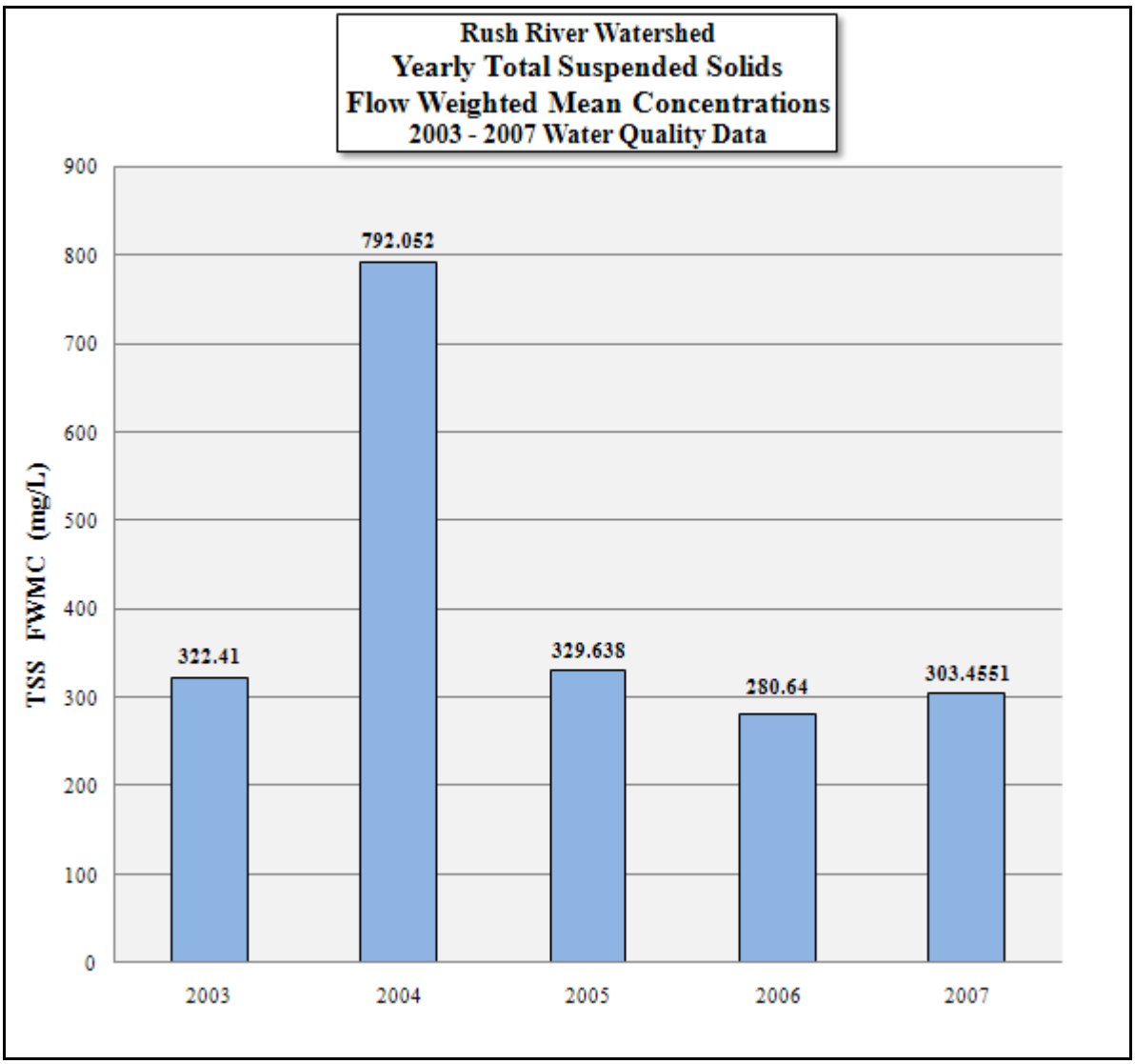
RUSH RIVER MONITORING RESULTS: 2003-2007

Water quality monitoring is crucial to the Rush River Implementation Project in evaluating the success of the implemented Best Management Practices and educational outreach activities. Monitoring site 1RP is located near the Rush River outlet on MN State Highway 93, three miles south of Henderson. This site represents nearly all of the drainage acreage in the Rush River Watershed. The monitoring season usually ran from March to October. Twenty-one samples were collected in 2006 and thirty-four samples in 2007. Samples were collected during baseline flows and storm events.

TOTAL SUSPENDED SOLIDS:



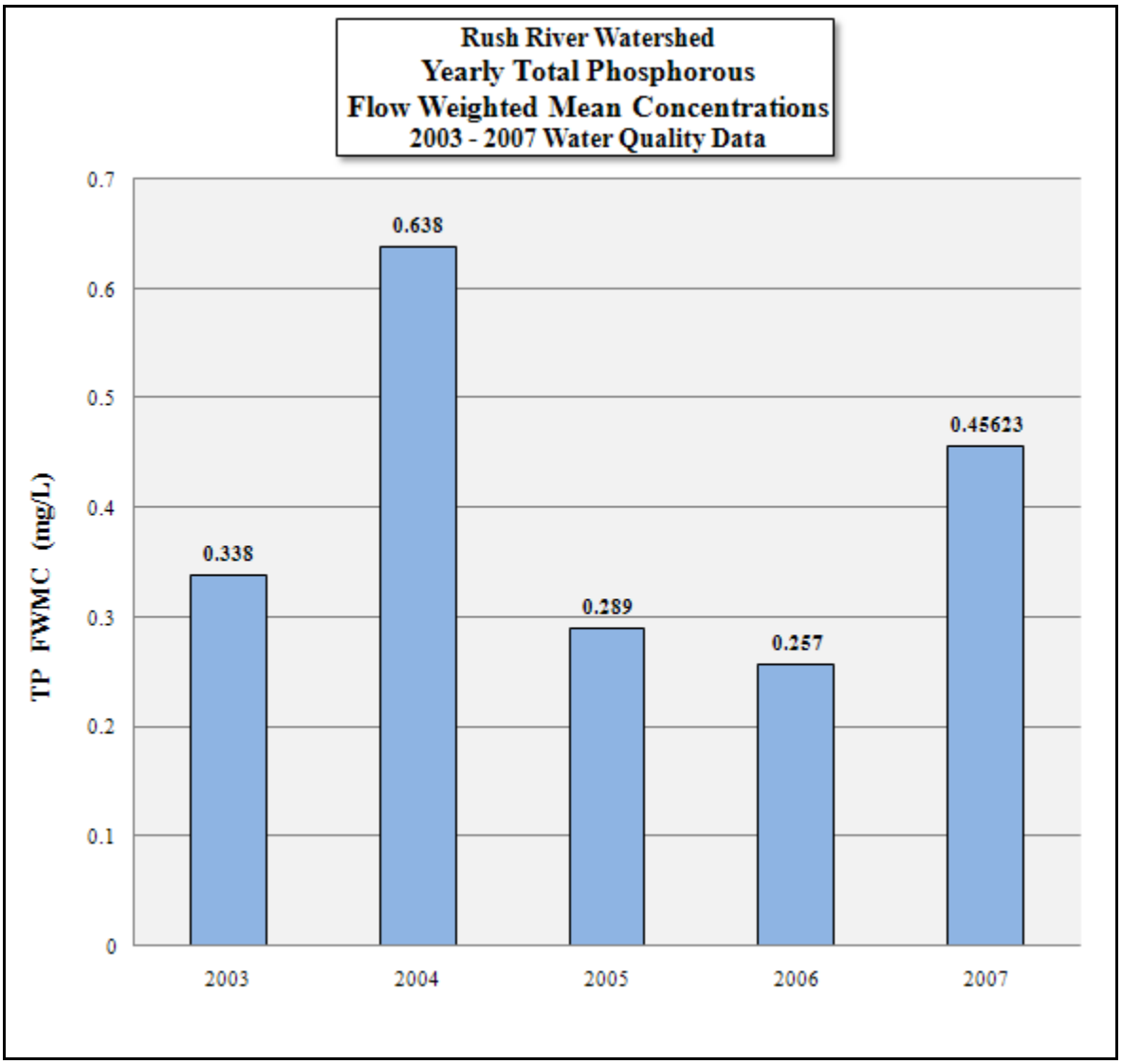
Based on data from the State of the Minnesota River Report from 2003, the Rush River was ranked as one of the most impaired waters in the Minnesota River Basin for Total Suspended Solid (TSS) Flow Weighted Mean Concentrations (FWMC). High concentrations of suspended sediments can cause a stream to lose its ability to support a diversity of aquatic life, including plants, fish and invertebrates. High TSS concentrations can also often mean higher concentrations of bacteria, nutrients, pesticides and metals are in the water. These pollutants get attached to the sediment particles on land and are then carried into the water through runoff.

Monitoring data from the Rush River Assessment Project revealed that the major source of TSS in the Rush River Watershed is coming from the steeply sloped eastern portion of the watershed. Over 74% of the TSS load in 2003 and 91% of the load in 2004 (April through September) came from this portion of the watershed. There is currently EPA water quality standard for TSS, but a standard for turbidity has been established at 25 Nephelometric Turbidity Units (NTU). Equations calculated using TSS and Turbidity values in the Rush River found

that 25 NTU's equates to approximately 88 mg/L TSS. Since there is a strong relationship between TSS and Turbidity, the project uses 88 mg/L as the watershed standard.

The Rush River Implementation Project goal for TSS was a 20% reduction in FWMC at the outlet of the Rush River. The TSS FWMC for 2007 was 303.45. This is a 62% reduction from the 2004 FWMC and an 8% reduction from the 2005 FWMC. Since high intensity rainfall events usually result in high sediment loads, the reductions made could be due to climatic variations of the timing and intensity of precipitation in the watershed. A longer data term set would be needed to assess if there are any true decreasing TSS trends. Besides 2004, a year which had a few high intensity storm events, the TSS concentrations appear to be holding steady. As suggested in the Rush River Assessment Project, watershed wide restoration of wetlands would help to reduce total and peak flows and thereby reduce streambank erosion. Increasing the implementation of wetland restorations and vegetative practices should get the project closer towards achieving the 88mg/L standard.

TOTAL PHOSPHOROUS:

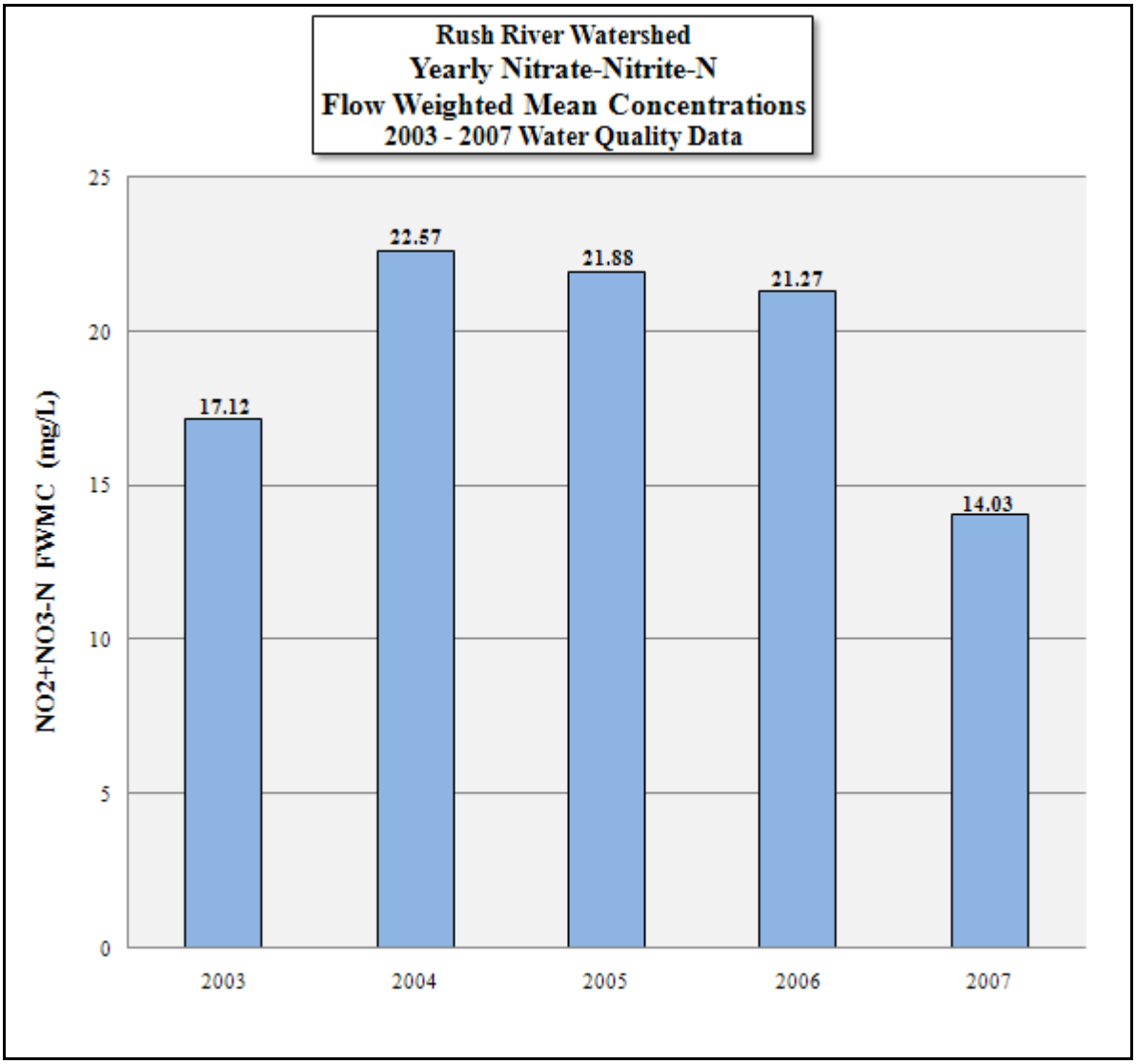


Total phosphorus (TP) levels are another significant concern in the Rush River. The Lower MN River Watershed, in which the RRW is located, is listed on the Federal 303d list for a dissolved oxygen (DO) impairment. Excessive TP levels contribute to low DO levels in the Lower MN River Watershed. Therefore, a reduction in TP levels from the Rush River is an important step in raising DO levels in the Lower MN River Watershed. The majority of TP load at the outlet of the Rush River is sediment bound in origin. It is believed to be a result of agricultural runoff and excessive soil erosion in the steeply sloped eastern portion of the watershed. There is currently no water quality standard in Minnesota for Total Phosphorous, but the Environmental

Protection Agency recommends 0.100 mg/L as a standard. Values over 0.200 mg/L are considered to be excessive amount of Total Phosphorous.

The Rush River Implementation Project goal for Total Phosphorous was a 20% reduction in Flow Weighed Mean Concentration (FWMC) at the Rush River outlet. The 2007 Total Phosphorous FWMC was 0.45. This is a 28% reduction in FWMC from 2004, but a 37% increase in FWMC from 2005. It is unsure what caused the increase in phosphorous in 2007. Since phosphorus is usually attached to sediment, the fluctuations in FWMC seen in this project could be due to changes in precipitation events. As with the TSS recommendations, increasing the implementation of wetland restorations and vegetative practices should get the project closer towards achieving the TP standard of 0.100 mg/L.

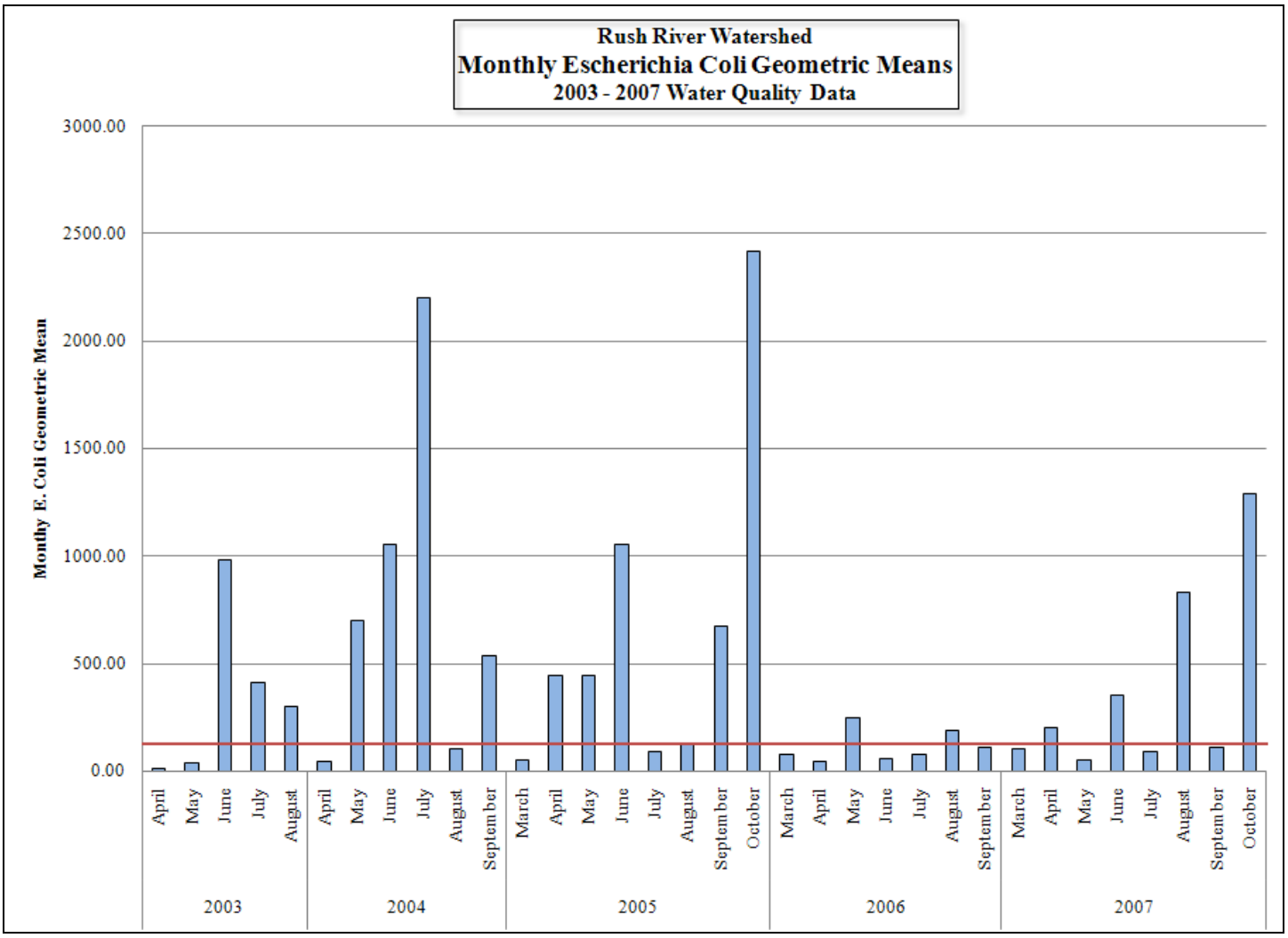
NITRATE+NITRITE-NITROGEN:



Nitrates in streams and rivers can enter groundwater through aquifer recharge areas and result in negative health effects for those drinking the affected water. Excessive nitrates are also contributing to the "dead zone" in the Gulf of Mexico. The drinking water standard for nitrate-N is 10 mg/L, as set by EPA's Safe Drinking Water Act. For minimally impacted streams in the Minnesota River Basin, the NO2+NO3-N range is from 0.9 to 6.5 mg/l. The project uses the drinking water standard of 10 mg/L as a guideline for safe NO2+NO3-N levels. The Rush River is a significant source of nitrates entering the Minnesota River, with the NO2+NO3-N Flow Weighted Mean Concentrations (FWMC) near the highest for all sites monitored in the Minnesota River Basin in 2003 and 2004. Monitoring indicates the majority of the NO2+NO3-N load in the Rush River Watershed comes from the extensively ditched and tiled, flat upland portion of the watershed.

The Rush River Implementation Project goal was for a 10% concentration reduction of NO2+NO3-N in the Rush River and its tributaries. The NO2+NO3-N FWMC for 2007 was 14.03. This is a 38% reduction from the 2004 FWMC and a 36% reduction from the 2005 FWMC. While the FWMC of 14.03 is still over the project's standard of 10 mg/l, the FWMC is closer to being in compliance. More data would be needed in order to determine whether the reductions made are the results of climatic variability or implemented Best Management Practices (BMPs).

ESCHERICHIA COLI:



Fecal coliform (FC) bacteria is a significant concern in the Rush River, with the south branch of the Rush River being listed as impaired on the Federal 303d Impaired Waters list. Found in the intestines of warm-blooded animals, the presence of FC bacteria indicates that disease causing pathogens or disease-producing bacteria could also be present. High levels of FC bacteria indicate waters might not be safe for body-contact recreation and can also be linked to low dissolved oxygen levels. Data from the Rush River Assessment Project concluded that the high levels of FC bacteria in the Rush River are most likely from surface run-off of applied manure and noncompliant feedlots. Recently, the state water quality standard was changed from fecal coliform bacteria to E. coli. As such, Rush River samples were tested for E. coli in lieu of testing for FC bacteria. The current EPA recommended monthly geometric mean for E. coli is 126 MPN/100 mL. this standard is indicated by the red line in the graph shown above.

The project goal was to achieve compliance with the state water quality standard of 126 MPN/100mL for E. coli. In 2006 and 2007, six months between the two years exceeded the monthly geometric mean standard. These results are an improvement over those of 2004 and 2005 where nine months exceeded the monthly geometric mean standard. A true monthly geometric mean includes at least 5 samples per month. For certain months, five samples were not taken. Therefore, while the data seems to show that the amount of

months in exceedence of the standard is decreasing, the data could be slightly skewed due to the lack of a full data set for each month.

It is too early to assess any decreasing trends in E. coli in the Rush River. The slight decrease in monthly exceedances could be due to farming practices, septic system upgrades and precipitation variability. Several more years of data will be required to identify real trends in E. coli concentrations. It is important to note that the numbers calculated could actually be higher than represented due to a lack of laboratory dilution on some samples. The equipment used at the Minnesota Valley Testing Laboratory to test for E. coli can only read up to 2419 org/100ml without the samples being diluted. Repeatedly, samples from 2003-2007 have been greater than this amount, but were not calculated as so because they were not diluted prior to testing. Therefore when calculating the monthly geometric means, this was the max number used.