Conservation ecologists lay out a set of guidelines for how de-extinction can be made more ecologically responsible

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Woolly mammoth. Credit: Tracy O (Flickr) via Wikimedia Commons

Can the woolly mammoth be brought back from the dead? Scientists say it's only a matter of time.

In fact this year, the International Union for Conservation of Nature issued its first official set of guidelines on resurrecting extinct species. What's more, university research labs and non-governmental agencies have projects in motion to bring back extinct species. But is all of this a good idea?

A new paper by UC Santa Barbara researchers explores de-extinction—the process of resurrecting an extinct species—as a potential win for conservation and suggests how to make it so.

In an analysis in the journal *Functional Ecology*, UCSB ecologist Douglas McCauley and colleagues recommend several ways in which the science of de-extinction would have to evolve in order to make it maximally benefit ecological communities and ecosystems.

"The idea of de-extinction raises a fundamental and philosophical question: Are we doing it to create a zoo or recreate nature?" said co-author Benjamin Halpern, director of UCSB's National Center for Ecological Analysis and Synthesis. "Both are reasonable answers, but restoring species to a natural state will be a much, much harder endeavor. We offer guidelines for how to make ecological de-extinction more successful and how to avoid creating 'eco-zombies.' "

Bringing back species useful for conservation requires big-picture thinking. For example, the grassland ecosystem in which the mammoth once lived looks totally different today. For a variety of reasons—human population expansion among them—some areas where these creatures once roamed cannot be restored to their former ecology.

UCSB graduate student Molly Hardesty-Moore and ecologist Douglas McCauley. Credit: Sonia Fernandez

"What some are proposing to do with de-extinction will be like manufacturing a part from the engine of a Model T and trying to shove it into a Tesla," said lead author McCauley, an assistant professor in UCSB's Department of Ecology, Evolution and Marine Biology. "You just can't take a part and put it into a brand new system and expect it to

work without considering how its ecological context has changed.

"Good conservation is a holistic science that acknowledges the fact that many species interact in complex ways," McCauley added. "The rules in that complex web of life don't stay static but evolve dynamically."

The UCSB team developed three recommendations for restoring ecological function through de-extinction. The first suggests resurrecting recently extinct species rather than those that disappeared thousands of years ago. These creatures may fit more seamlessly into their ecosystems because there has been less time for change to occur. The researchers offer several examples of these "young" extinctions, including the Christmas Island pipistrelle bat, the Réunion giant tortoise and Australia's lesser stick-nest rat.

Secondly, the group advises choosing animals whose ecological jobs are truly irreplaceable. For example, the Christmas Island pipistrelle bat was once the only insect-eating bat in its habitat. Its de-extinction would plug a hole in an ecosystem that nature would otherwise have a hard time filling.

Ditto for the Réunion giant tortoise, which dispersed seeds throughout its Indian Ocean island habitat before being driven extinct by hungry mariners. Those plants still exist, although they are moving closer to extinction without the tortoises to perform their ecological function as seed distributors.

The third guideline, according to co-author Molly Hardesty-Moore, a graduate student in McCauley's lab, is to bring back species that can be restored to functionally meaningful abundance levels. "You need to have enough individuals to perform their function well enough to affect the ecosystem," she said. "One wolf hunting and killing has minimal impact, but hundreds of wolves performing that function will change the

ecosystem."

Rather than oppose de-extinction outright, the UCSB scientists hope to start a conversation in the scientific community about how to make the process more ecologically smart. "Can we thoughtfully use this tool to do real conservation?" McCauley asked. "Answering that question is going to require a lot of perspectives, not only from the geneticists who are leading the process, but also from other types of scientists—ecologists, conservation biologists, ecosystem managers."

More information: Douglas J. McCauley et al. A mammoth undertaking: harnessing insight from functional ecology to shape de-extinction priority setting, *Functional Ecology* (2016). DOI: 10.1111/1365-2435.12728

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