CHAPTER 3.0
OVERVIEW OF DATA USED FOR ANALYSIS

The conceptual model for pathogens is based on a database 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 and intake locations throughout the watersheds of the Sacramento and San Joaquin Rivers. The database was supplemented with data from the Natomas East Main Drainage Canal (NEMDC) Studies (MWQI, 2005; Zanoli, personal communication), North Bay Aqueduct Sampling, and the United States Geological Survey's (USGS) National Water Information System (NWIS) database. This report includes an appendix that contains a listing of all stations with pathogen and related data, including the number of data points for each parameter 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.

This chapter provides an overview of the 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 semi-quantitative analyses in the next chapter. The geographic scope of the conceptual model, including key watersheds, stream reaches, important sampling locations, and current and future water supply intakes, has been presented in previous reports (Tetra Tech, 2006b) and is not repeated here.

As noted in the introduction, the vast majority of data on pathogens are not true measurements of pathogens, but indicator species that are likely to be present whenever fecal contamination is present. This feature is common to all pathogen monitoring programs nationally. The indicator species data that are contained in the database include total coliforms, fecal coliforms, and *E. coli*. Much of the evaluation that follows is limited to these constituents, although where possible, data on pathogens, notably, *Cryptosporidium* and *Giardia*, are presented.

3.1 OVERVIEW OF CONCENTRATION DATA OF INDICATOR SPECIES

Maps of median concentration data for total coliforms, fecal coliforms, and *E. coli* are presented in Figures 3-1 through 3-3[1]. The maps show the spatial intensity of data collection as well as the actual levels observed in the Central Valley and in the Delta. In general, there are significantly more total coliform data available than fecal coliform or *E. coli* data. The total coliform data show low concentrations in the Sacramento River basin, especially upstream of the Sacramento urban area. Concentrations are generally higher near Sacramento as well as in the San Joaquin basin, indicating the potential sources of coliforms from urban areas and the San Joaquin watershed. Concentrations shown for the San Joaquin River and its tributaries may be biased low because the sampling reported data only up to ~2400 MPN/100 ml, and a large number of stations exceeded this limit. Fecal coliform measurements are very limited and some high concentrations are observed above Sacramento and in the San Joaquin Valley. *E. coli* values show some similarities with total coliforms, except that some of the highest values are found in the middle portion of the San Joaquin River. *E. coli* concentrations decline with proximity to the Delta. *E.Coli* concentrations in the Delta are somewhat higher than in the San Joaquin River and the Sacramento River, again indicating the importance of in-Delta sources.

[1] Coliform concentration data are reported as most probable number per 100 ml (MPN/100 ml) or as colony forming units per 100 ml (CFU/100 ml). The differences in units relate to differences in the analytical methods used. However, the numerical values are generally correlated, and for the purpose of this chapter, data with either unit will be used interchangeably for maps and plots. For the Natomas East Main Drainage Canal, where measurements of total coliforms using both methods exist, the data show a good correlation ($r^2 = 0.65$).

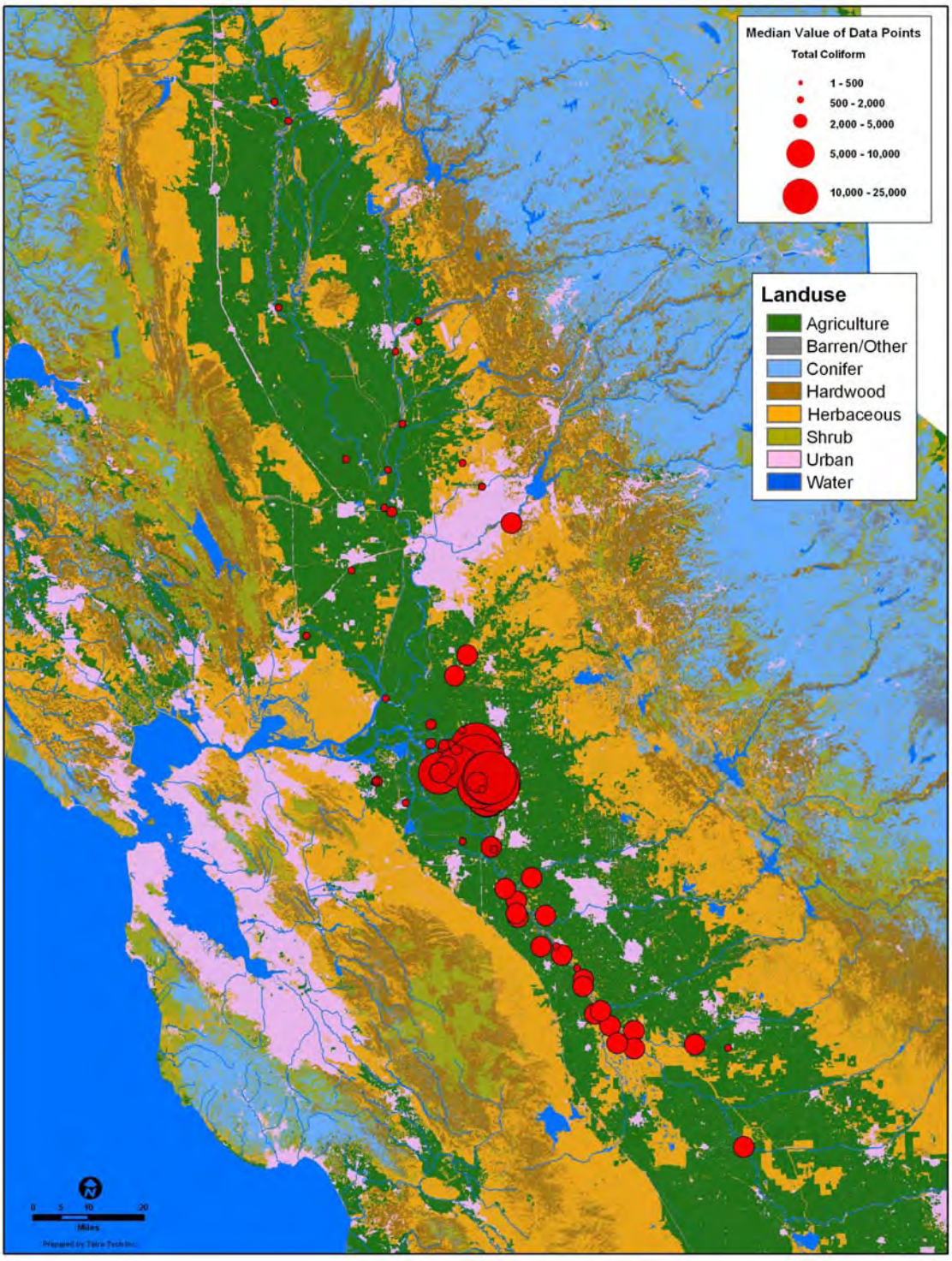

Figure 3-1. Total coliform concentrations in the Central Valley and Delta.

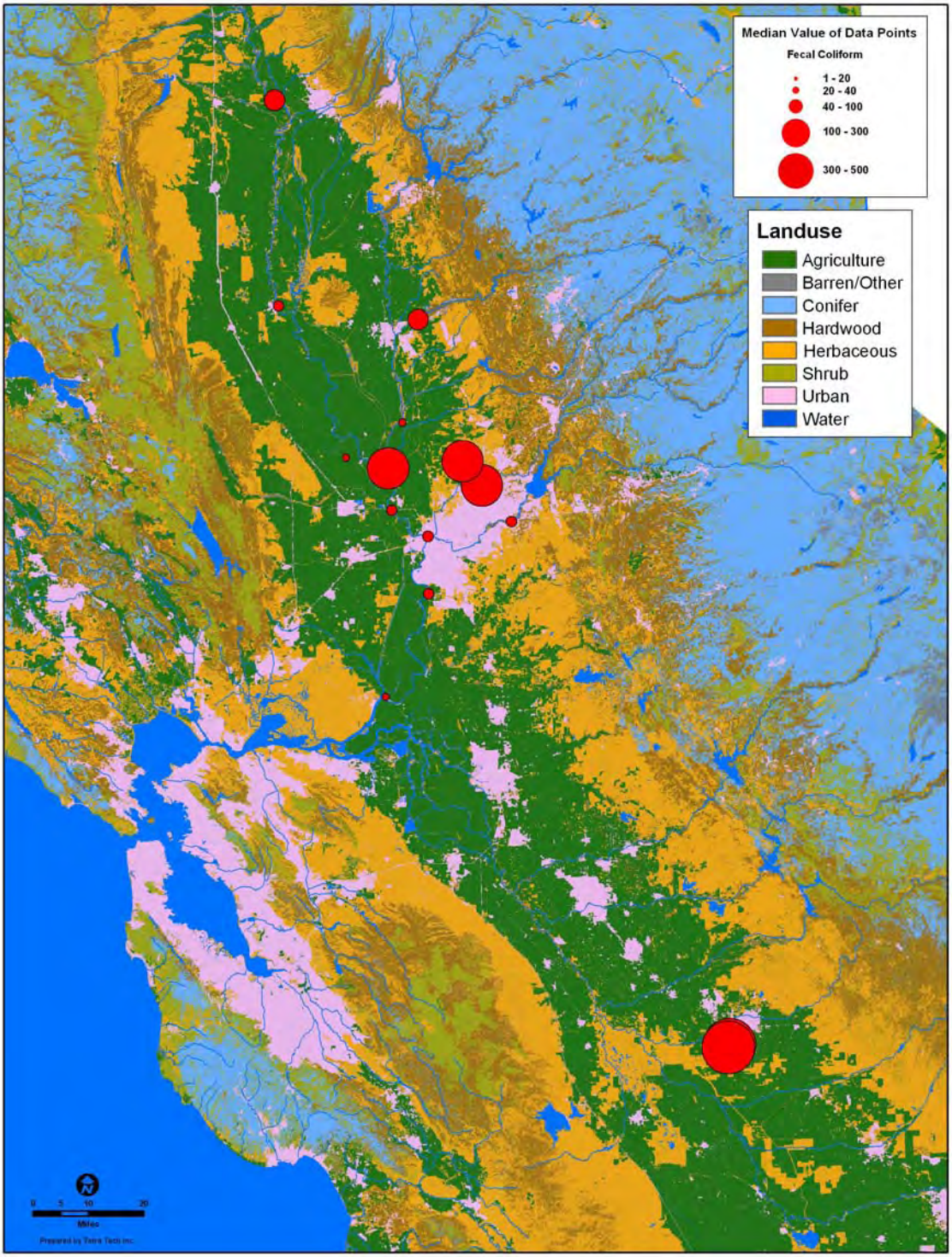

Figure 3-2. Fecal coliform concentrations in the Central Valley and Delta.

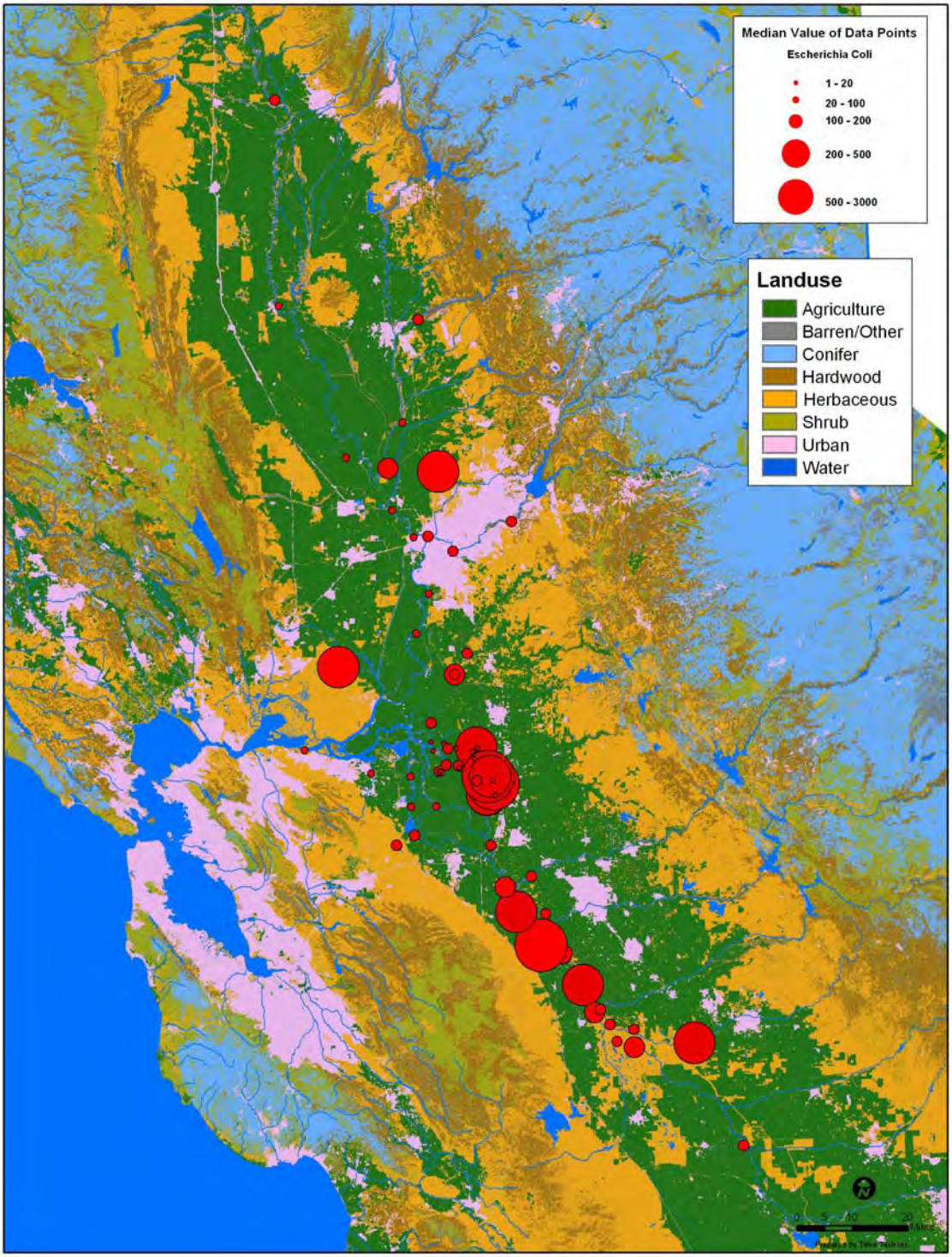

Figure 3-3. *E. coli* concentrations in the Central Valley and Delta.