Statistics for Environmental Science and Management

Bryan F.J. Manly
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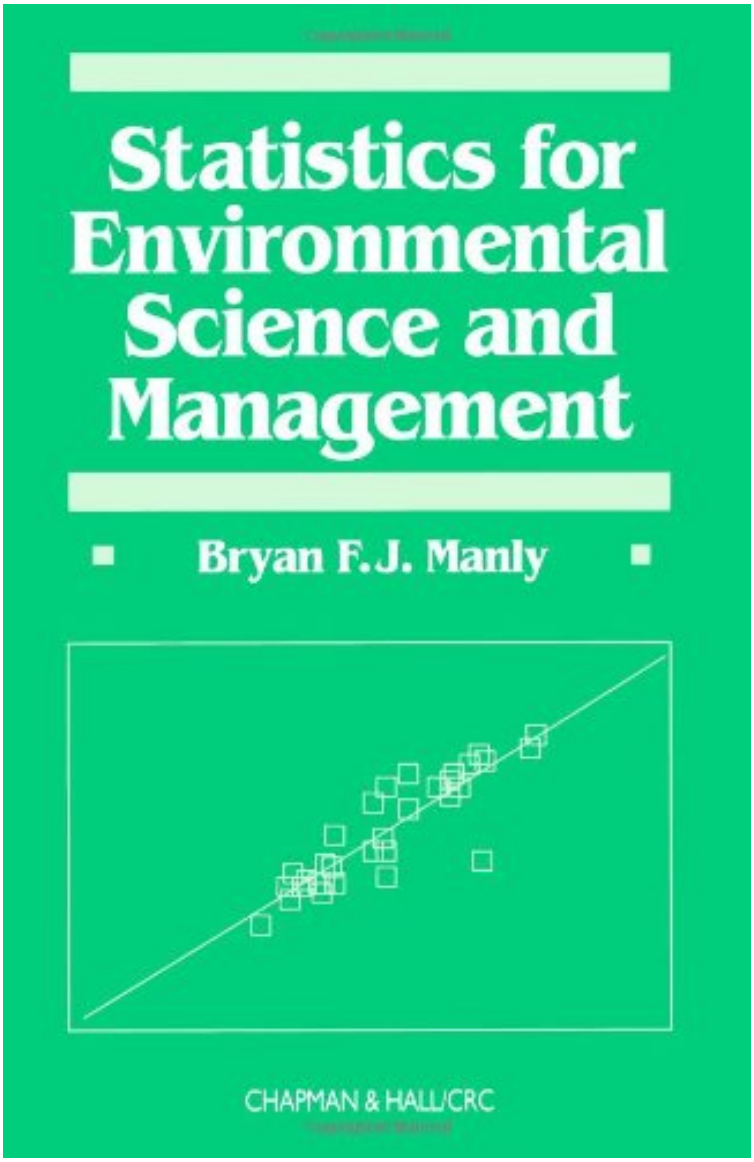

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Bryan F.J. Manly : Statistics for Environmental Science and Management before purchasing it in order to gage whether or not it would be worth my time, and all praised Statistics for Environmental Science and Management:

27 of 27 people found the following review helpful. well written applied bookBy Michael R. ChernickBryan Manly has written several very nice elementary texts on statistical design and methodology for both statisticians and practitioners. He has introduced permutation, bootstrap and Monte Carlo methods in one of his bestselling books.This text is designed to introduce the statistical methodology that is most used in environmental problems. It is intended for

the practitioner and assumes little mathematics and only the very basics of probability and statistics. He makes the text self-contained by including an Appendix A that covers basic summary statistics, confidence intervals and hypothesis testing.The book starts off with an overview of the role of statistics in environmental science and includes a number of real examples including the Exxon Valdez oil spill.Chapter 2 covers the standard survey sampling techniques and includes unequal probability sampling that is specialized to sampling proportional to size (a very common technique with environmental data). The approaches are clearly explained along with the reasons for their use. Formulas for estimation of population means and the estimates of the variances of these estimators are provided.Manly then provides in Chapter 3 on "Models for Data", descriptions of various discrete and continuous probability distributions along with their statistical properties. He carefully chooses those commonly used in environmental statistics (commonly called environmetrics these days). He then goes on to discuss linear regression, analysis of variance and generalized linear models.Chapter 4 "Drawing Conclusions from Data" is rather unique. He talks about the difference between observational studies and experiments and also describes quasi-experiments where treatments or interventions are placed on an existing process and changes are looked for at the time of intervention. He also introduces randomization (also called permutation) methods and the bootstrap. He looks at randomization for hypothesis testing and the bootstrap for confidence intervals. The bootstrap percentile t method is illustrated to obtain an approximate 95% confidence interval for the distribution of chlorophyll-a concentrations in 25 lakes. The data is very non-normal and hence bootstrap analysis is more suitable than applying the normal approximation intervals. Other interesting topic in this chapter include meta-analysis, Bayesian methods and multiple testing issues.Chapter 5 deals with environmental monitoring where change-points can be detected through various types of control charts. Each technique is illustrated with several real examples.Chapter 6 deals with impact assessment where before-and-after control impact designs are decribed. In these designs a site is chosen for an intervention and another similar site is picked for a control. The process is charted for both sites from before and after the intervention. Various designs are given along with examples.Chapter 7 deals with the assessment of site reclamation. Here the tricky topic of bioequivalence is explained very well including the sometimes confusing two one-sided t tests due to Schuirmann. Software packages to perform these tests including EquivTest and PASS are mentioned. The package nQuery produced by Statistical Solutions the company that also distributes EquivTest provides sample size determination for equivalence testing.Time Series analysis is introduced gently in Chapter 8. Manly concentrates on simple useful models and provides tests for serial correlation including the Durbin-Watson test.Especially important in environmental analysis is the analysis of spatial data. This is also covered rather gently in Chapter 9 concentrating on Kriging methods and the variogram in the examples.The remaining two chapters cover censored data and Monte Carlo Risk Assessment. By censoring Manly means that the values are truncated if they are above the upper limit of the measurement device (right censoring) or they are left censored if the measurement is below the smallest scale unit. In survival analysis, these same concepts are applied, but refer to time to event data where right censoring predominates. In the Monte Carlo Risk Assessment Chapter, Manly describes two software packages that provide add-ons to spreadsheets to do the Monte Carlo repetition within the spreadsheet and provide sumamry information using bar charts and tables from the spreadsheet software itself. This is a macro-type application in a spreadsheet. Manly illustrate the results for one example using one of these tools.This book is an excellent reference and could also be used for an introductory course either undergraduate or graduate. However as a text it does not contain any homework exercises.A nice feature is a summary reminder of the important points covered in each chapter. In each chapter these points are listed as bullet points in the last section titled "Chapter Summary".Sometimes when studying time series for environmental factors, we are interested in minimum or maximum levels(or extreme order statistics). Maximum levels are important when looking at exposure to pollutants. For climate changes we might be interested in the minimum or maximum temperatures observed in a particular region. Manly uses data on minimum temperatures in Uppsala Sweden during the month of July for the years from 1900 to 1981. He uses a runs test to see if the behavior is random versus the alternative of an increasing trend.More detailed analyses of these extreme order statistics can be done based on the asymptotic theory for extremes for stationary stochastic processes. Such material can be found in specialized texts such as the one by Leadbetter, Lindgren and Rootzen that Manly cites.Environmental statistics has been a topic of research since at least the early 1970s. Back then, I was doing my thesis on extreme values based on research work to control pollutants, particularly those emitted from automobiles. There is now a wealth of research articles, particularly on spatial data analysis (which is also studied for geological or astronomical applications). Manly's book is the first statistics text that provides a good overview of environmetrics. He also has references to the related specialized journals that cover it including the Journal of Agricultural Biological and Environmental Statistics that he edits. Chapter 12 is a brief one page summary where Manly describes general references including the Encyclopedia of Environmetrics and the Handbook of Statistics Volume 12 Environmental Statistics. There he also speculates on future research directions.An excellent text on spatial data analysis is the text by Noel Cressie that Manly does not cite.1 of 2 people found the following review helpful. Great book for environmental statisticiansBy VitabuAn excellent book for a college level environmental statistics course and for practising environmental scientists as well as statisticians.

The use of appropriate statistical methods is essential when working with environmental data. Yet, many environmental professionals are not statisticians. A ready reference guide to the most common methods used in environmental applications, Statistics for Environmental Science and Management introduces the statistical methods most frequently used by environmental scientists, managers, and students. Using a non-mathematical approach, the author describes techniques such as: environmental monitoring, impact assessment, assessing site reclamation, censored data, and Monte Carlo risk assessment, as well as the key topics of time series and spatial data. The book shows the strengths of different types of conclusions available from statistical analyses. It contains internet sources of information that give readers access to the latest information on specific topics.The author's easy to understand style makes the subject matter accessible to anyone with a rudimentary knowledge of the basics of statistics while emphasizing how the techniques are applied in the environmental field. Clearly and copiously illustrated with line drawings and tables, Statistics for Environmental Science and Management covers all the statistical methods used with environmental applications and is suitable as a text for graduate students in the environmental science area.

A former faculty member who has written books for environmental science and now a statistician for an environmental consulting company, the author knows the needs of environmental environmental scientists. He also knows how to effectively present methodology to his audienceOverall, this book has a huge variety of topics and numerous examplesa great and inexpensive library addition for statisticians and environmental scientists who analyze environmental data.- Technometrics, May 2002This book will do much to promote good statistical practice in environmental matters, an area of worldwide concern. -Short Book s of the ISI, Vol. 21, No. 2, August 2001It assumes little previous statistical training, and aims to take the reader from basics through the middle ground of modelling and inference to deliver a grounding in advanced techniques appropriate for the specific audience.covers a remarkably broad range of topics for its sizetext is commendably clear, describes the objectives as well as the mechanics of particular analyses, and points out some logical difficulties that no amount of statistical wizardry can overcomeprovides a clear overview of many statistical techniques, and ample references to further readingit serves its purpose well.--D. Elston, Biometrics, June 2001