# Water Quality Trends for Minnesota Rivers and Streams at Milestone Sites

Five of seven pollutants better, two getting worse

Minnesota Pollution Control Agency

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# Summary

Long-term trend analysis of seven different water pollutants measured at 80 locations across Minnesota for more than 30 years shows consistent reductions in five pollutants, but consistent increases in two pollutants. Concentrations of total suspended solids, phosphorus, ammonia, biochemical oxygen demand, and bacteria have significantly decreased, but nitrate and chloride concentrations have risen, according to data from the Minnesota Pollution Control Agency's (MPCA) "Milestone" monitoring network. Recent, shorter-term trends are consistent with this pattern, but are less pronounced. Pollutant concentrations show distinct regional differences, with a general pattern across the state of lower levels in the northeast to higher levels in the southwest.

These trends reflect both the successes of cleaning up municipal and industrial pollutant discharges during this period, and the continuing challenge of controlling the more diffuse "nonpoint" polluted runoff sources and the impacts of increased water volumes from artificial drainage practices.

# Minnesota Milestone Monitoring Program

The Minnesota Milestone sites are a collection of 80 monitoring locations at rivers and streams across the state with good, long-term water quality data. The period of record is generally more than 30 years, through 2010, with monitoring at some sites going back to the 1950s. While the Milestone sites are not necessarily representative of Minnesota's rivers and streams as a whole, they do provide a valuable and wide-spread historical record for many of the state's waters.

Monitoring was done by MPCA staff for a standard set of key pollutants on a regular basis, usually monthly for 9 to 10 months of the year. Generally, sites were sampled each year through the mid-1990s, at which time the sampling frequency was reduced to two out of every five years on a rotating basis. In some cases and when appropriate for this report, data from the Milestone sites has been supplemented with data collected at the sites through other monitoring efforts. All water quality data is stored in the Environmental Quality Information System (EQuIS).

In 2010 the Minnesota Milestone program was superseded by the Minnesota Watershed Pollutant Load Monitoring Network, which will be used to evaluate water quality trends in the future. This new network has more than twice as many monitoring sites, much more frequent monitoring, and includes streamflow to document not only the concentration of pollutants, but also pollutant loads, flow-weighted mean pollutant concentrations, and watershed pollutant yields.

# Analysis methods

The analysis in this report was performed using the Seasonal Kendall Test for Trends. The Seasonal Kendall is a nonparametric test that has the advantages of being robust to outliers, missing values, and values less than detection limits, can account for seasonal differences, and is now commonly used to analyze water quality trends. The trends shown are monotonic in nature, meaning that they are one-way trends over the relevant period. As such, they may not reflect shorter-term trends within the period. For example, early decreases in pollutant levels, followed by maintenance of those levels, will be listed as a "decreasing trend." Likewise, increasing levels of pollutants followed by decreasing levels of pollutants may be listed as "no trend." Because flow information is not available for many of the sites, flow adjustment for the trends is not part of the analysis.

It should be noted that the period of record shown for each monitoring site does not necessarily indicate regular, continuous monitoring for all the listed pollutants over all years. In some cases, monitoring for certain of the pollutants may have begun some time subsequent to the initial date; the

initial 10-year period for which median pollutant concentrations are shown can thus vary from pollutant to pollutant. In addition, the analytical detection limit for ammonia was lowered considerably in the 1970s, and the trend analysis for that pollutant generally begins at that time.

Likewise, there are sometimes significant gaps in the data when monitoring for some or all of the pollutants was interrupted for a time. Such gaps can occasionally result in under- or over-estimates regarding annual and overall changes; the latter is particularly true for chloride, which had relatively little monitoring for a number of years. In such cases, looking at the median concentrations for the beginning and ending 10-year periods can help to give a better picture of actual conditions.

Trends shown are statistically significant at the 90% confidence level. Percentage changes are statistical estimates based on the available data, and actual changes could of course be higher or lower. A designation of "no trend" means that a statistically significant trend has not been found; this may be because there is not enough data or there is too much natural variability in the data to discern the actual trend.

The annual and overall changes in pollutant concentrations and the median concentrations are estimates from the available data, and are subject to the various limitations of that data. In particular, the results for individual sites can be affected by such things as the precise timing of the monitoring, gaps in the data, small data sets, and the large amount of natural variability inherent in water quality monitoring.

The pollutant concentrations shown in the table and maps are median summer (June-August) values, except for chlorides, which are median year-round values. All concentrations are in mg/L (parts per million). No map has been created for recent 10-year median ammonia concentrations because levels at the vast majority of Milestone sites are now below laboratory detection limits.

# Results

*Improvements:* The Minnesota Milestone sites, as a whole, show significant reductions over the period of record across the state for total suspended solids, phosphorus, ammonia, and biochemical oxygen demand. For all four of these parameters, the trends that are discernible are almost entirely in a positive environmental direction. In addition, it should be noted that bacterial pollution in Minnesota streams has also decreased significantly over the Milestone monitoring period. While the change in monitoring parameter in the early 2000s from fecal coliform bacteria to E. coli (the latter is considered to be a better indicator of pathogens which can affect human health) has precluded an accurate updating of the earlier trends work, the vast majority (82%) of Milestone sites showed decreasing pollutant trends for bacteria through the year 2000, and the continued monitoring for E. coli gives no indication of any reversal in this trend.

*Increasing Problems:* For nitrate and chloride, the picture is much different, with Milestone sites largely showing trends in the opposite direction, with increasing pollutant levels, or no trends.

The results of this study, while not identical because of differences in both the data and the statistical methods used, are consistent with those of other studies of trends in Minnesota rivers and streams.

The positive, decreasing pollutant trends for total suspended solids, phosphorus, ammonia, biochemical oxygen demand, and bacteria reflect the considerable progress made during the overall Milestone period in controlling municipal and industrial point sources of pollution. The negative, increasing pollutant trends for nitrate and chloride, on the other hand, likely reflect continuing, and in some ways more difficult, nonpoint source problems such as agricultural practices (nitrogen) and road salt application (chloride).

Concern regarding nitrogen in Minnesota's waters has grown in recent decades, with the discovery that some streams now exceed the state's human-health drinking water standard, with increasing studies showing the toxic effects of nitrate on aquatic life, and with the fact that nitrogen in the Mississippi River – originating in part from Minnesota – plays the major role in causing a large oxygen-depleted "dead zone" in the Gulf of Mexico. In response, the MPCA is developing aquatic-life-toxicity water quality standards for nitrogen and is likewise developing a state-level Nutrient Reduction Strategy which will identify how further progress can be made to reduce nitrogen (and phosphorus) in our waters.

Concern regarding chloride in Minnesota's waters is somewhat newer. An examination of Milestone trends in 2000 did not look at chloride because of a lack of sufficient data. Increased monitoring since that time, however, has shown significant, largely statewide increases in chloride concentrations over the years of the Milestone program. Monitoring for chloride has subsequently been increased in other waters, especially in the Twin Cities metro area. The MPCA has listed a number of waters as impaired by the pollutant and is working with local governments and others to reduce the amount of chloride that enters our waters from the various sources, especially the application of road-deicing salts.

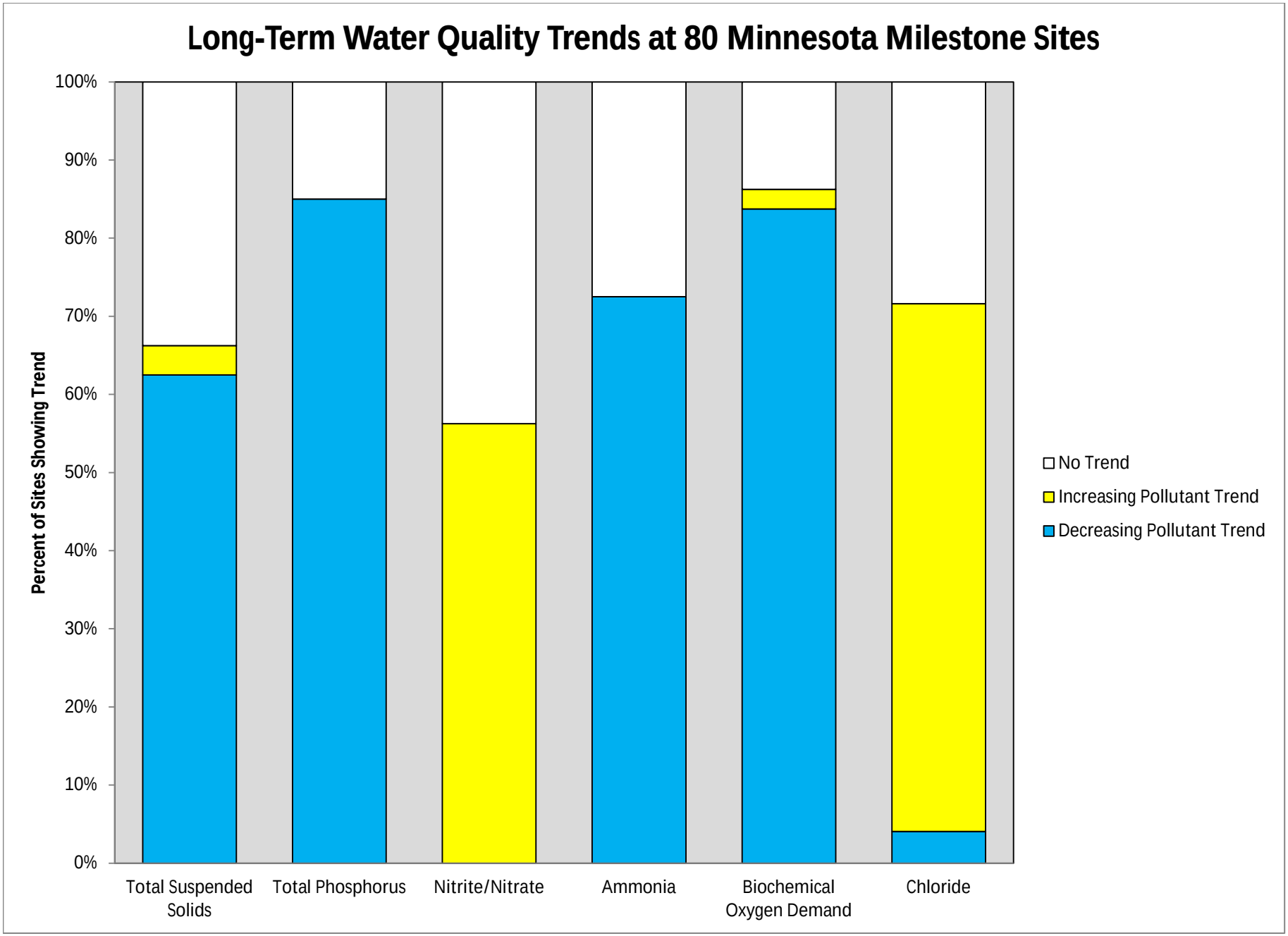
*Regional differences:* Distinct regional differences in pollutant concentrations are evident at the Milestone sites. As a general pattern, levels are lower in the northeast portion of the state and higher as one moves south and west. The differences are sometimes dramatic – median pollutant concentrations can be more than one hundred times as high at a site in one part of the state in comparison with another site in another part of the state.

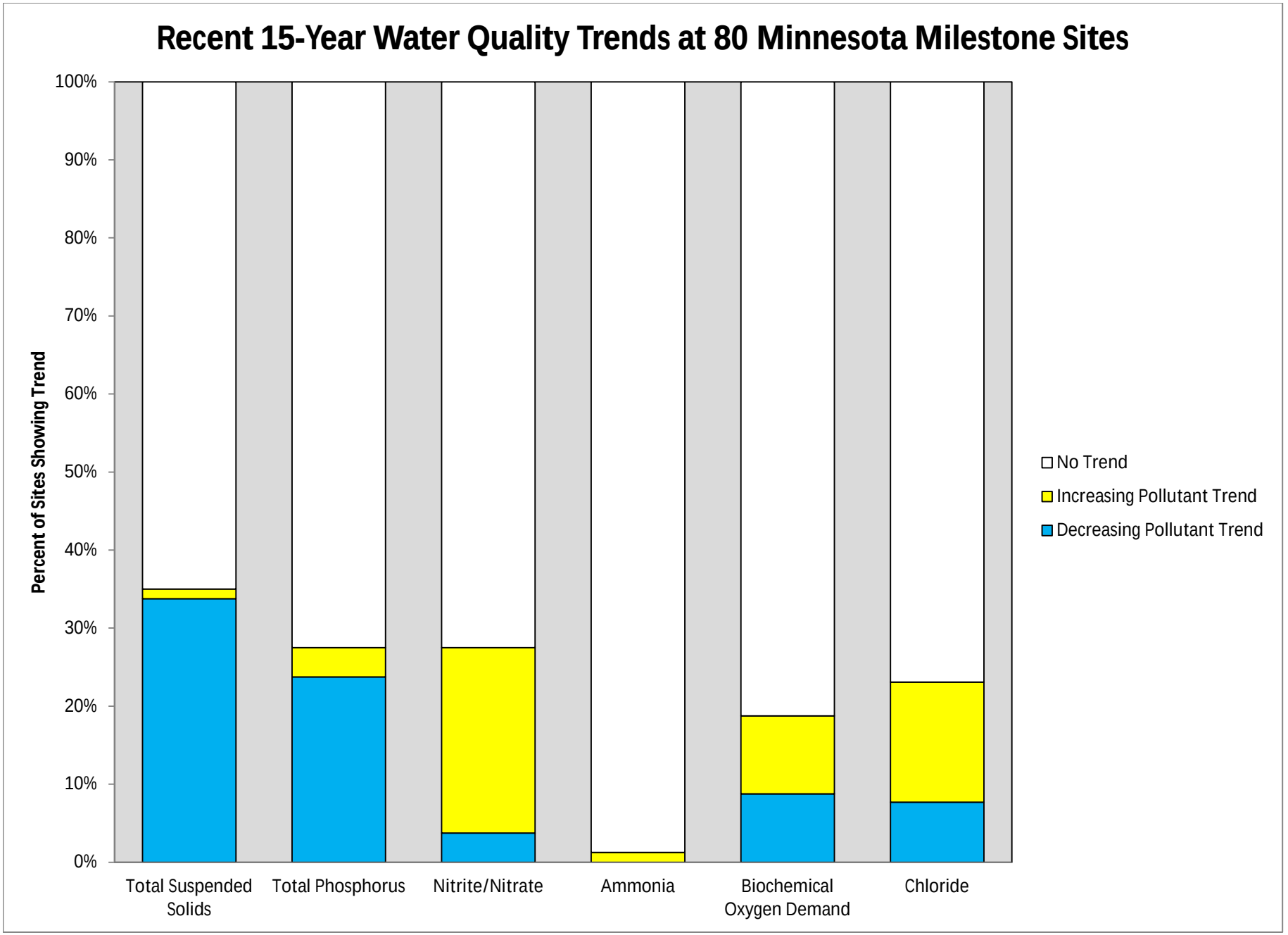
These differences correspond with the division of the state into "ecoregions," representing differences in climate, soils, geology, topology, vegetation, etc. The differences in pollutant concentrations are reflective both of differences in natural conditions across the state, and, more importantly, in differences in the resulting types and intensity of land use.

*Recent flattening of trends:* While the overall trends are quite clear when looking at the entire period of record for most sites, trends show up much less frequently when looking at only the most recent 15 years. There are three possible reasons for this:

- Given the natural variability in pollutant concentrations, trends often take a considerable length of time to be discernible as statistically significant.
- Monitoring became less frequent and regular in the latter years of the Milestone program – there is simply less data to work with – making trends more difficult to ascertain.
- In cases where overall decreasing pollutant levels have been found, while this is not clear from this data, it may be the case that the largest reductions came in the earlier years of the MPCA's efforts from the relatively more easily attained limitations on municipal and industrial point sources. In contrast, the remaining problems are largely nonpoint in nature, more diffuse, and more difficult to resolve from a regulatory, socio-economic, and technical standpoint.

Nevertheless, the combined results from the Milestone sites give an accurate and useful picture of overall conditions and changes in pollutant levels across the state of Minnesota. As such, they are indicative of past and current successes as well as future challenges.


Long-Term Water Quality Trends at 80 Minnesota Milestone Sites
Percent of Sites Showing Trend
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Total Suspended Solids
Total Phosphorus
Nitrite/Nitrate
Ammonia
Biochemical Oxygen Demand
Chloride
No Trend
Increasing Pollutant Trend
Decreasing Pollutant Trend


Recent 15-Year Water Quality Trends at 80 Minnesota Milestone Sites
Percent of Sites Showing Trend
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Total Suspended Solids
Total Phosphorus
Nitrite/Nitrate
Ammonia
Biochemical Oxygen Demand
Chloride
No Trend
Increasing Pollutant Trend
Decreasing Pollutant Trend

## Water Quality Trends at 80 Minnesota Milestone Sites

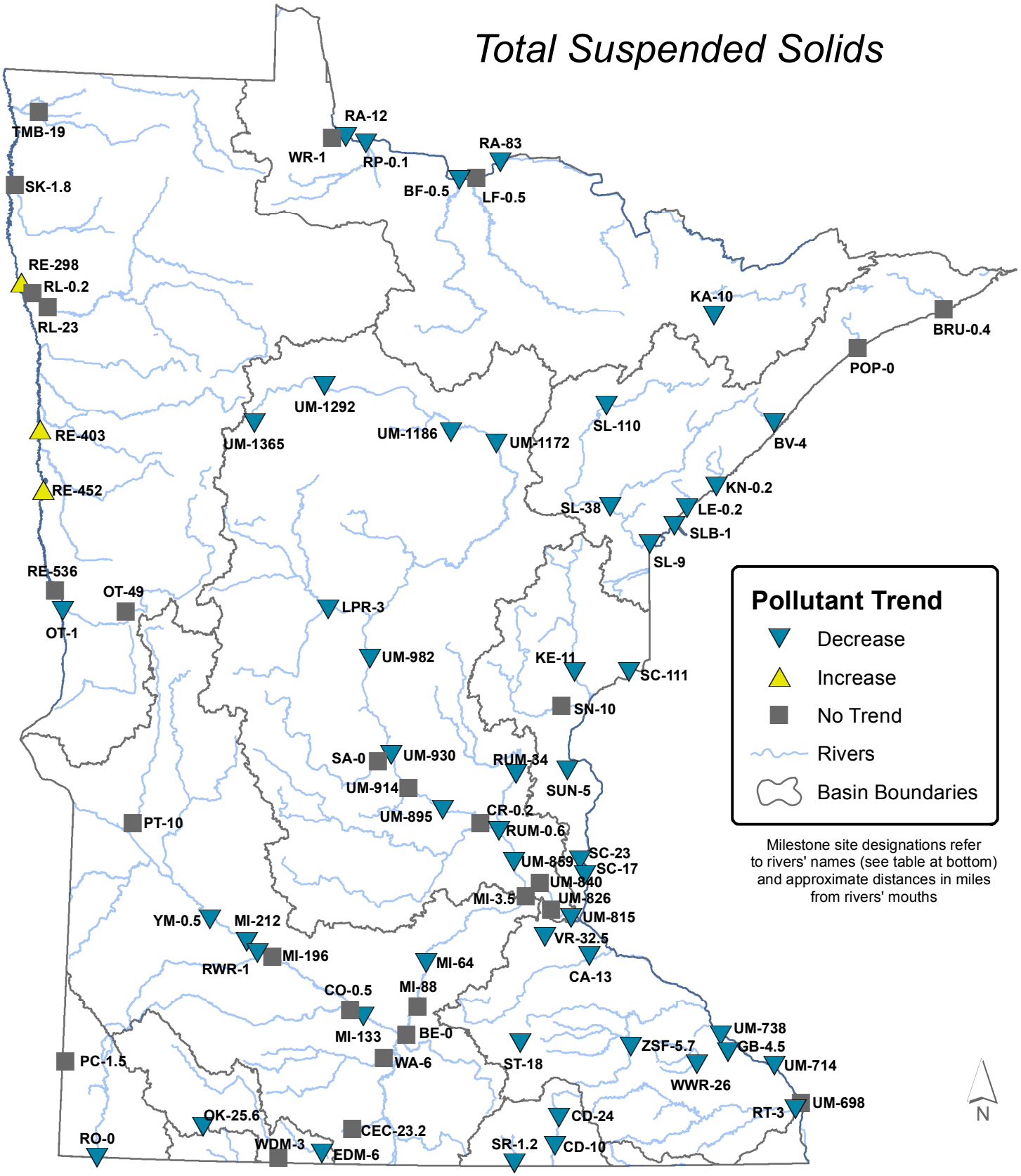
| | | Long-Term Trend | | | | | | Recent 15-Year Trend | | | | | | Recent 10-Year Median Concentration | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River | Station | Total Suspended Solids | Total Phosphorus | Nitrite / Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride | Total Suspended Solids | Total Phosphorus | Nitrite / Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride | TSS | TP | $NO_2$ / $NO_3$ | $NH_3$ | BOD | Cl |
| **Red River of the North Basin** | | | | | | | | | | | | | | | | | | | |
| Red | RE-536 | no trend | no trend | increase | no trend | decrease | increase | increase | increase | no trend | no trend | no trend | increase | 74 | 0.3 | 0.2 | <0.05 | 3 | 15 |
| Red | RE-452 | increase | no trend | increase | no trend | decrease | increase | no trend | no trend | no trend | no trend | no trend | no trend | 120 | 0.3 | 0.3 | <0.05 | 2 | 17 |
| Red | RE-403 | increase | decrease | increase | decrease | decrease | no trend | no trend | no trend | no trend | no trend | decrease | no trend | 230 | 0.5 | 0.4 | 0.05 | 2 | 18 |
| Red | RE-298 | increase | no trend | increase | decrease | decrease | increase | no trend | no trend | no trend | no trend | decrease | no trend | 160 | 0.4 | 0.5 | <0.05 | 1 | 19 |
| Otter Tail | OT-49 | no trend | decrease | no trend | no trend | decrease | increase | no trend | no trend | no trend | no trend | no trend | little data | 13 | 0.1 | 0.06 | <0.05 | 1 | 10 |
| Otter Tail | OT-1 | decrease | decrease | increase | decrease | decrease | increase | no trend | no trend | no trend | no trend | no trend | no trend | 64 | 0.1 | 0.06 | <0.05 | 1 | 10 |
| Red Lake | RL-23 | no trend | decrease | increase | no trend | decrease | increase | no trend | no trend | no trend | no trend | no trend | no trend | 79 | 0.2 | 0.1 | <0.05 | 2 | 7 |
| Red Lake | RL-0.2 | no trend | decrease | increase | decrease | decrease | increase | no trend | no trend | no trend | no trend | no trend | no trend | 98 | 0.2 | 0.1 | <0.05 | 1 | 7 |
| Snake | SK-1.8 | no trend | decrease | no trend | decrease | decrease | no trend | no trend | decrease | no trend | no trend | no trend | decrease | 70 | 0.3 | <0.05 | <0.05 | 2 | 14 |
| Two Rivers | TMB-19 | no trend | decrease | no trend | no trend | decrease | no trend | no trend | no trend | no trend | no trend | no trend | no trend | 30 | 0.2 | 0.08 | <0.05 | 2 | 17 |
| **Rainy River Basin** | | | | | | | | | | | | | | | | | | | |
| Rainy | RA-83 | decrease | decrease | increase | no trend | decrease | no trend | no trend | no trend | no trend | no trend | no trend | little data | 2 | 0.02 | <0.05 | <0.05 | 1 | 2 |
| Rainy | RA-12 | decrease | decrease | increase | no trend | decrease | increase | no trend | no trend | no trend | no trend | no trend | little data | 4 | 0.03 | <0.05 | <0.05 | 1 | 3 |
| Kawishiwi | KA-10 | decrease | decrease | no trend | no trend | no trend | no trend | no trend | decrease | no trend | no trend | no trend | little data | 3 | 0.02 | <0.05 | <0.05 | 1 | 2 |
| Little Fork | LF-0.5 | no trend | decrease | no trend | no trend | decrease | increase | no trend | no trend | no trend | no trend | no trend | little data | 12 | 0.1 | 0.06 | <0.05 | 1 | 4 |
| Big Fork | BF-0.5 | decrease | decrease | no trend | decrease | decrease | no trend | no trend | no trend | no trend | no trend | increase | little data | 12 | 0.05 | <0.05 | <0.05 | 1 | 2 |
| Rapid | RP-0.1 | decrease | decrease | no trend | no trend | no trend | decrease | no trend | no trend | no trend | no trend | no trend | little data | 9 | 0.05 | <0.05 | <0.05 | 1 | 1 |
| Winter Road | WR-1 | no trend | no trend | no trend | no trend | decrease | little data | no trend | no trend | no trend | no trend | no trend | little data | 4 | 0.03 | <0.05 | <0.05 | 1 | 2 |
| **Lake Superior Basin** | | | | | | | | | | | | | | | | | | | |
| Brule | BRU-0.4 | no trend | decrease | no trend | no trend | no trend | no trend | no trend | decrease | no trend | no trend | no trend | little data | 2 | 0.01 | <0.05 | <0.05 | <0.5 | 1 |
| Poplar | POP-0 | no trend | decrease | no trend | no trend | no trend | no trend | no trend | no trend | no trend | no trend | no trend | little data | 3 | 0.02 | 0.05 | <0.05 | 0.7 | 2 |
| Beaver | BV-4 | decrease | decrease | increase | no trend | decrease | increase | no trend | no trend | increase | no trend | no trend | little data | 2 | 0.01 | 0.4 | <0.05 | 0.6 | 7 |
| Knife | KN-0.2 | decrease | decrease | no trend | no trend | decrease | no trend | no trend | no trend | no trend | no trend | no trend | little data | 2 | 0.01 | <0.05 | <0.05 | 0.5 | 5 |
| Lester | LE-0.2 | decrease | decrease | no trend | no trend | no trend | increase | no trend | no trend | no trend | no trend | no trend | little data | 2 | 0.02 | <0.05 | <0.05 | 0.8 | 11 |
| St. Louis | SL-110 | decrease | decrease | no trend | decrease | decrease | little data | no trend | decrease | decrease | no trend | no trend | little data | 4 | 0.03 | <0.05 | <0.05 | 0.8 | 6 |
| St. Louis | SL-38 | decrease | decrease | no trend | decrease | decrease | increase | no trend | no trend | no trend | no trend | no trend | little data | 4 | 0.04 | 0.06 | <0.05 | 1 | 5 |
| St. Louis | SL-9 | decrease | decrease | no trend | decrease | decrease | decrease | decrease | no trend | no trend | no trend | no trend | little data | 5 | 0.04 | 0.09 | <0.05 | 1 | 7 |
| St. Louis | SLB-1 | decrease | decrease | increase | decrease | decrease | decrease | no trend | no trend | increase | increase | no trend | increase | 5 | 0.05 | 0.2 | 0.07 | 1 | 11 |
| **Upper Mississippi River Basin** | | | | | | | | | | | | | | | | | | | |
| Mississippi | UM-1365 | decrease | decrease | no trend | no trend | decrease | no trend | no trend | increase | no trend | no trend | no trend | little data | 2 | 0.05 | <0.05 | <0.05 | 1 | 2 |
| Mississippi | UM-1292 | decrease | decrease | no trend | decrease | decrease | increase | no trend | no trend | no trend | no trend | no trend | little data | 1 | 0.03 | <0.05 | <0.05 | 1 | 7 |
| Mississippi | UM-1186 | decrease | decrease | no trend | decrease | decrease | increase | no trend | no trend | no trend | no trend | no trend | little data | 2 | 0.03 | <0.05 | <0.05 | 1 | 3 |
| Mississippi | UM-1172 | decrease | decrease | no trend | decrease | decrease | no trend | decrease | decrease | no trend | no trend | no trend | little data | 3 | 0.04 | <0.05 | <0.05 | 1 | 5 |
| Mississippi | UM-982 | decrease | decrease | increase | decrease | decrease | increase | no trend | no trend | no trend | no trend | no trend | little data | 5 | 0.05 | 0.2 | <0.05 | 1 | 9 |
| Mississippi | UM-930 | decrease | decrease | increase | decrease | decrease | increase | no trend | no trend | increase | no trend | no trend | little data | 7 | 0.08 | 0.2 | <0.05 | 1 | 9 |
| Mississippi | UM-914 | no trend | decrease | increase | decrease | decrease | increase | no trend | no trend | increase | no trend | no trend | little data | 8 | 0.07 | 0.2 | <0.05 | 2 | 11 |
| Mississippi | UM-895 | decrease | decrease | increase | decrease | decrease | no trend | decrease | no trend | increase | no trend | no trend | little data | 8 | 0.09 | 0.4 | <0.05 | 2 | 12 |
| Mississippi | UM-859 | decrease | decrease | increase | decrease | decrease | increase | decrease | no trend | no trend | no trend | no trend | little data | 19 | 0.1 | 0.3 | <0.05 | 2 | 25 |
| Mississippi | UM-840 | no trend | decrease | increase | decrease | decrease | increase | decrease | decrease | no trend | no trend | no trend | little data | 68 | 0.2 | 3 | <0.05 | 2 | 25 |
| Mississippi | UM-826 | no trend | decrease | increase | decrease | decrease | increase | decrease | decrease | increase | no trend | decrease | little data | 48 | 0.2 | 3 | 0.08 | 2 | 31 |
| Mississippi | UM-815 | decrease | decrease | increase | decrease | decrease | increase | decrease | decrease | no trend | no trend | no trend | little data | 42 | 0.2 | 2 | 0.05 | 3 | 28 |
| Long Prairie | LPR-3 | decrease | no trend | increase | decrease | decrease | increase | no trend | no trend | no trend | no trend | decrease | little data | 3 | 0.09 | 0.1 | <0.05 | 1 | 25 |
| Sauk | SA-0 | no trend | decrease | increase | decrease | no trend | increase | no trend | no trend | increase | no trend | no trend | little data | 9 | 0.2 | 0.4 | <0.05 | 2 | 32 |
| Crow | CR-0.2 | no trend | no trend | increase | no trend | no trend | increase | decrease | no trend | no trend | no trend | no trend | no trend | 51 | 0.3 | 0.7 | <0.05 | 6 | 33 |
| Rum | RUM-34 | decrease | decrease | increase | decrease | decrease | increase | no trend | no trend | no trend | no trend | no trend | little data | 14 | 0.1 | 0.2 | <0.05 | 2 | 12 |
| Rum | RUM-0.6 | decrease | decrease | increase | no trend | decrease | increase | no trend | no trend | no trend | no trend | decrease | little data | 8 | 0.1 | 0.1 | <0.05 | 2 | 18 |

## Water Quality Trends at 80 Minnesota Milestone Sites

| | | Long-Term Trend | | | | | | Recent 15-Year Trend | | | | | | Recent 10-Year Median Concentration | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River | Station | Total Suspended Solids | Total Phosphorus | Nitrite / Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride | Total Suspended Solids | Total Phosphorus | Nitrite / Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride | TSS | TP | $NO_2$ / $NO_3$ | $NH_3$ | BOD | Cl |
| **Minnesota River Basin** | | | | | | | | | | | | | | | | | | | |
| Minnesota | MI-212 | decrease | decrease | no trend | decrease | no trend | little data | decrease | decrease | decrease | no trend | increase | little data | 54 | 0.2 | 0.2 | <0.05 | 4 | 22 |
| Minnesota | MI-196 | no trend | decrease | no trend | decrease | decrease | increase | no trend | no trend | no trend | no trend | increase | little data | 68 | 0.2 | 0.7 | <0.05 | 4 | 26 |
| Minnesota | MI-133 | decrease | decrease | no trend | decrease | decrease | increase | decrease | decrease | no trend | no trend | increase | little data | 79 | 0.2 | 1 | <0.05 | 4 | 29 |
| Minnesota | MI-88 | no trend | decrease | no trend | decrease | decrease | increase | decrease | decrease | no trend | no trend | increase | little data | 87 | 0.2 | 4 | <0.05 | 4 | 29 |
| Minnesota | MI-64 | decrease | decrease | no trend | decrease | decrease | increase | decrease | decrease | no trend | no trend | increase | little data | 81 | 0.2 | 3 | <0.05 | 4 | 32 |
| Minnesota | MI-3.5 | no trend | decrease | no trend | decrease | no trend | little data | decrease | decrease | no trend | no trend | no trend | little data | 71 | 0.2 | 7 | <0.05 | 3 | 55 |
| Pomme de Terre | PT-10 | no trend | decrease | increase | decrease | decrease | increase | decrease | no trend | no trend | no trend | no trend | no trend | 73 | 0.2 | 0.3 | <0.05 | 2 | 13 |
| Yellow Medicine | YM-0.5 | decrease | decrease | increase | decrease | decrease | increase | decrease | decrease | no trend | no trend | decrease | little data | 26 | 0.1 | 0.3 | <0.05 | 2 | 18 |
| Redwood | RWR-1 | decrease | no trend | no trend | decrease | decrease | no trend | no trend | increase | no trend | no trend | no trend | little data | 51 | 0.3 | 2 | <0.05 | 4 | 71 |
| Cottonwood | CO-0.5 | no trend | decrease | no trend | decrease | decrease | increase | decrease | decrease | no trend | no trend | increase | little data | 65 | 0.1 | 3 | <0.05 | 5 | 29 |
| Center Creek | CEC-23.2 | no trend | decrease | increase | decrease | decrease | no trend | decrease | no trend | increase | no trend | no trend | little data | 38 | 0.3 | 6 | 0.08 | 4 | 79 |
| Watonwan | WA-6 | no trend | decrease | no trend | decrease | decrease | increase | decrease | no trend | no trend | no trend | no trend | little data | 52 | 0.2 | 6 | <0.05 | 2 | 42 |
| Blue Earth | BE-0 | no trend | decrease | no trend | decrease | decrease | increase | decrease | decrease | no trend | no trend | increase | little data | 62 | 0.2 | 7 | <0.05 | 5 | 31 |
| **St. Croix River Basin** | | | | | | | | | | | | | | | | | | | |
| St. Croix | SC-111 | decrease | decrease | no trend | no trend | decrease | increase | no trend | decrease | no trend | no trend | no trend | little data | 4 | 0.03 | <0.05 | <0.05 | 1 | 5 |
| St. Croix | SC-23 | decrease | decrease | increase | no trend | decrease | increase | no trend | no trend | no trend | no trend | no trend | little data | 10 | 0.1 | 0.1 | <0.05 | 2 | 7 |
| St. Croix | SC-17 | decrease | decrease | increase | decrease | decrease | increase | no trend | no trend | no trend | no trend | no trend | no trend | 5 | 0.1 | 0.2 | <0.05 | 1 | 7 |
| Kettle | KE-11 | decrease | decrease | no trend | decrease | decrease | increase | no trend | no trend | increase | no trend | no trend | little data | 3 | 0.05 | 0.1 | <0.05 | 1 | 8 |
| Snake | SN-10 | no trend | no trend | no trend | decrease | no trend | increase | no trend | no trend | no trend | no trend | no trend | little data | 7 | 0.09 | 0.06 | 0.06 | 2 | 8 |
| Sunrise | SUN-5 | decrease | no trend | increase | no trend | increase | no trend | decrease | no trend | increase | no trend | no trend | little data | 8 | 0.1 | 2 | <0.05 | 1 | 31 |
| **Lower Mississippi River Basin** | | | | | | | | | | | | | | | | | | | |
| Mississippi | UM-738 | decrease | decrease | increase | decrease | decrease | increase | decrease | no trend | increase | no trend | decrease | little data | 17 | 0.1 | 1 | <0.05 | 2 | 23 |
| Mississippi | UM-714 | decrease | decrease | increase | decrease | decrease | increase | no trend | no trend | increase | no trend | no trend | little data | 21 | 0.2 | 2 | <0.05 | 2 | 18 |
| Mississippi | UM-698 | no trend | decrease | increase | decrease | decrease | no trend | no trend | no trend | increase | no trend | no trend | little data | 20 | 0.2 | 0.9 | <0.05 | 2 | 18 |
| Vermillion | VR-32.5 | decrease | decrease | no trend | decrease | increase | little data | decrease | decrease | decrease | no trend | no trend | little data | 12 | 0.5 | 5 | <0.05 | 1 | 52 |
| Straight | ST-18 | decrease | decrease | no trend | decrease | decrease | increase | no trend | no trend | no trend | no trend | no trend | little data | 23 | 0.3 | 4 | <0.05 | 1 | 30 |
| Cannon | CA-13 | decrease | decrease | increase | decrease | decrease | increase | no trend | no trend | increase | no trend | no trend | little data | 14 | 0.2 | 4 | <0.05 | 2 | 28 |
| Zumbro | ZSF-5.7 | decrease | decrease | increase | decrease | decrease | increase | decrease | no trend | no trend | no trend | no trend | little data | 16 | 0.2 | 7 | <0.05 | 2 | 54 |
| Whitewater | WWR-26 | decrease | no trend | increase | decrease | decrease | increase | no trend | no trend | increase | no trend | no trend | little data | 16 | 0.4 | 11 | <0.05 | 1 | 43 |
| Garvin Brook | GB-4.5 | decrease | decrease | increase | decrease | decrease | increase | decrease | no trend | increase | no trend | no trend | little data | 23 | 0.1 | 2 | <0.05 | 1 | 13 |
| Root | RT-3 | decrease | decrease | increase | decrease | decrease | increase | decrease | no trend | increase | no trend | no trend | little data | 58 | 0.1 | 4 | <0.05 | 1 | 13 |
| **Missouri River Basin** | | | | | | | | | | | | | | | | | | | |
| Rock | RO-0 | decrease | decrease | increase | decrease | decrease | increase | no trend | no trend | increase | no trend | no trend | little data | 30 | 0.1 | 5 | <0.05 | 2 | 26 |
| Pipestone Creek | PC-1.5 | no trend | decrease | increase | decrease | decrease | no trend | decrease | no trend | no trend | no trend | no trend | little data | 39 | 0.2 | 4 | 0.07 | 5 | 26 |
| **Des Moines River Basin** | | | | | | | | | | | | | | | | | | | |
| W Fk Des Moines | WDM-3 | no trend | no trend | increase | decrease | no trend | no trend | no trend | no trend | no trend | no trend | no trend | little data | 71 | 0.2 | 3 | <0.05 | 8 | 38 |
| E Fk Des Moines | EDM-6 | decrease | decrease | no trend | decrease | decrease | no trend | no trend | no trend | no trend | no trend | no trend | little data | 20 | 0.2 | 11 | <0.05 | 5 | 36 |
| Okabena Creek | OK-25.6 | decrease | no trend | increase | decrease | decrease | little data | decrease | decrease | no trend | no trend | no trend | little data | 32 | 5 | 42 | <0.05 | 2 | 175 |
| **Cedar River Basin** | | | | | | | | | | | | | | | | | | | |
| Cedar | CD-24 | decrease | decrease | increase | decrease | decrease | no trend | no trend | no trend | no trend | no trend | no trend | little data | 11 | 0.2 | 8 | <0.05 | 1 | 20 |
| Cedar | CD-10 | decrease | decrease | increase | decrease | decrease | no trend | no trend | no trend | increase | no trend | no trend | little data | 34 | 0.2 | 9 | <0.05 | 2 | 28 |
| Shell Rock | SR-1.2 | decrease | decrease | increase | decrease | decrease | increase | no trend | no trend | no trend | no trend | no trend | little data | 54 | 0.4 | 2 | <0.05 | 7 | 43 |
| **Milestone Sites (Having Sufficient Data) Showing:** | | | | | | | | | | | | | | | | | | | |
| **Decreasing Pollutant Trend** | | 63% | 85% | 0% | 73% | 84% | 4% | 34% | 24% | 4% | 0% | 9% | 8% | | | | | | |
| **Increasing Pollutant Trend** | | 4% | 0% | 56% | 0% | 3% | 68% | 1% | 4% | 24% | 1% | 10% | 15% | | | | | | |
| **No Trend** | | 34% | 15% | 44% | 28% | 14% | 28% | 65% | 73% | 73% | 99% | 81% | 77% | | | | | | |

# Long-Term Water QualityTrends At Minnesota Milestone Sites

## *Total Suspended Solids*

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ZSF - Zumbro River (S Fork)

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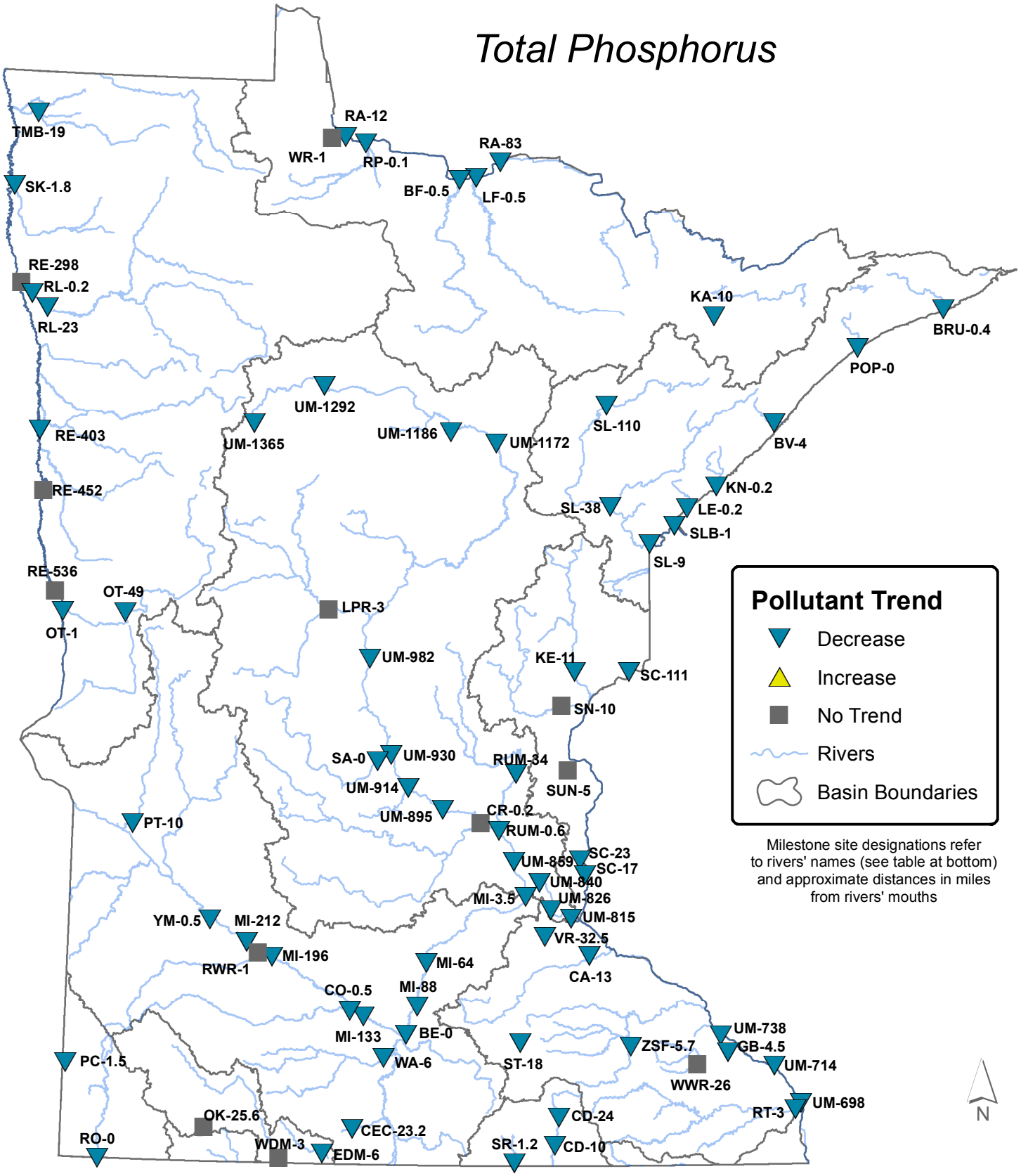


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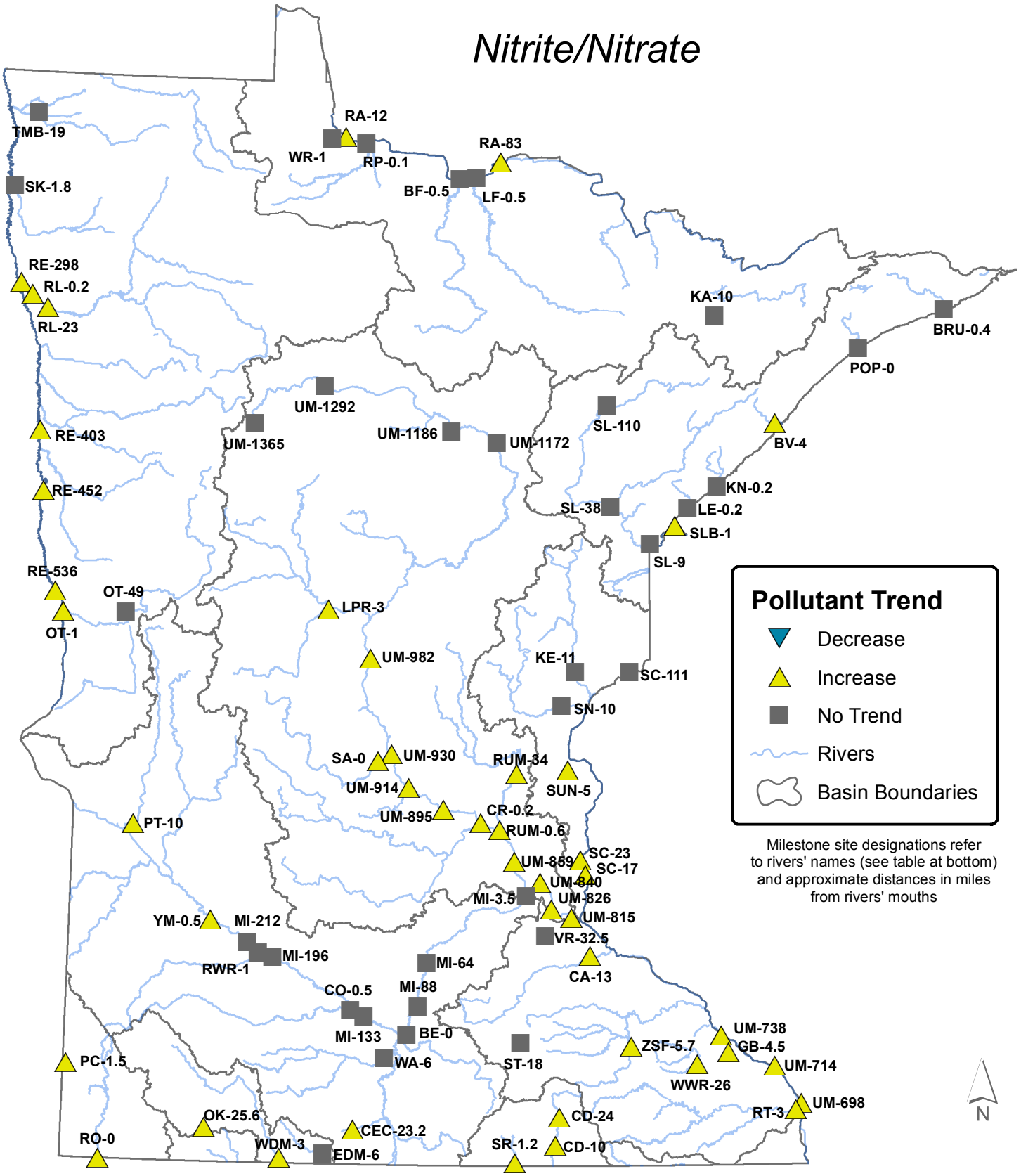
# Long-Term Water QualityTrends At Minnesota Milestone Sites

## *Nitrite/Nitrate*

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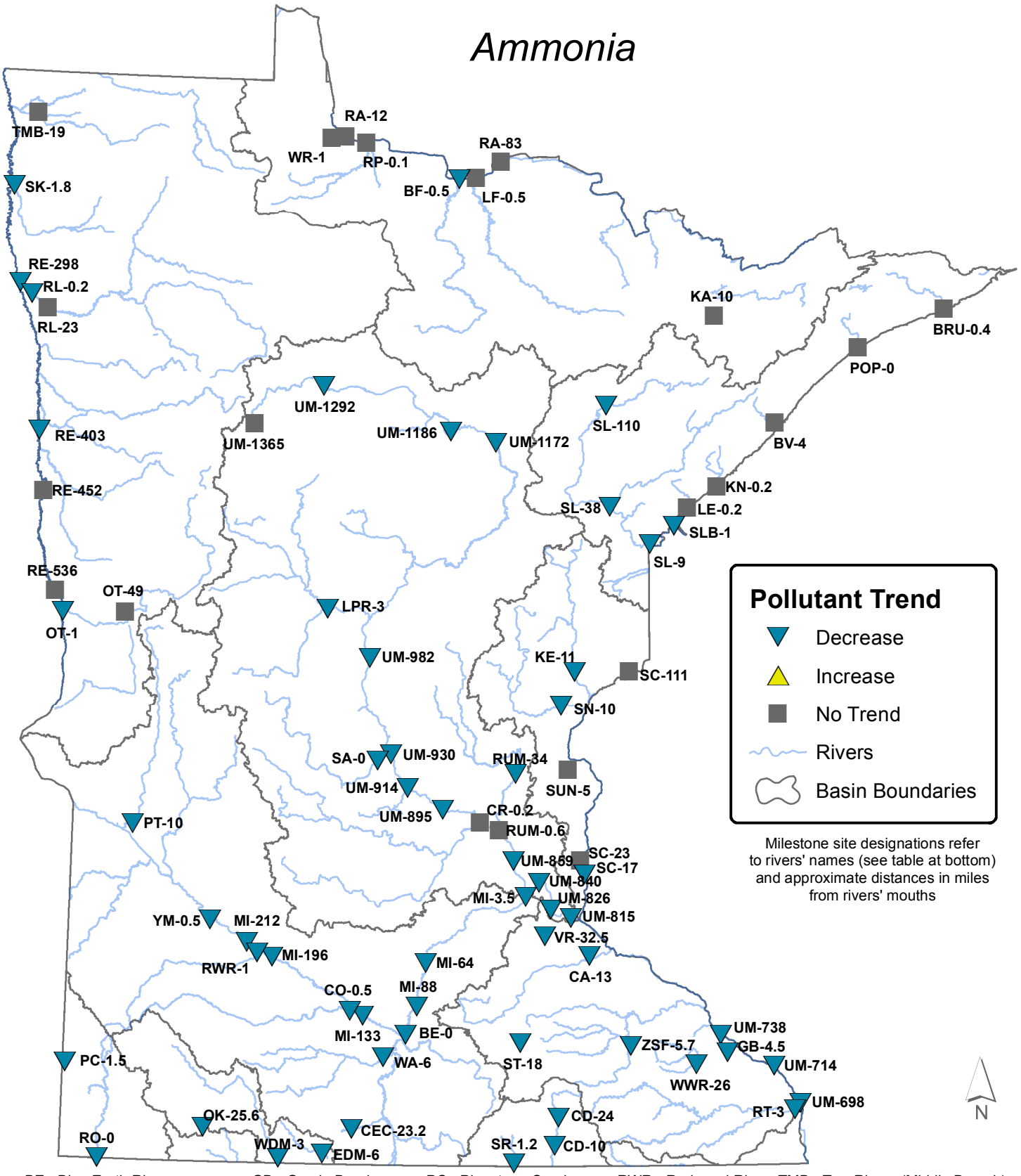


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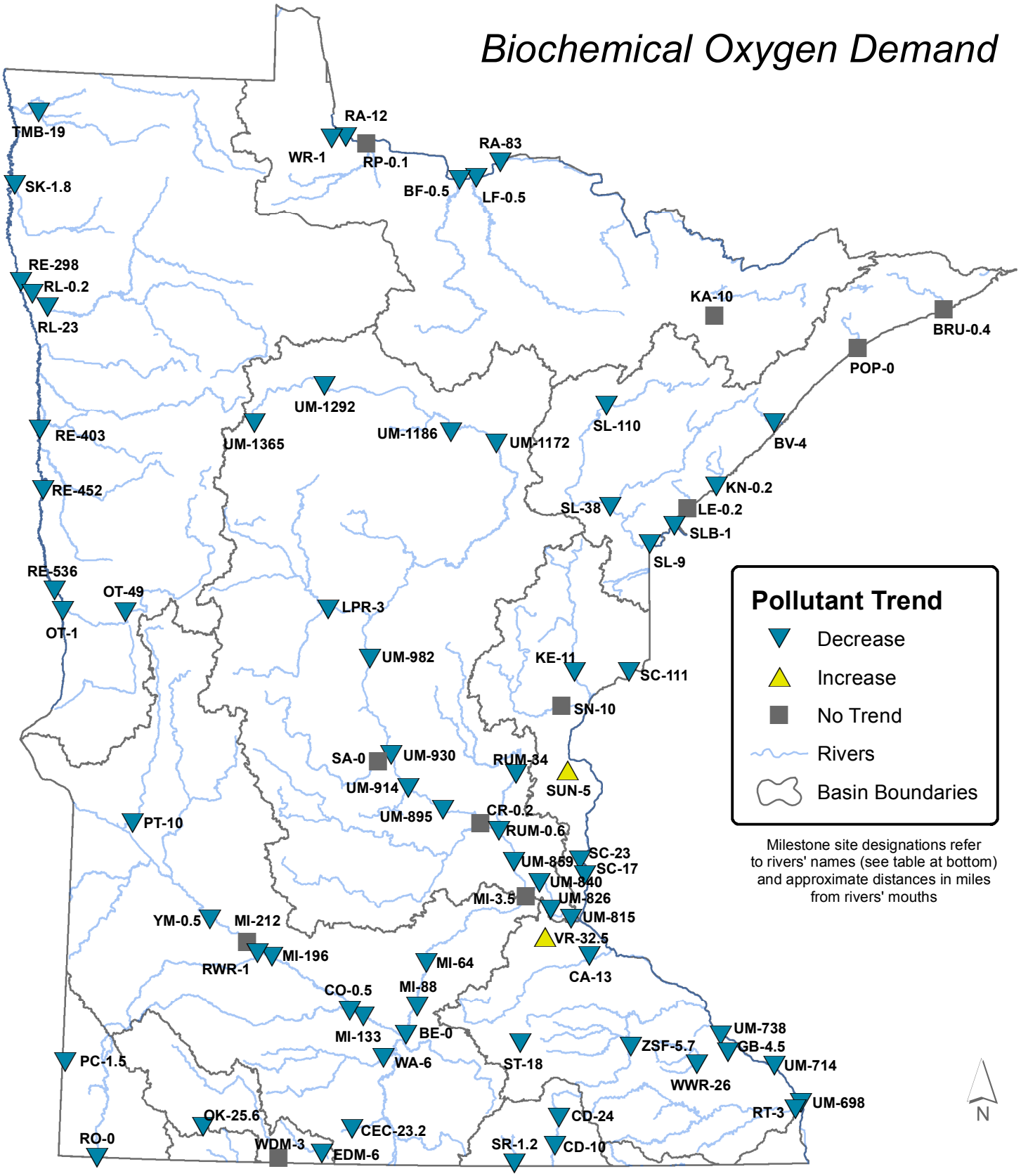
# Long-Term Water QualityTrends At Minnesota Milestone Sites

## *Biochemical Oxygen Demand*

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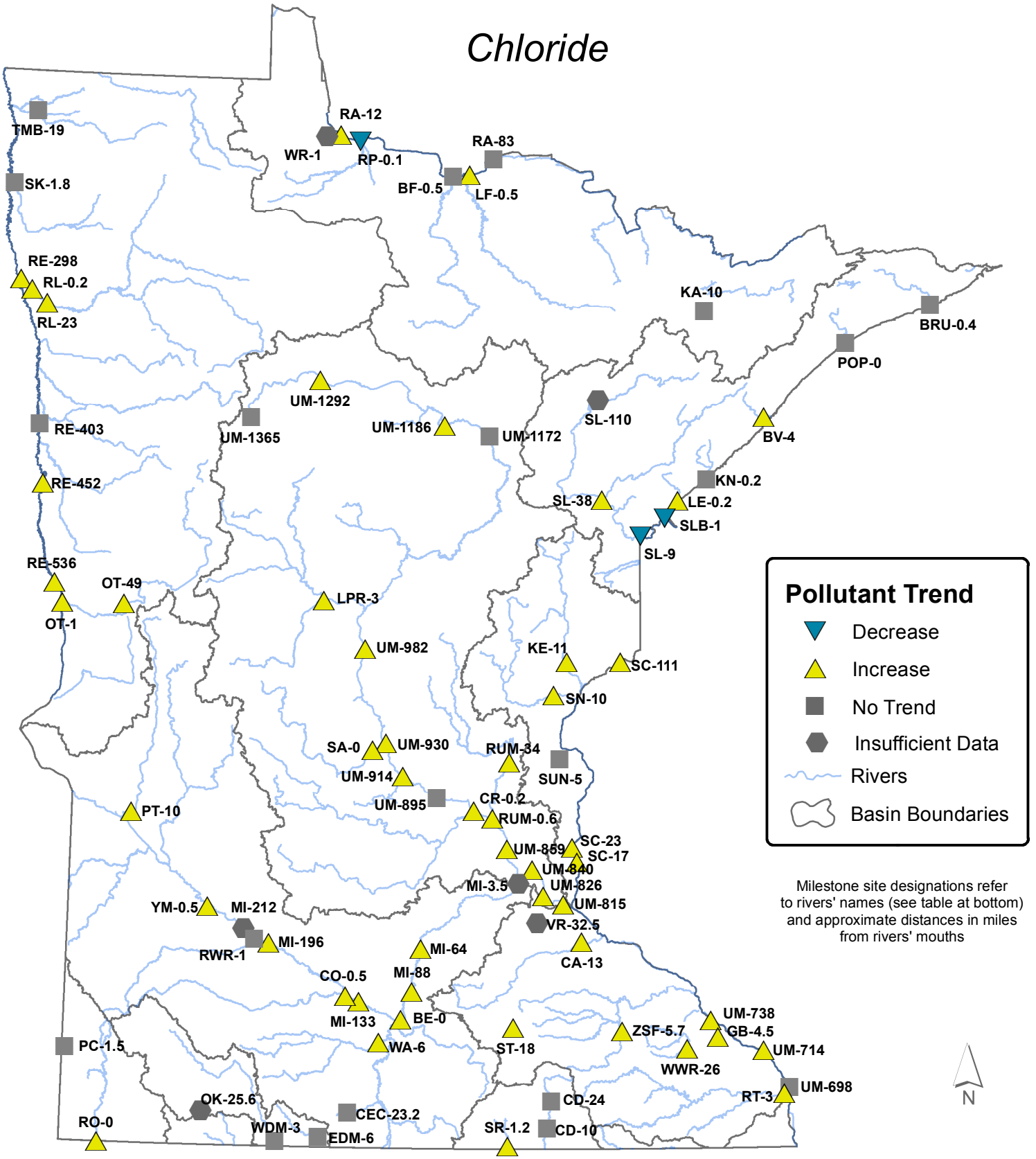


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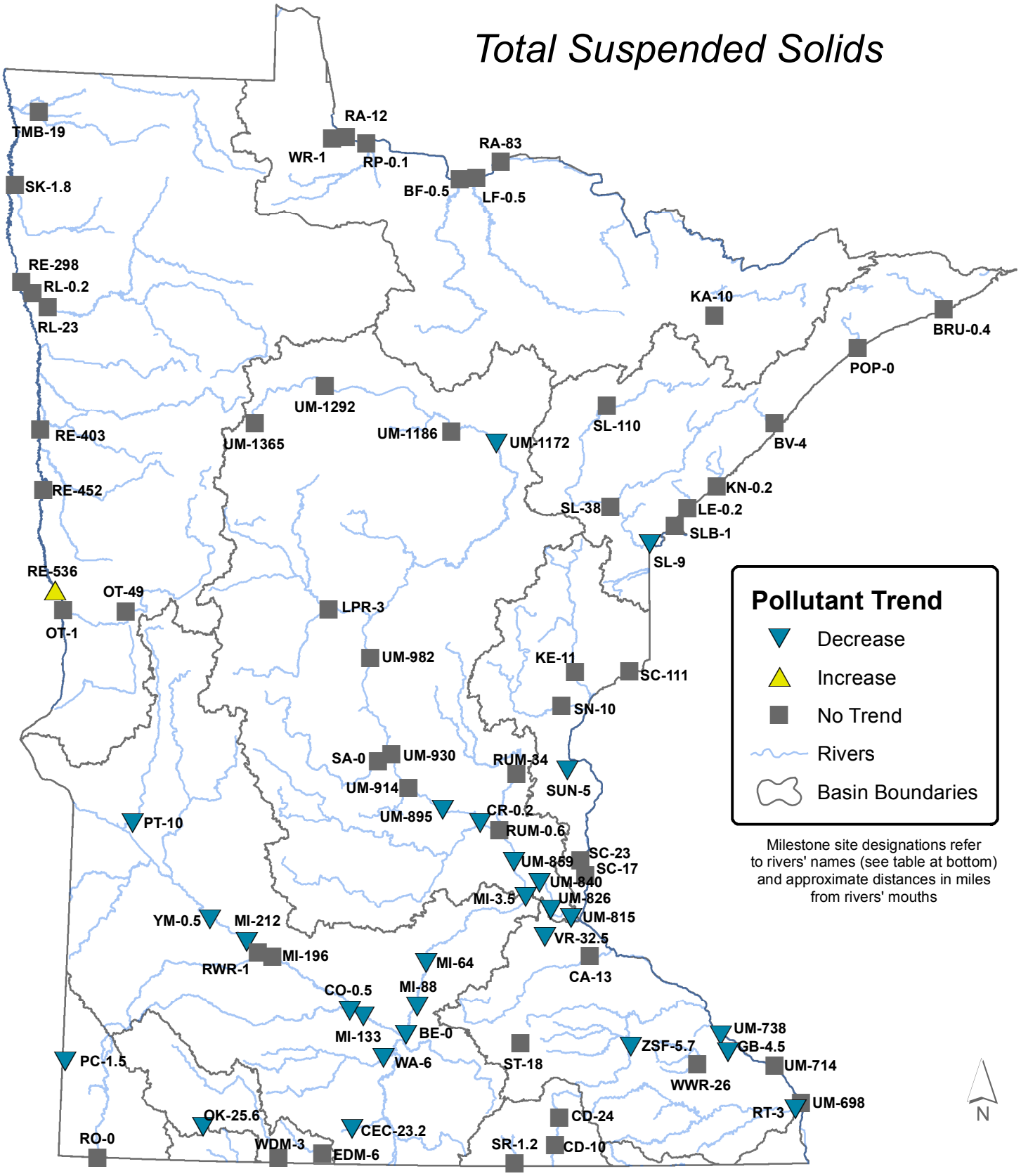


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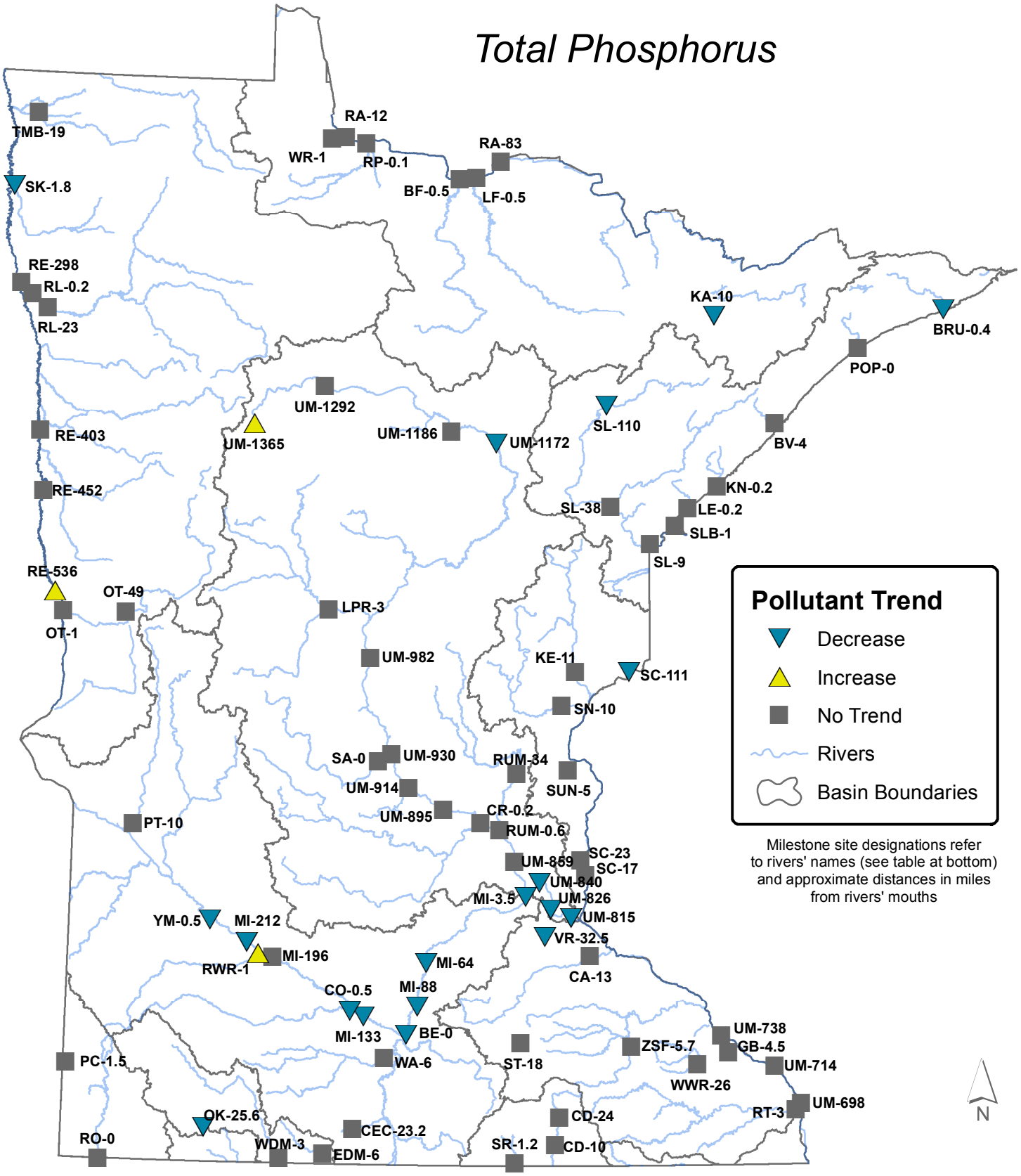


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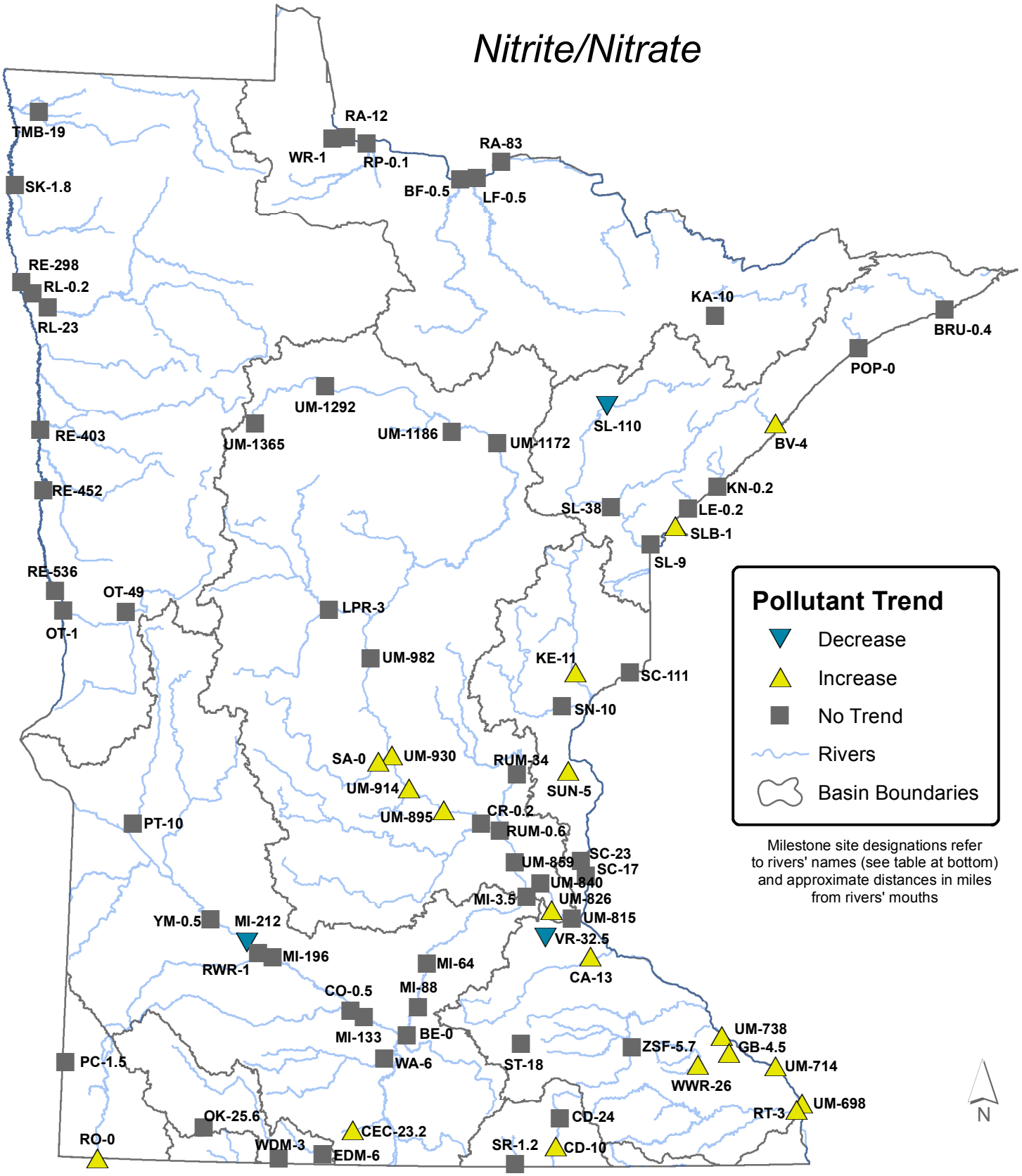


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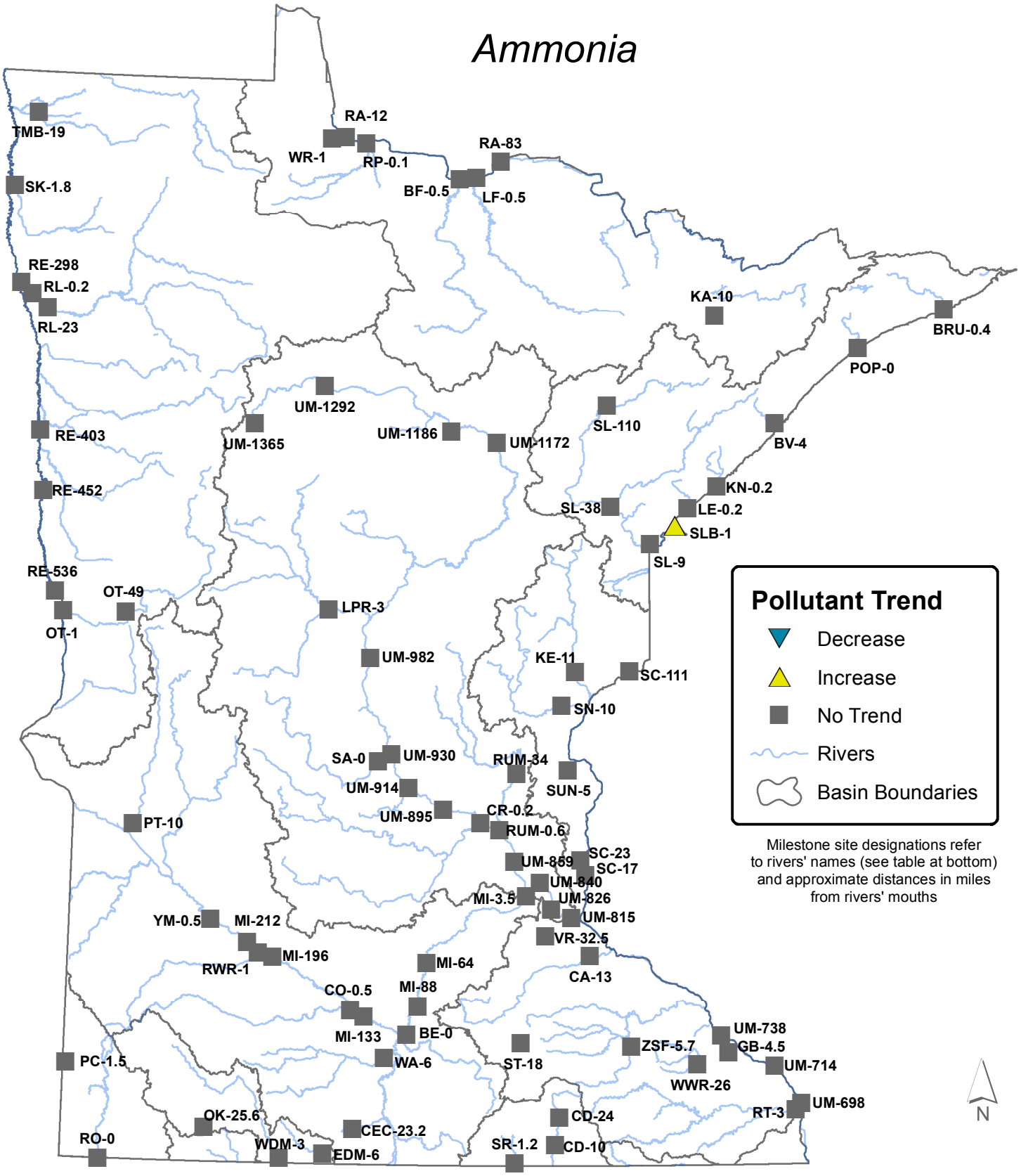


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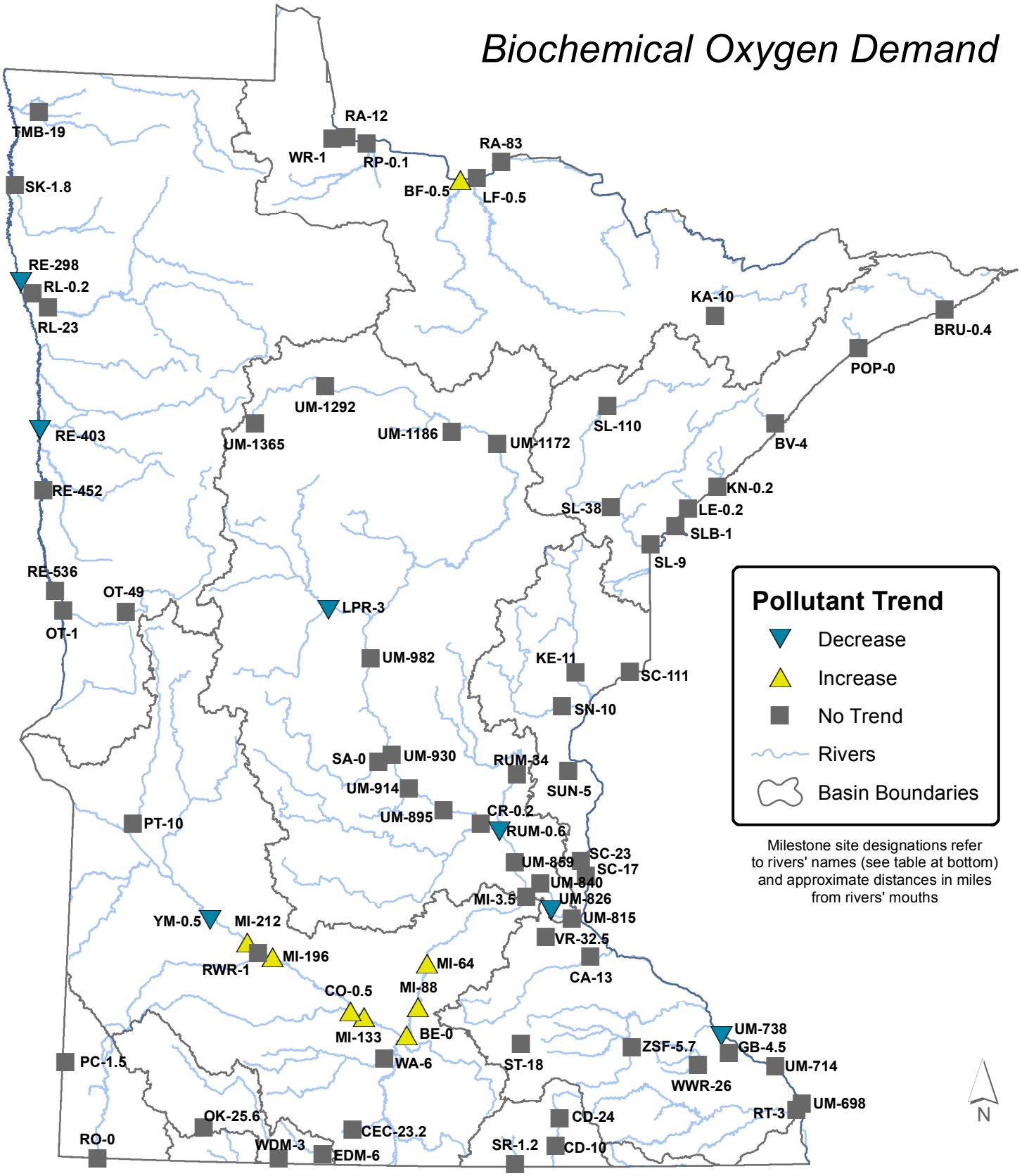
## *Biochemical Oxygen Demand*

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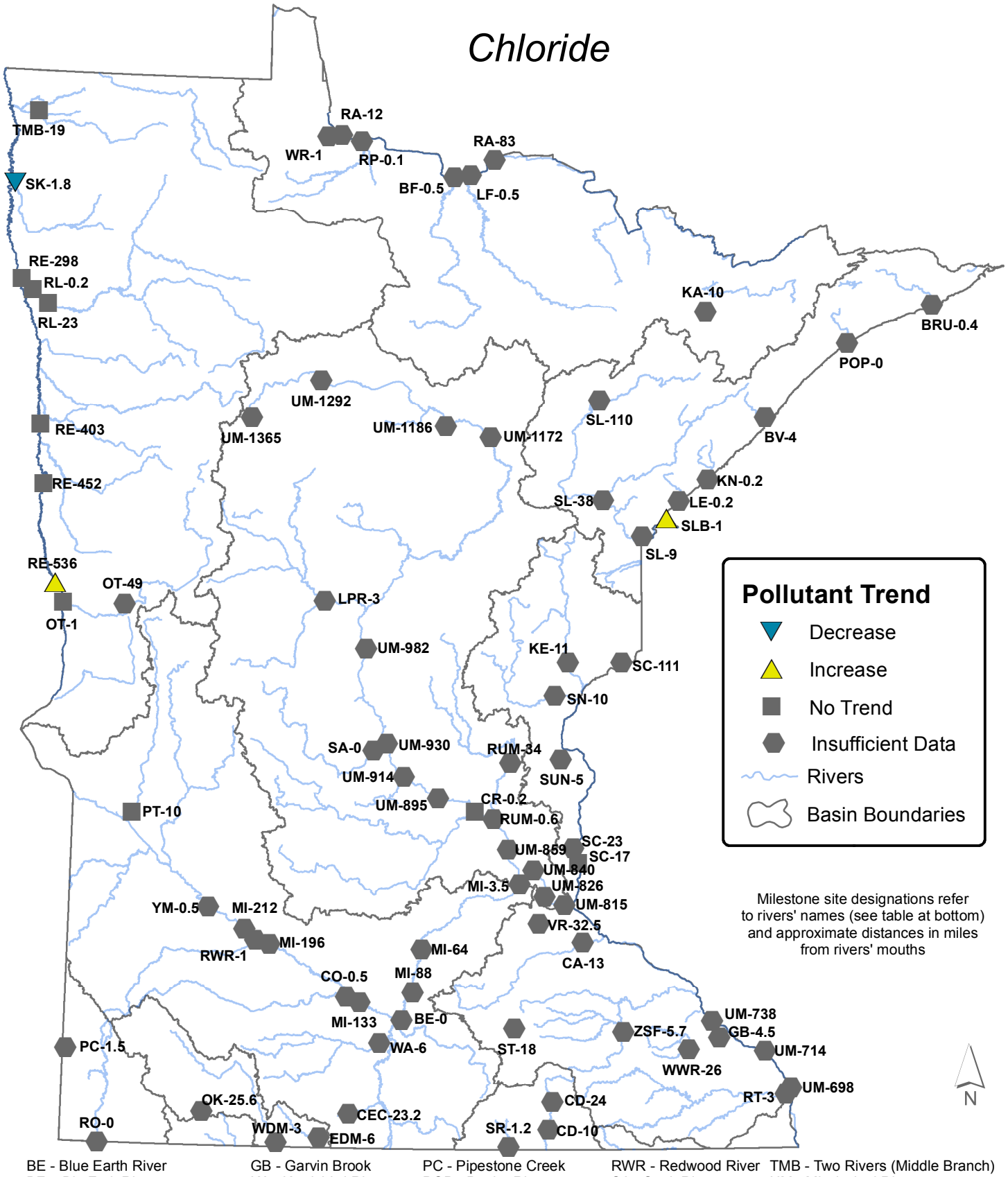


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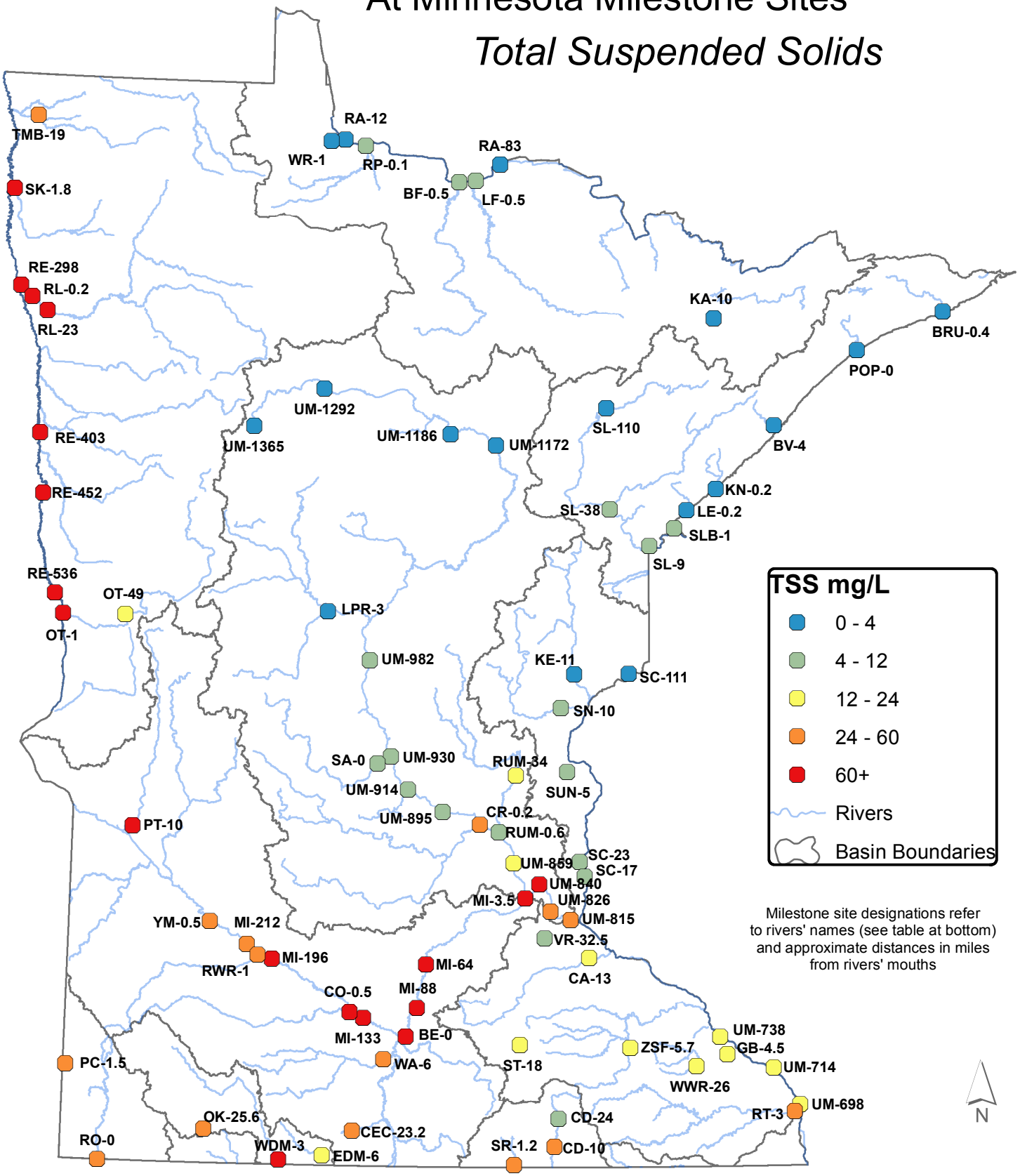
# Recent 10-Year Median Pollutant Concentrations At Minnesota Milestone Sites

## *Total Suspended Solids*

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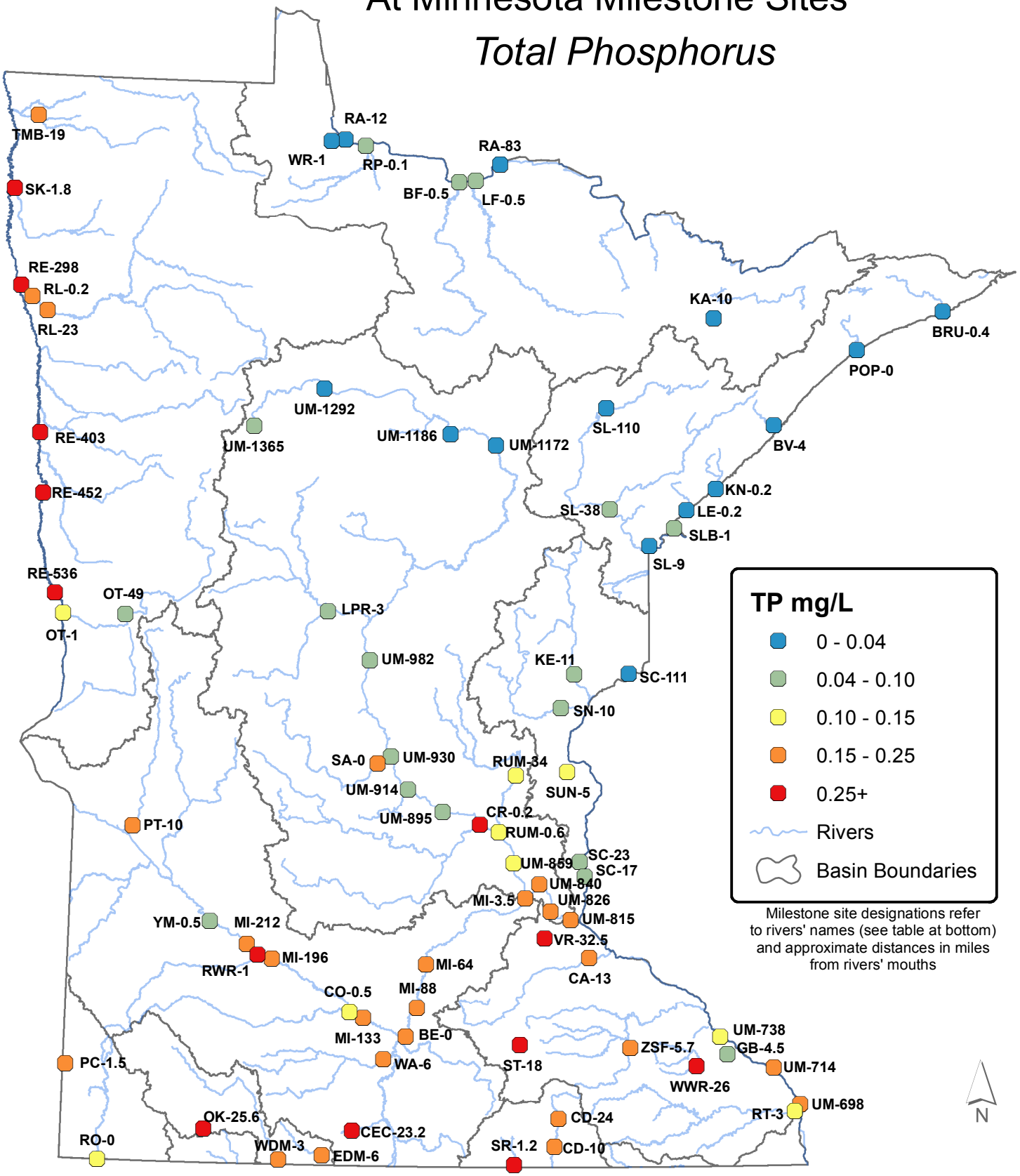
# Recent 10-Year Median Pollutant Concentrations At Minnesota Milestone Sites

## *Total Phosphorus*

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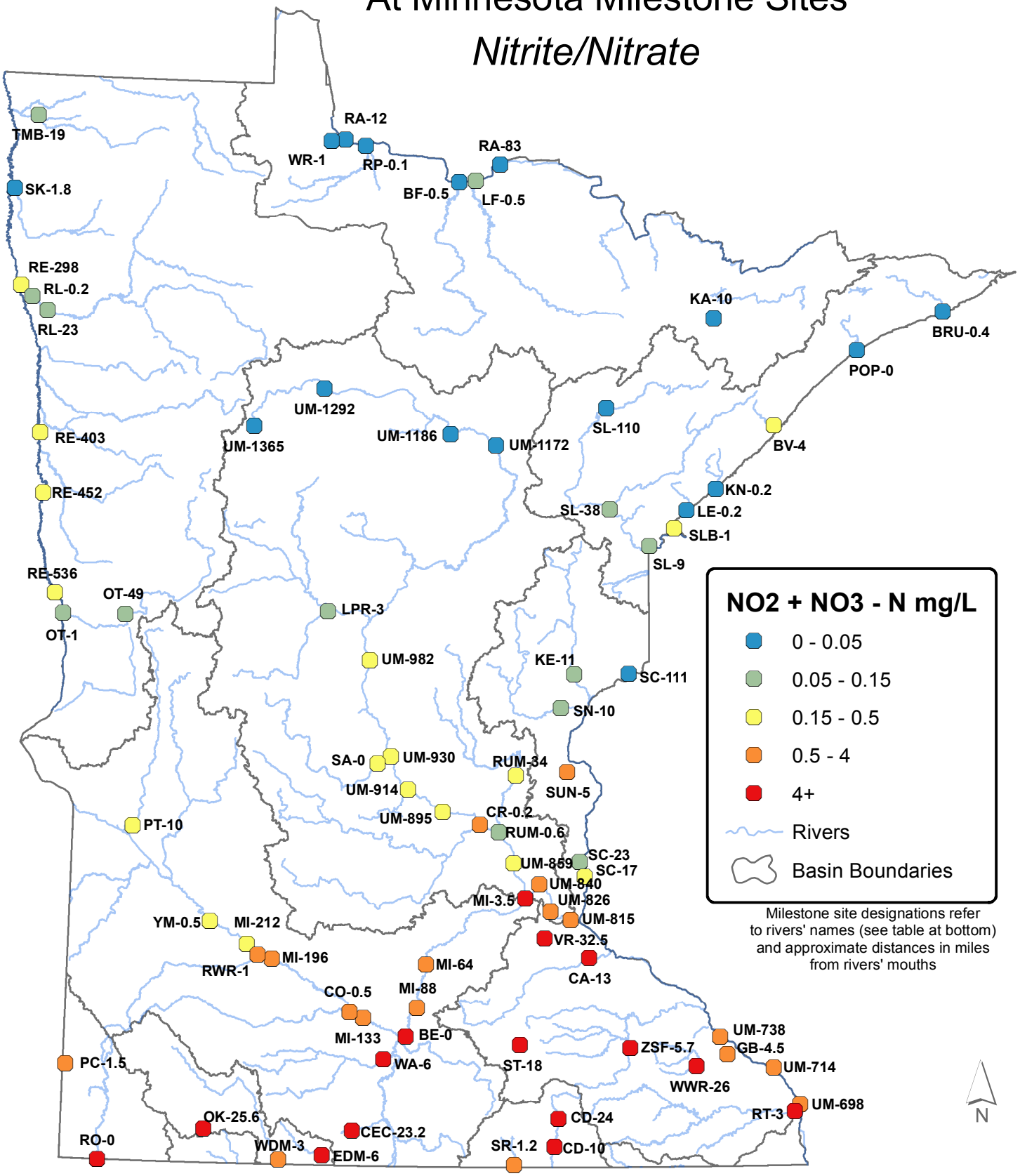


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KA - Kawishiwi River
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LF - Little Fork River
LPR - Long Prairie River
MI - Minnesota River
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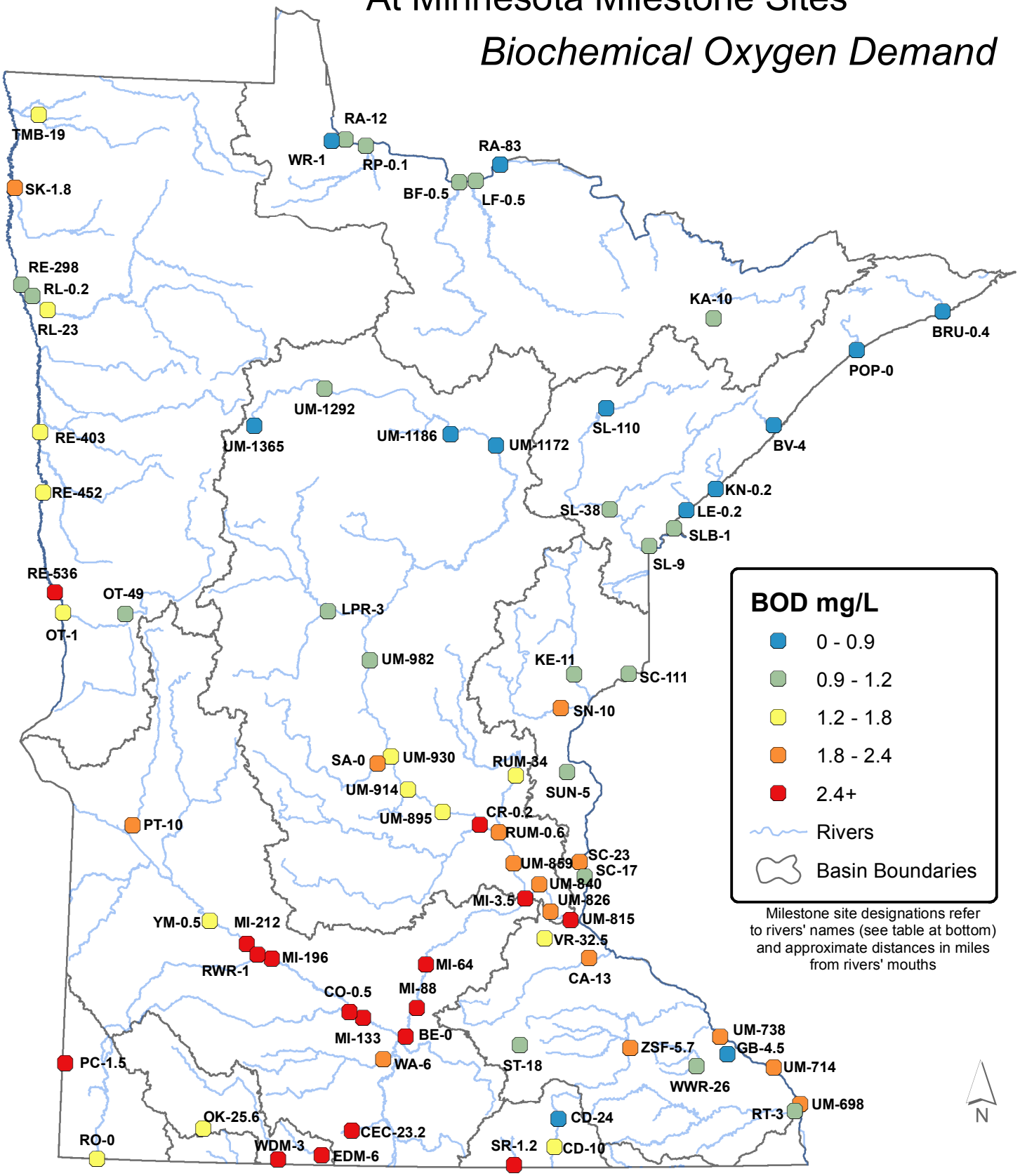
OT - Otter Tail River
PC - Pipestone Creek
POP - Poplar River
PT - Pomme De Terre River
RA - Rainy River
RE - Red River
RL - Red Lake River
RO - Rock River
RP - Rapid River
RT - Root River
RUM - Rum River
RWR - Redwood River
SA - Sauk River
SC - St. Croix River
SK - Snake River
SL - St. Louis River
SLB - St. Louis Bay
SN - Snake River
SR - Shell Rock River
ST - Straight River
SUN - Sunrise River
TMB - Two Rivers (Middle Branch)
UM - Mississippi River
VR - Vermillion River
WA - Watonwan River
WDM - Des Moines River (W Fork)
WR - Winter Road River
WWR - Whitewater River
YM - Yellow Medicine River
ZSF - Zumbro River (S Fork)

# Recent 10-Year Median Pollutant Concentrations At Minnesota Milestone Sites

## *Biochemical Oxygen Demand*




Milestone site designations refer to rivers' names (see table at bottom) and approximate distances in miles from rivers' mouths

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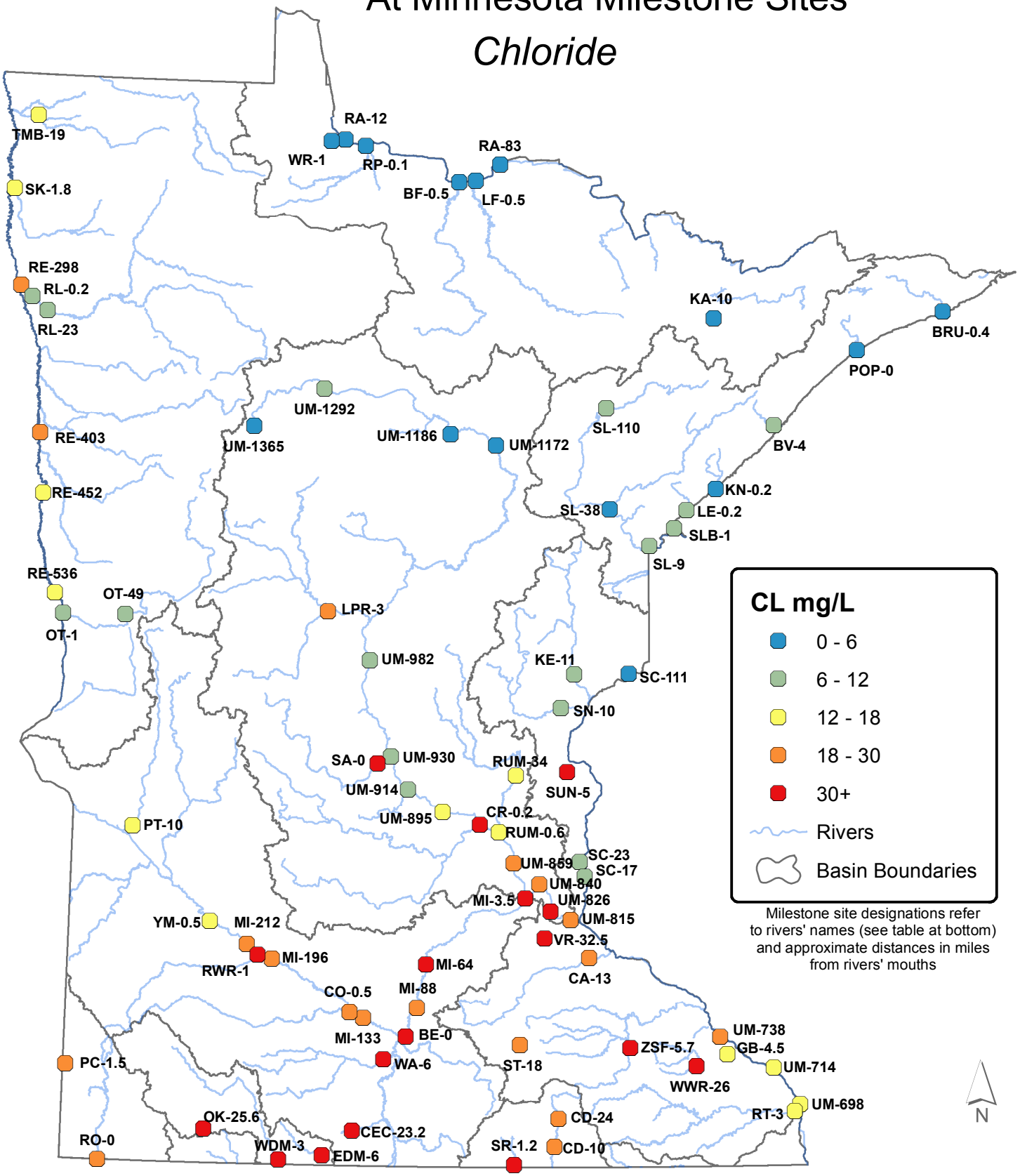
# Recent 10-Year Median Pollutant Concentrations At Minnesota Milestone Sites

## *Chloride*

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WWR - Whitewater River
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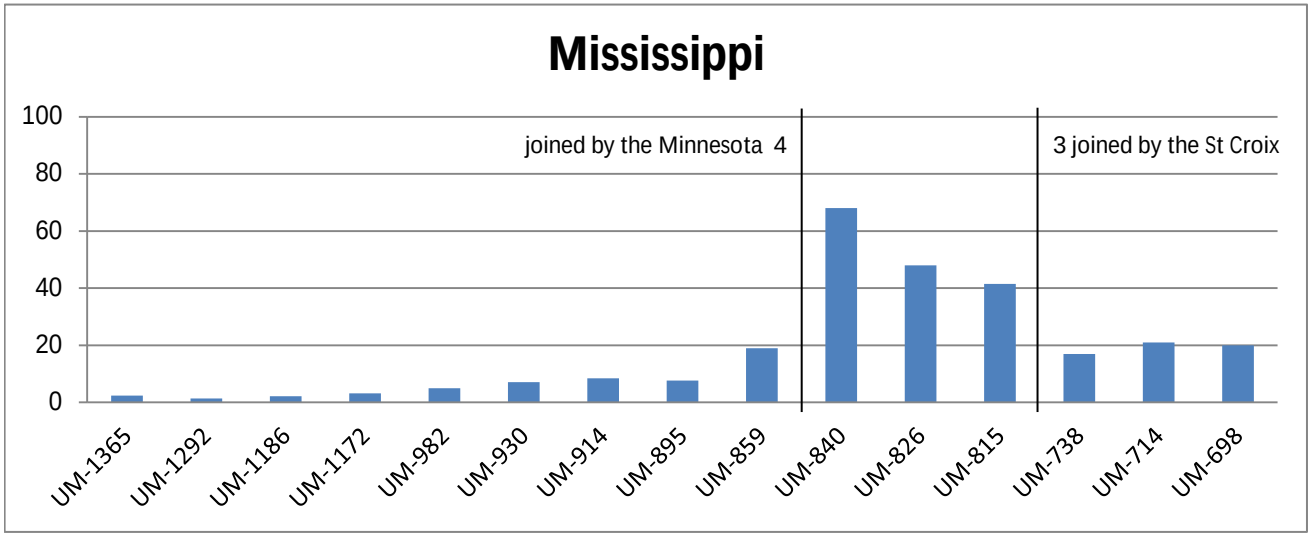
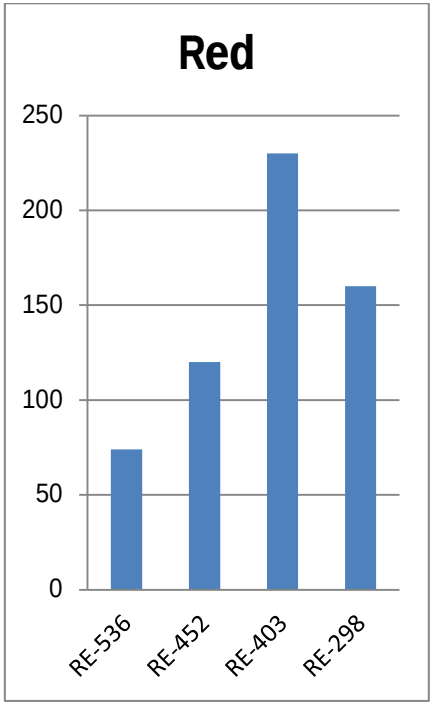
## Longitudinal concentrations along mainstems

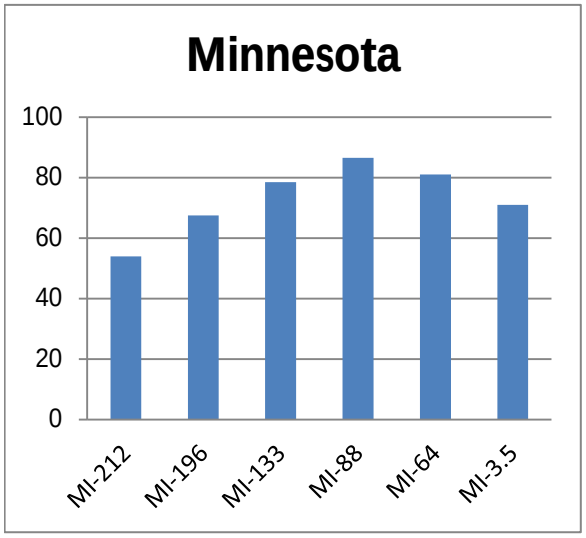
The graphs that follow illustrate longitudinal changes in median pollutant concentrations along the Mississippi, Red, Minnesota, St. Louis, and St. Croix River mainstems, moving from upstream to downstream. Worth noting is the marked differences in pollutant concentrations among the different rivers, reflecting the different ecoregions in which they lie. Also worth noting is the marked increase in concentrations for certain pollutants in the Mississippi where the river enters the Twin Cities metropolitan area – between UM-895 in Monticello and UM-859 in Fridley – and/or where it is joined by the Minnesota River – between UM-859 in Fridley and UM-840 in St. Paul.

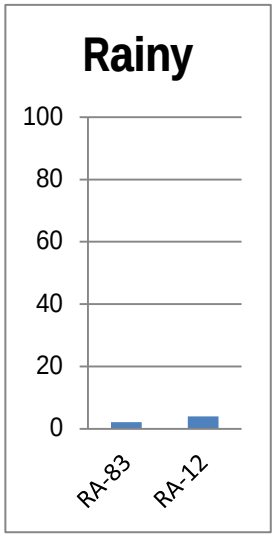
# Total Suspended Solids Concentrations at Mainstem Milestone Sites

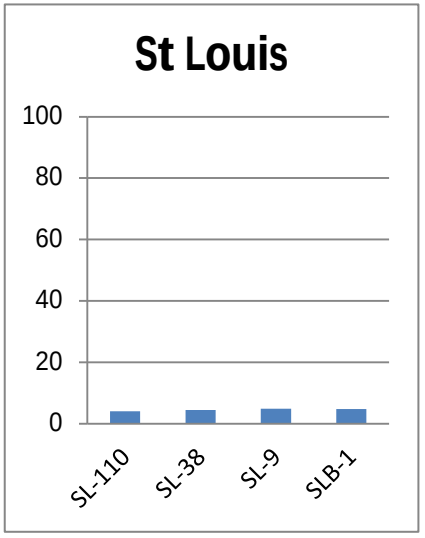
**(in mg/L)**

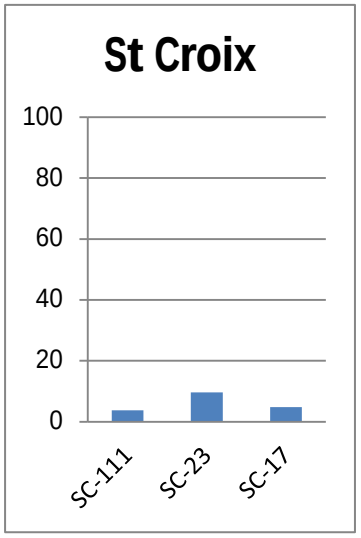


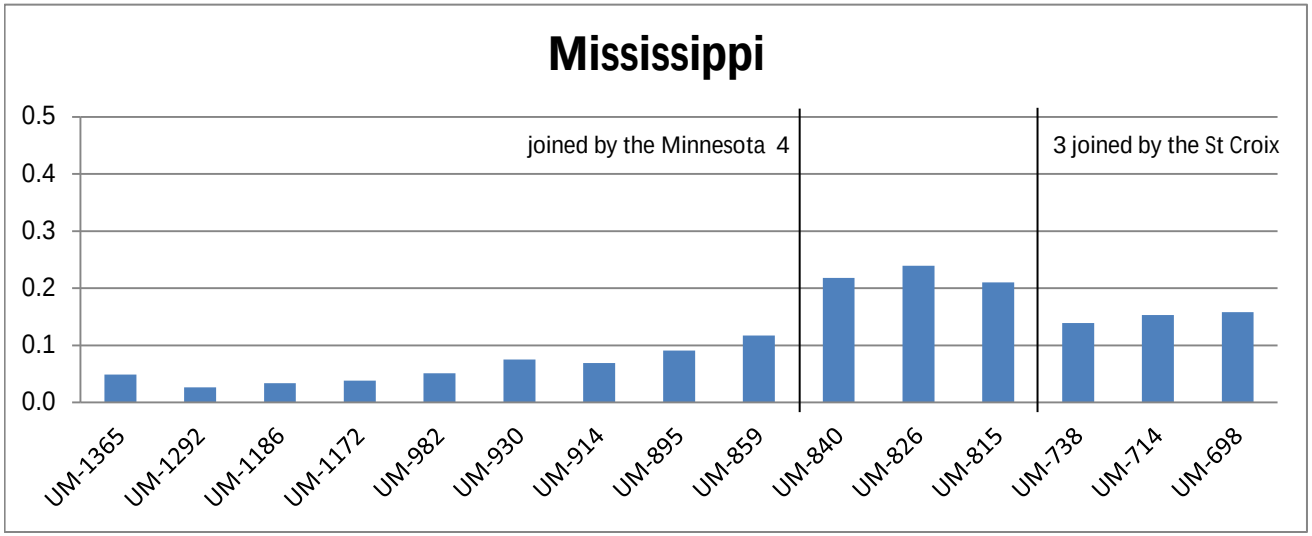



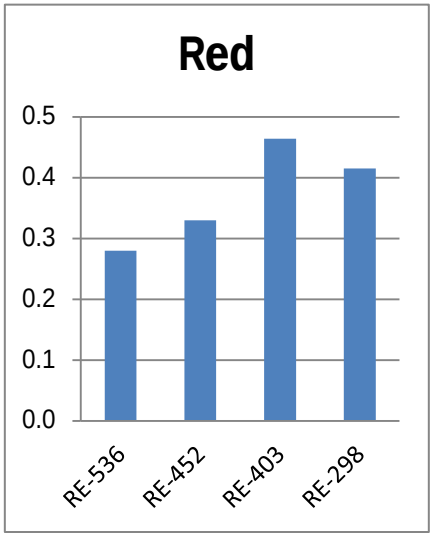



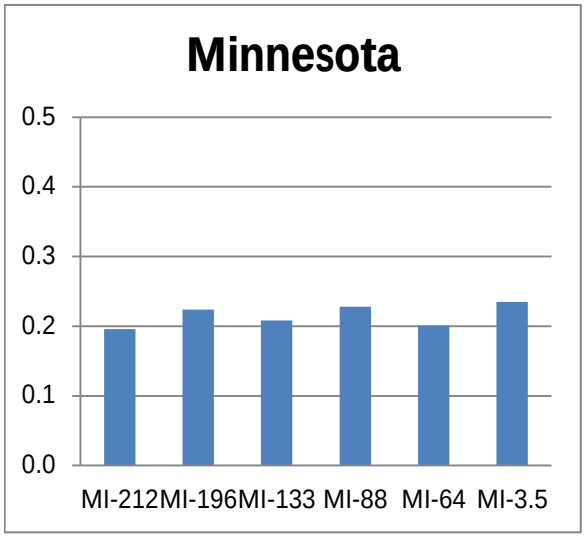



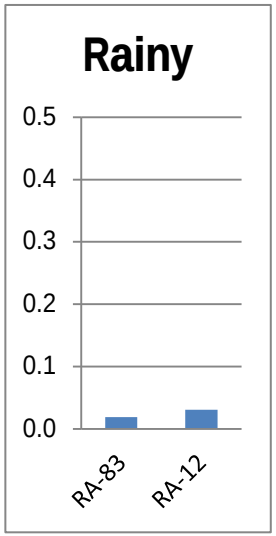
# Total Phosphorus Concentrations at Mainstem Milestone Sites

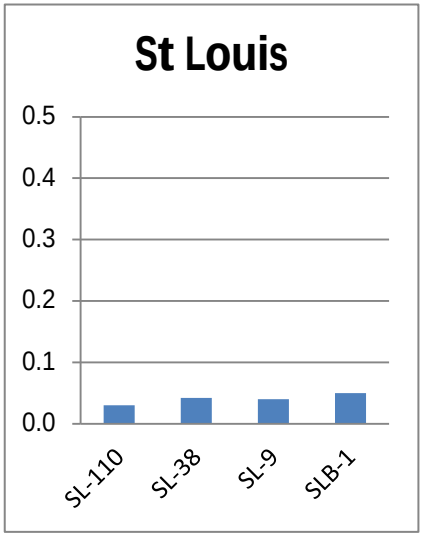
**(in mg/L)**

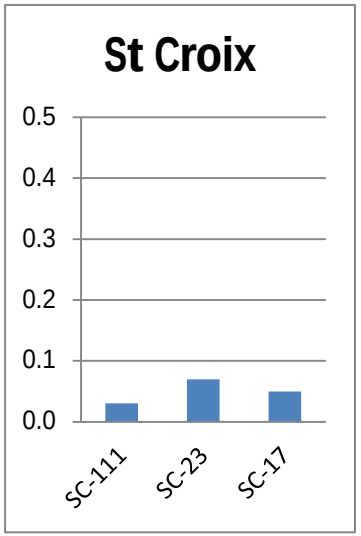


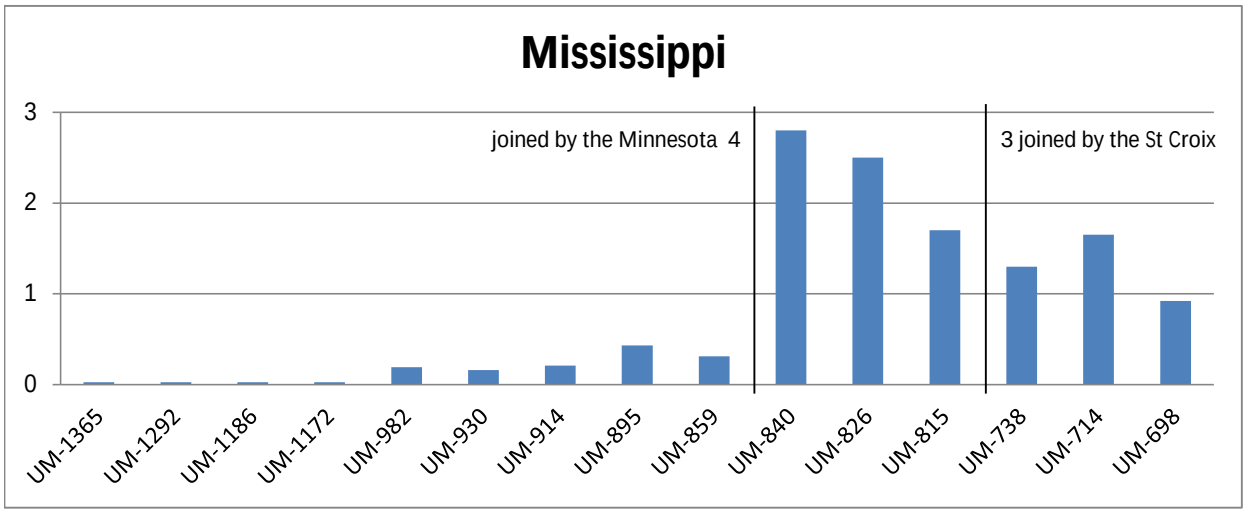



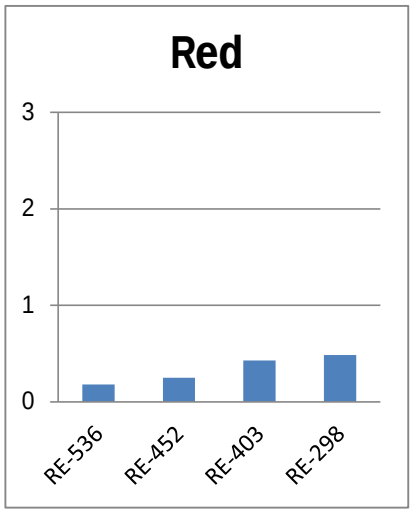



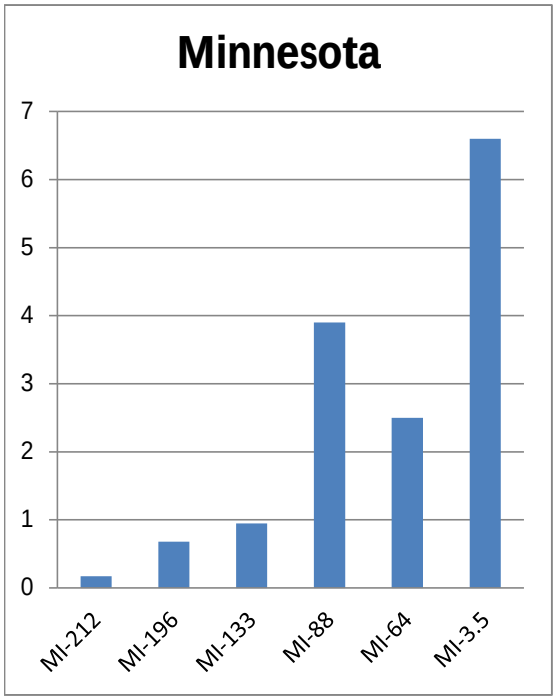



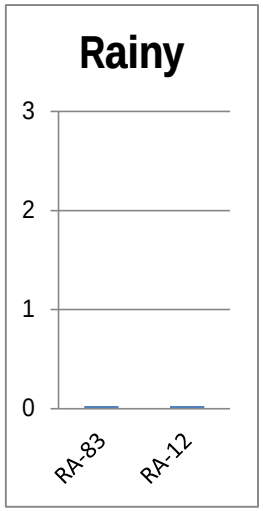
# Nitrite/Nitrate Concentrations at Mainstem Milestone Sites

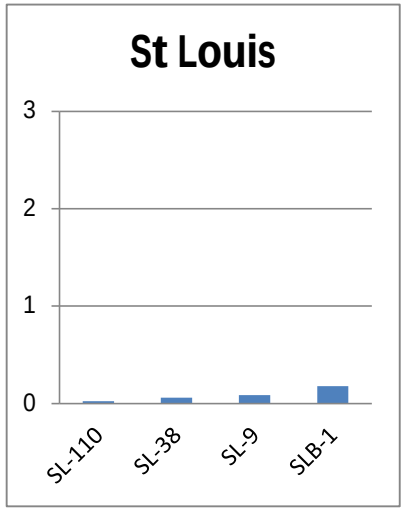
**(in mg/L)**

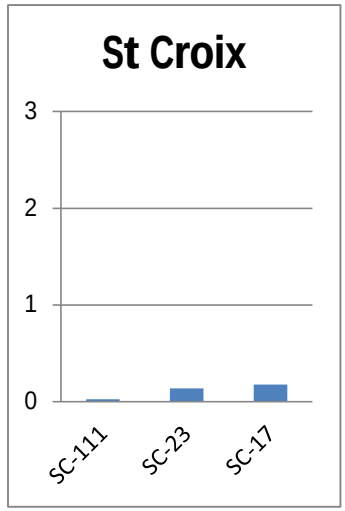


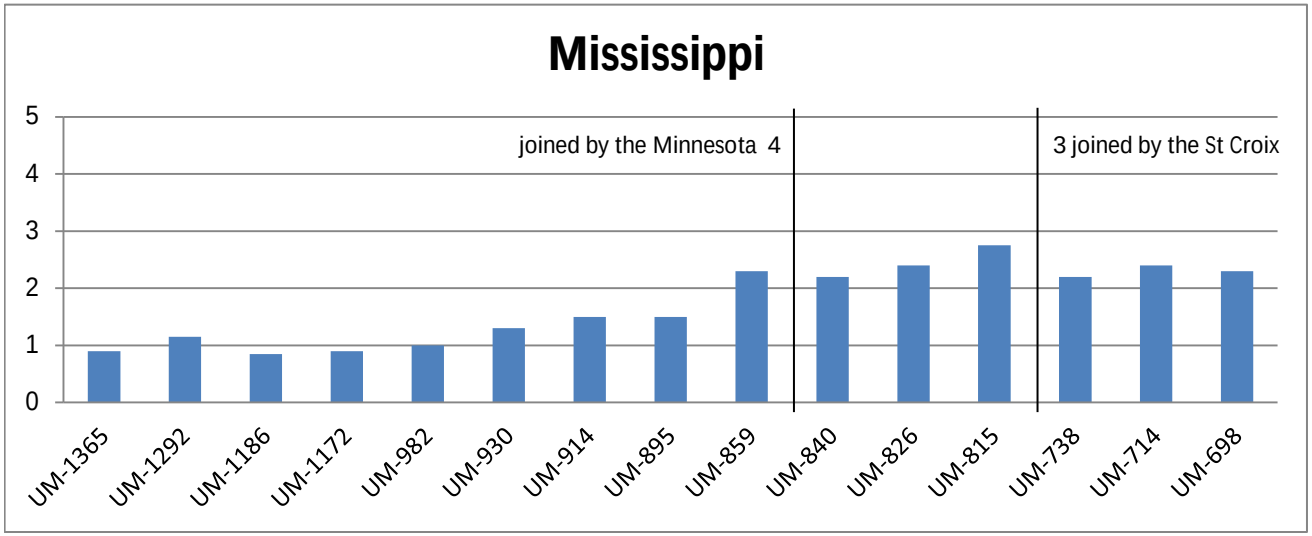



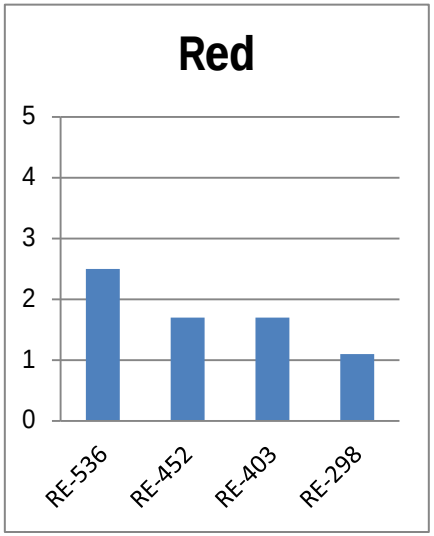



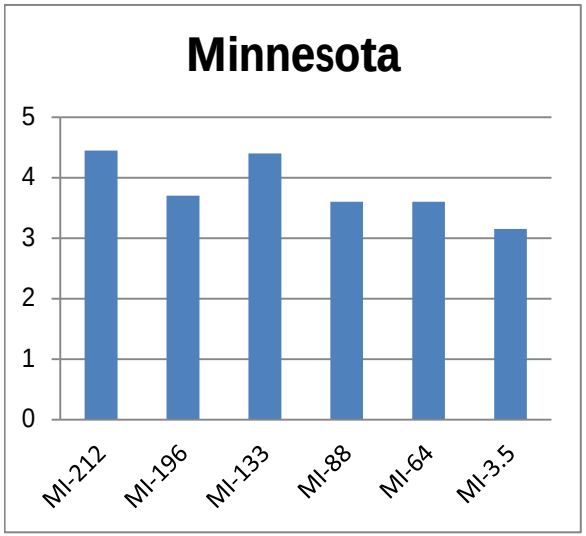



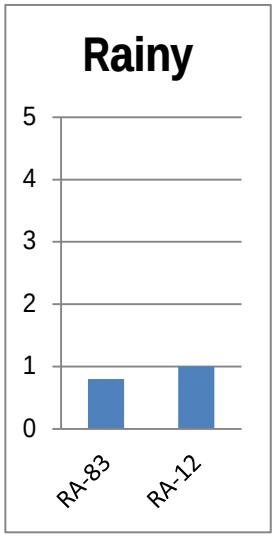
# Biochemical Oxygen Demand Concentrations at Mainstem Milestone Sites

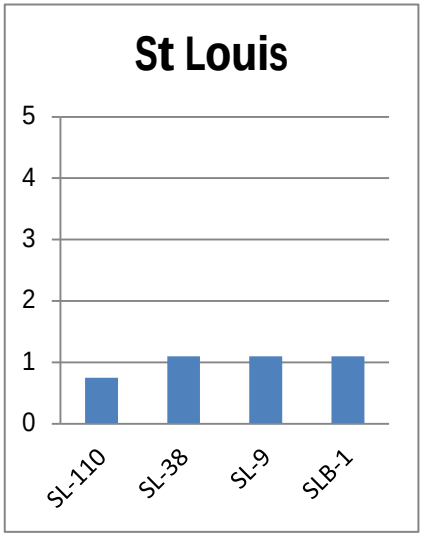
**(in mg/L)**

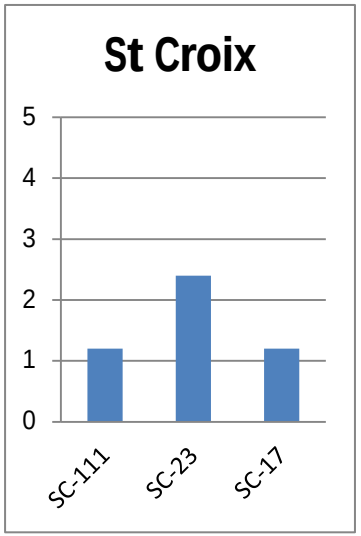


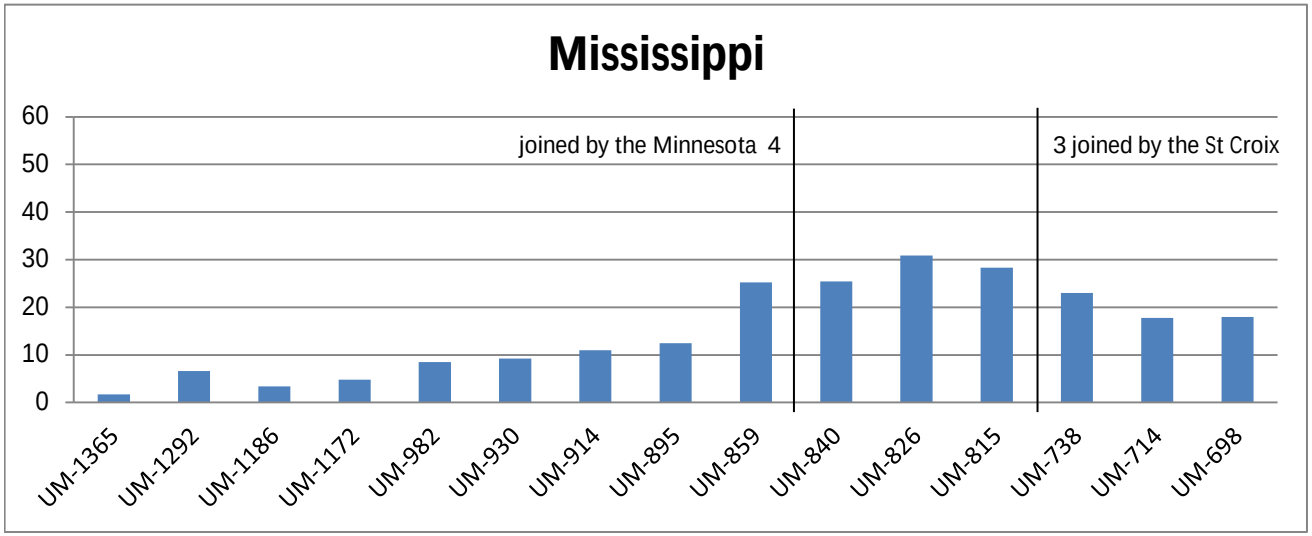



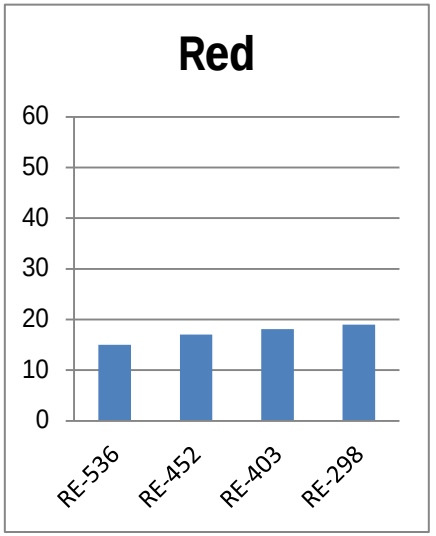



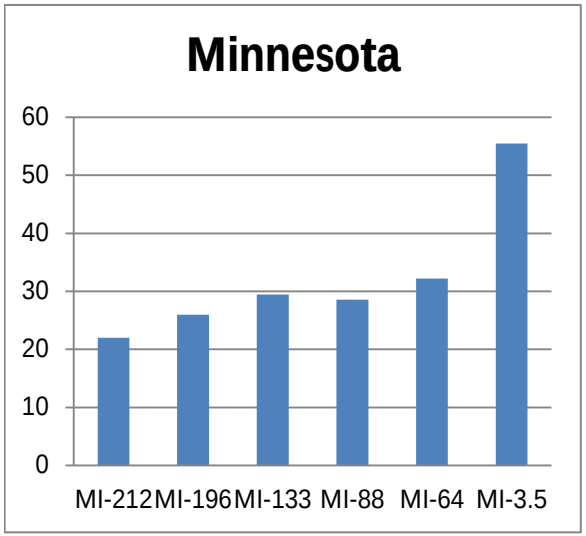



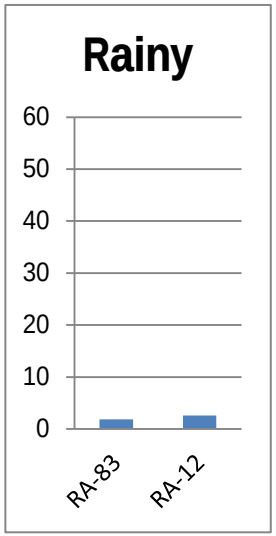
# Chloride Concentrations at Mainstem Milestone Sites

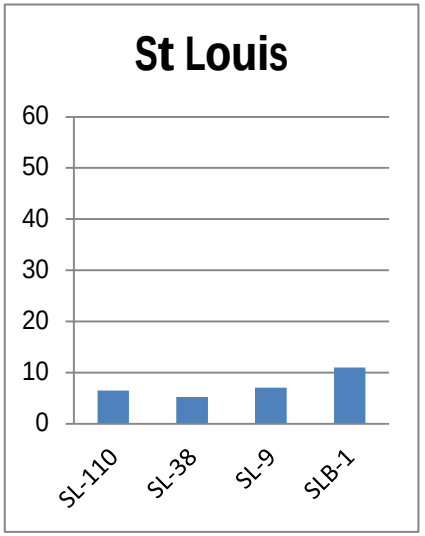
**(in mg/L)**

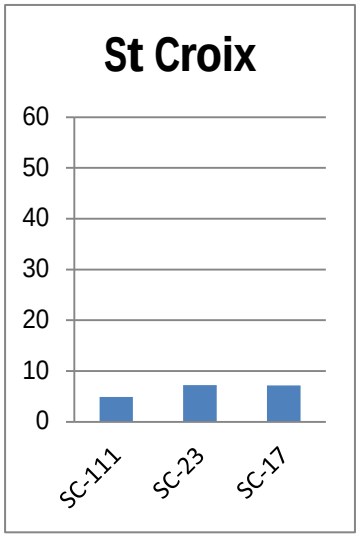


## Detailed trends and concentrations at individual milestone sites

The tables that follow show estimated changes in pollutant concentrations, both over the entire period of record for each site and over the 15-year period from 1995 to 2010, as well as median pollutant concentrations for the initial and most recent 10 years. Sites are arranged by major river basins, from northwest to southeast across the state, and, within the basins, showing first the mainstem (if present) from upstream to downstream and then the tributaries to the mainstem.

# Red River of the North Basin

## Red River at Bridge on CSAH-18, 0.5 Mi W of Brushvale (S000-012)(RE-536) (period of record 1953 - 2009)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | no trend | no trend | increase | no trend | decrease | increase |
| estimated average annual change | | | 1.4% | | -0.7% | 3.1% |
| estimated total change | | | 63% | | -33% | 448% |
| 1995 - 2009 trend | increase | increase | no trend | no trend | no trend | increase |
| estimated average annual change | 4.7% | 5.7% | | | | 1.7% |
| estimated total change | 58% | 75% | | | | 23% |
| median concentrations first 10 years | 68 | 0.3 | 0.1 | 0.12 | 3 | 3 |
| median concentrations most recent 10 years | 74 | 0.3 | 0.2 | <0.05 | 3 | 15 |

## Red River at Bridge on Main Ave at 3rd St. in Moorhead (S000-183)(RE-452) (period of record 1971 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | increase | no trend | increase | no trend | decrease | increase |
| estimated average annual change | 2.3% | | 2.0% | | -1.8% | 2.1% |
| estimated total change | 135% | | 94% | | -47% | 118% |
| 1995 - 2009 trend | no trend | no trend | no trend | no trend | no trend | no trend |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 55 | 0.2 | 0.1 | 0.10 | 3 | 10 |
| median concentrations most recent 10 years | 120 | 0.3 | 0.3 | <0.05 | 2 | 17 |

## Red River at Bridge on CSAH-39, 1 Mi W of Perley (S000-113)(RE-403) (period of record 1967 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | increase | decrease | increase | decrease | decrease | no trend |
| estimated average annual change | 1.1% | -0.5% | 2.3% | -5.6% | -2.0% | |
| estimated total change | 63% | -19% | 115% | -84% | -59% | |
| 1995 - 2010 trend | no trend | no trend | no trend | no trend | decrease | no trend |
| estimated average annual change | | | | | -3.2% | |
| estimated total change | | | | | -43% | |
| median concentrations first 10 years | 170 | 0.5 | 0.3 | 0.15 | 4 | 19 |
| median concentrations most recent 10 years | 230 | 0.5 | 0.4 | 0.05 | 2 | 18 |

## Red River at Bridge 50' Upstream of Red Lake R Confl (S001-222)(RE-298) (period of record 1953 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | increase | no trend | increase | decrease | decrease | increase |
| estimated average annual change | 1.2% | | 3.4% | -5.2% | -1.5% | 1.0% |
| estimated total change | 94% | | 212% | -82% | -59% | 75% |
| 1995 - 2010 trend | no trend | no trend | no trend | no trend | decrease | no trend |
| estimated average annual change | | | | | -3.0% | |
| estimated total change | | | | | -40% | |
| median concentrations first 10 years | 118 | 0.3 | 0.3 | 0.09 | 3 | 10 |
| median concentrations most recent 10 years | 160 | 0.4 | 0.5 | <0.05 | 1 | 19 |

## Otter Tail River at CSAH-15 Clvrts, W of Fergus Falls (S000-111)(OT-49) (period of record 1967 - 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **no trend** | **decrease** | **increase** |
| estimated average annual change | | -1.8% | | | -2.8% | 1.8% |
| estimated total change | | -54% | | | -70% | 119% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 33 | 0.2 | 0.09 | 0.07 | 4 | 4 |
| median concentrations most recent 10 years | 13 | 0.1 | 0.06 | <0.05 | 1 | 10 |

## Otter Tail River at Bridge on 4Th St N at Breckenridge (S000-006)(OT-1) (period of record 1953 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -0.5% | -2.2% | 2.3% | -4.9% | -1.7% | 2.2% |
| estimated total change | -26% | -68% | 117% | -80% | -62% | 260% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 96 | 0.2 | 0.05 | 0.09 | 3 | 3 |
| median concentrations most recent 10 years | 64 | 0.1 | 0.06 | <0.05 | 1 | 10 |

## Red Lake River at Bridge on CSAH-15 at Fisher (S000-031)(RL-23) (period of record 1955 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **increase** | **no trend** | **decrease** | **increase** |
| estimated average annual change | | -0.8% | 1.8% | | -1.7% | 1.7% |
| estimated total change | | -36% | 63% | | -62% | 156% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 94 | 0.2 | 0.02 | 0.08 | 4 | 3 |
| median concentrations most recent 10 years | 79 | 0.2 | 0.11 | <0.05 | 2 | 7 |

## Red Lake River Downstream of MN-220 Bridge in East Grand Forks (S000-013)(RL-0.2) (period of record 1953 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | | -1.4% | 1.1% | -4.9% | -1.7% | 1.7% |
| estimated total change | | -51% | 47% | -80% | -62% | 158% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 84 | 0.2 | 0.04 | 0.12 | 3 | 6 |
| median concentrations most recent 10 years | 98 | 0.2 | 0.13 | <0.05 | 1 | 7 |

## Snake River at Bridge on MN-220 N of Big Woods (S000-185)(SK-1.8) (period of record 1971 - 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **decrease** | **decrease** | **no trend** |
| estimated average annual change | | -0.7% | | -5.3% | -1.7% | |
| estimated total change | | -24% | | -88% | -49% | |
| 1995 - 2010 trend | **no trend** | **decrease** | **no trend** | **no trend** | **no trend** | **decrease** |
| estimated average annual change | | -1.3% | | | | -4.8% |
| estimated total change | | -22% | | | | -60% |
| median concentrations first 10 years | 47 | 0.3 | <0.01 | 0.25 | 4 | 22 |
| median concentrations most recent 10 years | 70 | 0.3 | <0.05 | <0.05 | 2 | 14 |

## Two Rivers on US-75, 1 Mi N of Hallock (S000-186)(TMB-19) (period of record 1971 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **no trend** | **decrease** | **no trend** |
| estimated average annual change | | -2.1% | | | -3.5% | |
| estimated total change | | -57% | | | -75% | |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 24 | 0.3 | <0.01 | 0.10 | 3 | 22 |
| median concentrations most recent 10 years | 30 | 0.2 | 0.08 | <0.05 | 2 | 17 |

# Rainy River Basin

## Rainy River at International Bridge at International Falls (S000-007)(RA-83) (period of record 1953 - 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **no trend** | **decrease** | **no trend** |
| estimated average annual change | -2.4% | -3.8% | 1.6% | | -2.6% | |
| estimated total change | -75% | -86% | 71% | | -78% | |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 7 | 0.05 | 0.02 | 0.05 | 2 | 1 |
| median concentrations most recent 10 years | 2 | 0.02 | <0.05 | <0.05 | 1 | 2 |

## Rainy River at International Bridge at Baudette (S000-063)(RA-12) (period of record 1958 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **no trend** | **decrease** | **increase** |
| estimated average annual change | -2.0% | -2.3% | 1.9% | | -2.5% | 1.5% |
| estimated total change | -64% | -71% | 90% | | -73% | 114% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 15 | 0.07 | 0.02 | 0.05 | 3 | 2 |
| median concentrations most recent 10 years | 4 | 0.03 | <0.05 | <0.05 | 1 | 3 |

## Kawishiwi River at Bridge on MN-1 at Dam 8 Mi SE of Ely (S000-108)(KA-10) (period of record 1967 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **no trend** | **no trend** | **no trend** |
| estimated average annual change | -1.4% | -1.3% | | | | |
| estimated total change | -46% | -43% | | | | |
| 1995 - 2009 trend | **no trend** | **decrease** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | -11.3% | | | | |
| estimated total change | | -62% | | | | |
| median concentrations first 10 years | 2 | 0.03 | 0.02 | 0.05 | 1 | 1 |
| median concentrations most recent 10 years | 3 | 0.02 | <0.05 | <0.05 | 1 | 2 |

## Little Fork River at MN-11 Bridge, 0.5 Mi W of Pelland (S000-179)(LF-0.5) (period of record 1971 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **no trend** | **decrease** | **increase** |
| estimated average annual change | | -1.3% | | | -1.1% | 2.0% |
| estimated total change | | -40% | | | -37% | 123% |
| 1995 - 2009 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 12 | 0.1 | 0.03 | 0.07 | 2 | 3 |
| median concentrations most recent 10 years | 12 | 0.1 | 0.06 | <0.05 | 1 | 4 |

## Big Fork River at Bridge On Mn-11, 4 Mi E Of Loman (S000-173)(BF-0.5) (period of record 1971 - 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | **no trend** |
| estimated average annual change | -1.5% | -1.6% | | -1.5% | -0.7% | |
| estimated total change | -46% | -47% | | -36% | -26% | |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **increase** | little data |
| estimated average annual change | | | | | 11.8% | |
| estimated total change | | | | | 144% | |
| median concentrations first 10 years | 13 | 0.07 | 0.01 | 0.08 | 2 | 3 |
| median concentrations most recent 10 years | 12 | 0.05 | <0.05 | <0.05 | 1 | 2 |

## Rapid River at Bridge on MN-11 at Clementson (S000-184)(RP-0.1) (period of record 1971 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **no trend** | **no trend** | **decrease** |
| estimated average annual change | -1.7% | -1.5% | | | | -2.9% |
| estimated total change | -48% | -44% | | | | -69% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 10 | 0.07 | 0.03 | 0.09 | 2 | 2 |
| median concentrations most recent 10 years | 9 | 0.05 | <0.05 | <0.05 | 1 | 1 |

## Winter Road River at MN-11 Bridge 4 Mi W of Baudette (S000-069)(WR-1) (period of record 1958 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **no trend** | **no trend** | **no trend** | **decrease** | little data |
| estimated average annual change | | | | | -2.2% | |
| estimated total change | | | | | -69% | |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 4 | 0.04 | 0.01 | 0.11 | 3 | -- |
| median concentrations most recent 10 years | 4 | 0.03 | <0.05 | <0.05 | 1 | 2 |

# Lake Superior Basin

## Brule River Upstream of US-61 at Judge C R Magney Park (S000-251)(BRU-0.4) (period of record 1973 - 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **no trend** | **no trend** | **no trend** |
| estimated average annual change | | -2.6% | | | | |
| estimated total change | | -63% | | | | |
| 1995 - 2010 trend | **no trend** | **decrease** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | -5.0% | | | | |
| estimated total change | | -60% | | | | |
| median concentrations first 10 years | 1 | 0.02 | 0.03 | 0.04 | 1.1 | 2 |
| median concentrations most recent 10 years | 2 | 0.01 | <0.05 | <0.05 | <0.5 | 1 |

## Poplar River between Foot Bridges at Lutsen Lodge (S000-261)(POP-0) (period of record 1973 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **no trend** | **no trend** | **no trend** |
| estimated average annual change | | -1.7% | | | | |
| estimated total change | | -48% | | | | |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 2 | 0.04 | 0.04 | 0.03 | 0.9 | 3 |
| median concentrations most recent 10 years | 3 | 0.02 | 0.05 | <0.05 | 0.7 | 2 |

## Beaver River South of CSAH-3 1.5 Mi NW of Beaver Bay (S000-252)(BV-4) (period of record 1973 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **no trend** | **decrease** | **increase** |
| estimated average annual change | -2.8% | -3.4% | 3.7% | | -1.0% | 2.6% |
| estimated total change | -65% | -72% | 248% | | -30% | 155% |
| 1995 - 2010 trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | | | 11.6% | | | |
| estimated total change | | | 528% | | | |
| median concentrations first 10 years | 4 | 0.03 | 0.01 | 0.06 | 1.0 | 3 |
| median concentrations most recent 10 years | 2 | 0.01 | 0.39 | <0.05 | 0.6 | 7 |

## Knife River Upstream of Old US-61 at Knife River (S000-257)(KN-0.2) (period of record 1973 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **no trend** | **decrease** | **no trend** |
| estimated average annual change | -1.3% | -1.5% | | | -2.0% | |
| estimated total change | -40% | -44% | | | -52% | |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 5 | 0.03 | <0.01 | 0.04 | 0.9 | 6 |
| median concentrations most recent 10 years | 2 | 0.01 | <0.05 | <0.05 | 0.5 | 5 |

## Lester River above Superior St, Lester Pk at Duluth (S000-258)(LE-0.2) (period of record 1973 - 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **no trend** | **no trend** | **increase** |
| estimated average annual change | -1.6% | -1.7% | | | | 2.0% |
| estimated total change | -45% | -48% | | | | 112% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 5 | 0.04 | 0.03 | 0.07 | 1.0 | 5 |
| median concentrations most recent 10 years | 2 | 0.02 | <0.05 | <0.05 | 0.8 | 11 |

## St. Louis River at Bridge at CSAH-7, 0.5 Mi S of Forbes (S000-119)(SL-110) (period of record 1967 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | little data |
| estimated average annual change | -1.7% | -1.9% | | -4.4% | -1.6% | |
| estimated total change | -52% | -58% | | -77% | -50% | |
| 1995 - 2010 trend | **no trend** | **decrease** | **decrease** | **no trend** | **no trend** | little data |
| estimated average annual change | | -3.2% | -0.9% | | | |
| estimated total change | | -42% | -15% | | | |
| median concentrations first 10 years | 6 | 0.04 | 0.04 | 0.08 | 1.2 | 6 |
| median concentrations most recent 10 years | 4 | 0.03 | <0.05 | <0.05 | 0.8 | 6 |

## St. Louis River at Bridge on US-2, 2 Mi SE of Brookston (S000-023)(SL-38) (period of record 1953 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -1.1% | -2.3% | | -4.8% | -1.6% | 1.5% |
| estimated total change | -49% | -67% | | -79% | -61% | 101% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 13 | 0.11 | 0.08 | 0.08 | 3 | 2 |
| median concentrations most recent 10 years | 4 | 0.04 | 0.06 | <0.05 | 1 | 5 |

## St. Louis River at Bridge on MN-23 at Fond Du Lac (S000-021)(SL-9) (period of record 1953 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | **decrease** |
| estimated average annual change | -2.5% | -3.4% | | -3.1% | -4.9% | -1.5% |
| estimated total change | -77% | -83% | | -69% | -95% | -58% |
| 1995 - 2010 trend | **decrease** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | -2.3% | | | | | |
| estimated total change | -32% | | | | | |
| median concentrations first 10 years | 13 | 0.12 | 0.06 | 0.10 | 5 | 7 |
| median concentrations most recent 10 years | 5 | 0.04 | 0.09 | <0.05 | 1 | 7 |

St. Louis River below I-535 Bridge at Superior, WI (S000-277) and Duluth, MN (S003-975)(SLB-1) (period of record 1974 - 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **decrease** |
| estimated average annual change | -4.3% | -3.2% | 0.7% | -3.8% | -2.5% | -1.4% |
| estimated total change | -80% | -70% | 27% | -71% | -61% | -40% |
| 1995 - 2010 trend | **no trend** | **no trend** | **increase** | **increase** | **no trend** | **increase** |
| estimated average annual change | | | 5.0% | 8.5% | | 2.8% |
| estimated total change | | | 117% | 270% | | 54% |
| median concentrations first 10 years | 11 | 0.10 | 0.1 | 0.11 | 2 | 14 |
| median concentrations most recent 10 years | 5 | 0.05 | 0.2 | 0.07 | 1 | 11 |

# Upper Mississippi River Basin

## Mississippi River at MN-200 Bridge 0.5 Mi W of Lake Itasca (S000-105)(UM-1365) (period of record 1965 - 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **no trend** | **decrease** | **no trend** |
| estimated average annual change | -1.9% | -1.4% | | | -2.2% | |
| estimated total change | -59% | -47% | | | -64% | |
| 1995 - 2010 trend | **no trend** | **increase** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | 2.0% | | | | |
| estimated total change | | 40% | | | | |
| median concentrations first 10 years | 4 | 0.06 | <0.01 | 0.06 | 2 | 3 |
| median concentrations most recent 10 years | 2 | 0.05 | <0.05 | <0.05 | 1 | 2 |

## Mississippi River at Bridge on CSAH-8 7 Mi E of Bemidji (S000-155)(UM-1292) (period of record 1967 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -2.7% | -4.8% | | -2.6% | -2.2% | 0.5% |
| estimated total change | -70% | -88% | | -56% | -62% | 24% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 5 | 0.09 | 0.01 | 0.07 | 3 | 4 |
| median concentrations most recent 10 years | 1 | 0.03 | <0.05 | <0.05 | 1 | 7 |

## Mississippi River at MN-6 Bridge 8 Mi SW of Cohasset (S000-154)(UM-1186) (period of record 1967 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -2.1% | -1.6% | | -4.1% | -2.7% | 0.2% |
| estimated total change | -59% | -51% | | -74% | -69% | 9% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 7 | 0.05 | <0.01 | 0.10 | 2 | 3 |
| median concentrations most recent 10 years | 2 | 0.03 | <0.05 | <0.05 | 1 | 3 |

## Mississippi River at Bridge on CR-441 1 Mi SW of Blackberry (S000-220)(UM-1172) (period of record 1974 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | **no trend** |
| estimated average annual change | -2.2% | -2.0% | | -4.2% | -2.7% | |
| estimated total change | -56% | -52% | | -70% | -63% | |
| 1995 - 2010 trend | **decrease** | **decrease** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | -2.7% | -2.0% | | | | |
| estimated total change | -37% | -29% | | | | |
| median concentrations first 10 years | 8 | 0.09 | 0.02 | 0.10 | 2 | 4 |
| median concentrations most recent 10 years | 3 | 0.04 | <0.05 | <0.05 | 1 | 5 |

## Mississippi River at Bridge on MN-115 at Camp Ripley (S000-151)(UM-982) (period of record 1967 - 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -1.0% | -2.0% | 4.8% | -3.3% | -2.3% | 2.7% |
| estimated total change | -35% | -59% | 399% | -66% | -63% | 216% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 8 | 0.07 | 0.07 | 0.08 | 2 | 4 |
| median concentrations most recent 10 years | 5 | 0.05 | 0.19 | <0.05 | 1 | 9 |

## Mississippi River at 9th Ave Bridge (Old MN-15) at Sauk Rapids (S000-026)(UM-930) (period of record 1953 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -2.0% | -1.4% | 2.3% | -4.3% | -1.8% | 3.8% |
| estimated total change | -68% | -53% | 116% | -75% | -65% | 762% |
| 1995 - 2010 trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | | | 3.3% | | | |
| estimated total change | | | 73% | | | |
| median concentrations first 10 years | 22 | 0.14 | 0.07 | 0.09 | 3 | 2 |
| median concentrations most recent 10 years | 7 | 0.08 | 0.16 | <0.05 | 1 | 9 |

## Mississippi River at Bridge on MN-24 at Clearwater (S000-148)(UM-914) (period of record 1967 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | | -1.6% | 2.8% | -4.1% | -2.0% | 3.7% |
| estimated total change | | -51% | 161% | -74% | -58% | 387% |
| 1995 - 2010 trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | | | 4.6% | | | |
| estimated total change | | | 96% | | | |
| median concentrations first 10 years | 11 | 0.11 | 0.1 | 0.10 | 3 | 5 |
| median concentrations most recent 10 years | 8 | 0.07 | 0.2 | <0.05 | 2 | 11 |

## Mississippi River at Bridge on MN-25 at Monticello (S000-221)(UM-895) (period of record 1976 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **no trend** |
| estimated average annual change | -1.3% | -2.1% | 4.7% | -5.2% | -1.1% | |
| estimated total change | -37% | -51% | 372% | -82% | -32% | |
| 1995 - 2010 trend | **decrease** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | -3.0% | | 4.1% | | | |
| estimated total change | -40% | | 97% | | | |
| median concentrations first 10 years | 15 | 0.12 | 0.2 | 0.10 | 2 | 8 |
| median concentrations most recent 10 years | 8 | 0.09 | 0.4 | <0.05 | 2 | 12 |

## Mississippi River at Mpls City Building at Fridley (S000-024)(UM-859) (period of record 1953 - 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -0.9% | -1.4% | 2.0% | -3.8% | -1.1% | 4.1% |
| estimated total change | -40% | -45% | 95% | -73% | -46% | 931% |
| 1995 - 2010 trend | **decrease** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | -4.2% | | | | | |
| estimated total change | -52% | | | | | |
| median concentrations first 10 years | 33 | 0.2 | 0.2 | 0.10 | 3 | 1 |
| median concentrations most recent 10 years | 19 | 0.1 | 0.3 | <0.05 | 2 | 25 |

## Mississippi River at Dock Upstream of Wabasha St Bridge, St Paul (S000-266)(UM-840) (period of record 1973 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | | -1.0% | 3.0% | -6.7% | -1.4% | 2.4% |
| estimated total change | | -30% | 186% | -89% | -41% | 137% |
| 1995 - 2010 trend | **decrease** | **decrease** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | -3.3% | -2.2% | | | | |
| estimated total change | -43% | -32% | | | | |
| median concentrations first 10 years | 34 | 0.2 | 2 | 0.18 | 3 | 16 |
| median concentrations most recent 10 years | 68 | 0.2 | 3 | <0.05 | 2 | 25 |

## Mississippi River at Pier at Gravel Quarry, Grey Cloud Island (S000-339)(UM-826) (period of record 1975 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | | -1.7% | 3.7% | -8.5% | -2.4% | 1.0% |
| estimated total change | | -46% | 270% | -96% | -59% | 44% |
| 1995 - 2010 trend | **decrease** | **decrease** | **increase** | **no trend** | **decrease** | little data |
| estimated average annual change | -2.2% | -3.5% | 1.8% | | -1.7% | |
| estimated total change | -32% | -46% | 36% | | -26% | |
| median concentrations first 10 years | 37 | 0.3 | 2 | 0.48 | 4 | 25 |
| median concentrations most recent 10 years | 48 | 0.2 | 3 | 0.08 | 2 | 31 |

## Mississippi River at Lock & Dam #2 at Hastings (S000-068)(UM-815) (period of record 1958 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -0.4% | -1.6% | 2.2% | -6.2% | -2.2% | 2.9% |
| estimated total change | -20% | -58% | 109% | -96% | -68% | 321% |
| 1995 - 2010 trend | **decrease** | **decrease** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | -3.4% | -3.2% | | | | |
| estimated total change | -44% | -43% | | | | |
| median concentrations first 10 years | 44 | 0.3 | 1 | 0.27 | 6 | 13 |
| median concentrations most recent 10 years | 42 | 0.2 | 2 | 0.05 | 3 | 28 |

## Long Prairie River at Bridge on US-10, South of Motley (S000-282)(LPR-3) (period of record 1974 -- 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **no trend** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -1.4% | | 0.8% | -3.6% | -0.7% | 2.9% |
| estimated total change | -40% | | 29% | -69% | -23% | 178% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **decrease** | little data |
| estimated average annual change | | | | | -2.0% | |
| estimated total change | | | | | -28% | |
| median concentrations first 10 years | 5 | 0.08 | 0.05 | 0.09 | 1 | 8 |
| median concentrations most recent 10 years | 3 | 0.09 | 0.10 | <0.05 | 1 | 25 |

## Sauk River Downstream of Bridge on CSAH-1 at Sauk Rapids (S000-017)(SA-0) (period of record 1953 - 2011)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **increase** | **decrease** | **no trend** | **increase** |
| estimated average annual change | | -1.5% | 2.1% | -4.5% | | 3.8% |
| estimated total change | | -44% | 131% | -85% | | 796% |
| 1995 - 2010 trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | | | 3.4% | | | |
| estimated total change | | | 80% | | | |
| median concentrations first 10 years | 23 | 0.3 | 0.4 | 0.14 | 4 | 3 |
| median concentrations most recent 10 years | 9 | 0.2 | 0.4 | <0.05 | 2 | 32 |

## Crow River at Bridge on CSAH-36 at Dayton (S000-004)(CR-0.2) (period of record 1953 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | **increase** |
| estimated average annual change | | | 3.0% | | | 1.4% |
| estimated total change | | | 371% | | | 125% |
| 1995 - 2009 trend | **decrease** | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** |
| estimated average annual change | -2.9% | | | | | |
| estimated total change | -35% | | | | | |
| median concentrations first 10 years | 80 | 0.3 | 0.1 | 0.13 | 7 | 8 |
| median concentrations most recent 10 years | 51 | 0.3 | 0.7 | <0.05 | 6 | 33 |

## Rum River at Bridge on CSAH-5, 0.5 Mi W of Isanti (S000-043)(RUM-34) (period of record 1955 - 2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -1.6% | -0.9% | 1.1% | -4.4% | -2.4% | 2.6% |
| estimated total change | -58% | -37% | 44% | -77% | -75% | 303% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 23 | 0.2 | 0.1 | 0.10 | 6 | 4 |
| median concentrations most recent 10 years | 14 | 0.1 | 0.2 | <0.05 | 2 | 12 |

Rum River at Bridge on Pleasant St in Anoka (S000-016)(RUM-0.6) (period of record 1953 - 2010)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **no trend** | **decrease** | **increase** |
| estimated average annual change | -2.2% | -1.5% | 0.6% | | -1.8% | 3.5% |
| estimated total change | -72% | -51% | 22% | | -65% | 606% |
| 1995 - 2010 trend | **no trend** | **no trend** | **no trend** | **no trend** | **decrease** | little data |
| estimated average annual change | | | | | -3.3% | |
| estimated total change | | | | | -43% | |
| median concentrations first 10 years | 24 | 0.2 | 0.1 | <0.02 | 4 | 5 |
| median concentrations most recent 10 years | 8 | 0.1 | 0.1 | <0.05 | 2 | 18 |

# Minnesota River Basin

## Minnesota River at Bridge on CSAH-21, 3 Mi NE of Delhi (S000-055)(MI-212) (period of record 1981 - 2009)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **no trend** | little data |
| estimated average annual change | -1.4% | -0.8% | | -5.2% | | |
| estimated total change | -32% | -20% | | -77% | | |
| 1995 - 2009 trend | **decrease** | **decrease** | **decrease** | **no trend** | **increase** | little data |
| estimated average annual change | -4.2% | -3.4% | -6.6% | | 4.3% | |
| estimated total change | -49% | -43% | -67% | | 97% | |
| median concentrations first 10 years | 84 | 0.2 | 1.0 | 0.08 | 5 | -- |
| median concentrations most recent 10 years | 54 | 0.2 | 0.2 | <0.05 | 4 | 22 |

## Minnesota River at Bridge on US-71 and MN-19 at Morton (S000-145)(MI-196) (period of record 1967 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| estimated average annual change | | -0.5% | | -6.5% | -1.2% | 2.5% |
| estimated total change | | -20% | | -88% | -40% | 182% |
| 1995 - 2009 trend | **no trend** | **no trend** | **no trend** | **no trend** | **increase** | little data |
| estimated average annual change | | | | | 4.8% | |
| estimated total change | | | | | 110% | |
| median concentrations first 10 years | 86 | 0.3 | 1.4 | 0.11 | 5 | 18 |
| median concentrations most recent 10 years | 68 | 0.2 | 0.7 | <0.05 | 4 | 26 |

## Minnesota River at CSAH-24 Bridge, 1 Mi S of Courtland (S000-054)(MI-133) (period of record 1957 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -0.7% | -1.0% | | -5.0% | -1.6% | 3.2% |
| estimated total change | -30% | -42% | | -80% | -57% | 380% |
| 1995 - 2009 trend | **decrease** | **decrease** | **no trend** | **no trend** | **increase** | little data |
| estimated average annual change | -5.1% | -2.2% | | | 4.8% | |
| estimated total change | -56% | -30% | | | 110% | |
| median concentrations first 10 years | 125 | 0.3 | 2 | 0.10 | 7 | 14 |
| median concentrations most recent 10 years | 79 | 0.2 | 1 | <0.05 | 4 | 29 |

## Minnesota River at Bridge on MN-22 at St. Peter (S000-041)(MI-88) (period of record 1955 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| estimated average annual change | | -1.5% | | -5.3% | -1.8% | 5.0% |
| estimated total change | | -55% | | -82% | -63% | 1011% |
| 1995 - 2009 trend | **decrease** | **decrease** | **no trend** | **no trend** | **increase** | little data |
| estimated average annual change | -5.8% | -3.9% | | | 6.6% | |
| estimated total change | -61% | -47% | | | 177% | |
| median concentrations first 10 years | 110 | 0.4 | 4 | 0.10 | 6 | 16 |
| median concentrations most recent 10 years | 87 | 0.2 | 4 | <0.05 | 4 | 29 |

## Minnesota River at MN-19 Bridge at Henderson (S000-040)(MI-64) (period of record 1955 - 2009)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -0.7% | -1.3% | | -5.6% | -2.1% | 3.2% |
| estimated total change | -30% | -48% | | -83% | -68% | 362% |
| 1995 - 2009 trend | **decrease** | **decrease** | **no trend** | **no trend** | **increase** | little data |
| estimated average annual change | -4.3% | -2.6% | | | 4.7% | |
| estimated total change | -51% | -34% | | | 108% | |
| median concentrations first 10 years | 140 | 0.4 | 4 | 0.10 | 6 | 17 |
| median concentrations most recent 10 years | 81 | 0.2 | 3 | <0.05 | 4 | 32 |

## Minnesota River at MCES Site off SE End of Runway 12L/30R (S000-310)(MI-3.5) (period of record 1980 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **decrease** | **no trend** | little data |
| estimated average annual change | | -1.8% | | -7.7% | | |
| estimated total change | | -41% | | -90% | | |
| 1995 - 2009 trend | **decrease** | **decrease** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | -4.8% | -3.0% | | | | |
| estimated total change | -54% | -38% | | | | |
| median concentrations first 10 years | 77 | 0.4 | 3 | 0.28 | 4 | -- |
| median concentrations most recent 10 years | 71 | 0.2 | 7 | <0.05 | 3 | 55 |

## Pomme de Terre River above Dam E of MN-7 at Appleton (S000-195)(PT-10) (period of record 1971 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | | -1.4% | 3.9% | -6.3% | -2.1% | 1.6% |
| estimated total change | | -42% | 280% | -87% | -56% | 89% |
| 1995 - 2009 trend | **decrease** | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** |
| estimated average annual change | -3.1% | | | | | |
| estimated total change | -38% | | | | | |
| median concentrations first 10 years | 77 | 0.3 | 0.1 | 0.15 | 4 | 9 |
| median concentrations most recent 10 years | 73 | 0.2 | 0.3 | <0.05 | 2 | 13 |

## Yellow Medicine River at MN-67 Bridge 7 Mi SE of Granite Falls (S000-159)(YM-0.5) (period of record 1967 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -1.8% | -2.4% | 0.8% | -2.6% | -1.9% | 2.2% |
| estimated total change | -52% | -63% | 29% | -53% | -56% | 148% |
| 1995 - 2009 trend | **decrease** | **decrease** | **no trend** | **no trend** | **decrease** | little data |
| estimated average annual change | -10.6% | -5.1% | | | -4.7% | |
| estimated total change | -83% | -57% | | | -53% | |
| median concentrations first 10 years | 65 | 0.2 | 0.3 | 0.13 | 5 | 13 |
| median concentrations most recent 10 years | 26 | 0.1 | 0.3 | <0.05 | 2 | 18 |

## Redwood River at Bridge on CSAH-101 at North Redwood (S000-299)(RWR-1) (period of record 1974 - 2009)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **no trend** | **no trend** | **decrease** | **decrease** | **no trend** |
| estimated average annual change | 1.6% | | | -7.7% | -1.7% | |
| estimated total change | 74% | | | -90% | -45% | |
| 1995 - 2009 trend | **no trend** | **increase** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | 3.6% | | | | |
| estimated total change | | 76% | | | | |
| median concentrations first 10 years | 42 | 0.3 | 4 | 0.14 | 4 | 105 |
| median concentrations most recent 10 years | 51 | 0.3 | 2 | <0.05 | 4 | 71 |

## Cottonwood River at MN-15, 0.5 Mi SE of New Ulm (S000-139)(CO-0.5) (period of record 1967 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| estimated average annual change | | -1.6% | | -3.4% | -2.4% | 0.9% |
| estimated total change | | -50% | | -64% | -64% | 47% |
| 1995 - 2009 trend | **decrease** | **decrease** | **no trend** | **no trend** | **increase** | little data |
| estimated average annual change | -4.9% | -3.9% | | | 2.8% | |
| estimated total change | -55% | -47% | | | 54% | |
| median concentrations first 10 years | 49 | 0.2 | 5 | 0.08 | 6 | 22 |
| median concentrations most recent 10 years | 65 | 0.1 | 3 | <0.05 | 5 | 29 |

## Center Creek between S34/35, 1 Mi NE of Fairmont (S000-291)(CEC-23.2) (period of record 1974 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **increase** | **decrease** | **decrease** | **no trend** |
| estimated average annual change | | -5.2% | 3.5% | -9.5% | -3.4% | |
| estimated total change | | -85% | 215% | -96% | -70% | |
| 1995 - 2009 trend | **decrease** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | -4.4% | | 3.9% | | | |
| estimated total change | -51% | | 83% | | | |
| median concentrations first 10 years | 49 | 1.9 | 2 | 2.10 | 8 | 110 |
| median concentrations most recent 10 years | 38 | 0.3 | 6 | 0.08 | 4 | 79 |

## Watonwan River at Bridge on CSAH-13, 1 Mi W of Garden City (S000-163)(WA-6) (period of record 1968 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| estimated average annual change | | -0.5% | | -1.8% | -2.3% | 1.8% |
| estimated total change | | -20% | | -41% | -62% | 105% |
| 1995 - 2009 trend | **decrease** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | -5.4% | | | | | |
| estimated total change | -59% | | | | | |
| median concentrations first 10 years | 70 | 0.3 | 2 | 0.07 | 5 | 28 |
| median concentrations most recent 10 years | 52 | 0.2 | 6 | <0.05 | 2 | 42 |

## Blue Earth River in Sibley Park at Mankato (S000-134)(BE-0) (period of record 1967 - 2009)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| estimated average annual change | | -1.8% | | -4.6% | -2.3% | 1.5% |
| estimated total change | | -54% | | -77% | -63% | 85% |
| 1995 - 2009 trend | **decrease** | **decrease** | **no trend** | **no trend** | **increase** | little data |
| estimated average annual change | -7.1% | -6.1% | | | 4.7% | |
| estimated total change | -69% | -63% | | | 107% | |
| median concentrations first 10 years | 115 | 0.3 | 9 | 0.08 | 5 | 25 |
| median concentrations most recent 10 years | 62 | 0.2 | 7 | <0.05 | 5 | 31 |

# St. Croix River Basin

## St. Croix River at MN-48 Br, 3.5 Mi W of Danbury, WI (S000-056)(SC-111) (period of record 1957 - 2009)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **no trend** | **decrease** | **increase** |
| estimated average annual change | -2.3% | -2.6% | | | -2.7% | 2.0% |
| estimated total change | -70% | -74% | | | -76% | 163% |
| 1995 - 2009 trend | **no trend** | **decrease** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | 1.9% | | | | |
| estimated total change | | 35% | | | | |
| median concentrations first 10 years | 11 | 0.07 | 0.03 | 0.05 | 3 | 2 |
| median concentrations most recent 10 years | 4 | 0.03 | <0.05 | <0.05 | 1 | 5 |

## St. Croix River downstream of MN-212 Bridge in Stillwater (S000-019)(SC-23) (period of record 1953 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **no trend** | **decrease** | **increase** |
| estimated average annual change | -1.5% | -1.6% | 1.9% | | -1.0% | 1.3% |
| estimated total change | -59% | -57% | 74% | | -44% | 87% |
| 1995 - 2009 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 18 | 0.2 | 0.1 | 0.06 | 4 | 4 |
| median concentrations most recent 10 years | 10 | 0.1 | 0.1 | <0.05 | 2 | 7 |

## St. Croix River from RR Bridge at Hudson (S000-126)(SC-17) (period of record 1967 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -2.2% | -2.5% | 2.3% | -5.1% | -2.2% | 2.0% |
| estimated total change | -61% | -65% | 112% | -80% | -60% | 131% |
| 1995 - 2009 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 9 | 0.1 | 0.1 | 0.16 | 3 | 4 |
| median concentrations most recent 10 years | 5 | 0.1 | 0.2 | <0.05 | 1 | 7 |

## Kettle River at Bridge on MN-48, 4.5 Mi E of Hinckley (S000-121)(KE-11) (period of record 1967 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -2.0% | -1.4% | | -5.3% | -2.3% | 2.3% |
| estimated total change | -58% | -45% | | -83% | -63% | 159% |
| 1995 - 2009 trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | | | 2.4% | | | |
| estimated total change | | | 46% | | | |
| median concentrations first 10 years | 7 | 0.07 | 0.06 | 0.11 | 2 | 6 |
| median concentrations most recent 10 years | 3 | 0.05 | 0.10 | <0.05 | 1 | 8 |

## Snake River below Cross Lake Dam, 2 Mi NE of Pine City (S000-198)(SN-10) (period of record 1971 - 2009)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **no trend** | **no trend** | **decrease** | **no trend** | **increase** |
| estimated average annual change | | | | -2.0% | | 1.7% |
| estimated total change | | | | -32% | | 92% |
| 1995 - 2009 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 10 | 0.19 | 0.06 | 0.04 | 5 | 5 |
| median concentrations most recent 10 years | 7 | 0.09 | 0.06 | 0.06 | 2 | 8 |

## North Branch Sunrise River at MN-95, 4 Mi E of North Branch (S000-301)(SUN-5) (period of record 1974 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **no trend** | **increase** | **no trend** | **increase** | **no trend** |
| estimated average annual change | -1.8% | | 2.8% | | 2.2% | |
| estimated total change | -48% | | 70% | | 114% | |
| 1995 - 2009 trend | **decrease** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | -3.7% | | 3.0% | | | |
| estimated total change | -45% | | 61% | | | |
| median concentrations first 10 years | 26 | 0.1 | 2 | 0.03 | 2 | 8 |
| median concentrations most recent 10 years | 8 | 0.1 | 2 | <0.05 | 1 | 31 |

# Lower Mississippi River Basin

## Mississippi River at Lock & Dam #5 3 Mi SE of Minneiska (S000-287)(UM-738) (period of record 1974 - 2008)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -1.2% | -1.3% | 3.1% | -5.8% | -1.5% | 2.8% |
| estimated total change | -33% | -36% | 164% | -84% | -40% | 152% |
| 1995 - 2008 trend | **decrease** | **no trend** | **increase** | **no trend** | **decrease** | little data |
| estimated average annual change | -3.0% | | 2.2% | | -2.1% | |
| estimated total change | -37% | | 39% | | -27% | |
| median concentrations first 10 years | 22 | 0.2 | 1 | 0.12 | 4 | 14 |
| median concentrations most recent 10 years | 17 | 0.1 | 1 | <0.05 | 2 | 23 |

## Mississippi River at Lock & Dam #6 at Trempealeau, WI (S000-095)(UM-714) (period of record 1962 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -1.4% | -1.0% | 1.6% | -5.3% | -1.7% | 2.5% |
| estimated total change | -48% | -38% | 54% | -77% | -55% | 214% |
| 1995 - 2009 trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | | | 3.2% | | | |
| estimated total change | | | 60% | | | |
| median concentrations first 10 years | 34 | 0.2 | 1 | 0.09 | 5 | 9 |
| median concentrations most recent 10 years | 21 | 0.2 | 2 | <0.05 | 2 | 18 |

## Mississippi River under US-14 Bridge at La Crosse (S000-067)(UM-698) (period of record 1958 - 2008)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **increase** | **decrease** | **decrease** | **no trend** |
| estimated average annual change | | -0.9% | 2.6% | -4.9% | -1.9% | |
| estimated total change | | -31% | 78% | -64% | -53% | |
| 1995 - 2008 trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | | | 4.0% | | | |
| estimated total change | | | 21% | | | |
| median concentrations first 10 years | 28 | 0.2 | 0.9 | 0.10 | 4 | 12 |
| median concentrations most recent 10 years | 20 | 0.2 | 0.9 | <0.05 | 2 | 18 |

## Vermillion River at Bridge on Blaine Ave, 4 Mi NE of Farmington (S000-896)(VR-32.5) (period of record 1982 - 2008)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **increase** | little data |
| estimated average annual change | -1.7% | -1.9% | | -3.0% | 1.6% | |
| estimated total change | -37% | -40% | | -56% | 54% | |
| 1995 - 2008 trend | **decrease** | **decrease** | **decrease** | **no trend** | **no trend** | little data |
| estimated average annual change | -4.0% | -9.6% | -4.3% | | | |
| estimated total change | -41% | -73% | -43% | | | |
| median concentrations first 10 years | 19 | 0.8 | 4 | 0.08 | 1 | -- |
| median concentrations most recent 10 years | 12 | 0.5 | 5 | <0.05 | 1 | 52 |

## Straight River near CSAH-1, 1 Mi SE of Clinton Falls (S000-047)(ST-18) (period of record 1955 - 2009)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | **increase** |
| average annual change | -1.9% | -1.0% | | -7.4% | -3.5% | 1.4% |
| total change | -64% | -43% | | -98% | -85% | 114% |
| 1995 - 2009 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| average annual change | | | | | | |
| total change | | | | | | |
| median concentrations first 10 years | 38 | 0.7 | 1 | 0.44 | 7 | 17 |
| median concentrations most recent 10 years | 23 | 0.3 | 4 | <0.05 | 1 | 30 |

## Cannon River at Bridge on CSAH-7 at Welch (S000-003)(CA-13) (period of record 1953 - 2008)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| average annual change | -2.6% | -2.3% | 1.4% | -7.0% | -0.8% | 1.8% |
| total change | -77% | -69% | 105% | -97% | -37% | 178% |
| 1995 - 2008 trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| average annual change | | | 1.9% | | | |
| total change | | | 31% | | | |
| median concentrations first 10 years | 26 | 0.3 | 1 | 0.20 | 4 | 11 |
| median concentrations most recent 10 years | 14 | 0.2 | 4 | <0.05 | 2 | 28 |

## Zumbro River at CSAH-14, 3 Mi N of Rochester (S000-268)(ZSF-5.7) (period of record 1973 - 2008)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| average annual change | -2.9% | -7.1% | 2.3% | -10.0% | -4.6% | 3.0% |
| total change | -64% | -92% | 120% | -97% | -81% | 186% |
| 1995 - 2008 trend | **decrease** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| average annual change | -6.7% | | | | | |
| total change | -42% | | | | | |
| median concentrations first 10 years | 45 | 0.9 | 3 | 0.50 | 5 | 36 |
| median concentrations most recent 10 years | 16 | 0.2 | 7 | <0.05 | 2 | 54 |

## Whitewater River S Fork N of CR-115 3.5 Mi NW of Utica (S000-288)(WWR-26) (period of record 1974 - 2008)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **no trend** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -2.4% | | 1.8% | -2.0% | -2.8% | 1.9% |
| estimated total change | -57% | | 79% | -46% | -64% | 94% |
| 1995 - 2008 trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | | | 2.5% | | | |
| estimated total change | | | 46% | | | |
| median concentrations first 10 years | 32 | 0.5 | 7 | 0.08 | 3 | 27 |
| median concentrations most recent 10 years | 16 | 0.4 | 11 | <0.05 | 1 | 43 |

## Garvin Brook at CSAH-23, SW of Minnesota City (S000-828)(GB-4.5) (period of record 1981 - 2008)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -4.0% | -1.7% | 3.1% | -2.0% | -1.8% | 3.6% |
| estimated total change | -67% | -38% | 130% | -42% | -38% | 159% |
| 1995 - 2008 trend | **decrease** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | -8.5% | | 2.6% | | | |
| estimated total change | -74% | | 46% | | | |
| median concentrations first 10 years | 62 | 0.1 | 1 | 0.09 | 2 | 6 |
| median concentrations most recent 10 years | 23 | 0.1 | 2 | <0.05 | 1 | 13 |

## Root River at Bridge on MN-26, 3 Mi E of Hokah (S000-065)(RT-3) (period of record 1958 - 2008)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -1.3% | -2.4% | 3.7% | -1.0% | -4.1% | 1.4% |
| estimated total change | -41% | -70% | 355% | -34% | -88% | 76% |
| 1995 - 2008 trend | **decrease** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | -8.2% | | 2.2% | | | |
| estimated total change | -61% | | 39% | | | |
| median concentrations first 10 years | 120 | 0.3 | 1 | 0.15 | 4 | 7 |
| median concentrations most recent 10 years | 58 | 0.1 | 4 | <0.05 | 1 | 13 |

# Missouri River Basin

## Rock River at Bridge on Stateline Rd 10 Mi S of Luverne (S000-097)(RO-0) (period of record 1962 - 2011)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -1.6% | -2.4% | 4.3% | -4.6% | -2.7% | 2.1% |
| estimated total change | -55% | -70% | 334% | -74% | -73% | 175% |
| 1995 - 2011 trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | | | 1.5% | | | |
| estimated total change | | | 29% | | | |
| median concentrations first 10 years | 110 | 0.4 | 0.8 | 0.09 | 9 | 23 |
| median concentrations most recent 10 years | 30 | 0.1 | 5.4 | <0.05 | 2 | 26 |

## Pipestone Creek at Bridge on N Line of S24 (T106N/R47W) (S000-099)(PC-1.5) (period of record 1963 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **decrease** | **increase** | **decrease** | **decrease** | **no trend** |
| estimated average annual change | | -6.3% | 2.0% | -7.8% | -2.8% | |
| estimated total change | | -95% | 91% | -91% | -73% | |
| 1995 - 2009 trend | **decrease** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | -5.4% | | | | | |
| estimated total change | -58% | | | | | |
| median concentrations first 10 years | 57 | 1.9 | 2 | 0.24 | 9 | 87 |
| median concentrations most recent 10 years | 39 | 0.2 | 4 | 0.07 | 5 | 26 |

# Des Moines River Basin

## West Fork Des Moines River at Petersburg Rd, S of Petersburg (S000-156)(WDM-3) (period of record 1967 - 2009)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **no trend** | **no trend** | **increase** | **decrease** | **no trend** | **no trend** |
| estimated average annual change | | | 1.9% | -5.3% | | |
| estimated total change | | | 89% | -78% | | |
| 1995 - 2009 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 67 | 0.3 | 0.4 | 0.11 | 9 | 37 |
| median concentrations most recent 10 years | 71 | 0.2 | 3.0 | <0.05 | 8 | 38 |

## East Fork Des Moines River at MN-263, 2 Mi NE Ceylon (S000-141)(EDM-6) (period of record 1967 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **no trend** | **decrease** | **decrease** | **no trend** |
| estimated average annual change | -1.2% | -2.0% | | -6.2% | -3.0% | |
| estimated total change | -41% | -57% | | -88% | -72% | |
| 1995 - 2009 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 85 | 0.4 | 7 | 0.18 | 5 | 36 |
| median concentrations most recent 10 years | 20 | 0.2 | 11 | <0.05 | 5 | 36 |

## Okabena Creek at CSAH-14, 2 Mi SE of Brewster (S000-240)(OK-25.6) (period of record 1973 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **no trend** | **increase** | **decrease** | **decrease** | little data |
| estimated average annual change | -4.9% | | 6.0% | -8.6% | -4.2% | |
| estimated total change | -84% | | 422% | -92% | -79% | |
| 1995 - 2009 trend | **decrease** | **decrease** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | -8.5% | -20.1% | | | | |
| estimated total change | -76% | -97% | | | | |
| median concentrations first 10 years | 86 | 2 | 8 | 0.19 | 4 | --- |
| median concentrations most recent 10 years | 32 | 5 | 42 | <0.05 | 2 | 175 |

# Cedar River Basin

## Cedar River at CSAH-2, 0.5 Mi E of Lansing (S000-137)(CD-24) (period of record 1967 - 2009)

| | Total Suspended Solids | Total Phosphorus | Nitrite/ Nitrate | Ammonia | Biochemical Oxygen Demand | Chloride |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **no trend** |
| estimated average annual change | -2.8% | -2.0% | 3.2% | -1.6% | -4.1% | |
| estimated total change | -71% | -58% | 294% | -50% | -83% | |
| 1995 - 2009 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 38 | 0.3 | 2 | 0.10 | 4 | 20 |
| median concentrations most recent 10 years | 11 | 0.2 | 8 | <0.05 | 1 | 20 |

## Cedar River at CSAH-4, 3 Mi S of Austin (S000-136)(CD-10) (period of record 1967 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **no trend** |
| estimated average annual change | -2.9% | -2.9% | 2.5% | -5.2% | -3.9% | |
| estimated total change | -71% | -72% | 193% | -90% | -82% | |
| 1995 - 2009 trend | **no trend** | **no trend** | **increase** | **no trend** | **no trend** | little data |
| estimated average annual change | | | 3.1% | | | |
| estimated total change | | | 53% | | | |
| median concentrations first 10 years | 42 | 0.7 | 3 | 0.29 | 6 | 41 |
| median concentrations most recent 10 years | 34 | 0.2 | 9 | <0.05 | 2 | 28 |

## Shell Rock River at Bridge on CSAH-1, 1 Mi W of Gordonsville (S000-084)(SR-1.2) (period of record 1961 - 2009)

| | | | | | | |
|---|---|---|---|---|---|---|
| overall trend | **decrease** | **decrease** | **increase** | **decrease** | **decrease** | **increase** |
| estimated average annual change | -1.9% | -1.0% | 4.6% | -0.9% | -2.9% | 1.0% |
| estimated total change | -60% | -38% | 563% | -37% | -77% | 59% |
| 1995 - 2009 trend | **no trend** | **no trend** | **no trend** | **no trend** | **no trend** | little data |
| estimated average annual change | | | | | | |
| estimated total change | | | | | | |
| median concentrations first 10 years | 99 | 0.5 | 1 | 0.10 | 14 | 35 |
| median concentrations most recent 10 years | 54 | 0.4 | 2 | <0.05 | 7 | 43 |