

How Ecologists “Visualize” Research Results in Publications: VISTAS Project Ecology Journal Survey

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Introduction and Objectives

The VISualization of Terrestrial-Aquatic Systems (VISTAS) Project brings together computer scientists, social scientists, and ecologists to develop visualization software to determine which visualizations are effective for which audiences and for which purposes. To inform VISTAS’ scientists and software developers of how ecologists currently use visualization, we surveyed six months (July-December 2011) of articles from eight peer-reviewed ecology journals.

Our objectives were to: 1) create a database of visualizations and evaluate their use in print journals, 2) enumerate types of visualizations most often used and define *visualization of interest* [to VISTAS], 3) identify software and visualization centers that help ecologists create visualizations, and 4) analyze the frequency in print journals of *visualizations of interest* by field (e.g., hydrology, atmospheric science, general ecology).

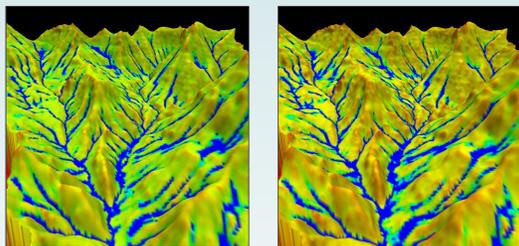


Fig 1: VISTAS 3-D hydrology animation. Soil moisture 3/2/1994 & 3/10/1994. High values are blue, low values are red.

Methods

Data were collected for each article and each visualization was classified as a subtype (graph, map, photograph, illustration, etc.). Further information was recorded for visualizations that were considered of interest to VISTAS. The following characteristics were noted: dimensionality, axis labels, scale (e.g., time, meter, plot, basin), time-series, color, etc. We also recorded the figure numbers and captions, and how the visualization was created. VOIs were characterized as *natural, conceptual and/or actual phenomena*.

To achieve a definition of VOI, qualitative information on the visualizations was recorded, e.g., *phenomenon visualized, author’s point*. Visualizations considered outstanding, novel or similar to VISTAS visualizations were marked for further review.

Preliminary Results

Our survey *inductively* developed our working definition of a *visualization of interest* (VOI) by looking at almost 25,000 visualizations. Table 1 shows the percentage of articles per journal containing a VOI. We observed that journals for hydrology and ecosystems were more likely to contain VOI.

Journal	Proportion (%) of articles per journal containing 1 or more VOI
Water Resources Research	20%
Ecosystems	19%
Journal of Hydrology	11%
Canadian Journal of Forest Research	9%
Boundary Layer Meteorology	7%
Agriculture and Forest Meteorology	6%
Atmospheric Environment	4%
Ecology	2%

Table 1: Journals listed from most to fewest percentage of articles with VOI. Future work will analyze whether and why certain fields of ecology are using visual analytics and visualizations similar to VISTAS’.

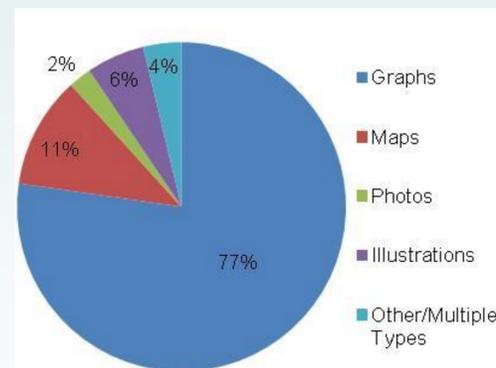
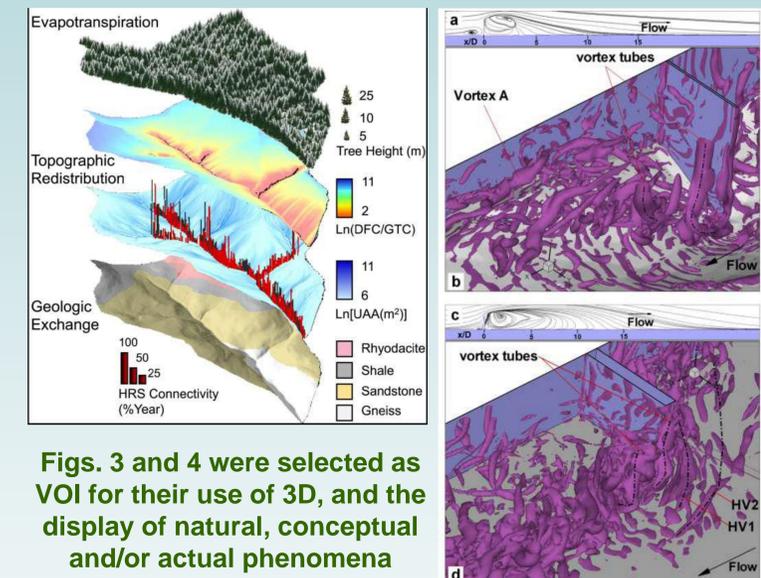


Fig. 2: What types of visualizations did we encounter during our survey?

Visualizations of Interest Examples

A visualization of interest (VOI): is 3-D; attempts to show multiple time or spatial scales; represents a natural phenomena; has color carrying information; has extruded volume; includes two or more spatial or temporal scales; is a comparison of two models, or multiple representations of different possible physical realities, or comparison of modeled and actual realities; AND/OR is a computer simulation of what a person would see when looking at phenomena.



Figs. 3 and 4 were selected as VOI for their use of 3D, and the display of natural, conceptual and/or actual phenomena

Fig. 3 (left): From Jenco and McGlynn (2011) Water Resources Research Vol. 47

Fig. 4 (right): From Koken and Constantinescu (2011) Water Resources Research Vol. 47

Future Work

Future work on this project will include reviews of visualization at conference presentations and in computer science journals. At ESA 2012 we will conduct an in-situ experiment to determine if ecologists use different visualization types at conferences than in the print journals reviewed.

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For more information visit <http://blogs.evergreen.edu/vistas> or contact: judyc@evergreen.edu



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