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The Viability of Pleistocene Rewilding

Sound conservation, or another attempt at novelty?

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A core ideal within wildlife conservation is to revert to a time in history with less human impact, usually within a few hundred years. However, during a spark of public interest in conservation, a rather controversial idea was published to instead use the timeframe of the Pleistocene era, around 13,000 years ago. This 'Pleistocene rewilding' would introduce surrogate species into North American landscapes to mimic extinct megafauna from that era. Now, almost 15 years later, this essay looks at the viability of this conservation method. Through numerous back-and-forth publications, criticizers of Pleistocene Rewilding have debunked many of the method's arguments. Although the method never had a proper case study of its own, it was clear the method's scientific integrity had been compromised in favour of sparking public interest through sensation. As such, by using Pleistocene Rewilding as a prime example, I hope to show that although important, public interest should not come before scientific viability of conservation methods.

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1. Introduction

It comes as no surprise to anyone that far more than any other species on earth, humans have altered their environment, ecosystems, and the very course of evolution by eliminating other species (Sala et al. 2000, Myers and Knoll 2001). This behaviour and related courses of action are likely to continue in the future (Western 2001). In fact, we are currently at an unprecedented level of human impact of the global environment, with climate change being only one of the reasons it is worsening (Donlan et al. 2006). Of course, the impact humans have on the environment takes a whole range of forms, such as the standard and well known habitat change, pollution, habitat fragmentation, and resource exploitation (Donlan et al. 2006). When it comes to exploitation, an extreme example of this is megafauna extinction, of whom there is already been significant biodiversity change all across the globe (Burney and Flannery 2005). If megafauna is not extinct in a continent, they're threatened with extinction (Balmford et al. 2001).

Restoring lost ecosystems and protecting nearly extinct species has thus been the goal of many conservation strategies. There have been attempts to restore large fauna in the past, such as the Wildlands Network aimed at bringing back large carnivores to North American landscapes (Jørgensen 2015). Like many conservation efforts, this required a timeframe to return to. After all, life is ever dynamic and changing, especially with human influences, and thus choosing a time period in history can determine the desired wildlife the conservation efforts aim to return to do (Donlan et al. 2006, Rubenstein et al. 2006). Many conservation efforts such as the Wildlands Network choose a time-frame that was viewed by some as an "implicit post-Columbian bias" (Donlan et al. 2006). This essentially means that the timeframe used for restoration projects is based on the ecosystems that were in place when America was rediscovered and colonized by Europeans (Donlan et al. 2006). Although this 'bias' of course not a bad thing by itself, this did pave the way for conservation efforts using different timeframes.

One conservation method in particular however viewed this post-Columbian timeframe as arbitrary and argues that attempting to set the timeframe further in the past allows us to reinstate ecosystems long lost to us and creating entirely 'new benchmarks' for restoration (Donlan et al. 2006). Instead of the post-Columbian timeframe, the suggested time period was the Pleistocene era, before the Bering Strait land bridge, and thus before any human interference in North America (Donlan et al. 2005). Because all megafauna of the Pleistocene era is extinct, the method would use taxon replacement by using surrogate species such as the African elephant (*Loxodonta africa*) and the African lion (*Panthera leo*) (Donlan et al. 2005).

The suggestion for this conservation method was quite drastic and caused rather fierce debate in the scientific community (Jørgensen 2015). The method was introduced in 2005, and now almost 15 years later, this essay looks at the positives, the negatives, and some examples of the conservation method in practise to determine whether Pleistocene Rewilding is a viable conservation method or another attempt at novelty.

2. Pleistocene Rewilding: History and Definition

Pleistocene Rewilding has its roots, as the name suggests, in rewilding, a conservation idea that sparked the public's interest quite intensely and was therefore able to evolve into the many different types of rewilding we see today (Hayward et al. 2019). The term 'Rewilding' itself generally meant "to make wild again" and was first coined as a scientific term in 1991 as a reference to the 'Wildlands Project' (now Wildlands Network) (Jørgensen 2015). The aim of this project was to create large interconnected wilderness environments free of human activity for large fauna, specifically carnivores, to roam (Jørgensen 2015). Nowadays this project is often cited as the main manifest and groundwork of rewilding (Soule and Noss 1998). The whole idea was based around the three C's: cores, corridors, and carnivores, which was essentially a summarization of the vision to create large home territories for carnivores (Soule and Noss 1998). Although this early rewilding concept was never completely integrated into scientific circles, it did set the groundwork for conservation methods using extant large fauna (Jørgensen 2015).

Shortly after this early concept, the term 'rewilding' was built upon and clarified. Although the exact definition changed often (and is still discussed today), in essence, rewilding is the reintroduction of species that have disappeared from an area within 'recent' history (Jørgensen 2015). 'Recent' is the key term here, as the relativity and subjectivity of this term can lead to many different conservation ideals. With the initial concept of rewilding, this time frame was set as less than a hundred years, as for example the disappearance of wolves from Yellowstone

National Park was used as an example of destruction of the wild to be restored by rewilding (Soule and Noss 1998). This was key, as examples like these immensely sparked the public's interest, resulting in many authors joining the novel idea of rewilding and putting their own twist, terminology, and spark to it (Hayward et al. 2019). In 2005, Donlan et al. realized the subjectivity of wolf-disappearance time scale and subsequently threw the entire early rewilding concept on its head and created his own twist of the conservation method (Donlan et al. 2005). He published a rather controversial paper detailing his idea on Pleistocene Rewilding; a rewilding concept for North American landscapes that sets its relative time frame as that of the end of the Pleistocene era: around 13,000 BP that aims to recreate those lost ecosystems (Donlan et al. 2005).

Donlan et al. argued that the level of human impact was already too big with the first human 'invasion' of North America via the Bering Strait land bridge compared to the second human 'invasion' when America was rediscovered and colonized by Europeans (Haag 1962, Donlan et al. 2005). This was mainly because the megafauna extinctions were much higher during this first 'invasion' than during the second one (Jørgensen 2015). As such, Donlan et al. chose a time reference point in which humans were not even present in North America at all: the Pleistocene era (Donlan et al. 2005). During this time period, North America was inhabited by American lions, giant tortoises, *Miracinonyx* (American 'cheetahs', but not actual cheetahs), dire wolves, mammoths, camels, and much more (Donlan et al. 2005, Carrasco et al. 2009). Of course, seeing as the actual species themselves are extinct, Donlan et al. opted for taxon replacement by using surrogate still extant species such as African lion (*Panthera leo*), African elephant (*Loxodonta africana*), and Asian elephant (*Elephas maximus*) (Donlan et al. 2005). The method was created with two goals in mind: (1) to regain lost ecosystem potential while (2) conserving what few megafauna we do have left on the globe (Rubenstein et al. 2006). Although the method and the idea itself was built around introduction in the United States of America, it could still be used in other continents using the same pre-human disturbance timeframe of the Pleistocene era (Donlan et al. 2005). As mentioned before, the article was quite controversial and sparked an influx of papers as a response to it swiftly after publication, including a follow-up paper by the same authors (Donlan et al. 2006, Fuhlendorf et al. 2009, Richmond et al. 2010). In fact, ever since Donlan et al's publication in 2005, there has been at least one paper published about Pleistocene Rewilding every single year (Jørgensen 2015).

3. An Optimistic Outlook for Modern Conservation

Donlan et al.'s publication in 2005 sparked a heavy debate mainly because the idea of Pleistocene Rewilding was quite drastic without much evidence to back it up. The paper itself was after all only two pages long (Donlan et al. 2005). It was thus only logical for Donlan and his colleagues to provide support for their claims. Therefore in their publication the next year, they provided much needed background, support, and ecological arguments for the potential success of the conservation method (Donlan et al. 2006). That was not to say that this second publication also did not receive quite heavy criticism, but it did set the groundwork for the ecological arguments in favour of Pleistocene Rewilding with hopes of showcasing that the method can provide an optimistic outlook for modern conservation.

3.1 Ecological and Evolutionary Life History Supporters Arguments

Supporters of Pleistocene Rewilding based many of their ecological arguments on the role the megafauna had in the system (Donlan et al. 2006). In the Pleistocene era, the megafauna were of significant importance to the ecosystem interactions of that time (Soule et al. 1988, Sinclair et al. 2003, Donlan et al. 2006). The megafauna in these systems may have prevented ecosystem degradation and shaped the life history of other species in the ecosystem as well as having altered the system's characteristics through heavy species interactions (Donlan et al. 2006). Thus, through their disappearance, the ecosystem might have been dysfunctional and caused chain reactions leading to other extinctions in the system (Donlan et al. 2006). Supporters of Pleistocene Rewilding thus argue that by reintroducing megafauna, these crucial interactions can be restored for the greater benefit of the ecosystem (Donlan et al. 2006).

Much like other modern conservation methods, the theory behind Pleistocene Rewilding takes its evolutionary history into account while also increasing megafauna distribution. Because of the previously mentioned mass extinction at the end of the Pleistocene era due to human influences, the very evolution of the ecosystems at the time were altered entirely. For instance, before these extinction events, the mammal body size distributions were remarkably similar to one another across all continents despite there being little to no similarity in species

composition. Following the extinction events, this composition was altered in favour of smaller species, which significantly altered not only the ecological, but also the evolutionary processes in the system. Donlan et al. argue that while current conservation methods do take evolutionary history into account, they are still too focussed on existing processes rather than the recently extinct ones. As such, he believes Pleistocene Rewilding will restore the extinct processes and thus gradually over time return the mammal body size distribution as it was before to regain evolutionary potential. Moreover, it is likely that megafauna in Africa and Asia will also become extinct in the near future, and thus increasing their distribution to other continents will increase their chances of survival and thus conserve what few megafauna we do have left (Donlan et al. 2006).

3.2 Economic, Social, and Ethical Supporters Arguments

Lastly, it was argued that the economic and social value of parks and reserves that use Pleistocene rewilding is likely to increase. We have 'strong emotional and cultural relationships' to megafauna, according to Donlan et al., as well as an ethical responsibility redress the problems caused by the human-induced extinctions as far as possible. Because of these reasons, the appeal, public understanding, social-, and economic value is likely to increase of both public and private lands that use Pleistocene Rewilding much like it has done to Yellowstone Park when wolves were reintroduced. Potential costs can for example be reduced by using captive species already present in the United States rather than transporting wild species from Africa, which could potentially cause intercontinental problems (Donlan et al. 2006).

In his continuation paper in 2006, Donlan et al. provide ecological arguments, evolutionary, conservational, cultural and economic benefits of Pleistocene rewilding. While it supplied the conservation method with much needed support, it did little to quell the debate. As such, most papers criticizing the method often refer back to Donlan's paper in 2006.

4. Sensational, but at what cost?

There is no doubt in anyone's mind that to recreate the ecosystems of the Pleistocene era in North America would be an extraordinary endeavour and accomplishment (Donlan et al. 2005). However, while it could be argued humans might have an ethical and moral duty to uphold these lost systems (Donlan et al. 2006), the ecological consequences of reintroducing megafauna that has been gone from the system for over 13,000 years would have to be carefully considered (Rubenstein et al. 2006). While the precise effects of Pleistocene introductions are unknown, the potential negative effects of introduction are well known and could potentially be catastrophic, even going as far as to destroy current conservation value (Mack et al. 2000, Smith 2005).

4.1 Ecological and Evolutionary Life History Critics Arguments

The reason supporters of Pleistocene Rewilding believe it to be possible to recreate these lost ecosystems is that they believe that the ecosystems have not fundamentally changed too much since the end of the Pleistocene era (Donlan et al. 2005). However, criticizers of Pleistocene rewilding found that this is quite far from the truth, as for instance plant communities are incredibly dynamic and over the course of 13,000 years the vegetation communities have had ample time to evolve to situations without Pleistocene megafauna (Zazula et al. 2003). As such, criticizers of Pleistocene rewilding argue that due to the different ecosystem functioning and the plethora of uncertainties of these ecosystems, Pleistocene rewilding would create novel, unknown, 're-wilded' ecosystems instead of recreating historical wild ecosystems (Hobbs et al. 2006, Rubenstein et al. 2006). Furthermore, current vegetation can in fact be threatened by introductions of large fauna and change the vegetation entirely, thus endangering species in an ecosystem that's already threatened while not well protected (Levin et al. 2002, Hoekstra et al. 2005, Rubenstein et al. 2006). In fact, one study in particular showed that the current climate is not suitable at all for Pleistocene Rewilding (Richmond et al. 2010). Of course, problems like these can be addressed and built upon in a test run, but given the lifespan and range of megafauna, such a test would take at least a couple of decennia, which is proven by the fact that the in 1989 established Pleistocene Park has yet to produce a lot of data (Zimov 2005, Rubenstein et al. 2006). Thus in the end it comes down to weighing off the options between creating a new novel ecosystem or protecting the ecosystems already in place (Rubenstein et al. 2006).

4.2 Economic, Social, and Ethical Critics Arguments

Criticizers of Pleistocene rewilding state that when it comes to the economic and social aspects of Pleistocene rewilding it is important to keep the limitations in mind. For example, in the United States of America, the budget

for conservation is limited, and thus investing in Pleistocene rewilding might affect the spending of local conservation efforts (Rubenstein et al. 2006). While costs could indeed be limited by using captive individuals of the to-be-introduced species, it is important to note that these introductions have been far less successful than those from wild populations (Fischer and Lindenmayer 2000, Rubenstein et al. 2006). Lastly, it is important to note that criticizers of Pleistocene Rewilding do not disagree with supporters of the method that we have an ethical obligation to anthropogenically destroyed ecosystems, nor that the public's appreciation of the conservation effort might indeed increase due to the introduction of African/Asian megafauna. However, criticizers of the conservation method do stress that the same could potentially be achieved with less risky conservation efforts, such as introductions of the native *Puma concolor*, which might also restore lost ecosystem potential (Rubenstein et al. 2006).

5. In Practical Perspective

Ironically enough, despite the focus of Pleistocene rewilding in North America, the conservation method has not actually been conducted in practice in any way in the United States of America. Instead, Pleistocene Rewilding finds it only 'real' case study in Arctic Russia in the project of Pleistocene Park (Zimov 2005). Although it was initiated in 1989 (Zimov 2005), well before Pleistocene rewilding was first properly coined as a term, the project can still serve as a potential example of Pleistocene rewilding (Jørgensen 2015).

Although Pleistocene park is the closest example fit for a case study of the conservation method, examples of other conservation strategies using the same methods can be used, such as the Oostvaardersplassen. The Oostvaardersplassen (OVP), a relatively small area in the Netherlands (North-East of Amsterdam in the province of Flevoland) aimed to transform a polder into a nature reserve using wild animals similar to those who used to roam the country in the Pleistocene era (Jørgensen 2015). One of the main differences is that the Oostvaardersplassen used animals created by humans to be similar to extinct ones, rather than using taxon replacement with still extant animals. Despite this difference they share an inherent idea, and thus comparing the two becomes possible.

Of course, similarities can also be drawn between the other types of rewilding, where Trophic Rewilding is arguably the closest. This restoration strategy, which was developed later than Pleistocene Rewilding, was focussed on learning from its predecessor to enhance conservation efforts and see whether chosen locality and timeframe really matter (Svenning et al. 2016). Here, these three examples are compared to Pleistocene Rewilding to see how the method could fare in practicality.

5.1 Pleistocene Park

Shortly put, Pleistocene Park is an initiative that mainly aims to restore the steppe ecosystem of the mammoth by reintroducing large fauna present in the mammoth's era. Aside from that, it also strives to discover the exact roles Pleistocene fauna played in the maintaining of their ecosystem as well as finding ways to mitigate climate change by extending these Pleistocene grasslands and using reintroduced large ungulates for trampling. So far, the in 1989 initiated project has successfully reintroduced many large ungulates such as musk oxen, wapiti, and the European Bison. This was a great step towards the step of mitigation of climate change, as the trampling of the vegetation, soil, and snow by the ungulates maintained the ecosystem, but also exposed the ground to colder temperatures preventing ice in the soil from melting. In turn, this prevents permafrost from thawing out and thus mitigates some of the negative consequences of climate change (Zimov 2005).

When it comes to Pleistocene Rewilding however, results are quite limited. Despite the project being initiated in 1989, the amount of results published on the viability of the reintroductions of the fauna are sparse (Zimov 2005, Rubenstein et al. 2006). It is however known that the reintroductions of large ungulates for the trampling were successful and are still present to this day (Zimov 2005, Hayward et al. 2019). Although despite this potential success, it is important to note the locality of this project. The project being situated in arctic Russia rather than North America makes it hard to apply its practicality to Pleistocene Rewilding and might in fact even emphasize the differences between the two projects. For instance, aside from the climate differences, the Pleistocene Park project reintroduces animals that used to roam that area rather than using taxon replacement like Pleistocene Rewilding suggests (Zimov 2005, Donlan et al. 2006). This means that those reintroduced animals might be better suited to those ecosystems than animals from a different continent (Smith 2005, Rubenstein et al. 2006), thus

making proper comparisons hard. In the end however, without concrete data, making a comparison for Pleistocene Rewilding becomes difficult (Rubenstein et al. 2006).

5.2 The Oostvaardersplassen

Although the Oostvaardersplassen (OVP) is arguably often seen as the forerunner of rewilding in Europe rather than an example of Pleistocene rewilding, similarities can still be drawn between the two. This is mainly the case because the ecologist Frans Vera was at the heart of the experimental rewilding and suggested that the pre-human landscapes were predominantly open grazed pastures rather than closed forests like previously suggested by paleo-ecologists (Vera 2000). To prove this, he would need the extinct grazers. He thus worked on introducing species created by humans to resemble extinct species. For example, the Heck cattle were back-bred by Lutz and Heinz Heck back in 1920 to get as close to aurochs (an since 1627 extinct European bovine species) as possible (Jørgensen 2015). Both the OVP and Pleistocene Rewilding thus use a form of taxon replacement to rewild an open grassland, allowing for potential comparisons to be made.

Overall, although strongly debated to this day, it can be argued that the Oostvaardersplassen succeeded at its goals for rewilding and setting the groundwork for European rewilding initiatives (Lorimer and Driessen 2014). However, regardless of whether the OVP succeeded at its goals or not, when comparing it to Donlan et al.'s Pleistocene Rewilding idea, it is important to think of the ecosystem already present upon which the rewilding method is being subjected. In the case of the Oostvaardersplassen, the ecosystem prior to the rewilding efforts was a polder created by man that was to be used for an industrial site (Prior and Ward 2016). There was not much of an established ecosystem to begin with, at the very least not one that is threatened or has endangered species present in it. However, the grass landscapes Pleistocene Rewilding plans to use are in fact threatened and thus the reintroduction of the megafauna could significantly affect the ecosystem and might thus put threatened species in danger (Rubenstein et al. 2006). The Oostvaardersplassen emerging from a novel system is probably why it works well as a forerunner for the European rewilding rather than an example for North American Pleistocene Rewilding.

5.3 Trophic Rewilding

Trophic Rewilding is another type of rewilding that emerged after the sudden spark of public interest in conservation, but this type used Pleistocene Rewilding as its basis to build upon. They recognized some of the problems of the method, such as the taxon replacement using non-native species and the limited planed management, and built upon those. Trophic Rewilding has been described as "*an ecological restoration strategy that uses species introductions to restore top-down trophic interactions and associated trophic cascades to promote self-regulating biodiverse ecosystems*". Although relatively new, this restoration strategy does already have some practical examples that can be compared to Pleistocene Rewilding (Svenning et al. 2016).

Trophic Rewilding uses case studies of different timeframes and locality to check which restoration methods are most viable. Firstly, Trophic Rewilding was often successful when introducing species in an area where they became extinct less than 5000 years ago, but found that these introductions were less successful when species became locally extinct more than 5000 years ago. Secondly, they found that locality is important for reintroductions and proves more successful than non-native reintroductions. These successes described by Trophic Rewilding emphasize the problems with Pleistocene Rewilding, which is also why the authors of Trophic Rewilding improved upon this when making the method. Pleistocene Rewilding aims to restore species lost to an area over 13,000 years ago by introducing non-native species, which is a combination shown by Trophic Rewilding to not be as successful, and thus does not restore, but rather create a novel ecosystem like critics of the method predicted (Svenning et al. 2016).

6. The Problems with Sensation

For a conservation method to be viable it would have to produce sufficiently positive results as well as still being applicable in current time and therefore not have been disproven. With this essay I aimed to discover whether this is the case for Pleistocene Rewilding after almost fifteen years of its initial release as a conservation method. When reviewing the main arguments both in favour and against Pleistocene Rewilding a pattern becomes evident. Both parties mention the ecology, evolutionary history, economics, public appreciation, and the ethics/morality. Rather than giving new separate reasons as to why Pleistocene Rewilding might not work as a conservation method, those opposed to the method instead aim to debunk and criticize arguments made by those in favour of

the method. For instance, Donlan et al. argue that megafauna in the Pleistocene era prevented ecosystem degradation, provided important interactions with other species that were characteristic for the system and were key species in the ecosystem (Donlan et al. 2006). Contrastingly, criticizers of the method instead argue that recreating such interactions and dynamics is no longer possible because the system has changed too much since the Pleistocene era and that such drastic reintroductions would most likely do the extant system more harm than good and just create an entirely different ecosystem (Rubenstein et al. 2006). It has even been found that the climate itself simply is not suitable for Pleistocene Rewilding (Richmond et al. 2010). Supporters also argued that economic value of lands using Pleistocene Rewilding would increase (Donlan et al. 2006), but criticizers pointed out that the budget for conservation in the USA is limited and thus spending money of Pleistocene Rewilding might prevent other local conservation methods from functioning (Rubenstein et al. 2006). Similarly, supporters of Pleistocene Rewilding argued that the method would spark interest in rewilding and conservation from the general public (Donlan et al. 2006), and although this could potentially be the case, criticizers argued the same could be accomplished without using extreme reintroduction method such as those suggested in Pleistocene Rewilding (Rubenstein et al. 2006). Finally, on the case of our ethics, supporters argued that we have a moral duty to uphold the ecosystems lost to us because of the consequences of anthropogenic influences (Donlan et al. 2006), while criticizers pointed out that such an endeavour could endanger the systems currently in place to which we also have a moral duty to uphold (Rubenstein et al. 2006).

However, back and forth statements like these become hollow seeing as both parties provided evidence based on scientific grounds (Donlan et al. 2006, Rubenstein et al. 2006), thus practical examples of the conservation method are required. Sadly, as mentioned before, this is where Pleistocene Rewilding rather lacks. The method itself was built for usage in the United States of America, but it has never actually been conducted in North America (Jørgensen 2015). The only closely resembling project to Pleistocene Rewilding is Pleistocene Park, a project aimed to restore the mammoth's steppe ecosystem while also using fauna trampling to limit permafrost thawing (Zimov 2005). Although successful in its own goals, Pleistocene Park provides little insight into the success of its reintroductions and thus there is no empirical evidence to support Pleistocene Rewilding (Jørgensen 2015). Apart from Pleistocene Park, one could use other Rewilding projects using some form of taxon replacement to potentially draw conclusions from those. However, these projects all suffer from a lack of data on their reintroductions, but even if that is not the case the projects are too different from the inherent idea of Pleistocene Rewilding that comparing any evidence becomes arbitrary. Pleistocene Rewilding has no true case studies in North America and the only similar projects are closer to 'normal' rewilding rather than the Pleistocene variant. Thus, drawing a conclusion on the successes/failures of those projects with regards to Pleistocene Rewilding becomes difficult. That being said, with what comparisons can be made from other restoration methods such as Trophic Rewilding, it becomes clear that both the timeframe and locality of nature of the restoration efforts chosen by Pleistocene Rewilding is not as viable as other, more local and recent restoration efforts (Svenning et al. 2016).

6.1 A Search for Novelty and Sensation

The entire idea behind all rewilding projects is to go back to a previous state of an ecosystem, often without much human influence in order to make an area 'wild' again and reintroduce lost ecological processes (Jørgensen 2015). This is of course a rather broad definition, and in fact a multitude of papers have spent a good amount of time trying to figure out the general consensus behind rewilding (Jørgensen 2015, Nogués-Bravo et al. 2016, Hayward et al. 2019). This is because of the large amount of different 'types' of rewilding such as Island Rewilding, Functional Rewilding, Trophic Rewilding, Passive Rewilding, and of course Pleistocene Rewilding (Hayward et al. 2019). These different 'types' began to pop up following a sudden massive increase in public enthusiasm in conservation optimism (Hayward et al. 2019). One could argue this was a 'terminology war', where all authors were looking for novelty and sensation without actually making their ideas significantly different from regular restoration, which could be proven with the amount of papers published on figuring out exactly what rewilding is (Jørgensen 2015, Nogués-Bravo et al. 2016, Hayward et al. 2019). Furthermore, when the rewilding types began to emerge, the effects of ordinary restoration and reintroduction were already well-studied and had practical examples, but the dozen different spins on rewilding were all unstudied and thus had many uncertainties (Hayward et al. 2019). With this in mind, rewilding can be seen as one of the prime examples of how a scientific principle can easily enter the publics and activists eyes and in turn reshape the core ideals of the base scientific idea to create sensational ideas rather than conservationally sound ones (Jørgensen 2015). Within just ten years, it has gone from being a rare term to being the main conservation mantra (Jørgensen 2015).

"*Rewilding is a term with the potential to excite and engage the masses with its links to wolves, mammoths and mastodons; and because the call for re-establishing "wild" places fits to a perception of nature that many modern*

day humans can relate to" (Hayward et al. 2019). With Hayward et al.'s reference to mammoths in mind, one can realize that Pleistocene Rewilding is arguably the prime example of an idea searching for novelty and to strike enthusiasm in the publics eyes with extreme ideas. That is not to say that such an endeavour is a bad goal, after all, without this sudden spark of interest of the public into conservation, many rewilding areas and sites, such as the Oostvaardersplassen, would not exist (Vera 2000). However, when public interest turns a scientific principle into a hype-bandwagon promoting only the most sensational ideas at the cost of conservational integrity, it might have gone too far.

6.2 After the Pleistocene

It should be noted that there was relatively little time between the introduction of 'rewilding' as a general conservation term and 'Pleistocene Rewilding' as a term, it was in fact one of the pioneering rewilding types (Svenning et al. 2016). Most other types of rewilding thus came after Pleistocene Rewilding which made it possible for the other types to use Pleistocene Rewilding as a base concept or to simply learn from it and improve upon it (Svenning et al. 2016). This was quite important, as early concepts are rarely good from the get-go and often must be reworked before they are viable. There is after all a reason why the earlier mentioned three C's concept (cores, corridors, and carnivores) is not used as a conservation strategy today (Jørgensen 2015). Thus, whether Pleistocene Rewilding is viable or not, it did set the groundwork for other types of rewilding which potentially did become viable, some of which are still used today to great effect (Svenning et al. 2016). Island rewilding, functional rewilding, passive rewilding, and perhaps even the idea of the introductions of grazers could thus all be based on Pleistocene Rewilding, which makes it quite an important benchmark in restoration ecology, regardless of its own success.

This idea is perhaps shared by the scientific community as a whole, as the sensation for the Pleistocene Rewilding and the debates sparked by it were shown to have a declining trend (Jørgensen 2015). This could potentially be explained by the rise of the other types of rewilding, which is especially evident when trophic rewilding can be seen as an improved upon Pleistocene Rewilding (Svenning et al. 2016). There might therefore not be much Pleistocene Rewilding in the future. However, if it were to reappear today, it could look at the improvements trophic rewilding made to gain more viability, mainly it's locality and more recent timeframe (Svenning et al. 2016).

6.3 Viability over Sensation

Rubenstein et al. made a comparison between Pleistocene Rewilding and Crichton's novel Jurassic Park (Crichton 1990) about filling an island with extinct dinosaurs, stating it was "*only a slightly less sensational proposal*" (Rubenstein et al. 2006), which seems to be a perfect analogy of the method's problems. This analogy addresses both the problems inherent in the idea such as the ecology, evolutionary and economy-based ones, as well as the problem with searching for novelty, sensation, and putting these factors to the extreme.

The debate sparked by the introduction of Pleistocene Rewilding was fierce because of it's rather extreme idea, and criticizers of the idea were not shy with paper publications criticizing the idea that inherited the problems of rewilding and increased them tenfold (Rubenstein et al. 2006, Rubenstein and Rubenstein 2016). Despite what supporters of Pleistocene Rewilding suggest, modern ecosystems are in fact very different from those at the end of the Pleistocene era, which of course affects how well reintroduced species are going to fare (Zazula et al. 2003, Rubenstein et al. 2006). Currently extant ecosystems and species could become threatened as a result of the introductions because of the change the system has undergone over the course of evolution (Rubenstein et al. 2006). When putting this in perspective of the rewilding hype-bandwagon created by the public's interest, it becomes more clear that the method was created in this spark of the public interest and was thus created around that, to spark more interest into conservation rather than actually functioning as a proper conservation method.

Before rewilding was popularized by the public, the most common conservation method in the scientific community was simply 'restoration'. The principles behind restoration (and reintroduction) are actually well-studied and have clear practical examples (Hayward et al. 2019). Rather than creating sensational ideas aimed to spark the public interest with little scientific insight, perhaps it is instead better to use the now created public's interest in general conservation to create proper sound conservation methods according to well established science. With the now more than five different types of rewilding, perhaps the search for novelty should come to an end. With this essay, I hope to have shown that Pleistocene Rewilding can be put as the prime example of why public interest into conservation is important, but should not come before the viability and scientific integrity of the conservation method itself.

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