

STATISTICAL TECHNIQUES FOR TREND AND LOAD ESTIMATION

Facilitator

Dave Lorenz, U.S. Geological Survey

Presenters

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Biographical Sketches

Dave Lorenz is a hydrologist with the USGS. He has a B.S. in Civil Engineering from the University of Minnesota and has authored or co-authored several reports on surface water and water quality. He is the coordinator for the weeklong class the USGS sponsors on which this workshop is based.

Tim Cohn is currently a hydrologist in the USGS Office of Surface Water, has co-authored more than 25 papers on methods for estimating flood risk and other topics. He previously served as USGS Science Advisor for Hazards, where he helped coordinate USGS programs that apply science to the challenge of reducing the Nation's vulnerability to natural hazards. As the American Geophysical Union's 1995-96 AAAS Congressional Science Fellow, he served as legislative assistant to Senator Bill Bradley on issues related to energy and the environment. Tim holds M.S. and Ph.D. degrees from Cornell University and a B.A. from Swarthmore College.

Skip Vecchia is a statistician with the USGS. He received a Doctorate in Statistics from Colorado State University and has authored or co-authored over 40 journal articles and technical reports relating to stochastic hydrology or statistical time series analysis.

Short Course Description

The course will present general statistical concepts, data requirements, and specific examples for computing trends in concentrations of chemicals in the environment and loads of chemicals in river systems. The computer programs ESTREND, QWTREND, and LOADEST – developed by USGS and available to the public at no cost – will be described. At the time of the course, ESTREND and QWTREND will be available to be downloaded from a USGS web site and LOADEST is expected to be similarly available within a few months.

Topics to be covered include:

- Basic statistical concepts of trend and load estimation
- Principles for design of environmental monitoring networks that will produce data suitable for trend or load estimation;
- Methods for dealing with non-linearities and censored values;
- Real-world examples of the application of statistical tools to environmental issues:
 - Using ESTREND to detect monotonic trends in nutrient data.
 - Using QWTREND to analyze streamflow-related variability, detect non-monotonic trends, and determine efficient sampling designs for monitoring trends in concentrations of major ions and nutrients.
 - Using LOADEST to compute unbiased estimates of nutrient loads and evaluate statistical uncertainty of the estimated loads.

Attendees who have a basic understanding of statistical techniques will benefit most from the course. Advanced training in statistics or in software development and programming are not required. The course will include ample time for questions and discussion. Attendees will come away from the course with an awareness of the potential use and application of the statistical techniques and an appreciation for the data required to apply them. Attendees will receive copies of course materials, including information about where and how to obtain the software. Due to time constraints and a relatively large number of students, hands-on application of the statistical packages will not be offered. Additional in-depth training is likely to be necessary prior to actual use of the software.