

BUILDING AN ECOSYSTEM SERVICE TOOL TO SUPPORT RIDGE-TO-REEF MANAGEMENT AND CONSERVATION IN HAWAII

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Faced with increasing local and global anthropogenic stressors and declining ecological states, watershed and coastal managers are increasingly adopting a ridge-to-reef, and multi-objective approach. Attempts to shift towards an ecosystem-based management approach have raised opportunities and challenges, such as balancing multiple social-ecological objectives across linked terrestrial-marine systems. Hence, an ecosystem goods and services framing can help management efforts by: (1) operationalizing the concept of social–ecological systems, (2) identifying a range of complex tradeoffs, and (3) accounting for spatial and temporal dynamics across the system as a whole.

I will describe my lab's new research program focused on building a spatial ecosystem services-based decision-support tool for Hawaii. The tool can be used to (i) predict how land management will affect ecosystem services, (ii) map ecosystem service "hotspots", (iii) assess trade-offs between ecosystem services where improvement in one service leads to a decline in another, and win-win opportunities where managing one service will likely also improve another, (iv) devise cost-effective strategies based on ecosystem service-return-on-investment, and (v) facilitate stakeholder involvement in ecosystem-based management and spatial planning by translating science into human well-being terms.

We use mixed modeling methods to link landscape and seascape physical and ecological processes (erosion, hydrology, coral reef ecological dynamics, coastal wave dynamics) to ecosystem services delivery (sediment retention, water yield, groundwater recharge, nutrient retention, fish provision, cultural practices, recreational opportunity, storm protection). We apply economic and participatory valuation methods to assign value to modeled ecosystem services. We design management recommendations based on the models and valuation using trade-off analysis, which combines economic and decision-making theory.

Our pilot site comprises five watersheds in West Maui. Mauka side, residential and resort development is altering land cover, former plantation agriculture is in a state of transition, and protected forest resources are stressed by invasive plants and animals. Makai side, land based source pollutants, overfishing, recreational overuse, and climate change are

contributing to the decline of socially important and economically valuable coral reefs. The West Maui Ridge-to-Reef initiative seeks to restore the health and increase the resiliency of coral reefs and their associated services through integrated watershed management. This pilot research forms the building blocks for a tool that we ultimately intend to test and apply in other Pacific Island settings.