

CHAPTER 3.0

OVERVIEW OF DATA USED FOR ANALYSIS

The conceptual model for nutrients developed in this report is based largely on a database of nutrients and other constituents compiled by the Drinking Water Policy Workgroup in 2004-2005. Data in the database originate from a variety of agricultural, urban, point source, and surface water monitoring programs throughout the watersheds of the Sacramento and San Joaquin Rivers. The database was supplemented with data from Department of Water Resource's (DWR) Municipal Water Quality Investigations (MWQI) Program and the United States Geological Survey's (USGS) National Water Information System (NWIS) database.

This chapter provides an overview of the nutrient data contained in the database, notably the forms measured, the quantity and spatial distribution of the data, and the concentrations observed at various stations. The plots in this chapter present an informative snapshot of the available data, and set the stage for loading analyses in the next two chapters. Figure 3-1 illustrates stream reaches and key sampling locations in the Central Valley and Delta referred to in this and subsequent chapters. Figure 3-2 presents a close up of the Delta, including Delta islands and Delta pumping stations. Also note that three new Delta intakes are planned: by the Contra Costa Water District in Victoria Canal, by the City of Stockton in the San Joaquin River near Empire Tract, and by the Solano County Water Agency (Delta Region Drinking Water Quality Management Plan, 2005).

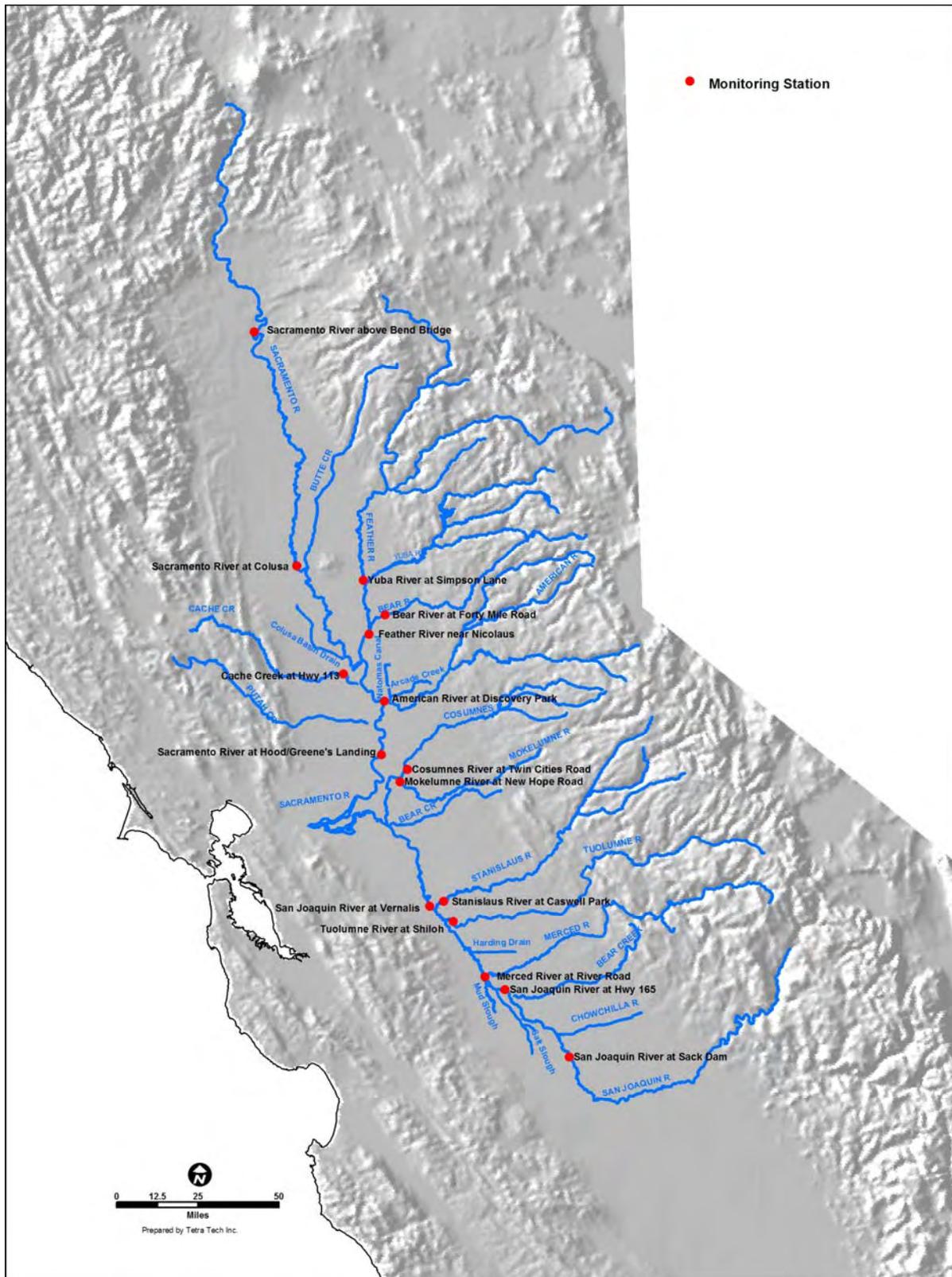


Figure 3-1. Surface water features and sampling locations in the Central Valley and Delta.

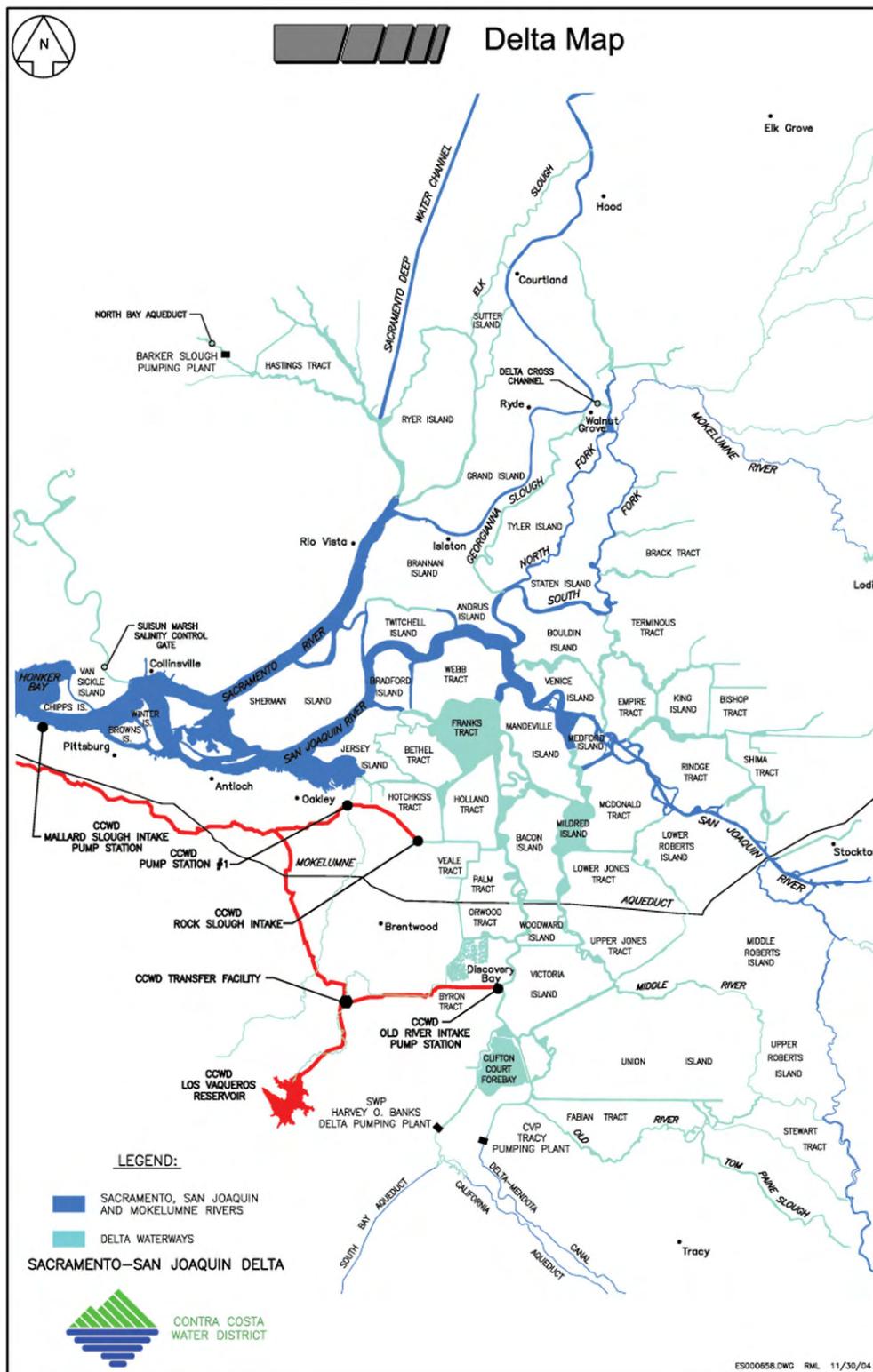


Figure 3-2. Key locations in the Sacramento-San Joaquin Delta. Map provided by Contra Costa Water District (CCWD).

3.1 OVERVIEW OF CONCENTRATION DATA

In addition to the Drinking Water Policy Database, a major additional source of chemistry data was the MWQI Program, from which data for stations in the Delta (Sacramento River at Hood, Sacramento River at Greene's Landing, San Joaquin River at Vernalis, and Delta drinking water intakes) were obtained electronically for this task from <http://wdl.water.ca.gov/wq-gst/>. MWQI data through 2000 were included in the Drinking Water Policy Database, however data from 2000 to the present were not available in the database. The MWQI Program obtains grab sample data on nitrate plus nitrite (NO₃+NO₂-N), ammonia-N, TKN, orthophosphate-P and total phosphorus (TP) concentrations at 10 locations around the Delta.

Other chemistry data were obtained from the USGS NWIS, available at <http://nwis.waterdata.usgs.gov/usa/nwis/qwdata>. This program reports all six nutrient constituents examined in this study. Data presented in this chapter from NWIS include nutrient data from stations on the mainstems of the Sacramento and San Joaquin Rivers and on major tributaries for which loading analyses were completed.

Maps showing the distribution of data in the Central Valley are presented in Figures 3-3 through 3-6 for nitrogen species (NO₃+NO₂-N, ammonia-N, TKN, and TN, respectively) and 3-7 and 3-8 for phosphorus species (orthophosphate-P and TP, respectively). Much of the data were collected along the main stems of the Sacramento and San Joaquin Rivers and in the Delta. There were limited data for the tributaries to the Sacramento and San Joaquin Rivers. An exception to this rule is noted for TN, for which much of the data are upstream of the Delta on the main stems of the Sacramento and San Joaquin Rivers. Over 90% of the TN data are from a US Fish and Wildlife Services and UC Davis Nutrient Study. Of all of the nutrient species, the least amount of data are available for TN. This is typical of water quality sampling programs. Approximately half the stations in the database had no coordinate information and are not shown in these maps; these data were not used in this analysis. Based on a spatial evaluation of the data, it appears that all of the nutrient data are measured widely enough for watershed-wide analysis. For the loading analysis, the TN data were supplemented with other nitrogen species data where TN data were not available.

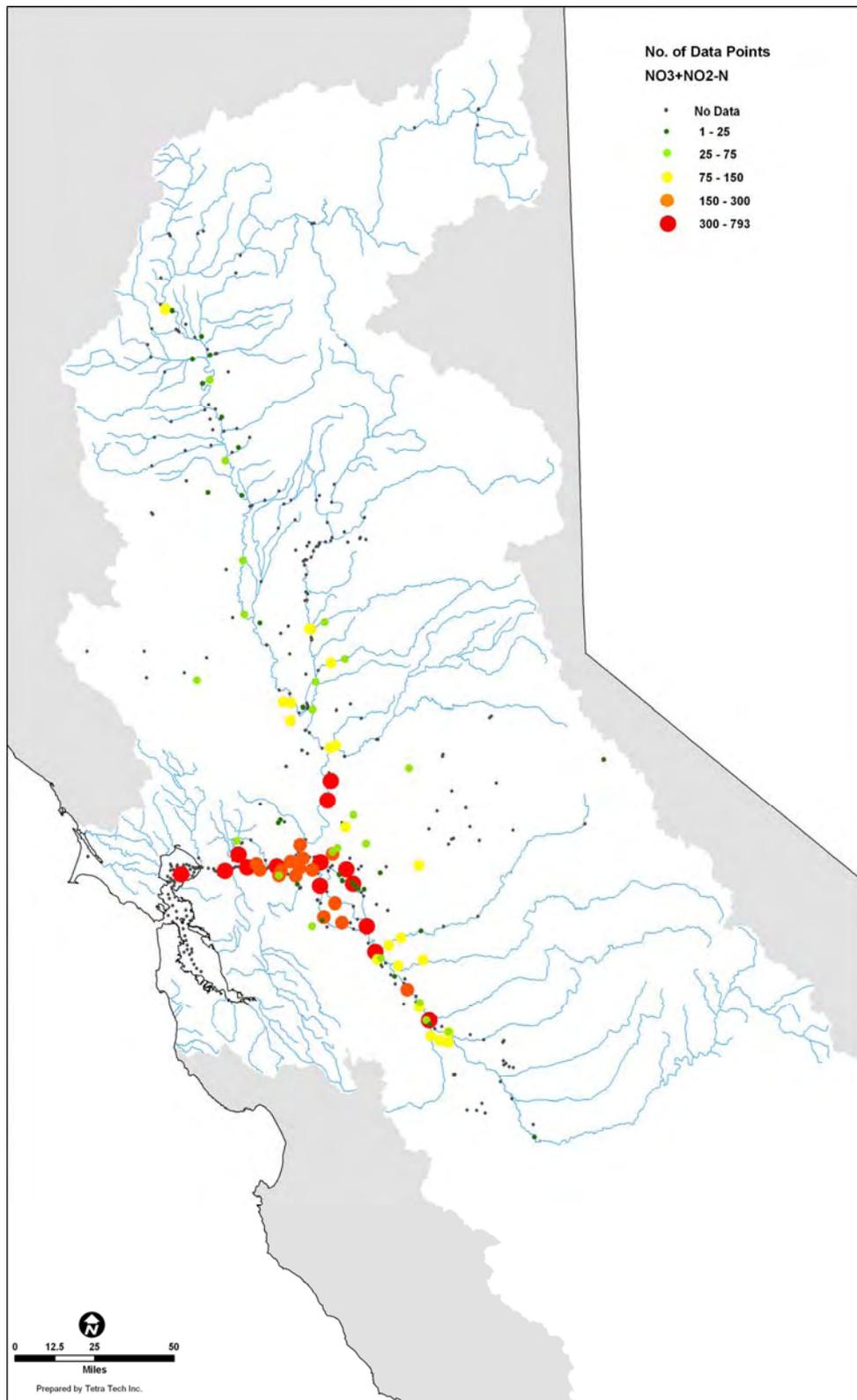


Figure 3-3. Number of NO₃+NO₂-N data points at each station in the Central Valley and Delta.

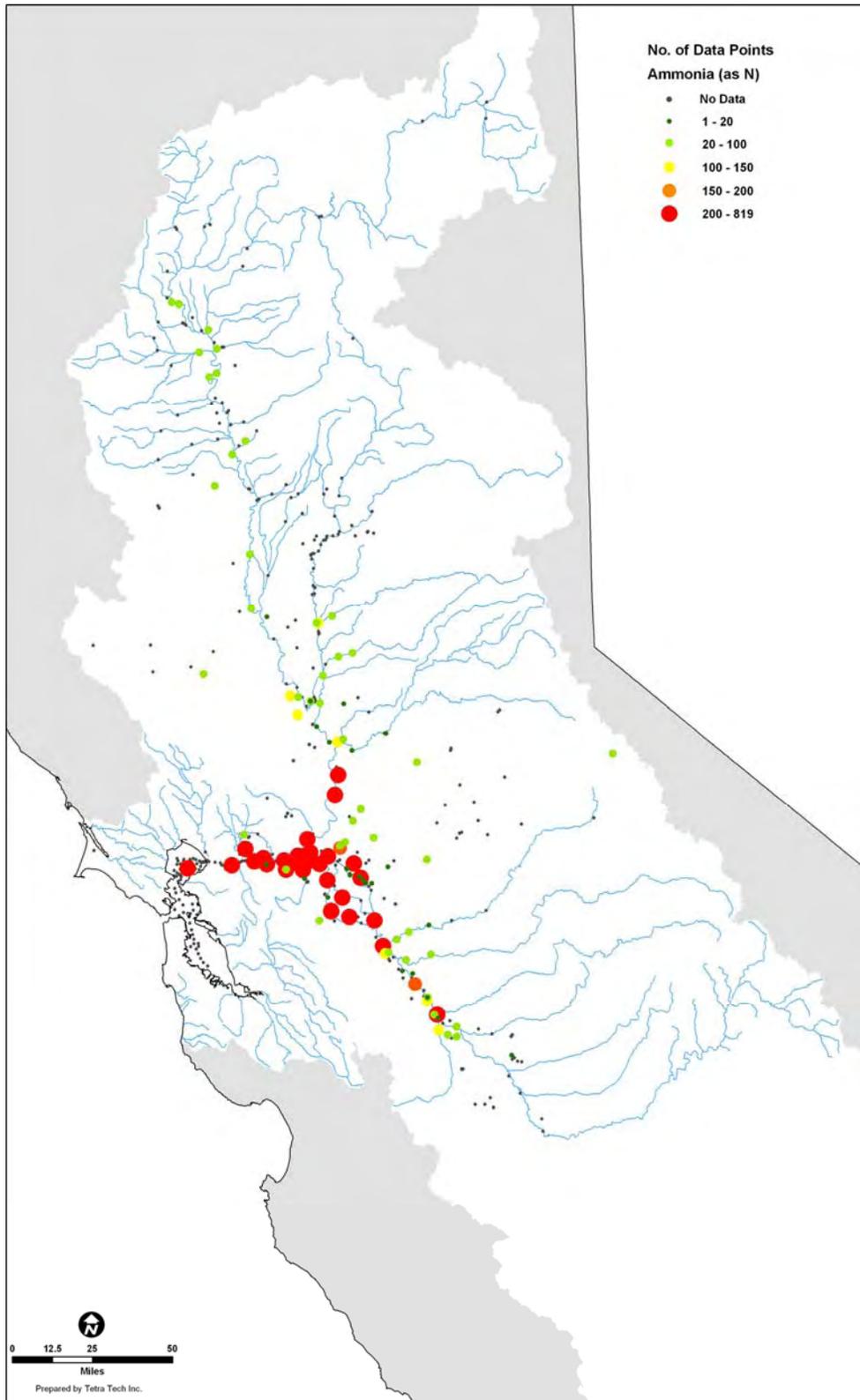


Figure 3-4. Number of Ammonia-N data points at each station in the Central Valley and Delta.

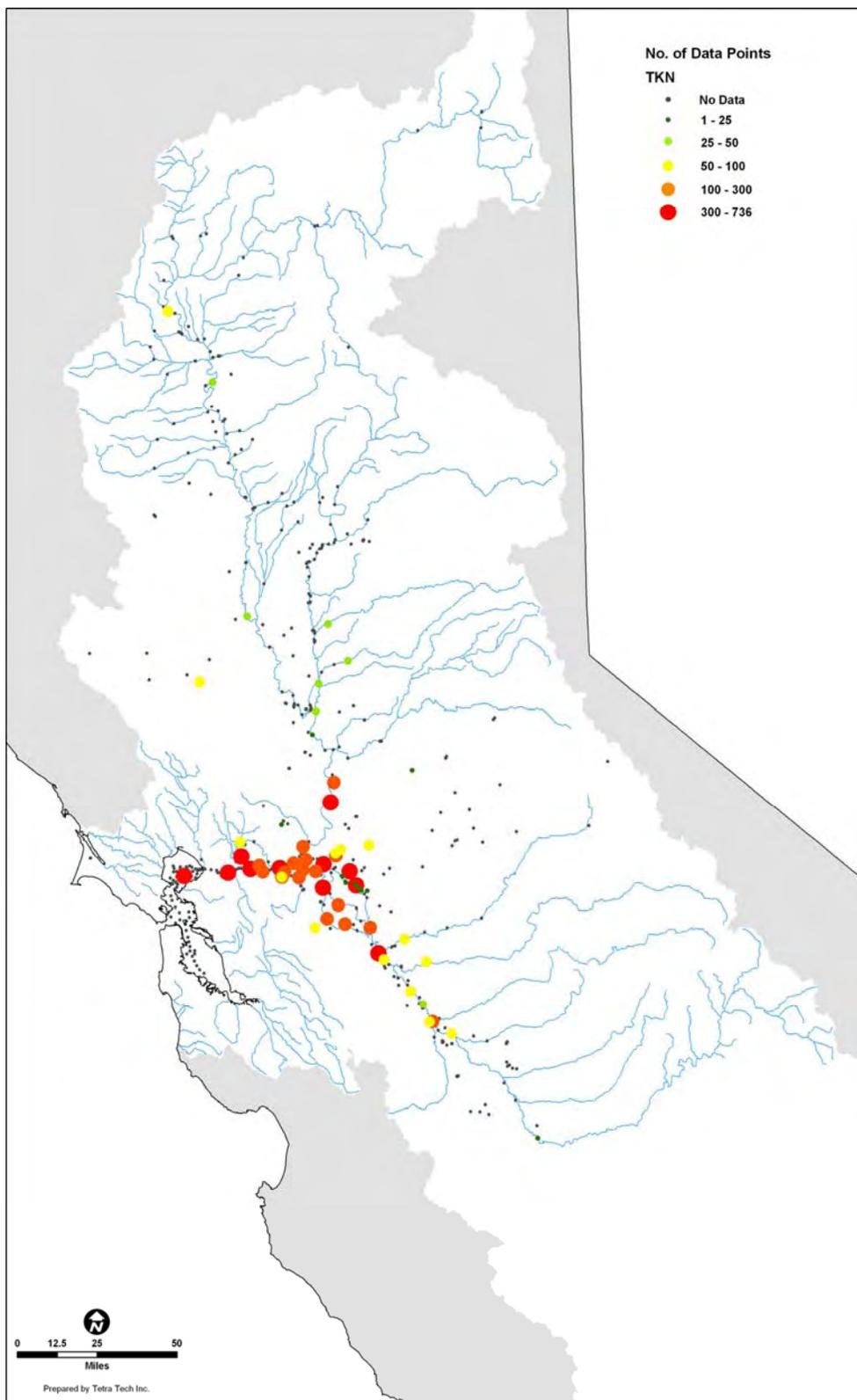


Figure 3-5. Number of TKN data points at each station in the Central Valley and Delta.

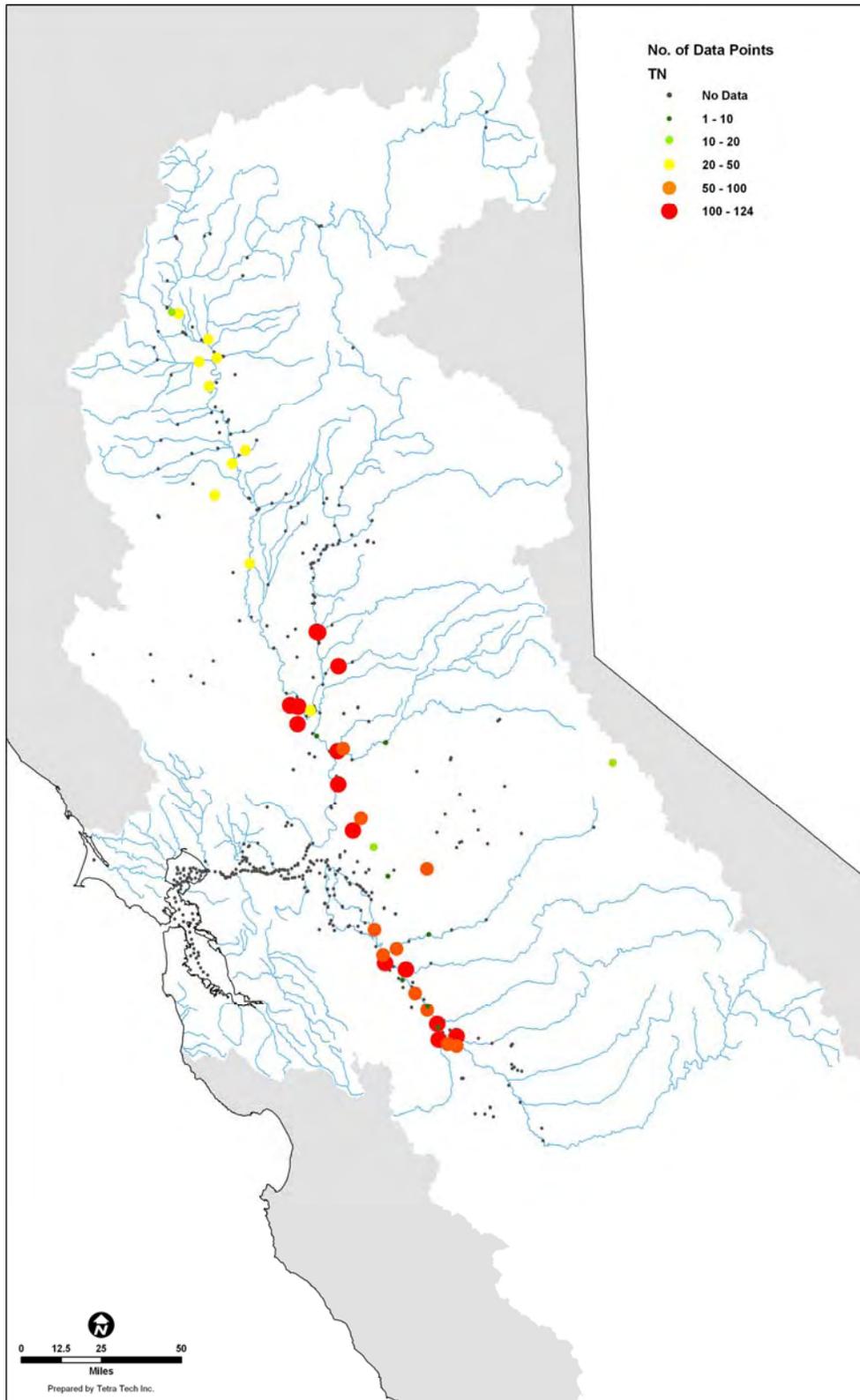


Figure 3-6. Number of TN data points at each station in the Central Valley and Delta.

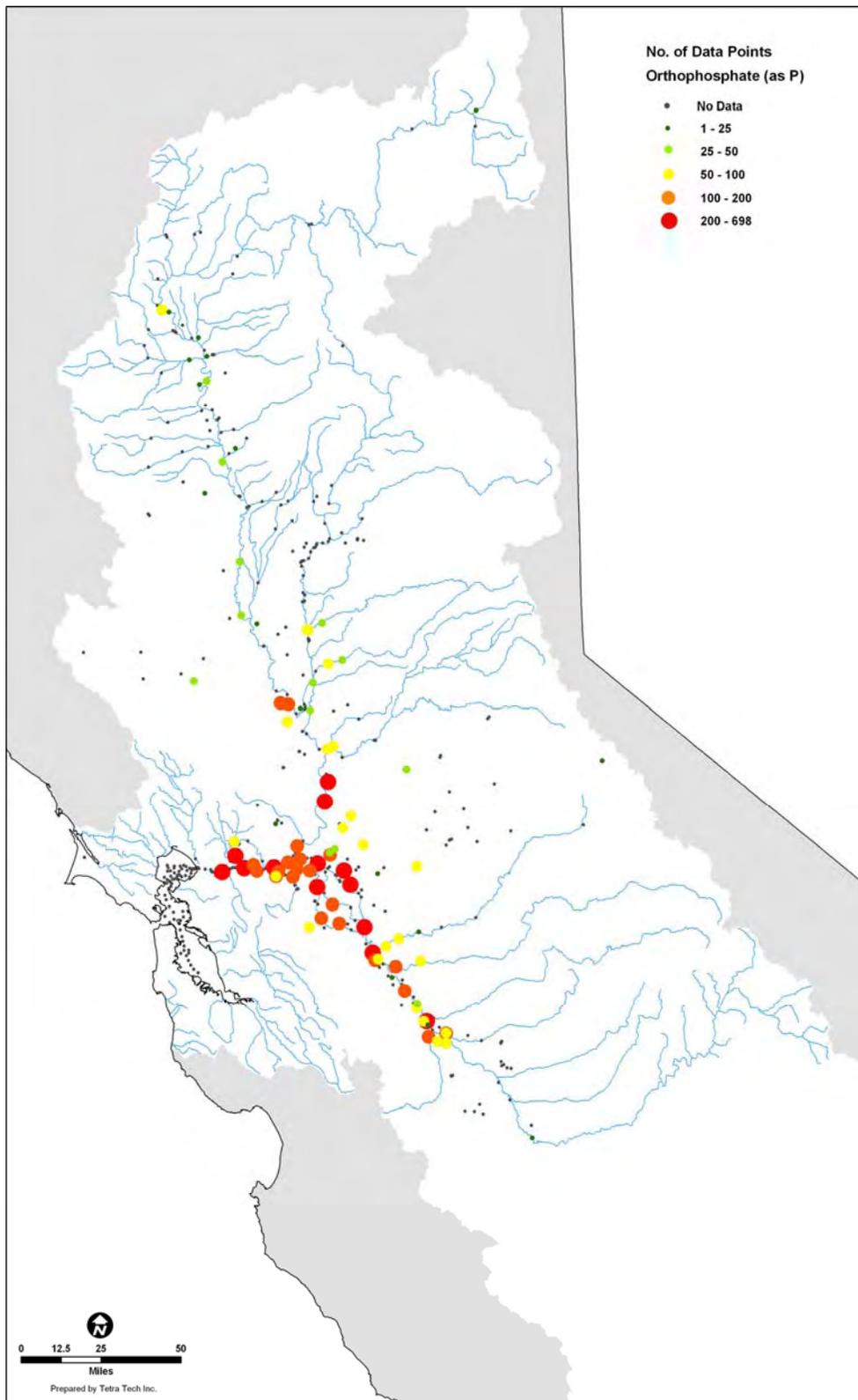


Figure 3-7. Number of Orthophosphate-P data points at each station in the Central Valley and Delta.

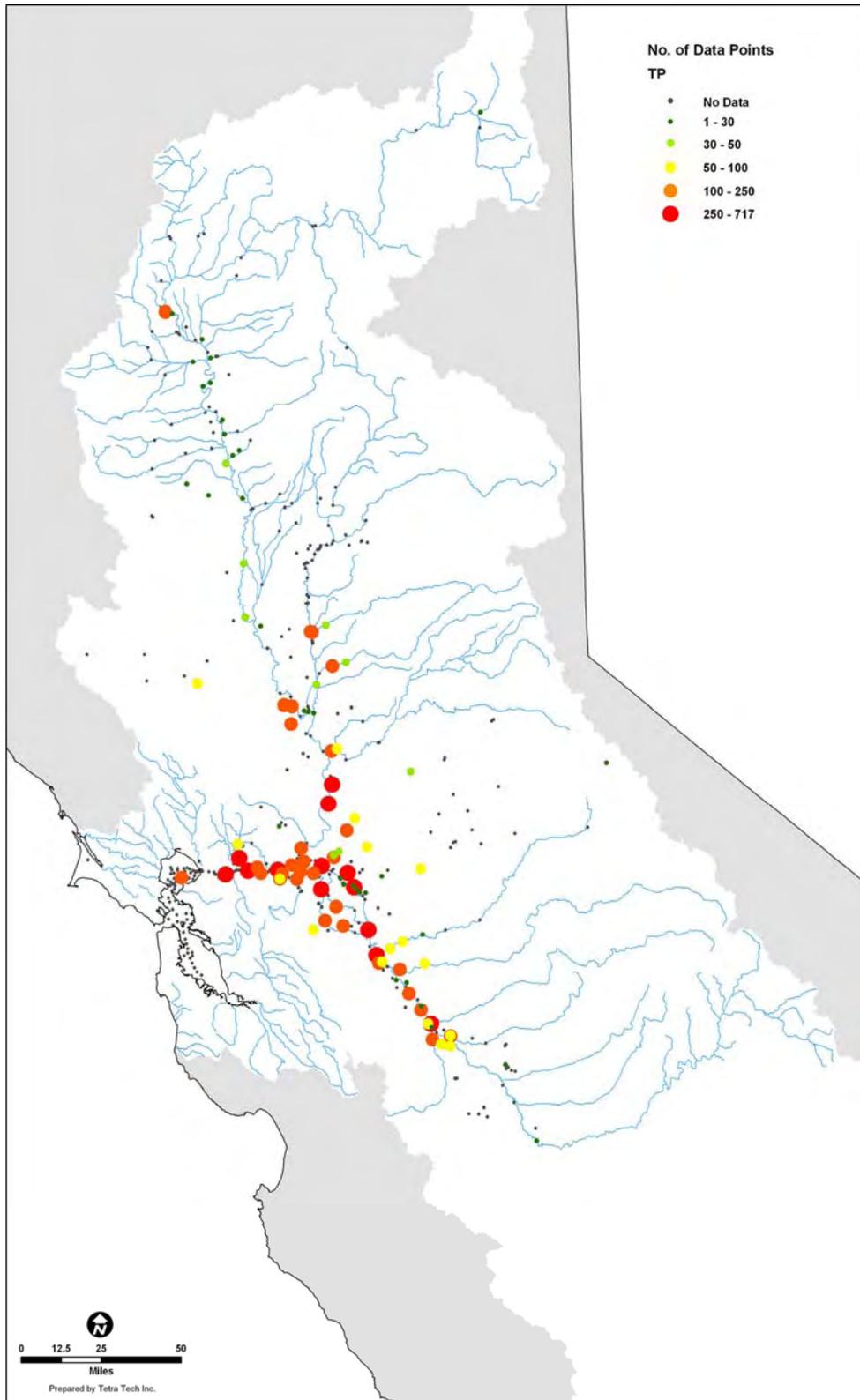


Figure 3-8. Number of TP data points at each station in the Central Valley and Delta.

Appendix A contains a listing of all stations with nutrient data, including the number of data points for each parameter (NO₃+NO₂-N, ammonia-N, TKN, TN, orthophosphate-P and TP), and the period over which sampling was conducted. This listing can be used as a reference to identify the quantity of relevant data associated with specific stations in the database, particularly for future work to identify patterns at greater spatial detail than presented in this report. Review of Appendix A shows that stations with the largest number of data points are those on the main stem of the Sacramento and San Joaquin Rivers, especially at stations near the Delta. Some locations had measurements of only one of the constituents, and data for all parameters were available for a small number of stations. The table illustrates the relative lack of TN data. It was further noted that many stations appeared in the database under different, slightly varying names. For this table, such stations were merged with a set of consistent names. It was also noted during the course of this work that nutrient species names and units were widely variable. For quality assurance, it is recommended that for future sampling efforts, a consistent, standardized set of nutrient species are requested for analysis and reporting.

A series of box plots was used to describe the range and number of nutrient concentrations at various locations in the watershed. Data from wastewater effluent and from urban runoff were excluded from these plots (these are presented in Chapter 4). Figures 3-9 to 3-12 show the nitrogen species (NO₃+NO₂-N, ammonia-N, TKN, and TN, respectively) concentrations by station, and Figures 3-13 and 3-14 show the phosphorus species (orthophosphate-P and TP, respectively) concentrations by station. In each figure, the data are shown on both a linear scale plot and log scale plot. All stations are shown in alphabetic order.

Nutrient data from Delta island agricultural drains (see Figure 3-2) are available in the database for NO₃-N only. These data are shown graphically in Figure 3-15. In general, the data show the same range of NO₃-N values as seen for the stations on Figure 3-9.

Figures 3-16 to 3-21 show a spatial overview for each of the nutrient species. These figures illustrate that concentrations are typically higher in the San Joaquin River Basin than in the Sacramento River basin.