MODELING ECOSYSTEM SERVICE TRADEOFFS FOR ALTERNATIVE LAND USE AND CLIMATE SCENARIOS

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Scientists, policymakers, community planners and others have discussed ecosystem services for decades, however, society is still in the early stages of developing methodologies to quantify and value the goods and services that ecosystems provide. Essential to this goal are highly integrated models that can be used to inform policy and management strategies for entire ecosystems, not just individual components. We developed the VELMA ecohydrological model to help address this need. VELMA – Visualizing Ecosystem Land Management Assessments – links a land surface hydrologic model with a terrestrial biogeochemistry model in a spatially-distributed framework to simulate the integrated responses of vegetation, soil, and water resources to changes in land use and climate. Here we briefly describe watershed-scale applications of VELMA conducted in the Pacific Northwest and Chesapeake Bay. Our goal is to evaluate how alternative policy, land use and climate scenarios affect tradeoffs among ecosystem services – specifically, provisioning services (water; food; fiber), supporting services (cycling of water and nutrients; habitat for wildlife), regulating services (climate; peak and low flows), and cultural services (recreational and spiritual pursuits). Products of this work include (1) alternative-future scenarios capturing stakeholder-relevant choices and drivers of change; (2) a well-validated model for mapping production of ecosystem goods and services under current and projected conditions; and (3) stakeholder-friendly visualization tools for summarizing and communicating modeled ecosystem service tradeoffs for alternative decision scenarios. We discuss how these products are being applied in a participatory planning approach that integrates researchers, stakeholders and decision makers in the process of identifying drivers, ecosystem services of concern, and solutions for a more sustainable future. For example, can optimal "decision paths" be identified for restoring the ecosystem services needed to sustainably support communities dependent on resource-based economies and traditions, such as agriculture, forestry, and fishing?

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