Visualizing Terrestrial and Aquatic Systems in 3D
Connecting Communities Through Data, Visualizations & Decisions

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About VISTAS

Grand challenge environmental science problems involve large data sets spanning multiple spatial and temporal scales, with complex, highly distributed, heterogeneous data. Visualizing natural phenomena helps scientists formulate new insights, tune models, and communicate results, but ecologists rarely use sophisticated visualization tools. Why not?

The **VISualization of Terrestrial and Aquatic Systems** (VISTAS) project, an NSF-funded collaboration among ecologists, computer scientists, and social scientists, has created software to help scientists better understand and communicate environmental science. VISTAS overlays 2D maps onto 3D digital elevation maps, emphasizing the landscape's topography and helping people recognize familiar landmarks and better understand the role complex topography plays in the ecology of the land.

Current Status

VISTAS focuses on 3D topographical visualizations over time and perspective. We superimpose measured or modeled variables as gridded or GIS data sets on digital elevation maps and allow scientists to view and interact with single frames, animations, or multiple images. Users can write new data plug-ins to accommodate new input formats. VISTAS does not use database technology

VISTAS software has been rewritten from C++ to Python and is freely available in the public domain. VISTAS 1.14 adds support for GeoTIFF data. Upcoming features include simple zonal statistics and Pandas functions for linear and multiple regression and PCA. Longer term users request a raster calculator, user contributed scripts, and data interface to Google Earth API.

https://github.com/VISTAS-IVES/pyvistas/releases/tag/1.14.0

Scientists & Decision Makers

VISTAS 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: climate change impacts at the local level, salmon recovery on Native Lands, and Great Basin vegetation changes. Images below elucidate concepts that collaborators believe are better conveyed using VISTAS than with prior tools.

VISTAS images remain the property of the person(s) creating them.

Hydro-Biogeochemical Processes
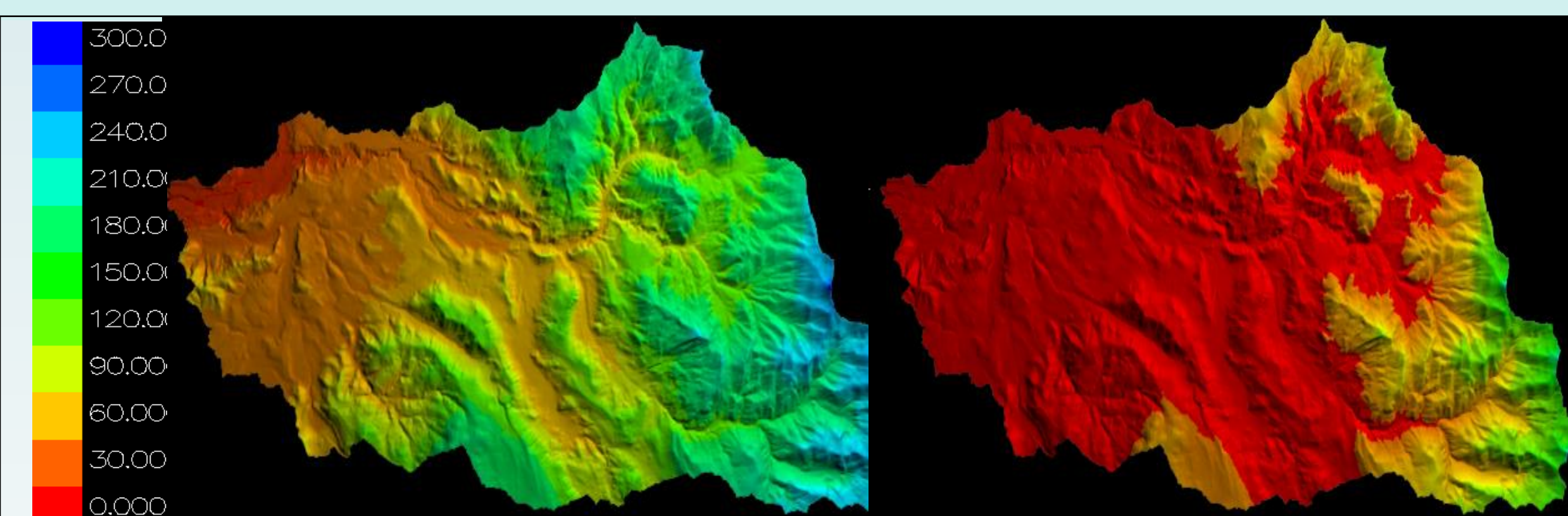


Mashel Watershed **Snow Depth (SWE)**
Feb 4 & 9, 1996
Begin & After Rain-on-Snow Event

VISTAS 3D stills help Bob McKane (EPA Corvallis) illustrate snow melt (above) and Forest Age consequent effects on stream hydrology & habitat. These and other visualizations are facilitating science-based decision support for Salmon Recovery Planning by Puget Sound tribes & communities. LandTrendr (data at right), R. Kennedy et al.

Mashel Forest Age Map Distribution 0 to ~150 yrs.
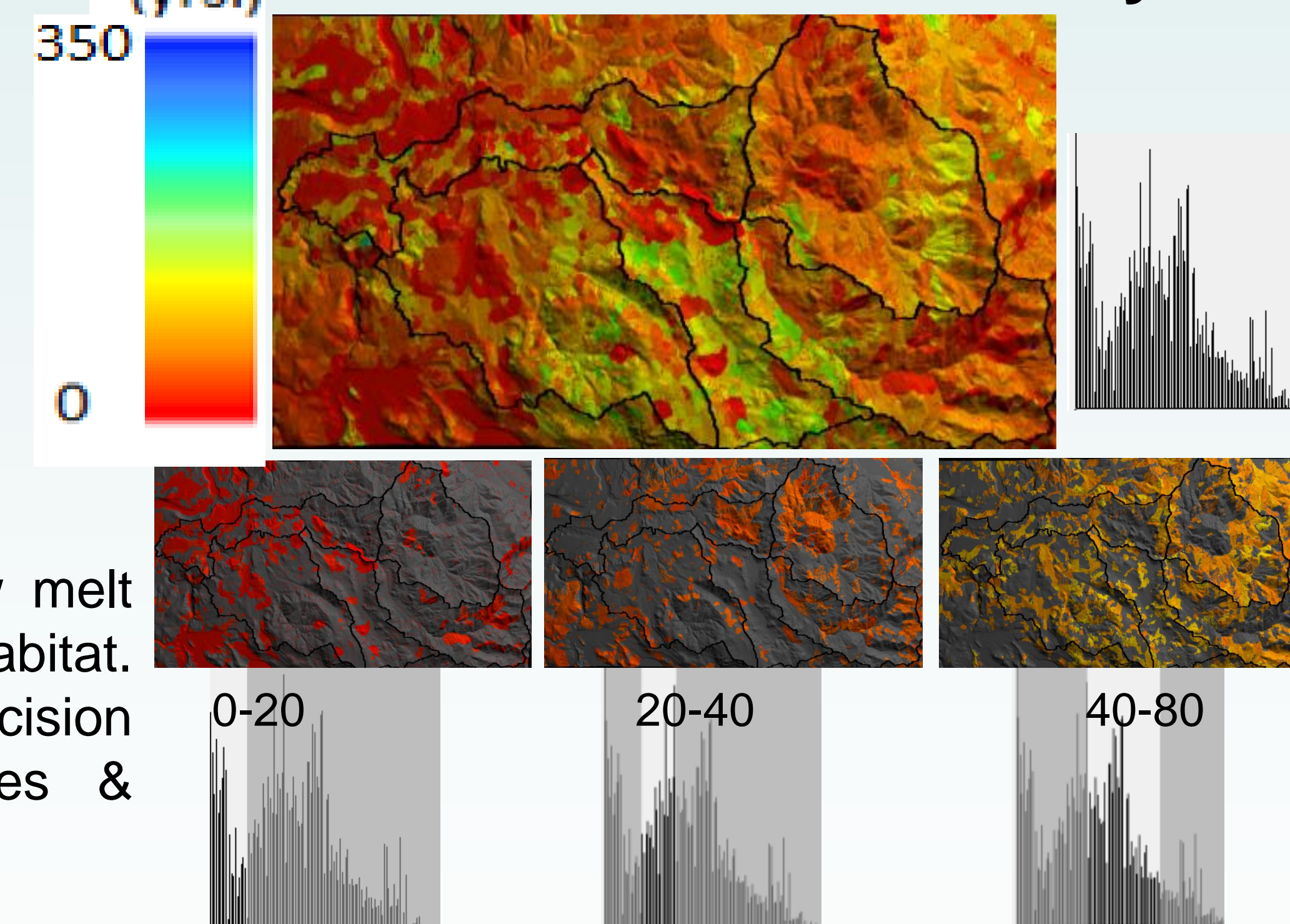
Alternative Land Use
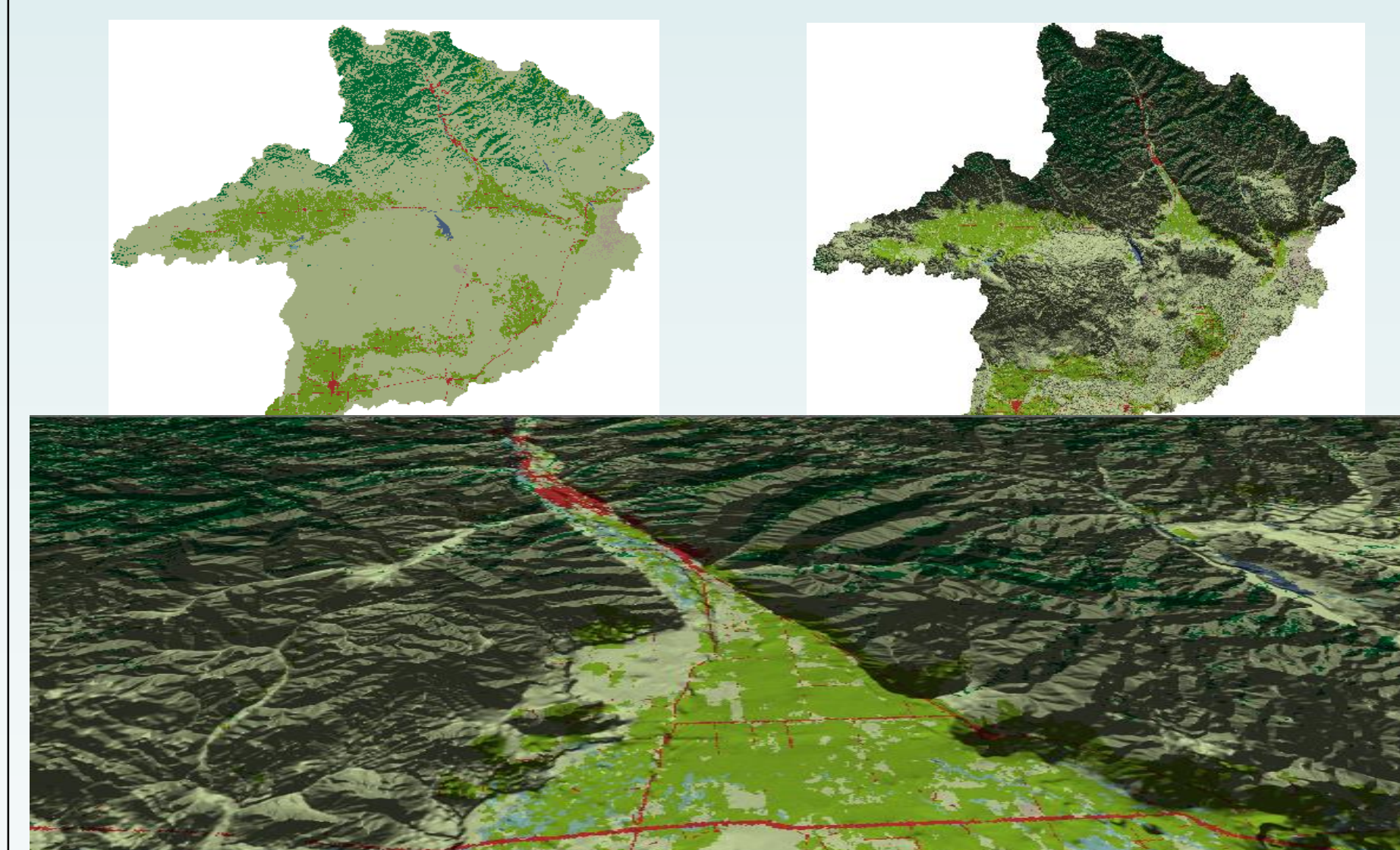

Vegetative Cover & Land Use Big Wood Basin, Idaho
Allison Inouye used VISTAS to show land use. Above (left) 2D image vs. (right) 3D image. Below: Still from VISTAS fly-through.

Social Science Inquiry

Findings:
- Visualizations critical for communicating & understanding information for scientists & stakeholders.
- Co-development is a viable and recommended way to produce visualizations and visualization software.
- Participants have increased confidene in complex information after it is visualized.

Impact: VISTAS has allowed ecologists to display, examine and explore data in new ways
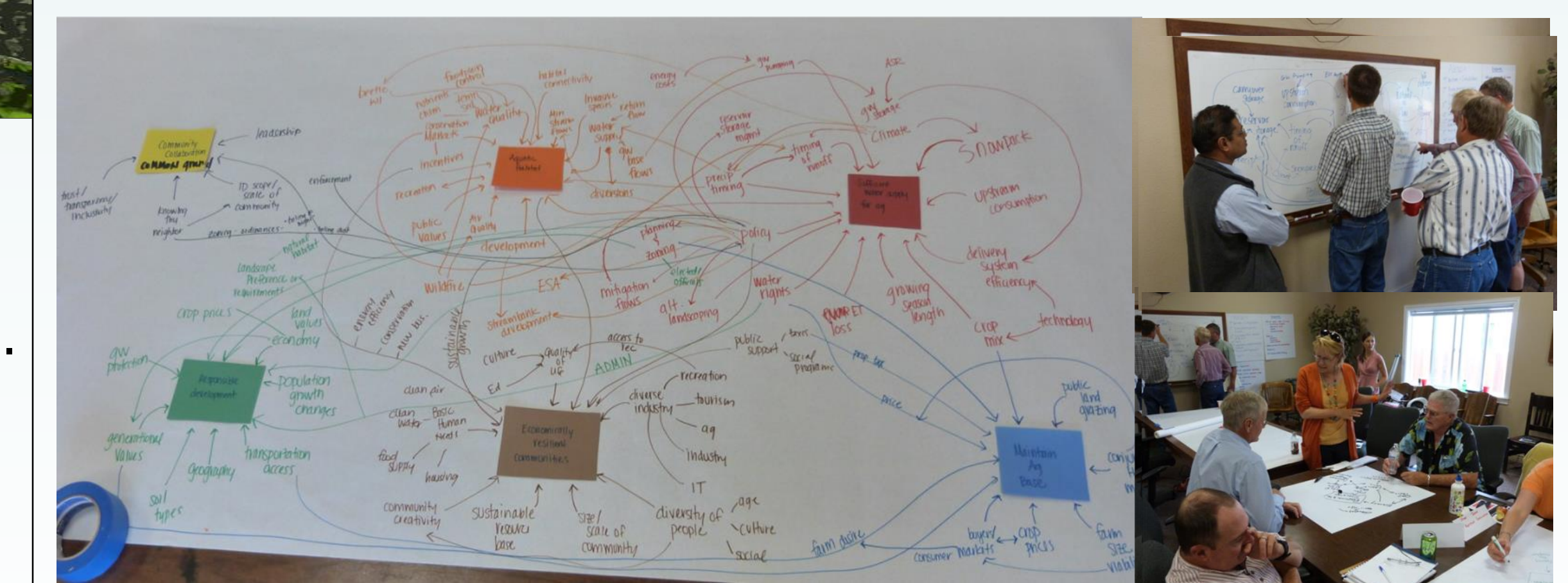
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