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Development of a Guidance Document for Applying Sound Statistics for Microbial Data Associated with Reclaimed Water Systems

Principal Investigator:

V. Jody Harwood, *University of South Florida*

Audrey Levine, *US Environmental Protection Agency*

Gordon Fox, *University of South Florida*

Cash Contributors (in addition to the Bureau of Reclamation):

State Water Resources Control Board (CA)

Document Title: Collecting, Exploring, and Interpreting Microbiological Data Associated with Reclaimed Water Systems: A Guidance Manual

Objectives

This project developed a guidance document for applying sound statistical approaches for microbiological characterization of reclaimed water including study design, sampling limitations, data management, data interpretation, and data communication. A systematic approach for statistical interpretation of microbiological water quality that is tailored to the reclaimed water community is presented here, with explanations and examples that will be easily accessible to end users.

Highlights

This manual represents a straightforward approach for statistical analysis of microbial data using a series of examples that are directly relevant to water reclamation. The manual introduces descriptive statistics and then describes basic concepts such as calculating log-reduction and dealing with data sets that include non-detected values. Sources of error and the use of careful study design to facilitate data interpretation are discussed. The manual also provides insight into the significance of "significance". The importance of power analysis in designing and interpreting studies is presented using a series of examples. An overview of hypothesis testing is provided with examples of using paired and unpaired data, univariate and multivariate analysis of variance, correlation analysis, and binary logistic regression.

Impact

This guidance manual was developed to provide users with a context for collecting, exploring, and interpreting microbiological data associated with reclaimed water. Basic concepts are presented to facilitate collection of meaningful information with an emphasis on design of sampling programs, data interpretation, and statistical analysis. The information provided here can help with routine monitoring programs and design of studies for detailed microbiological investigations. The examples and illustrations provided in this document are intended to help the reader tackle a range of microbial investigations associated with reclaimed water facilities. The tools provided herein will facilitate comparison within and among reclaimed water facilities, allow a better understanding of microbial water quality, and ultimately facilitate risk assessment efforts and the safeguarding of public health.