Workshop for Hyatt Regency Coconut Point, Bonita Springs, Florida, 2022 FLMS Conference

Tuesday – August 30, 2022 – Full Day Workshop: 8:15 am – 4:15 pm

Trend and Time Series Analysis with R

Dan Schmutz, M.S., Chief Environmental Scientist, Greenman-Pedersen, Inc.

Description:

The open source statistical software environment R is an amazing tool for solving a wide range of trend and time series data problems. Environmental science datasets often have a temporal component (e.g., daily or monthly time-stamped lake levels, rainfall, nutrient concentrations, etc.), so proper use of trend and time series methods is needed to display and model field-collected data. These methods can be used to succinctly describe the components of a time series (i.e., trend, seasonality, and noise), to characterize the relationships between multiple variables, and to forecast the dependent variable of interest into the future.

This full day workshop takes a deep dive into analysis of time series data in R including preparation, visualization, assumption evaluation, statistical testing, and modeling. This class is ideal for users with some previous exposure to R, but beginners are welcome too. Teaching methods will touch on both concepts and techniques, with an emphasis on implementation in R. We will send instructions for installing the free programs R and RStudio prior to the workshop, along with suggested practice exercises for beginners to get up to speed. Please bring your laptop, if possible, as the workshop will include a hands-on portion.

Topics:

- Objectives of time series analysis
- Characteristics and challenges of time series data and analysis techniques
- Time domain versus frequency domain
- Exploratory data analyses
- Decomposition into trend, seasonality, and noise
- Change point detection
- Trend tests (parametric, nonparametric, and including exogenous variables)
- Modeling and forecasting
    - regression models
    - autoregressive integrated moving average models (ARIMA)
    - machine learning approach using random forest

Instructor:

Dan Schmutz, M.S., is the Chief Environmental Scientist and a Vice President for Greenman-Pedersen, Inc. (GPI), a 1,600-person multidisciplinary consulting firm. He has over 25 years of professional experience focused on the development and application of ecological and hydrological assessments, GIS analyses, and appropriate statistical techniques for addressing questions of interest to water resource managers.