

Maintaining South Florida's Water Quality with Minitab

Coastal and river waters are critical to Florida's economy, providing jobs via recreation, fishing, and tourism. Protecting those waters helps safeguard Florida's economic health, but effective environmental management decisions need to be based on sound research. The Southeast Environmental Research Center (SERC), located on the main campus of Florida International University, unites researchers from a variety of disciplines to conduct scientific investigations in threatened environments of South Florida and the southern United States.

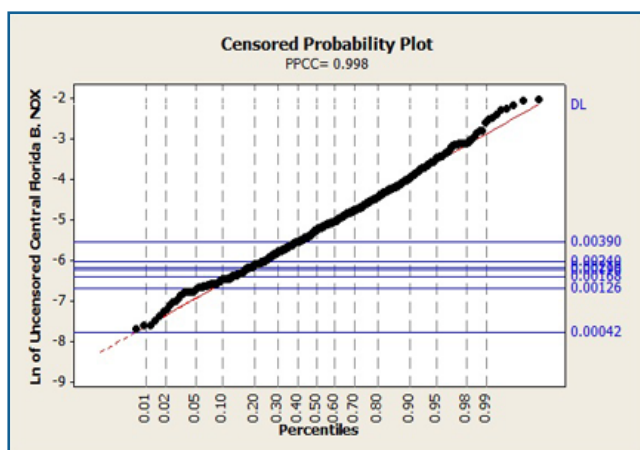


The Southeast Environmental Research Center used Minitab Statistical Software to analyze years of water quality data from South Florida waterways, like Marathon Island in the Florida Keys, pictured above.

The center's research projects in Biscayne National Park, Big Cypress National Preserve, Everglades National Park, Florida Bay, the Florida Keys and the Florida Keys National Marine Sanctuary have provided a basis for management decisions for sustaining these fragile resources. Combining data from all of the center's projects gave the researchers an opportunity to develop a unique, high-level view of conditions throughout South Florida waterways—but joining and analyzing 20 years worth of water quality data collected from hundreds of water monitoring stations was a major challenge. They needed to understand what their enormous wealth of data revealed about the health of Florida's waters. For that, SERC's researchers trusted Minitab Statistical Software.

Creating this overview of Florida's waterways was part of a National Park Service initiative to support the Florida Department of Environmental Protection and the U.S. Environmental Protection Agency to develop

numeric water quality criteria for the protection of aquatic life and human health. Years of data monitoring had already provided some insights into the relationships between water nutrient levels and pollution—for example, increased levels of nutrients, such as phosphorous and nitrogen, produce rapid algae growth. Rapid algae growth makes waters cloudy and depletes oxygen from the water column, causing fish populations to die-off. SERC researchers wanted to investigate further and find exactly what nutrient levels would trigger unwanted algal blooms in South Florida waters.



A Minitab Censored Probability Plot of the pollutant NOx present in the Central Florida Bay made it easy for SERC researchers to see how contamination levels changed over time.

Dr. Henry Briceño, FIU research associate and Principal Investigator at SERC, led the project. He and his team faced the task of analyzing literally millions of data points with samples collected from 350 stations across South Florida.

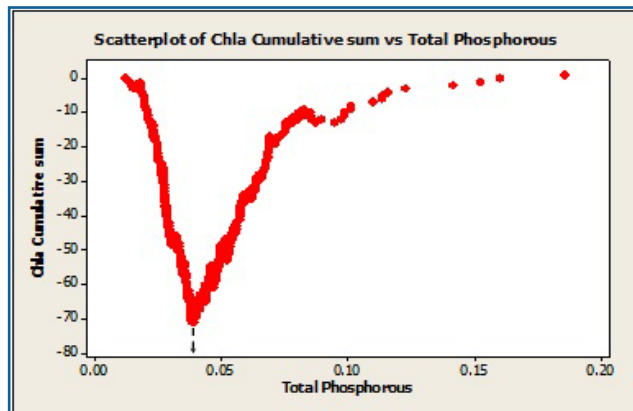
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specific variables. SERC was then able to group monitoring stations into different “water types” and make detailed maps of their geographical distribution. With the water bodies classified, the concentration levels, or thresholds, of phosphorous and nitrogen that would cause deadly algal blooms to thrive were assessed for each water type. This was achieved by plotting cumulative sum charts of chlorophyll-a along nutrient gradients in Minitab. These charts made it easy for researchers to quickly read the threshold levels directly without further analysis.

SERC researchers were able to formulate innovative methodologies to derive protective nutrient criteria for each individual water body. The knowledge gained from FIU and SERC studies and their Minitab analysis will help scientists

plan for continual conservation and restoration. Best of all, the information learned in South Florida can be beneficial for scientists working to correct pollution all over the world. These methodologies are currently under consideration for widespread use by the United States Environmental Protection Agency.

Dr. Briceño says this project has shown that South Florida water quality is excellent, and much of that has to do with a consistent focus on research to protect these critical natural resources. And when it comes to the data collection and analysis that underlies that research, “Minitab has provided us priceless tools to improve our craft,” Briceño says.



Minitab Cumulative Sum charts helped SERC researchers easily identify threshold levels of phosphorus and nitrogen that cause deadly algal blooms to grow.

Dr. Hesel's macros are freely available online at www.practicalstats.com/nada.