Connecting Communities Through Data, Visualizations & Decisions
Visualization for Terrestrial and Aquatic Systems (VISTAS)

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Visualization of Terrestrial and Aquatic Systems
VISTAS the Team and Software

- NSF-funded collaboration between environmental-, computer-, and social-scientists, has integrated new technologies and computer science research into visualization software

- We overlay 2D data onto 3D elevation maps to better understand how complex terrain affects ecological processes

- Visualizing phenomena with VISTAS helps environmental scientists build better models and formulate new hypotheses and insights

This Project – Scientists & Decision Makers
Knowledge Co-Production

- Our collaborators use VISTAS to improve their own understanding of models and data, explain results to decision makers, and work with stakeholders to jointly produce knowledge

- We use social science methods to study how software developers, environmental scientists, and decision-makers work together to co-produce technology and visualizations

- We partnered with 3 projects: 1) climate change impacts at the local level, 2) salmon recovery on Native Lands, and 3) vegetation changes in the Great Basin

Challenge

We aim to address our collaborators' needs for easy-to-produce and effective visualizations of complex data sets:

- Climate change is a critical problem facing Earth; what tools can best understand and communicate impacts?

- How do negotiations between user needs and technological capacity shape tool development and implementation?

- How do tools impact scientific results and community responses to critical ecological challenges?

Approach

Social science approach:

- Case studies structured through comparative pre/post-test design: baseline, development, and post-assessment phases

- We ask: Does the technology impact scientific understanding and the ability to communicate science?

Computer scientists approach:

- Visualization research to develop software that enables effective presentation and knowledge co-production

- Technical support for environmental- and social-science collaborators as they design and create visualizations

Aboveground Biomass, Mg C/ha
300 / 225 / 150 / 75 / <5
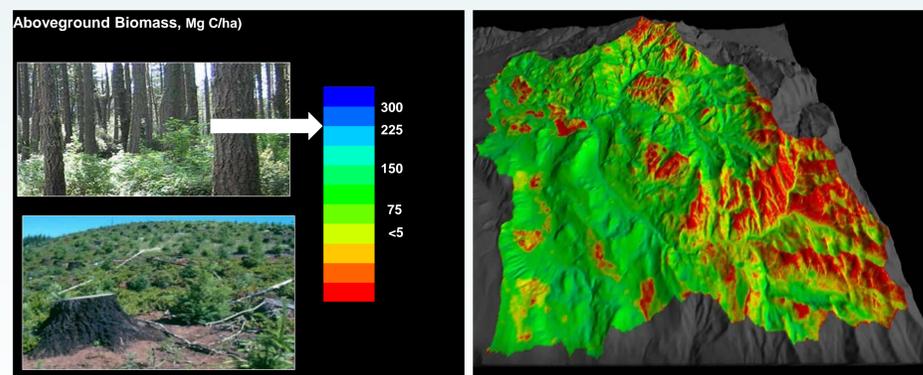
Left: forest biomass examples; Right: biomass visualized in VISTAS
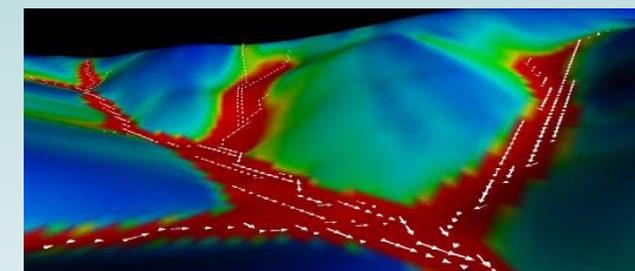
Major watershed flows, visualized in VISTAS using scaled vectors

Findings and impacts

Through social science inquiry, three main findings have emerged:

- Visualizations critical for communicating and understanding information for scientists and stakeholders

- Co-development between environmental scientists and software developers is a viable (and recommended) way to produce visualizations, and visualization software

- Participants have increased confidence in complex information after it was visualized

Impacts:

- VISTAS prototype software has allowed ecologists to display, examine, and explore data in new ways

Above: Decision makers & scientists meet to select climate impact models, a common example of stakeholder engagement among our collaborators