

US EPA ARCHIVE DOCUMENT

Results and Discussion

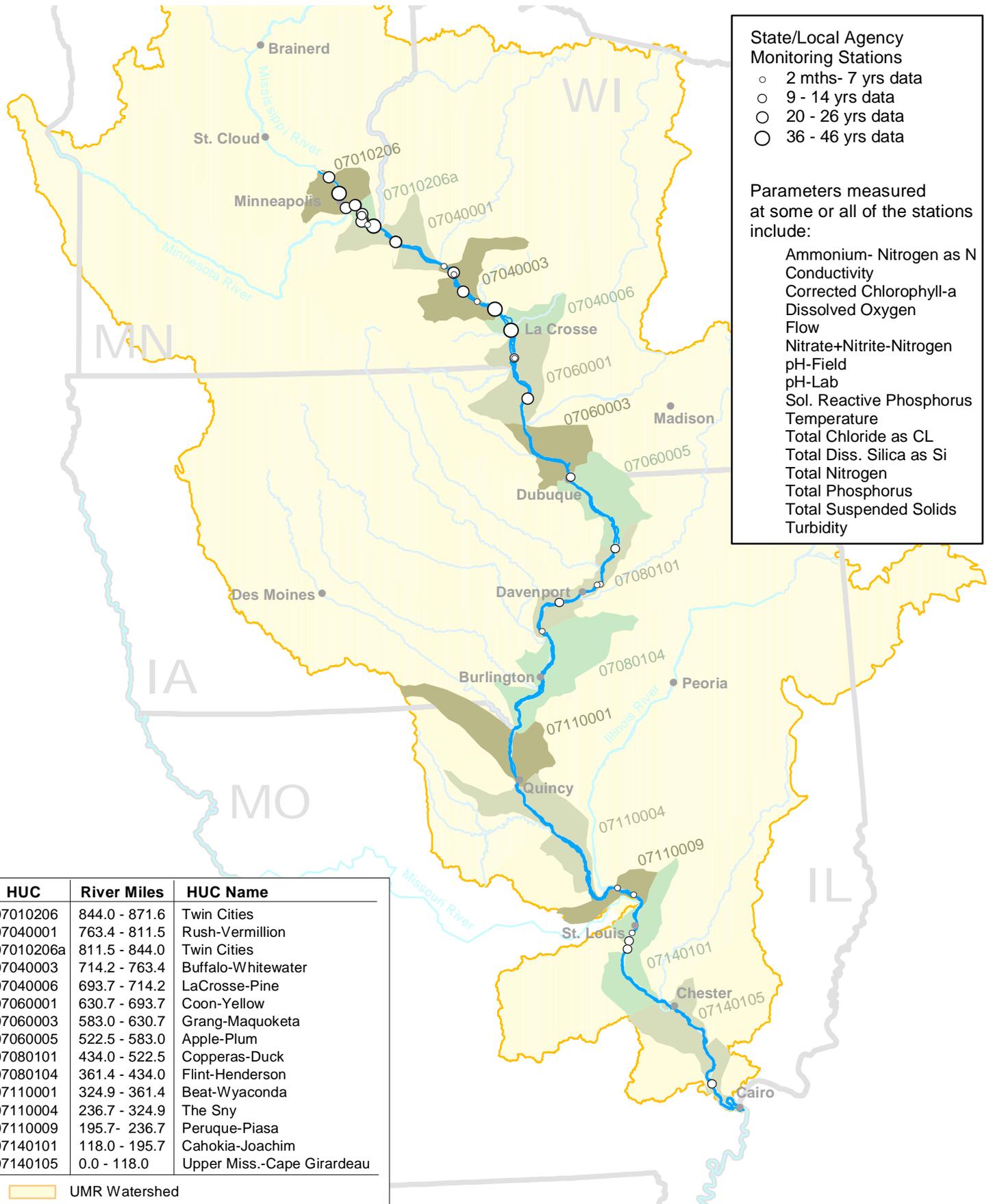
To assist with the visualization of the study area, and to help with interpretation of results, a series of maps were prepared, presented in Figures 1 through 4. These maps show USGS Hydrologic Unit Code (HUC) river segments with boundary mile points; locations of state, local agency and U.S. Army Corps of Engineers monitoring stations with summer months data; locations of USGS Long Term Resource Monitoring Program (LTRMP) stations with summer months data; and approximate gaps in station coverage after combining all stations. Figure 4 shows the gaps where no physical or chemical water monitoring is conducted in the Upper Mississippi River (UMR).

Most of the long term (>10 years) water quality monitoring of the UMR mainstem has been collected in four river reaches (Figures 5 and 6). These include: Anoka, MN to Rock Island, IL (RM 871.6 to RM 481), Burlington IA to Hannibal MO (RM 404 to RM 310), Pool 26 to below the Missouri River confluence (RM 241 to RM 193), and upstream of Cape Girardeau, MO to upstream of the Ohio River confluence (RM 79 to RM 9.7). There are three river segments where obvious data gaps occur. These include: below Rock Island, IL to above Burlington, IA (RM 480 to RM 405), below Hannibal, MO to Lock and Dam 25 (RM 403 to RM 241.5), and St. Louis to above Cape Girardeau, MO (RM 192 to RM 80). The total reach length where data were lacking was approximately 225 river miles and represented almost 26 percent of the UMR study area.

Over the 20-year study period, water quality data have been collected most consistently by three agencies, including the Metropolitan Council Environmental Services, the Minnesota Pollution Control Agency, and the Wisconsin Department of Natural Resources. Since the late 1980s, the U.S. Geological Survey's Long Term Resource Monitoring Program (with state participation) has been a major contributor of water quality data, especially for Pools 4, 8, 13, and 26, and portions of the open river reach (without locks and dams). For purpose of this report, the open river reach is defined as that portion of the UMR downstream from Pool 26. Table 3 provides a listing of the number of sites monitored in each UMR pool or reach by each agency.

A discussion of the analyses performed on each of the 11 water quality parameters/variables, along with river flow, is presented below. Actual data were plotted longitudinally by river mile, using four 5-year time periods within the 20-year study period. Basic statistical calculations were performed using statistical software. Boxplot diagrams were constructed (showing minimum, first quartile, median, third quartile, and maximum values) for each parameter/variable, and tables of statistical measures were prepared, for both the 5-year and 20-year time periods using the 15 longitudinal river segments. Outliers are shown with asterisks. The longitudinal plots and the statistical boxplots are presented in figures in the text. Tables of standard statistical measures for each parameter are presented in Appendix D.

Figure 2. Upper Mississippi River Water Quality Monitoring: State/Local Agency Stations (44) with Summer Months Data



State/Local Agency Monitoring Stations

- 2 mths- 7 yrs data
- 9 - 14 yrs data
- 20 - 26 yrs data
- 36 - 46 yrs data

Parameters measured at some or all of the stations include:

- Ammonium- Nitrogen as N
- Conductivity
- Corrected Chlorophyll-a
- Dissolved Oxygen
- Flow
- Nitrate+Nitrite-Nitrogen
- pH-Field
- pH-Lab
- Sol. Reactive Phosphorus
- Temperature
- Total Chloride as CL
- Total Diss. Silica as Si
- Total Nitrogen
- Total Phosphorus
- Total Suspended Solids
- Turbidity

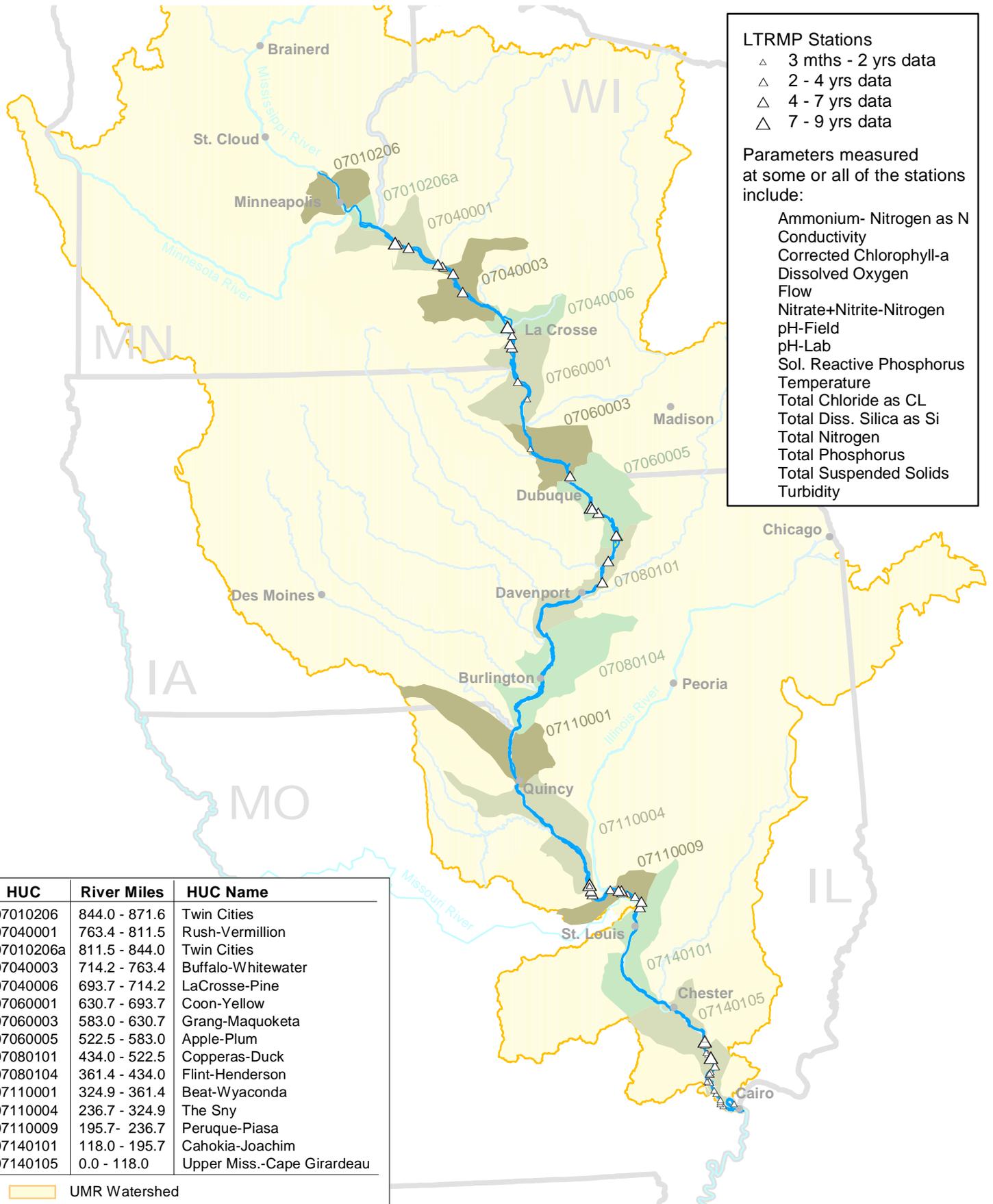
HUC	River Miles	HUC Name
07010206	844.0 - 871.6	Twin Cities
07040001	763.4 - 811.5	Rush-Vermillion
07010206a	811.5 - 844.0	Twin Cities
07040003	714.2 - 763.4	Buffalo-Whitewater
07040006	693.7 - 714.2	LaCrosse-Pine
07060001	630.7 - 693.7	Coon-Yellow
07060003	583.0 - 630.7	Grang-Maquoketa
07060005	522.5 - 583.0	Apple-Plum
07080101	434.0 - 522.5	Copperas-Duck
07080104	361.4 - 434.0	Flint-Henderson
07110001	324.9 - 361.4	Beat-Wyaconda
07110004	236.7 - 324.9	The Sny
07110009	195.7- 236.7	Peruque-Piasa
07140101	118.0 - 195.7	Cahokia-Joachim
07140105	0.0 - 118.0	Upper Miss.-Cape Girardeau

UMR Watershed





Figure 3. Upper Mississippi River Water Quality Monitoring: Long Term Resource Monitoring Program (LTRMP) Stations (62) with Summer Months Data



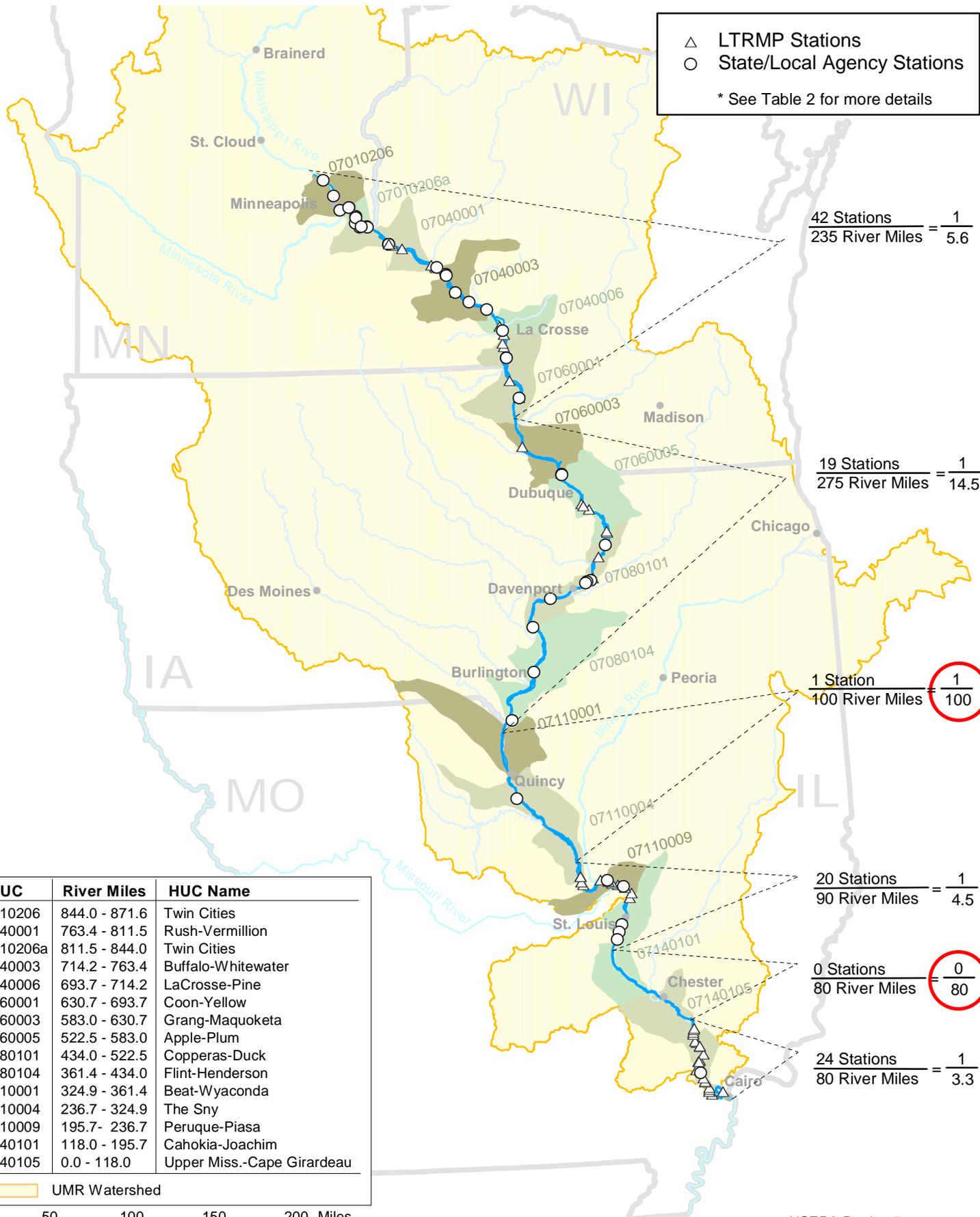
HUC	River Miles	HUC Name
07010206	844.0 - 871.6	Twin Cities
07040001	763.4 - 811.5	Rush-Vermillion
07010206a	811.5 - 844.0	Twin Cities
07040003	714.2 - 763.4	Buffalo-Whitewater
07040006	693.7 - 714.2	LaCrosse-Pine
07060001	630.7 - 693.7	Coon-Yellow
07060003	583.0 - 630.7	Grang-Maquoketa
07060005	522.5 - 583.0	Apple-Plum
07080101	434.0 - 522.5	Copperas-Duck
07080104	361.4 - 434.0	Flint-Henderson
07110001	324.9 - 361.4	Beat-Wyaconda
07110004	236.7 - 324.9	The Sny
07110009	195.7 - 236.7	Peruque-Piasa
07140101	118.0 - 195.7	Cahokia-Joachim
07140105	0.0 - 118.0	Upper Miss.-Cape Girardeau

UMR Watershed

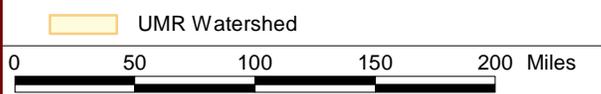


Figure 4. Upper Mississippi River Water Quality Monitoring: Large Gaps Remaining After Combining All Monitoring Stations

US EPA ARCHIVE DOCUMENT



HUC	River Miles	HUC Name
07010206	844.0 - 871.6	Twin Cities
07040001	763.4 - 811.5	Rush-Vermillion
07010206a	811.5 - 844.0	Twin Cities
07040003	714.2 - 763.4	Buffalo-Whitewater
07040006	693.7 - 714.2	LaCrosse-Pine
07060001	630.7 - 693.7	Coon-Yellow
07060003	583.0 - 630.7	Grang-Maquoketa
07060005	522.5 - 583.0	Apple-Plum
07080101	434.0 - 522.5	Copperas-Duck
07080104	361.4 - 434.0	Flint-Henderson
07110001	324.9 - 361.4	Beat-Wyaconda
07110004	236.7 - 324.9	The Sny
07110009	195.7 - 236.7	Peruque-Piasa
07140101	118.0 - 195.7	Cahokia-Joachim
07140105	0.0 - 118.0	Upper Miss.-Cape Girardeau



Number of Water Quality Monitoring Sites by Pool/Reach

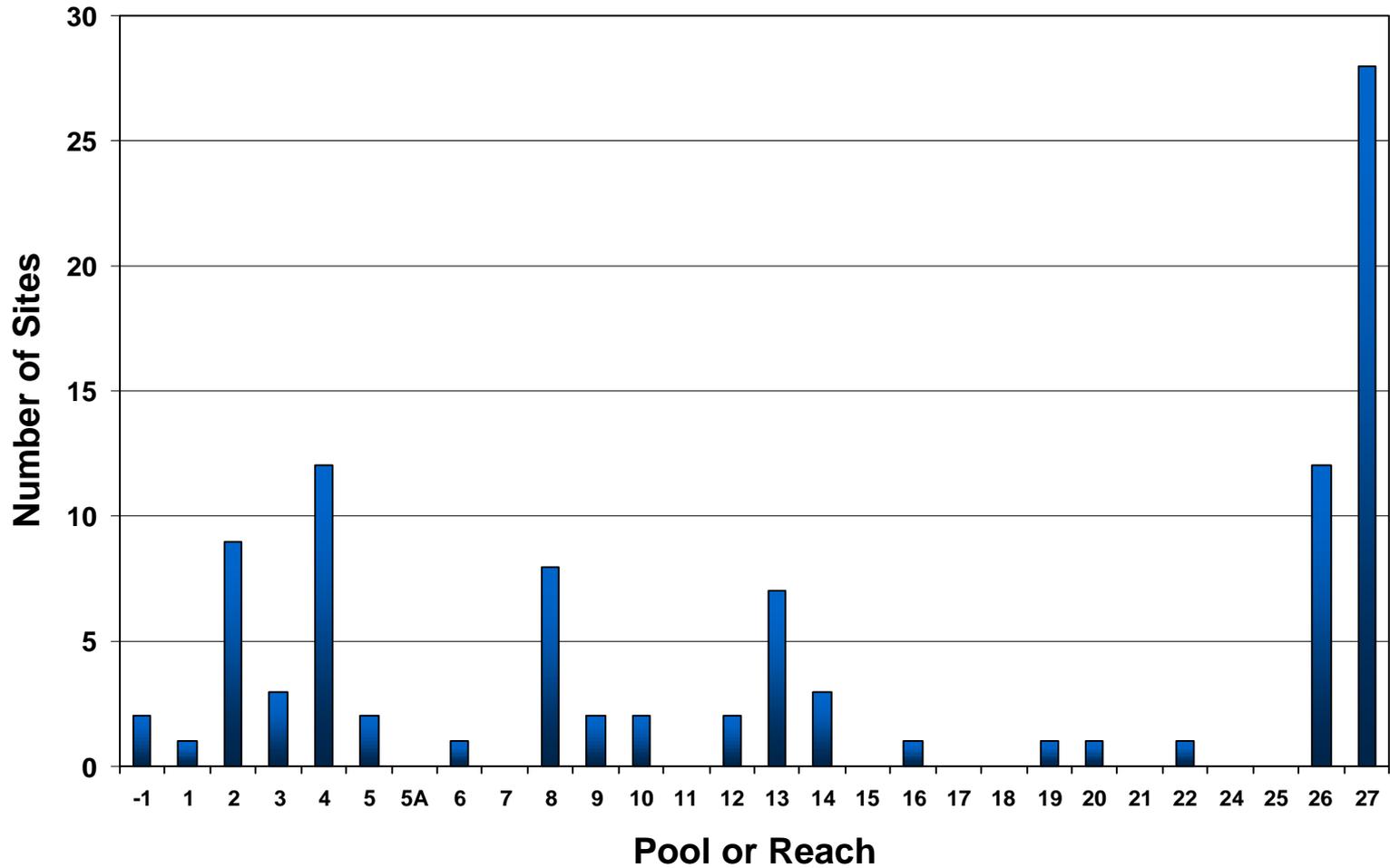


Figure 5. Distribution of Water Quality Monitoring Sites in the Upper Mississippi River by Pool or Reach. Note: Reach -1 is above Pool 1 and Reach 27 is the open river below Pool 26. There is no Pool 0 or 23.

Distribution of Sites by Pool or Reach vs River Mile

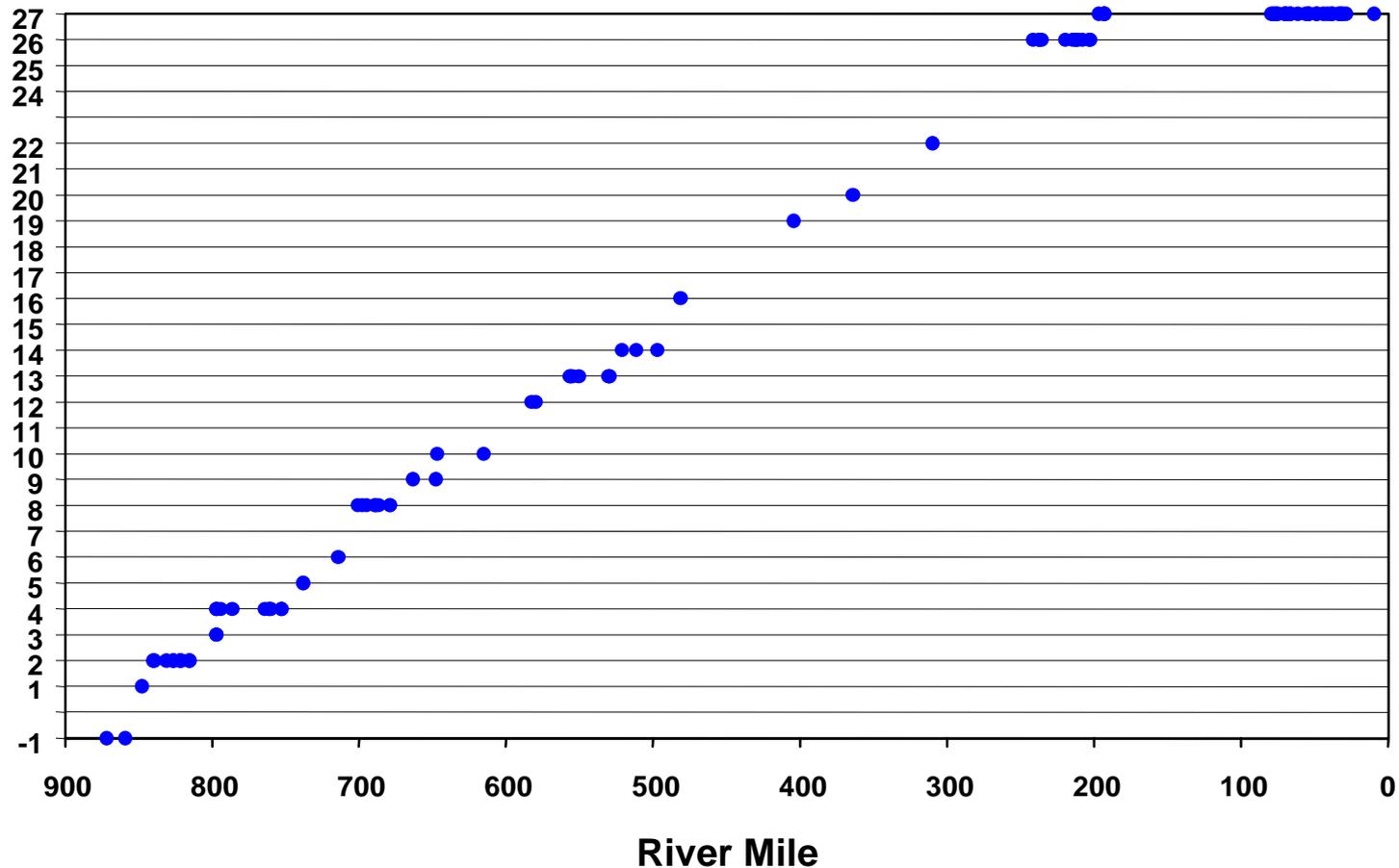


Figure 6. Distribution of Monitoring Sites by Pool or Reach Versus River Mile

Note: Reach -1 is above Pool 1 and Reach 27 is the open river below Pool 26. There is no Pool 0 or 23.

TABLE 3. Monitoring Stations for Summer Months (June 1st to September 15th) 1980-1999
 State, Federal and local agency water quality monitoring stations on the Upper Mississippi River. The numbers represent monitoring sites by Navigational Pool or reach collected on or near the main channel of the river during the period of 1980 to 1999.

Pool or Reach	Monitoring Agency						TOTAL
	MCES	MPCA	WDNR	USGS	21ILAMB	21ILSPEC	
Anoka, MN to							
St Anthony Falls	1	1	-	-	-	-	2
1	1	-	-	-	-	-	1
2	4	5	-	-	-	-	9
3	1	1	1	-	-	-	3
4	-	1	1	10	-	-	12
5	-	1	-	1	-	-	2
5a	-	-	-	-	-	-	-
6	-	1	-	-	-	-	1
7	-	-	-	-	-	-	-
8	-	2	1	5	-	-	8
9	-	-	1	1	-	-	2
10	-	-	-	2	-	-	2
11	-	-	-	-	-	-	-
12	-	-	-	1	-	1	2
13	-	-	-	7	-	-	7
14	-	-	-	2	1	-	3
15	-	-	-	-	-	-	-
16	-	-	-	-	-	1	1
17	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-
19	-	-	-	-	-	1	1
20	-	-	-	-	1	-	1
21	-	-	-	-	-	-	-
22	-	-	-	-	-	1	1
24	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-
26	-	-	-	10	2	-	12
LD 26 to	-	-	-	27	1	-	28
Ohio River							
Total	7	12	4	66	5	4	98

Agency Abbreviations:
 MCES - Metropolitan Council Environmental Services
 MPCA - Minnesota Pollution Control Agency
 WDNR - Wisconsin Department of Natural Resources
 USGS - Federal/State Long Term Resource Monitoring Program
 21ILAMB - Illinois Environmental Protection Agency
 21ILSPEC - U.S. Corps of Engineers - Rock Island District

March 5, 2002