

# STATISTICAL SIGNIFICANCE

*The environment is an enormously complex system. There is an endless number of variables, along with randomness, natural variations, and complicated interactions. Statisticians are essential to sorting through this complexity and uncertainty. Working with scientists from many disciplines, statisticians identify and quantify trends and influences to make projections.*

## Environmental Monitoring

**ECOLOGY:** Ecologists study the relationships of organisms to each other and their environment. Statistical methods in ecology help establish those relationships and determine when they change in our ever-changing world. For example, organisms from plankton to trees absorb atmospheric carbon related to global warming, and statistical models help understand these relationships and make predictions. Part of any prediction is an understanding of the uncertainty involved, where statistics plays a vital role.



**CLIMATE CHANGE:** Research on climate change depends on both sophisticated methods of data collection to monitor the current state of the Earth's climate and complex climate models to project future climate change. Statistical methods, especially time series analysis and spatial statistics, are essential to assessing inherent measurement error and uncertainties in calculating the effects of human intervention on current and future climate change. For determining action, statistical decision theory informs policy decisions on how to respond to the threat of serious adverse effects of future climate change.

**MONITORING NATURAL RESOURCES:** Statisticians play a critical role in the evaluation of the nation's natural resources through the design, implementation, and analysis of ongoing, systematic surveys such as the U.S. Forest Service's Forest Inventory and Analysis, the EPA's National Aquatic Resource Surveys and Environment Monitoring and Assessment Program, the many programs of the U.S. Department of Agriculture's National Agricultural Statistics Service, and the integrated work of independent organizations such as the National Ecological Observatory Network. The results of such surveys and studies drive state and national policies regarding agricultural and natural resources and provide critical input for deliberations regarding national and international responses to issues



such as pollution regulation, biological conservation, and climate change.

### POLLUTION REGULATION AND ENVIRONMENTAL HEALTH:

To protect the population from unsafe levels of pollutants in water, air, or soil, pollution standards and regulations are set by local governments throughout the country and world. Statisticians work closely with environmental scientists to assess pollution levels, health scientists to provide accurate and reliable estimates of human exposure and associated health effects, and policymakers to predict outcomes of proposed changes in policy.

"Statistics Monitors the Environment" is part of Statistical Significance, a series from the American Statistical Association documenting the contributions of statistics to our country and society. For more in this series, visit [www.amstat.org/outreach/statsig.cfm](http://www.amstat.org/outreach/statsig.cfm). The American Statistical Association is the foremost professional society of statisticians, representing 19,000 scientists in industry, government, and academia: [www.amstat.org](http://www.amstat.org). This Statistical Significance was produced under the supervision of the ASA Section on Statistics and the Environment.