Are novel ecosystems the only novelty of rewilding?

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Abstract

Since the introduction of the term "rewilding" in 1998, several definitions have been proposed, sparking debate around terminology and how (or if) rewilding differs from restoration. Many papers attempt to distinguish between the two terms through a series of descriptive attributes: historic baselines, landscape-driven transformation, ongoing human intervention, the connection of people with nature, and the creation of novel ecosystems. Here, we discuss the overlap between these terms and illustrate that the creation of novel ecosystems provides the clearest distinction between rewilding and restoration. If the definition of rewilding is distilled down to its most unique component - the creation of novel

ecosystems, perhaps scientists can then work to produce a clear framework for rewilding that is based on best conservation practice.

Keywords – conservation, distinguishing attributes, ecological restoration, scientific definitions, taxonomic substitutions

Conceptual Implications –

- Many attributes used to delineate rewilding from restoration are actually shared between both practices.
- The acceptance of novel ecosystems is the main point of difference between rewilding and restoration.
- There is a continued need for rewilding to clarify its definition and ensure its goals remain conservation focused.

Introduction

The term rewilding was introduced in 1998 as a method to restore ecosystem functions using connected habitat and the movement of keystone predators (Soule & Noss 1998). Since then, this term has evolved to cover multiple ecological scenarios and multiple definitions have arisen. The addition of new definitions or genres of rewilding, plus the similarity to traditional restoration, has created substantial debate over the independence and integrity of the term within the scientific literature (Jorgensen 2015; Corlett 2016; Pettorelli et al. 2018; Anderson et al. 2019; Durham 2019; Hayward et al. 2019; Perino et al. 2019; du Toit & Pettorelli 2019). Both sides of the debate agree that a clear definition is necessary to ensure that meaning is maintained when a term is shared between scientists, policy makers, and the public (Corlett 2016; Pettorelli et al. 2018; Hayward et al. 2019). However, we

believe that recent papers aiming to clarify the meaning of rewilding fall short, and there remains substantial overlap between restoration and rewilding definitions with the one prominent divergence being rewilding's acceptance of novel ecosystems.

Indistinguishable attributes

Du Toit and Pettorelli (2019) proposed that rewilding is more inclusive of people compared to restoration. However, this claim is not supported and directly contradicts other rewilding reviews that address how the "self-sustaining" component of rewilding will, by its very nature, exclude people from rewilded areas (Jorgensen 2014; Seddon et al. 2014). Conversely, many restoration programs, particularly in Australia, are completed through the aid of volunteer Landcare groups, making public involvement in the process vital (Catterall & Harrison 2006; Peters et al. 2015). Furthermore, restoration projects are regularly carried out on public land, making restored habitats just as accessible to communities as rewilded areas (e.g. Mulligan's Flat in south-eastern Australia; Shorthouse et al. 2012). The inclusion or exclusion of people within these managed habitats is an important aspect to consider. The Summit to Sea project in Wales (Summit 2 Sea 2018) came under strong public scrutiny when local land owners and community members did not agree with the direction of 'rewilding' management plans (Hearn 2019), highlighting how and why land management practices need to consider the views and values of all potential stakeholders. In reality, the inclusion of people within both restoration and rewilding projects will fall along a case-by-case continuum based on location and management goals, and therefore human involvement is not a useful way to separate these two management terms.

Another suggested key difference between rewilding and restoration is that restoration programs require long-term financial commitment, compared to rewilding projects that aim for little ongoing intervention (Pettorelli et al. 2018; du Toit & Pettorelli 2019). However, there are many instances where rewilding projects would require ongoing human

intervention; either for the control of released herbivore populations when carnivores cannot be supported in the landscape (Schweiger et al. 2019); the maintenance of historical fire regimes in fire-dependant landscapes such as Australia (Hayward et al. 2005; Kelly et al. 2011); or the control or early detection of invasive predators or pest species in landscapes where these species are drivers of biodiversity declines (Donlan 2008; Iles & Kelly 2014; Bellard et al. 2016). It is also erroneous to claim that restoration projects inherently rely upon ongoing management. There are countless examples of restoration projects that aim to establish self-managing ecosystems (e.g. Bradshaw 1997; Smale et al. 2001; Warren et al. 2002; De Lillis et al. 2004; Meira-Neto et al. 2011). We argue that the creation of a self-sustaining/managing system is just as much a goal of restoration as is it for rewilding.

Part of a self-sustaining ecosystem is the opportunity for environmentally-driven system transformations. This process has also been used to distinguish rewilding from restoration, with emphasis given to rewilding as more accepting of environmentally driven system transformation (du Toit & Pettorelli 2019; Perino et al. 2019). This may be because rewilding is more open to passive ecosystem change (Perino et al. 2019; Van Meekbeek et al. 2019). But this hands-off approach does not mean that rewilding projects experience more environmentally-driven landscape transformation than restoration. The dynamic, ever evolving nature of ecological systems has been recognised within the field of ecosystem restoration for a long time (Macdonald & King 2018). Indeed, many restoration projects aim for, and depend upon, naturally-driven processes, such as natural succession, pollination, seed dispersal, mutualistic relationships, predation, or ecosystem functioning (Bradshaw 1997; Handel 1997; De Lillis et al. 2004; Hayward et al. 2007; Montoya et al. 2012).

The goal of most restoration projects is to restore an ecosystem back to a condition that is based on a historical benchmark, typically built around endemic or native species. Whereas proponents of rewilding advocate historical benchmarks or species fidelity are less

important for rewilding projects (Pettorelli et al. 2018; du Toit & Pettorelli 2019). However, many rewilding projects do set historical benchmarks. A clear example is Pleistocene rewilding, which has the goal of returning missing ecological functions and evolutionary potential referenced from the historically agreed upon benchmark of the Pleistocene (Donlan et al. 2006; Corlette 2016). Even trophic rewilding projects that incorporate taxon substitutions to fill missing top-down trophic interactions, rely heavily on historical baselines and the ecological memory of an area to ensure selected substitute species will shape the ecosystem toward the desired trajectory (Svenning & Faurby 2017; Schweiger et al. 2019). For example, the Oostvaardersplassen rewilding project used taxonomically substituted species that were carefully selected to restore habitat to the desired historical state of mixed open forest/grassland (Vera 2009; Hayward et al. 2019). Yet, the historical influence of human actions on most landscapes can create uncertainty over what historical benchmark to aim for in both rewilding and restoration projects (Lorimer et al. 2015, Macdonald and King 2018).

Separation through novelty

The aforementioned attributes have been used to argue independence between rewilding and restoration (Corlett 2016; Perino et al. 2019; Table 1. in du Toit and Pettorelli 2019). We have shown that in most cases, these distinctions are not clear-cut. The one attribute that we do agree separates these two terms is the acceptance of creating novel ecosystems. “Novel ecosystem” is a relatively new paradigm used to describe an area that has sustained a significant shift in species composition due to human land use, invasive species, climate change, or a combination of these factors (Hobs et al. 2006, Murcia et al. 2014). This definition differs from a degraded landscape in the sense that a novel ecosystem does not need to be restored. Because ecological restoration aims to repair species compositions or

ecosystem functions to an accepted state, there is little scope for restoration projects to incorporate ecosystems made-up of mostly novel species. Conversely, the lack of invasive species management in passive rewilding, the use of introduced species in trophic rewilding, and the potential for environmentally-driven processes to change a habitat, all highlight how rewilding is much more accepting of novel ecosystem creation.

What does this mean for rewilding?

The original use of the term rewilding was strongly set within the umbrella of restoration as it advocated for the conservation of habitat for large carnivores (Soule and Noss 1998). Yet as the definition of rewilding has evolved, its use as a conservation restoration method has shifted (Jorgensen 2015). While many still see rewilding as a component of restoration (Perino et al. 2019; Schweiger et al. 2019), the continued adoption of taxon substitutions and lack of invasive species management has resulted in recent claims that rewilding is never part of restoration (du Toit and Pettorelli 2019). This presents an issue for rewilding because if rewilding is to be distinguished from restoration via the creation of novel ecosystems, then there are legitimate concerns surrounding the conservation value of this practice. A dominant component of novel ecosystems is the pervasiveness of introduced species (Hobbs et al. 2006), despite invasive species being a leading driver of global biodiversity decline (McKenzie et al. 2007; Doherty et al. 2016). Therefore, under a rewilding scenario where novel ecosystems are accepted, countries like Australia, for example, will likely be left with European red foxes *Vulpes vulpes* and feral cats *Felis catus*, and New Zealand left with stoats, *Mustela erminea*, and brushtail possums, *Trichosurus vulpecula*, at the expense of a rich, endemic marsupial and avian fauna, respectively (Hayward et al. 2019; Towns et al. 2012).

We previously argued that overlap in rewilding and restoration definitions will create multiple issues if rewilding is to be adopted as a unique scientific term (Hayward et al. 2019). Despite these concerns, it is possible that rewilding may continue to be adopted within conservation science, although the need for a robust and agreed upon definition is still required. This need is highlighted by the creation of an IUCN Rewilding task force dedicated to "developing a conceptual and methodological framework for rewilding" so that "a more unified and cohesive rewilding approach" can be followed. We believe that if rewilding is to become an established practice, it should remain under the umbrella of restoration rather than become an independent landscape management practice, which may have more human-centric motivations. Keeping rewilding within restoration will constrain rewilding to the underlying framework of conservation and ecological science. That way, if rewilding does incorporate any novel ecosystem components, the reasons for incorporating these components must be backed by solid science and conservation reasoning.

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