

Ecological resilience, robustness and vulnerability: how do these concepts benefit ecosystem management?

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Abstract

Ecosystem management is beset with potentially confusing terminology over the use of resilience, robustness and vulnerability. Here, we distinguish these concepts, discuss their operationalization, and identify the objectives that each is suited to. Resilience is useful when ecosystems risk losing the ability to recover and requires system modelling. Vulnerability can either be quantitative, measuring the ability of a system to remain above a critical threshold, or qualitative and used to evaluate the exposure of a system to disturbance and attributes that confer adaptive capacity and sensitivity to disturbance. As such, vulnerability is well-suited to assessments of coupled social-ecological systems. Robustness measures the ability of a system to maintain itself within a narrow range of function and is ideally suited to problems that require careful setting of upper and lower bounds for system properties, such as optimal fisheries yield.

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