INVITED STRATEGIC ARTICLE

A primer on choosing goals and indicators to evaluate ecological restoration success

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Abstract

We discuss aspects of one of the most important issues in ecological restoration: how to evaluate restoration success. This first requires clearly stated and justified restoration goals and targets; this may seem "obvious" but in our experience, this step is often elided. Indicators or proxy variables are the typical vehicle for monitoring; these must be justified in the context of goals and targets and ultimately compared against those to allow for an evaluation of outcome (e.g. success or failure). The monitoring phase is critical in that a project must consider how the monitoring frequency and overall design will allow the postrestoration trajectories of indicators to be analyzed. This allows for real-time management adjustments—adaptive management (sensu *lato*)—to be implemented if the trajectories are diverging from the targets. However, as there r____ large variation in early postrestoration stages or complicated (nonlinear) trajector___ caution is needed before committing to management adjustments. Ideally, there is not only a goal and target but also a model of the expected trajectory—that only can occur if there are sufficient data and enough knowledge about the ecosystem or site being restored. With so many possible decision points, we focus readers' attention on one critical step—how to choose indicators. We distinguish generalizable and specific indicators which can be qualitative, semiquantitative, or quantitative. The generalizable indicators can be used for meta-analyses. There are many options of indicators but making them more uniform would help mutual comparisons among restoration projects.

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