Letters

Pleistocene Rewilding, Frankenstein Ecosystems, and an Alternative Conservation Agenda

Some conservation biologists (e.g., Galetti 2004; Donlan et al. 2006; Nicholls 2006) propose to reestablish some ecological processes lost in the Americas in the late Pleistocene, a little over 10,000 years ago, by rewilding, that is, by translocating a suite of large African and Asian vertebrates to the American continent. There is a strong evidence that the megafauna in the Americas at that time was driven to extinction by humans (Martin & Klein 1984), which caused the loss of many ecological interactions such as dispersal of particular fruits eaten by megafauna (Janzen & Martin 1982). Those who support rewilding hope the introduction of surrogates for vanished large animals will bring back ecological processes indirectly disrupted by humans and allow the recreation, to some extent, of natural ecosystems in the Americas before the late Pleistocene extinctions.

The unprecedented scale of rewilding has attracted much attention, and several biologists have criticized the idea, pointing out its uncertainties and high costs (e.g., Smith 2005; Rubenstein et al. 2006; Caro 2007). One issue has not yet received the attention it deserves, either by rewilding advocates or by their opponents: evolutionary history. Pimm (1991) proposes that many features of the structure of biological communities can only be understood in light of their evolutionary history. The species composition and ecological interactions of any given community reflect the history of how it was assembled, including many contingent colonization and extinction processes in the past and coevolutionary interactions among its species over thousands or millions of years.

Donlan et al. (2006) and Flannery (2001) highlight the importance of taking into account evolutionary history and ecological interactions in the rewilding process. These authors make two related points. First, there was an intense faunal interchange between North America and Eurasia before the Pleistocene, supporting the idea that the megafaunas of these continents share much of their evolutionary histories. Second, there are some supposed ecological anachronisms in North America, such as the continued existence of fruits eaten by megafauna and the overbuilt speed of the pronghorn, both of which indicate that vanished ecological interactions could arise again with rewilding.

These points are important, but they are not enough to answer Pimm's questions, and they do not offer much assurance of the wisdom of rewilding. Although the anachronisms could indicate latent interactions, evidence is based on isolated pairs of species and not on most of the species assemblage. Besides, the biggest problem is not the possibility of failing to restore lost interactions, but rather the risk of getting new, unwanted interactions instead. Biological control has already provided us many empirical examples of the magnitude of this risk. Many species have acquired unpredicted new ecological roles when introduced in a new range, often leading native populations and communities to tragic fates (e.g., Gur & Wratten 2000; Roy & Wajnberg 2008). Indeed, about half of introduced vertebrates have become pests (Hokkanen & Lynch 1995). If rewilding plans ignore these lessons, the risk of irreversibly extinguishing and reducing native populations of many species will be high.

We do not believe extinct ecological processes can be viewed simply as a reflection of the collection of species present; rather, they reflect a long evolutionary history of the vanished communities. Thus, we have little reason to believe it is sensible to introduce many large-bodied animals, that potentially would have large effects on today's ecosystems, and then to expect ecological processes similar to those that existed in the late Pleistocene to be recreated. The ecological consequences, in the shape of unwanted ecological interactions with native species, could spread to whole continents in ways that are unpredictable.

We propose an alternative major conservation goal for the 21st century: refaunation through restoration of extant species to their original geographical distributions. The world has plenty of empty forests in biodiversity-rich places where ecological interactions are waiting to be restored by the same species for which these interactions once evolved. Massive refaunation—replacing local rather than global extinctions—would produce immense benefits for conservation, without incurring risks of producing unpredictable interactions. By distracting our focus from this badly needed agenda, rewilding may actually represent the exchange of feasible species restoration for the mirage of building Frankenstein-like ecosystems.

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Avoiding Unintended Outcomes from REDD

Tropical forests occur almost exclusively in developing countries and sustain at least half of the world's species (Wilson 1992). These forests store vast amounts of carbon (IPCC 2007) and provide homes and resources for 60 million people (WCFSD 1999). If they continue to be cleared at current rates of 6–12 million ha/year (Achard et al. 2002; FAO 2006), all economically exploitable tropical forests, and the values they sustain, could disappear before 2100 (TCG 2009).

Payments for reduced emissions from deforestation and degradation (REDD) could reverse the trend of clearing tropical forests (Laurance 2008; Venter et al. 2009). REDD provides financial incentives for developing countries to reduce forest loss and carbon emissions below a reference level (UNFCCC 2007), which is the scenario of expected emissions without REDD intervention. A decision will be made in Copenhagen in December 2009 about including REDD in the climate agreement that will replace the Kyoto Protocol. If successful the scheme could generate up to US$13 billion annually for the improved management and conservation of tropical forests (Ebeling & Yasue 2008). Although REDD may represent the best available option for reducing tropical forest loss (Miles & Kapos 2008), we fear that without careful monitoring and specific policies REDD could inadvertently cause a rush to clear even more forests in the short term.

A REDD mechanism could place the first widespread restrictions on tropical forest conversion. But these restrictions might not be implemented until after Kyoto expires in 2012. This leaves 2 years during which forest loss will not be counted against carbon payments. Some countries could view this period as an opportunity to fell forests and expand agriculture before REDD takes effect.

Such unintended outcomes are not uncommon as new environmental strictures are enacted. For example, there is a mandatory 2-year gap between proposing to uplist and restrict trade in a harvested species under the Convention on International Trade of Endangered Species (www.cites.org) and implementation of the proposal. During those 2 years, trade in the species increases on average by 130% relative to historic rates (Rivalan et al. 2007). A 4-year gap passed between the government of Queensland signaling its intent to stop vegetation clearance and enforcement in 2003. Land holders responded by clearing native vegetation at a rate of 71% above the previous 8-year period (DNRM 2004). If developing countries act similarly in response to a pending REDD mechanism, millions of hectares of tropical forests could be felled before REDD is implemented.

To safeguard forests from clearing before REDD is enacted, we urge implementation of policies to reward early efforts by developing countries to reduce forest loss and to penalize any rush-to-clear behavior. Rewards could take the form of granting credits for early emissions reductions, which could then be sold or otherwise compensated when the REDD mechanism takes effect. In addition, REDD funds currently available from Norway, Australia, and the World Bank could be used to provide early incentives for forest conservation. A potential penalty may be to annul or discount future REDD credits in countries that increase their rates of forest clearance and degradation, until the enhanced forest loss is offset.

Although the rewards and penalties might only be effected post-Kyoto, comprehensive monitoring of forest loss and associated carbon emissions should start as soon as possible following the December meeting. This will require the rapid development and updating of satellite-derived maps of land cover needed to assess carbon stocks (Grainger 2009). Also, national-level reference scenarios will be required to determine whether carbon credits should be granted or penalized. The timely delivery of these data will be difficult. But if developing countries know what their reference levels are and have land cover maps to track progress against them, they can manage their rates of forest loss fully informed of the potential benefits and costs.

REDD offers hope in the effort to save tropical forests and therefore much of the world's biological diversity. We urge policy makers and scientists to ensure that key opportunities are not lost before REDD can be implemented.

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