Using Portfolio Theory to Manage Climate-change Risk in Conservation and Environmental Management

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Abstract

Climate change is starting to have major effects on species, habitats, and ecosystem services across the globe. However, the scale of climate change and the spatial patterns of its effects are all highly uncertain. That causes problems for conservation agents because we do not know which places will be best for investments in conservation. This talk presents research from four papers that develop tools based on Modern Portfolio Theory (MPT) to guide conservation planning and help reduce conservation risk. The first paper develops the basic method and shows how assumptions regarding the likelihood of different future climate scenarios are critical to investment planning. The second paper explores sensitivity to how returns are measured, and shows that portfolio recommendations are robust to using a biophysical index instead of an economic measure of the value of conservation outcomes if, but emphatically only if, that index is a linear function of the true social value. The third paper presents a method for conservation portfolio analysis when decision makers only want to avoid downside (rather than symmetric) risk. The fourth paper develops a method to do fine-scale analysis in the face of limited information of the spatial pattern of ecological outcomes under different climate scenarios. The talk concludes with a discussion of next steps in the research agenda to make this research tool useful to conservation scientists and practitioners.