Methods for visualising complex water quality data

Michael John Silberbauer, August 2009

Thesis presented for the degree of Doctor of Philosophy in the Department of Zoology, University of Cape Town.

The quality of South Africa's over-stretched water resources is a matter of concern, and access to the data is essential. Visualisation has cognitive benefits for the presentation and interpretation of these data, and judicious use of visual methods can help in assessing the quality of their water and deciding on remedial measures. Four visual methods developed in this study for summarising, interpreting and communicating government water quality data are multivariate time-series inventory plots of sampling frequency and data; radial multivariate map symbols; a 3D-globe-based spatially referenced inventory of water quality data; and summary plots of mass transfer in rivers. Also discussed is the use of visual methods in communicating results of biomonitoring of the ecological status of rivers to a wide audience. Methods included geographical information system scripting and extensible markup language generation for Google Earth. Visual summaries proved to be of great value in perceiving the content, layout and meaning of large water quality data sets, and for placing the results in context. Some methods are applicable within the scientific community and others more suited for communicating outside the narrow water quality field. In general, our understanding of the human aspects of effective visual communication of water quality status has not kept pace with the remarkable advances in the technology, remaining largely intuitive and providing a variety of opportunities for further inter-disciplinary research. Many South Africans do not have access to the Internet, so an important area for development in the continuing democratisation of water information communication will be the use of more pervasive and affordable technology, such as the cellular telephone network.