Managing Uncertainty in Decision Making for Conservation Biology

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7.5.2023

Abstract Science-based decision-making is the ideal. However, scientific knowledge is incomplete, and sometimes wrong. Responsible science-based policy, planning, or action must exploit our knowledge while managing our uncertainty. This paper describes the info-gap methodology to manage deep uncertainty surrounding knowledge that is used for decision-making in conservation biology. A central concept is "satisficing" which means "satisfying a critical requirement." Alternative decisions are prioritized by their robustness to uncertainty, while critical outcome requirements are satisficed. Robustness is optimized; outcome is satisficed. This is called "robust satisficing". A decision whose outcome is sub-optimal may be preferred over an outcome-optimal decision if the former is more robust for achieving acceptable outcome. Many biological conservation applications employ info-gap theory, considering parameter uncertainty but not uncertainty in functional relations. Info-gap models of functional uncertainty, widely used outside of conservation biology, are described and applied to a conservation problem. We discuss value of new information based on the robustness function, and the info-gap opportuneness function for seeking better-than-anticipated outcomes. The methodology is illustrated by analyzing the conservation of an endangered plant species.

Keywords conservation decisions; reproductive output function; uncertainty; info-gaps; robustness; decision methodology.

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