

## Evaluating managed relocation by the numbers

**WHEN ATTEMPTING TO MITIGATE NEGATIVE EFFECTS OF** climate change in protected areas, the cart may occasionally have to come before the horse. That is to say, the unrelenting surge in climate change scenarios may pressure stakeholders to decide on potential resource management solutions with only partial and inexact information. One such intervention—managed relocation or assisted migration—is foreseen by Richardson et al. (2009) as growing in the coming decades as changes in climate become more distinct and species may be faced with extinction. The authors do not give their outright stamp of approval for widespread use of managed relocation, but propose a multivariate decision-making framework that brings to light the risks and benefits of such a strategy in the context of social values.

Managed relocation is the intentional movement of a species, population, or other defined biological unit from one area of occupancy to another where the probability of future survival may be higher. Ideal outcomes of this strategy are to reduce the threat of diminished ecosystem services or extinction, though undesirable consequences could include disturbing ecological integrity or introducing competition in otherwise functional ecosystems. Richardson et al. (2009) note that managed relocation is typically viewed as a “last-ditch option should other conservation strategies be inadequate” and has been used “sparingly to date” by land managers to negate the effects of climate change.

Evaluation of managed relocation strategies has heretofore consisted of a linear analysis, which the authors concur sufficiently addresses neither the large amount of uncertainty nor the competing interests of social values and scientific reasoning. They stress that as a multifaceted tool, managed relocation raises questions that integrate scientific information, aesthetic and cultural values, public policy and logistical concerns, and many other values that can be exceptionally difficult to codify.

Having qualitatively evaluated three hypothetical cases of managed relocation, Richardson et al. (2009) present their graphical, multidimensional evaluation method, a tool the authors hope will clarify the uncertainties for land managers sufficiently to afford justification for a decision. All three cases allow for the exhibition of uncertainty; indeed the study shows how different stakeholder groups could come to very different conclusions about managed relocation, even with the same information, or how varying levels of scientific information produce varying levels of uncertainty. With their evaluation method, the authors seek to diminish the difficulty in codifying and prioritizing the vast amount of variables land managers face when deciding whether or not to engage in managed relocation or other adaptation measures.

The authors categorize the evaluation of managed relocation into four general classes: (1) impacts of conducting or not conducting managed relocation on a given biological unit (“focal impact”), (2) impacts of this activity on a recipient ecosystem (“collateral impact”), (3) practical “feasibility,” and (4) social “acceptability.” By assigning general numerical values to each category and transferring that information to a polygonal chart, resource managers have a heuristic tool that incorporates both ecological and social criteria in a multidimensional framework. Furthermore, the authors anticipate that their multidimensional evaluation could catalyze public participation and debate, thereby legitimizing decisions related to the use or nonuse of managed relocation and potentially increasing public acceptability of a particular management decision.

Ultimately, the decision of whether or not to use managed relocation is in the hands of the stakeholders, but as the old adage goes, you cannot win if you do not play. Or as Richardson et al. (2009) write, “A decision of nonaction based on intractable conservation disagreement may often result in a loss of biodiversity.”

## Reference

- Richardson, D. M., J. J. Hellmann, J. S. McLachlan, D. F. Sax, M. W. Schwartz, P. Gonzalez, E. J. Brennan, A. Camacho, T. L. Root, O. E. Sala, S. H. Schneider, D. M. Ashe, J. R. Clark, R. Early, J. R. Etterson, E. D. Fielder, J. L. Gill, B. A. Minter, S. Polasky, H. D. Safford, A. R. Thompson, and M. Vellend. 2009. Multidimensional evaluation of managed relocation. *Proceedings of the National Academy of Science of the United States of America* 106(24):9721–9724.

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