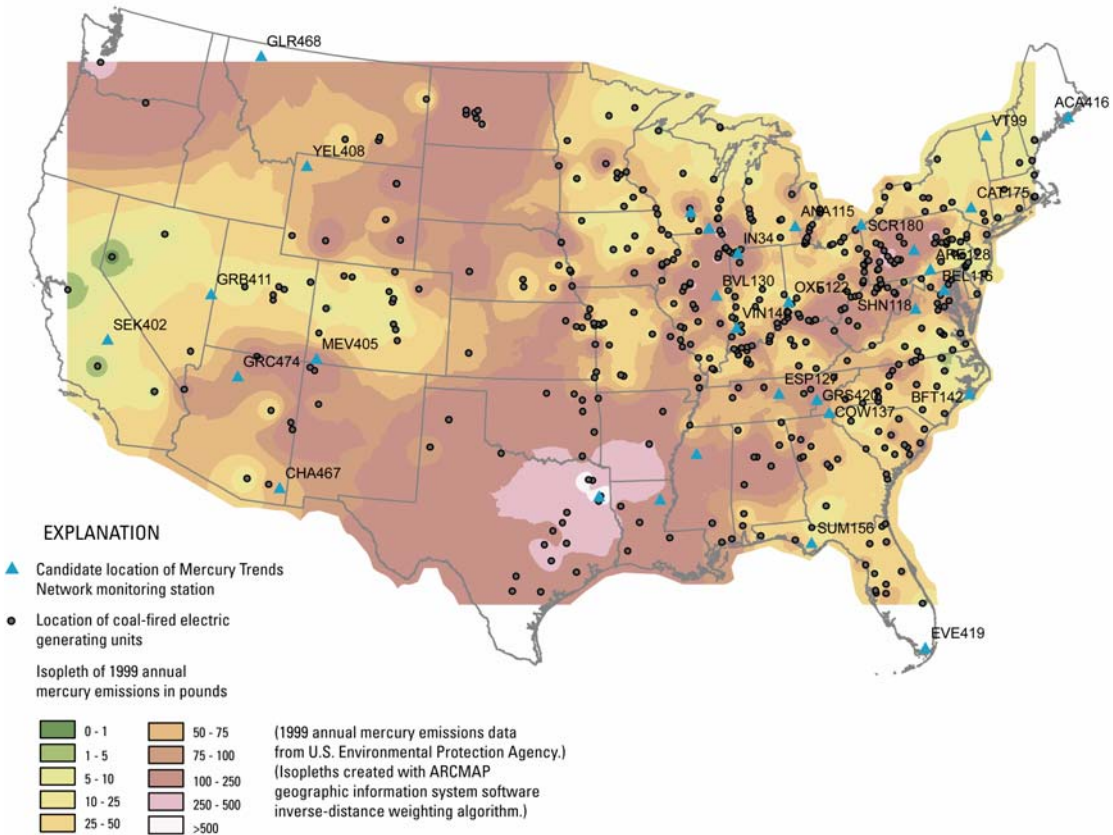


Figure 8. Isopleth map of annual mercury emissions in the United States in 1999 (U.S. Environmental Protection Agency, 2005, adapted by U.S. Geological Survey, 2005) with candidate locations for proposed NADP Mercury Trends Network monitoring stations.

Total Mercury Wet Deposition, 2004

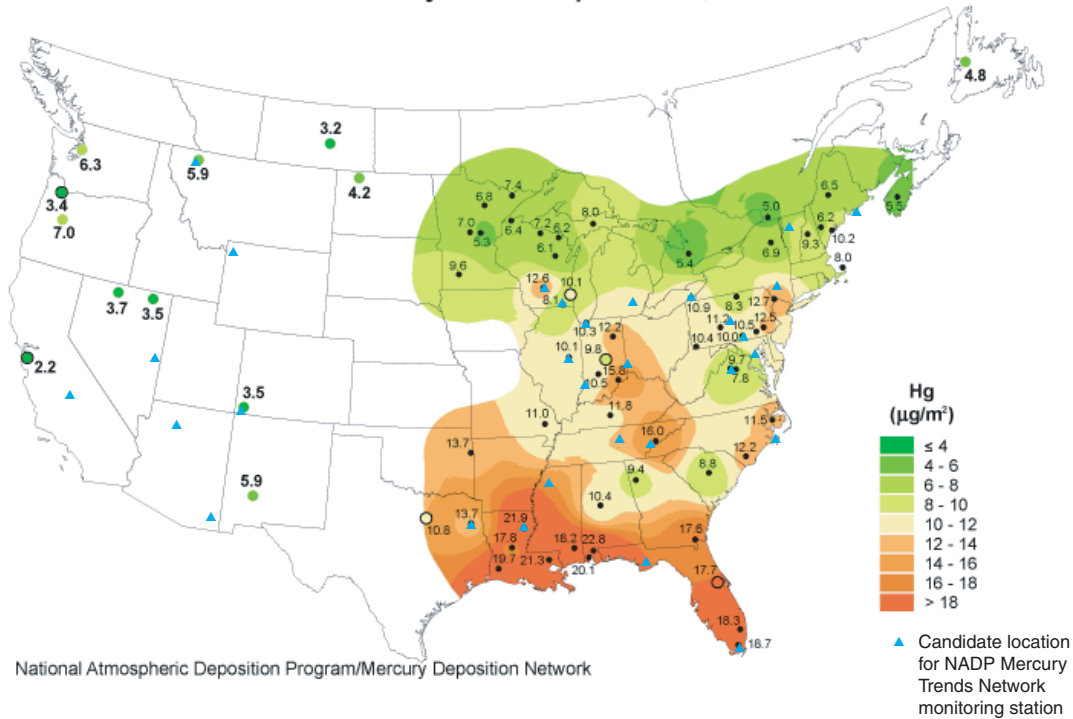


Figure 9a. Isopleth map of annual mercury wet deposition in North America in 2004 (National Atmospheric Deposition Network, 2005) with candidate locations for proposed NADP Mercury Trends Network monitoring stations.

Total Mercury Wet Deposition, 2003

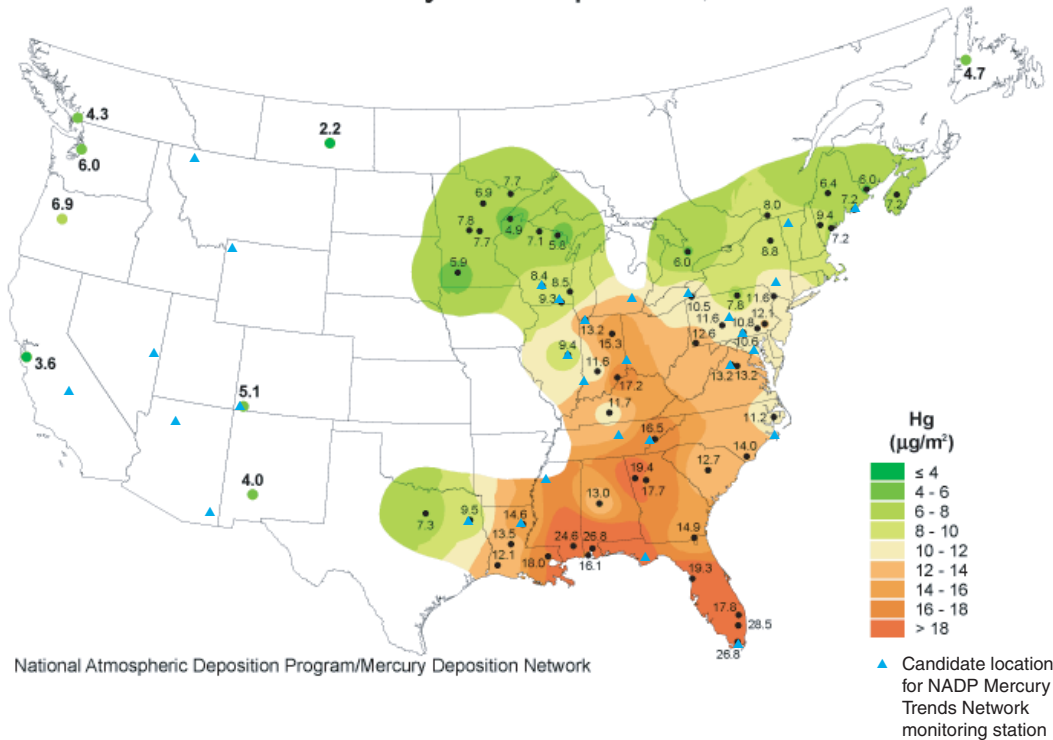


Figure 9b. Isopleth map of annual mercury wet deposition in North America in 2003 (National Atmospheric Deposition Network, 2005) with candidate locations for proposed NADP Mercury Trends Network monitoring stations.

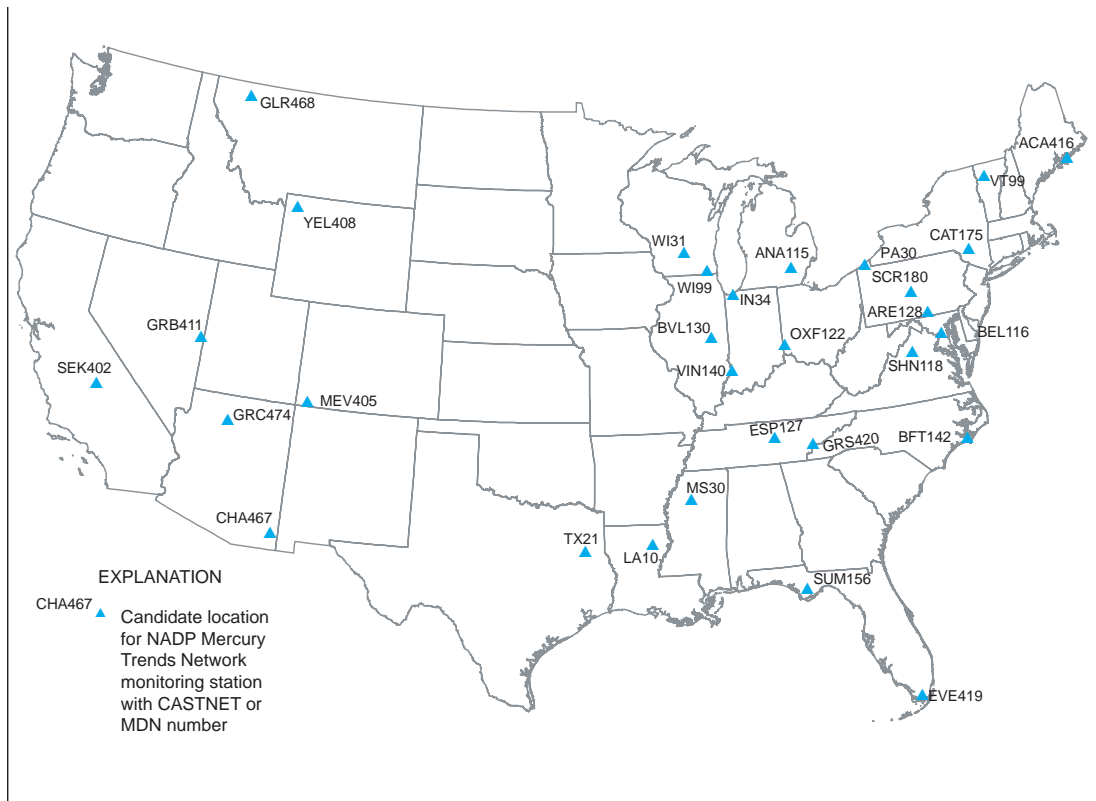


Figure 10. Locations for proposed NADP Mercury Trends Network monitoring stations

	Location	MDN*	CASTNET
1	Grand Canyon Natl. Park, Arizona		GRC474
2	Chiricahua Natl. Mon., Arizona		CHA467
3	Sequoia Natl Park, California	CA75	SEK402
4	Mesa Verde Natl. Park, Colorado	CO99	MEV405
5	Everglades Natl. Park, Florida	FL11	EVE419
6	Sumatra, Florida		SUM156
7	Bondville, Illinois	IL11	BVL130
8	Vincennes, Indiana		VIN140
9	Indiana Dunes Natl Lakeshore, Indiana	IN34	
10	Acadia Natl. Park, Maine	ME98	ACA416
11	Beltsville, Maryland		BEL116
12	Ann Arbor, Michigan		ANA115
13	Glacier Natl. Park, Montana	MT05	GLR468
14	Great Basin Natl. Park, Nevada		GRB411
15	Biscuit Brook, New York	NY68	CAT175
16	Beaufort, North Carolina		BFT142
17	Oxford, Ohio		OXF122
18	Arendtsville, Pennsylvania	PA00	ARE128
19	Penn State, Pennsylvania		SCR180
20	Smoky Mts. National Park, Tennessee	TN11	GRS420
21	Walker Branch, Tennessee		ESP127
22	Shenandoah National Park, Virginia	VA28	SHN518
23	Underhill, Vermont	VT99	
24	Yellowstone National Park, Wyoming	WY08	YEL408
25	Longview, Texas	TX21	
26	Chase, Louisiana	LA10	
27	Coffeeville, Mississippi	MS30	
28	Erie, Pennsylvania	PA30	
29	Lake Geneva, Wisconsin	WI99	
30	Devils Lake, Wisconsin	WI31	

APPENDIX

Table 1. Regionally representative locations for NADP Mercury Trends Network based on ecoregion, hydrologic unit, and existing atmospheric monitoring networks

	Location	Ecoregion	Hydrologic Unit	MDN*	CASTNET	NTN	AIRMoN
1	Grand Canyon Natl. Park, Arizona	Xeric West	Lower Colorado		GRC474	AZ03	
2	Chiricahua Natl. Mon., Arizona	Xeric West	Lower Colorado		CHA467	AZ98	
3	Sequoia Natl Park, California	Western Forested Mountains	California	CA75	SEK402	CA75	
4	Mesa Verde Natl. Park, Colorado	Xeric West	Upper Colorado	CO99	MEV405	CO99	
5	Everglades Natl. Park, Florida	Southern Florida Coastal Plain	South Atlantic-Gulf	FL11	EVE419	FL11	
6	Sumatra, Florida	Southern Coastal Plain	South Atlantic-Gulf		SUM156	FL23	
7	Bondville, Illinois	Corn Belt & Northern Great Plains	Upper Mississippi	IL11	BVL130	IL11	IL11
8	Vincennes, Indiana	Central & Eastern Forested Uplands	Ohio		VIN140	IN22	
9	Indiana Dunes Natl Lakeshore, Indiana	Glaciated Upper Midwest & Northeast	Great Lakes	IN34		IN34	
10	Acadia Natl. Park, Maine	Glaciated Upper Midwest & Northeast	New England	ME98	ACA416	ME98	
11	Beltsville, Maryland	Southeastern Temperate Forest, Plains, & Hills	Mid Atlantic		BEL116	MD03	
12	Ann Arbor, Michigan	Mostly Glaciated Dairy Region	Great Lakes		ANA115	MI52	
13	Glacier Natl. Park, Montana	Western Forested Mountains	Pacific Northwest	MT05	GLR468	MT05	
14	Great Basin Natl. Park, Nevada	Xeric West	Great Basin		GRB411	NV05	
15	Biscuit Brook, New York	Glaciated Upper Midwest & Northeast	Mid Atlantic	NY68	CAT175	NY68	
16	Beaufort, North Carolina	Eastern Coastal Plain	South Atlantic-Gulf		BFT142	NC06	
17	Oxford, Ohio	Corn Belt & Northern Great Plains	Ohio		OXF122	OH09	OH09
18	Arendtsville, Pennsylvania	Southeastern Temperate Forest, Plains, & Hills	South Atlantic-Gulf	PA00	ARE128	PA00	
19	Penn State, Pennsylvania	Central & Eastern Forested Uplands	Mid Atlantic		SCR180	PA15	PA15
20	Smoky Mts. National Park, Tennessee	Central & Eastern Forested Uplands	Tennessee	TN11	GRS420	TN11	
21	Walker Branch, Tennessee	Central & Eastern Forested Uplands	Tennessee		ESP127	TN00	TN00
22	Shenandoah National Park, Virginia	Central & Eastern Forested Uplands	South Atlantic-Gulf	VA28	SHN518	VA28	
23	Underhill, Vermont	Glaciated Upper Midwest & Northeast	Mid Atlantic	VT99			VT99
24	Yellowstone National Park, Wyoming	Western Forested Mountains	Missouri	WY08	YEL408	WY08	

*NOTE: New MDN stations will be established at locations selected for the network that do not already have MDN stations.

Table 2. Hydrologic units and ecoregions represented by potential locations for NADP Mercury Trends Network monitoring stations

	Hydrologic Unit	Potential location		Level II Ecoregion	Potential location
1	New England	x	1	Central Cultivated Great Plains	
2	Mid Atlantic	x	2	Central and Eastern Forested Uplands	x
3	South Atlantic-Gulf	x	3	Corn Belt and Northern Great Plains	x
4	Great Lakes	x	4	Eastern Coastal Plain	x
5	Ohio	x	5	Great Plains Grass and Shrublands	
6	Tennessee	x	6	Mostly Glaciated Dairy Region	x
7	Upper Mississippi	x	7	Glaciated Upper Midwest and Northwest	x
8	Lower Mississippi		8	Southeastern Temperate Forested Plains and Hills	x
9	Souris-Red-Rainy		9	Southern Coastal Plain	x
10	Missouri	x	10	Southern Florida Coastal Plain	x
11	Arkansas-White-Red		11	Texas-Louisiana Coastal and Mississippi Alluvial Plains	
12	Texas-Gulf		12	Western Forested Mountains	x
13	Rio Grande		13	Willamette and Central Valleys	
14	Upper Colorado	x	14	Xeric West	x
15	Lower Colorado	x			
16	Great Basin	x			
17	Pacific Northwest	x			
18	California	x			

Table 3. Rating of annual mercury emissions and annual mercury deposition for regionally-representative locations for NADP Mercury Trends Network monitoring stations, with additional locations based on annual mercury emissions and annual mercury deposition

	Location of regionally representative Mercury Trends Network monitoring station candidate	Level of annual mercury emissions ¹	Level of 2004 mercury wet deposition ²	Level of 2003 mercury wet deposition ²
1	Grand Canyon Natl. Park, Arizona	medium	no data	no data
2	Chiricahua Natl. Mon., Arizona	medium	no data	no data
3	Sequoia Natl Park, California	medium	no data	no data
4	Mesa Verde Natl. Park, Colorado	high	no data	no data
5	Everglades Natl. Park, Florida	no data	high	high
6	Sumatra, Florida	medium	high	high
7	Bondville, Illinois	high	medium	medium
8	Vincennes, Indiana	medium	medium	medium
9	Indiana Dunes Natl Lakeshore, Indiana	high	medium	medium
10	Acadia Natl. Park, Maine	no data	low	low
11	Beltsville, Maryland	medium	medium	medium
12	Ann Arbor, Michigan	medium	medium	medium
13	Glacier Natl. Park, Montana	no data	no data	no data
14	Great Basin Natl. Park, Nevada	medium	no data	no data
15	Biscuit Brook, New York	medium	medium	medium
16	Beaufort, North Carolina	medium	medium	medium
17	Oxford, Ohio	medium	high	medium
18	Arendtsville, Pennsylvania	medium	medium	medium
19	Penn State, Pennsylvania	high	medium	medium
20	Smoky Mts. National Park, Tennessee	medium	high	high
21	Walker Branch, Tennessee	medium	medium	medium
22	Shenandoah National Park, Virginia	medium	low	medium
23	Underhill, Vermont	medium	low	low
24	Yellowstone National Park, Wyoming	medium	no data	no data
25	Longview, Texas	high	medium	low
26	Chase, Louisiana	high	high	high
27	Coffeeville, Mississippi	high	high	high
28	Erie, Pennsylvania	high	medium	medium
29	Lake Geneva, Wisconsin	high	low	low
30	Devils Lake, Wisconsin	high	medium	medium

¹Annual mercury emissions from coal-fired power plants in 1999 (U.S. Environmental Protection Agency, 2005), mapped as isopleth regions by U.S. Geological Survey (2005) were used to rate the mercury emissions where the proposed MTN monitoring station was located—low (less than 10 pounds per year), medium (10 to 100 pounds per year), high (greater than 100 pounds per year).

²Annual mercury wet deposition in 2004 and 2003, mapped as isopleth regions (National Atmospheric Deposition Program, 2005 and 2004) were used to rate the mercury deposition where the proposed MTN monitoring station was located—low (less than 10 micrograms per year); medium (10 to 14 micrograms per year); and high (more than 14 micrograms per year).