

Ethical Dimensions of Rewilding as a Nature-Based Approach to Climate Change Mitigation

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ABSTRACT

The growing recognition of the urgent need to address climate change has led to increased interest in nature-based solutions, such as rewilding, which seeks to restore natural ecosystems and processes to mitigate the impacts of climate change. Rewilding involves reintroducing keystone species, restoring habitat connectivity, and allowing natural ecological processes to unfold, aiming to enhance biodiversity, ecosystem resilience, and carbon storage. While rewilding holds promise for climate change mitigation, it also raises ethical concerns related to human-animal interactions, land use conflicts, and social justice implications. This article aims to critically examine the ethical dimensions of rewilding as a nature-based approach to climate change mitigation, considering the perspectives of diverse stakeholders and exploring the implications for environmental ethics, animal welfare, and social justice. The ethical implications of rewilding have received limited attention in the literature, despite its growing popularity as a climate change mitigation strategy. There is a need to explore the ethical dimensions of rewilding to ensure that it aligns with principles of environmental stewardship, social equity, and animal welfare. This study employs a qualitative research approach, combining case studies and literature review to explore the ethical dimensions of rewilding. Case studies from diverse geographical regions and cultural contexts are analyzed to identify common themes and patterns, while a comprehensive review of existing literature provides insights into the theoretical and practical aspects of rewilding ethics. The findings highlight the complex and multifaceted nature of rewilding ethics, with tensions emerging between conservation goals,

human interests, and animal welfare considerations. The discussions explore potential approaches to addressing these ethical challenges. Rewilding holds promise as a nature-based approach to climate change mitigation, but its ethical dimensions must be carefully considered to ensure that it promotes environmental sustainability, social justice, and animal welfare. By adopting a holistic and inclusive approach to rewilding ethics, policymakers, conservation practitioners, and local communities can navigate the complexities of rewilding and maximize its benefits for both humans and nature.

Keywords: Rewilding, climate change mitigation, nature-based solutions, environmental ethics, animal welfare, social justice, biodiversity conservation, carbon sequestration.

I. INTRODUCTION

Scientists, governments, and conservation practitioners have the task of addressing both climate change and loss of biodiversity. Traditionally, solutions to each problem were considered unconnected, but this perspective is changing. Recent research suggests that animals can help reduce climate change by influencing the capture and storage of carbon in ecosystems, highlighting a possible link between biodiversity and climate issues (Cromsigt et al., 2018; Kristensen et al., 2022; Malhi et al., 2022). Therefore, keeping up with the emphasis of landscape conservation on increasing either animal variety or carbon absorption and storage might lead to lost chances to achieve the two simultaneously (Schmitz et al., 2023).

Nature-based solutions to climate change and declining biodiversity incorporate landscape-scale conservation practices geared toward

controlling carbon uptake and storage through the safeguarding and restitution of biodiversity, ecosystem processes, and primarily ecological adaptability for human beings as well as nature (Seddon et al., 2021; Woroniecki et al., 2020). Nature-based solutions are strongly advocated by global organizations like the United Nations (UN) and its Sustainable Development Goals (SDGs), and have attracted significant interest for their capacity for integrating the mitigation of climate change efforts with the preservation of biodiversity (Dinerstein et al., 2019; UN, 2021). The World Health Organization, recognizing the deep relationship between the the well-being of humans and the health of ecosystems, stresses the necessity of holistic strategies that do not only mitigate climate change but also promote ecosystem services (WHO, 2021).

Among these nature-based activities, an emerging climate change mitigation technique is energizing the cycle of carbon through rewilding. Animating the carbon cycle understands that animals, particularly big vertebrates, can have considerable influence on ecosystem capture of carbon despite their reduced overall biomass in contrast to other biological generators that facilitate carbon cycle (e.g., plants or microorganisms; Schmitz et al., 2014, 2023) Rewilding rebuilds habitats by restoring intact animal populations, the trophic structure of food webs, and ecological processes and services for both humans and animals (Carver et al., 2021; Svenning et al., 2016). Thus, Rewilding to Revive the Carbon Cycle leverages both systems, positing that rewilding animals' ecological roles in habitats may simultaneously promote biodiversity conservation and boost carbon uptake and storage in ecosystems.



Figure 1: A typical rewilding site

Source: <https://orionmagazine.org/article/the-great-rewilding/> 2024

Rewilding is a fresh and fast evolving technique for ecosystem management, reflecting a revolutionary approach to protecting biodiversity. Originally described as a conservation technique centered on 'cores, corridors, and carnivores' (Soule' and Noss, 1998), the concept is now generally understood as the restoration or refurbishment of an ecosystem's functionality by the (re)introduction of chosen species. Although the phrase first came into print in 1990, its popularity began to increase dramatically during the previous decade; during this period, rewilding has gone from a theoretical notion to a practical idea. It is now being praised by many as a highly cost-effective way to reestablish vegetation succession, reactivate a top-down trophic relationships and predation procedures, and improve ecosystem functionality via the (re)introduction of ecological engineers (Pettorelli et al., 2018). Several rewilding programs have now been launched in different nations throughout the world, all being predicted to offer promise for boosting biodiversity locally, ecological adaptability, and ecological (Lorimer et al., 2015; Pereira and Navarro, 2015; Svenning et al., 2016)

As expressed by international organizations such as the United Nations (UN), the World Health Organization (WHO), and UNESCO, tackling climate change and biodiversity loss is imperative for accomplishing the sustainable development goals (SDGs) and guaranteeing the well-being of present and future generations (UN, n.d.; WHO, 2021; UNESCO, 2021). Rewilding corresponds with these aims by boosting ecosystem resilience, boosting carbon sequestration and retention, and promoting biodiversity recovery (Svenning et al., 2016; Seddon et al., 2021).

The beginnings of rewilding can be attributed to the 'traditional' conservation movement (Holmes et al. 2017) in the United States, which concentrated on protecting huge, contiguous wilderness regions with a complete suite of critical biological agents, notably predators (Soule' and Noss 1998). Emerging from this, Donlan et al (2006) asserted that numerous key ecological entities, such as giant tortoises, saber-toothed cats and mastodons, had been made to become extinct due to human activities during the Pleistocene and early Holocene, and this disappearance of vital ecological processes had fundamentally altered the ecology of North America. As such, they pushed for the return of these animals or their near equivalents, in a bid to 'rewild' North America to something akin to its pre-human form. Since then, a varied variety of rewilding concepts and programs have evolved

globally, for conservation that tries to rebuild functional ecosystems with decreased human control and restored ecological processes (see Jørgensen 2015; Lorimer et al. 2015). Beyond the attention-grabbing notions such transplanting elephants to the Great Plains, such ideas criticize several aspects of conventional conservation. Whilst conventional conservation tends to concentrate on ecosystem composition as well as abundance of species, such suggestions focus on ecosystem services. Unlike mainstream conservation, which calls for human control of ecosystems towards established and static biodiversity objectives, rewilding advocates for open-ended, autonomous, ecological processes administration (Navarro and Pereira 2015; Jepson 2016).

Figures derived from a selected group of animals across various ecosystems reveal that animals can significantly change an ecosystem's carbon budget by an average of 60 to 95 percent compared to instances in which focal animals do not exist (Schmitz & Leroux, 2020), thus potentially increasing ecosystem carbon capture and storage worldwide by at least 6.4 billion tonnes annually (Schmitz et al., 2023). By contrast, that figure challenge that of each of the Intergovernmental Panel for Climate Change (IPCC) top five recommendations to minimize net emissions swiftly, including a rapid switch to solar and wind technology, decreasing the conversion of natural environments, enhancing carbon sequestration and storage in agriculture, and revitalizing, afforesting and reforesting ecosystem (IPCC, 2022).

Rewilding movement can be distinguished by its range of beliefs, as described exhaustively elsewhere (Lorimer et al. 2015; Jørgensen 2015; Gammon 2018; Pettoirelli et al. 2018). Jørgensen (2015) distinguishes six distinct perspectives of rewilding: restoration of vast regions of related wilderness with present species, giving up on human-managed land, and four different types of organisms reintroductions (reintroducing analogues for extinct Pleistocene large mammals using extant organisms, bringing back analogues for recent extinctions on the islands, transforming landscapes by reintroducing locally extinct organisms, and letting go of captive-bred animals to bolster marginal wild populations). Lorimer et al suggest five dimensions for understanding rewilding. Rewilding that:

1) Concentrates on post-productive environments versus working in areas with minimal intensity agriculture (a type of land sparing/land sharing – Phalan et al. 2011);

2) Is reductionist and concentrated on genes and breeds versus rewilding that is focused on ecologic systems functions and processes,

3) Aims to restore previous ecosystems versus future-oriented rewilding,

4) Focuses on unadulterated and remote outdoor areas versus rewilding that concentrates on hybrid nature closer to human beings, and

5) Is grounded in regionally specific wildness versus a more cosmopolitan wildness.

There is a spatial factor to conflicts. Several authors (e.g. Jørgensen 2015; Corlett 2016; Prior and Brady 2016) detect a difference between North American rewilding, which has a greater emphasis on purity and reviving modern replicas of previous ecosystems, and European rewilding which is more future oriented, although Brown et al. (2011) argue for reviving past ecosystems in Europe, to the extent that some proponents question the utility of the 're' prefix (Wynne-Jones et al. 2018). Similarly, whereas North American rewilding may be more centered on carnivores, in Europe there is a higher concentration on grazers. (Lorimer et al. 2015; Svenning et al. 2016). This leads to arguments and disputes on (re)creating genetically and morphologically suitable grazers (Lorimer and Driessen 2014).

This multiplicity of opinions raises the issue as to if there is any unifying thread among rewilding. Prior and Ward (2016) have suggested rewilding techniques have a similar focus on independent nature, and that this renders it different to other kinds of conservation. For Jørgensen (2015), the variance makes it a flexible notion, ambiguous and imprecise, without a defined meaning. Jørgensen contends that such adaptability might give rewilding specific potency, so it can bridge both the scientific and the political realms. Such versatility also implies that a variety of programs from the experimental and revolutionary to the much-less-controversial may be regarded under the same tent of 'rewilding'. Deary and Warren (2017) observe that some environmentalists proposing less contentious initiatives utilizing autonomous self-willed nature purposefully shun the word 'rewilding' to avoid adverse links with controversial individuals and concepts. This symbolizes a contradiction between more revolutionary rewilding, proposing major or quick changes, and more gradual or constrained change. Such conflicts may be part of other dimensions of variation within rewilding, for example, contrasting potentially transformational plans to build massive wilderness preserves and more practical strategies to foster hybrid nature in human-dominated

environments (Lorimer et al. 2015). There may be disparities in opinions about what is desired, based on core principles, or on what is judged possible or pragmatic, an appraisal of possibilities.

The enormous capacity of rewilding to add to the repertoire of nature-based solutions makes it an enticing option to promote animal conservation worldwide to address the simultaneous difficulties of mitigating climate change and the loss of biodiversity. However, we are at a point where a little caution is necessary, as more rewilding programs develop and expand, it is important integrating ethical issues into every rewilding effort. As rewilding efforts are investigated as a nature-based strategy to climate change mitigation, this article aims to attract the attention of all stakeholders participating in rewilding projects to the urgency of identifying and addressing the ethical components inherent in these programs. By putting first the welfare and rights of indigenous communities and local stakeholders, respecting biodiversity and ecosystem integrity, upholding transparency and accountability, and committing to long-term monitoring and evaluation, we can ensure that rewilding efforts are not only effective in combating climate change but also socially and environmentally responsible.

OBJECTIVE

Through the exploration of the perspectives of diverse stakeholders and considering the implications for environmental ethics, animal welfare, and social justice, this article seeks to provide insights into how rewilding can be conducted ethically, ensuring alignment with principles of environmental stewardship, social equity, and animal welfare.

RESEARCH METHODOLOGY

This study employed a qualitative research approach, this method involves a combination of case studies and literature review to provide a comprehensive understanding of the topic. Case studies from diverse geographical regions and cultural contexts were analyzed to identify common themes and patterns related to ethical considerations in rewilding projects. These case studies offered insights into real-world implementations of rewilding initiatives, highlighting the ethical dilemmas faced by stakeholders and the strategies employed to address them. Additionally, a thorough review of existing literature on rewilding ethics was conducted to explore the theoretical frameworks and practical implications of ethical decision-making in rewilding practices. By synthesizing findings from

case studies and literature review, a nuanced understanding of the ethical dimensions of rewilding was evolved and valuable insights for policymakers, conservation practitioners, and local communities involved in rewilding initiatives were provided.

REWILDING VIZ-A-VIZ OTHER ENVIRONMENTAL CONSERVATION APPROACHES

Rewilding represents a distinct approach to environmental conservation that differs from traditional conservation strategies in its focus and methodology. Unlike conventional conservation efforts that often prioritize preserving existing ecosystems or protecting specific species, rewilding aims to restore ecosystem functionality and promote ecological resilience through the (re)introduction of key species and ecological processes (Svenning et al., 2016). This approach emphasizes restoring natural processes and ecological interactions, such as trophic cascades and seed dispersal, which have been disrupted by human activities (Seddon et al., 2014). In contrast, traditional conservation approaches may focus more narrowly on preserving specific habitats or species without necessarily considering the broader ecosystem dynamics (Seddon et al., 2021). One key distinction between rewilding and traditional conservation lies in their respective goals and objectives. While traditional conservation efforts often seek to maintain or restore ecosystems to a pre-disturbance state, rewilding embraces dynamic and evolving landscapes that may differ significantly from historical conditions (Lorimer et al., 2015). Rewilding acknowledges that ecosystems are constantly changing and seeks to enhance their resilience to future environmental pressures, including those associated with climate change (Pettorelli et al., 2018). In this sense, rewilding is forward-looking and adaptive, aiming to create novel ecosystems that can thrive in a rapidly changing world (Lorimer et al., 2015). Traditional conservation, on the other hand, may be more focused on preserving existing biodiversity patterns and preventing further habitat loss or degradation (Seddon et al., 2021).

Another key distinction between rewilding and other environmental strategies lies in their approaches to human intervention and management. While traditional conservation often involves active management interventions, such as habitat restoration or species reintroductions, rewilding advocates for a more hands-off approach that allows natural processes to drive ecosystem recovery (Seddon et al., 2021). Rewilding projects

may involve minimal human intervention, instead relying on natural processes, ecological succession, and the resilience of ecosystems to recover and self-regulate over time (Svenning et al., 2016). This contrasts with traditional conservation approaches, which may rely more heavily on human interventions such as captive breeding programs, habitat manipulation, or predator control (Seddon et al., 2021). By minimizing human intervention and allowing ecosystems to function autonomously, rewilding seeks to promote ecological integrity and the intrinsic value of wild nature (Lorimer et al., 2015).

TYPES OF REWILDING STRATEGIES

There are several types of rewilding strategies that vary in their focus, scale, and implementation. Each type of rewilding has its unique benefits and challenges, and the choice of approach depends on the specific goals, ecological context, and social dynamics of the project area. By understanding the different types of rewilding strategies, conservation practitioners can design and implement effective restoration interventions that promote biodiversity conservation and ecosystem resilience.

Passive Rewilding involves allowing natural processes to occur without direct human intervention. It aims to restore degraded ecosystems by removing human impacts and providing conditions for natural regeneration to take place (Navarro & Pereira, 2012). This approach often includes habitat restoration, such as reforesting abandoned agricultural land or allowing natural succession to occur in abandoned urban areas (Sandom et al., 2014).



Figure 2: Passive rewilding study sites next to Monks Wood, Cambridgeshire

Source:

<https://www.eurekalert.org/multimedia/895100>
2024

Trophic Rewilding focuses on restoring ecological interactions between species and reintroducing key predators or large herbivores to ecosystems (Donlan et al., 2006). By reinstating these keystone species, trophic rewilding aims to restore natural food webs, regulate herbivore populations, and promote biodiversity (Svenning et al., 2016). Examples of trophic rewilding projects include the reintroduction of wolves in Yellowstone National Park and the reintroduction of beavers in European wetlands (Monbiot, 2013).



Figure 3: Trophic rewilding

Source:<https://earth.org/trophic-rewilding-science-of-reintroducing-predators-into-an-ecosystem/>
2024

Cultural Rewilding emphasizes the restoration of traditional ecological knowledge and practices among indigenous communities. It involves reconnecting people with their ancestral landscapes, traditional land management techniques, and cultural relationships with nature (Colding & Folke, 2001). Cultural rewilding projects often focus on revitalizing indigenous land stewardship practices and promoting community-based conservation efforts (Berkes, 2009).

Ecosystem Rewilding aims to restore entire ecosystems to their natural state by reintroducing native species, reinstating natural processes, and restoring ecological functions (Donlan et al., 2006). This approach seeks to create self-sustaining and resilient ecosystems capable of supporting diverse plant and animal communities (Marris, 2014). Ecosystem rewilding projects typically involve large-scale restoration efforts in areas with extensive habitat loss or degradation (Sandom et al., 2013).



Figure 4: Ecosystem rewilding

Source: <https://relationalthinkingblog.com/2022/03/14/plain-language-summary-to-capitalise-on-the-decade-of-ecosystem-restoration-we-need-institutional-re-design-to-empower-advances-in-restoration-ecology-and-rewilding/> 2024

Urban Rewilding focuses on reintroducing native vegetation, enhancing green spaces, and promoting biodiversity in urban environments (Kowarik, 2011). This approach seeks to improve urban ecological connectivity, provide habitat for wildlife, and enhance the quality of life for city residents (Hope et al., 2020). Urban rewilding projects may include initiatives such as rooftop gardens, community parks, and green corridors within cities (Miller & Hobbs, 2002).



Figure 5 : Urban rewilding

Source: <https://www.wur.nl/en/show/urban-rewilding-restore-your-local-ecosystem.htm> 2024

REWILDING AS A NATURE-BASED CLIMATE CHANGE MITIGATION STRATEGY.

Rewilding has emerged as a promising nature-based climate change mitigation strategy, leveraging ecological restoration efforts to enhance ecosystem resilience and sequester carbon from the atmosphere (Seddon et al., 2020). By restoring degraded habitats and reintroducing keystone species, rewilding projects aim to rebuild biodiversity and ecosystem functioning, which in turn can contribute to climate change mitigation

efforts (Perring et al., 2015). Through trophic rewilding initiatives, such as the reintroduction of apex predators, ecosystems can regain their natural balance and increase carbon storage capacity (Ripple et al., 2014). Moreover, rewilding promotes the conservation of intact ecosystems, which are more resilient to climate change impacts than fragmented landscapes (Dinerstein et al., 2019). By protecting large, interconnected areas of wilderness, rewilding projects help safeguard carbon-rich habitats such as forests, wetlands, and mangroves, which serve as crucial carbon sinks (Keith et al., 2009). Furthermore, rewilding can enhance ecosystem services such as water purification, flood regulation, and soil carbon storage, contributing to climate change adaptation efforts (BenDor et al., 2015).



Figure 6 : climate solutions

Source: <https://vectormine.com/item/climate-solutions-to-protect-nature-and-save-environment-outline-diagram/> 2024

Additionally, rewilding initiatives that focus on protecting intact ecosystems can provide significant climate benefits. For example, the conservation of intact forests, grasslands, and peatlands preserves their carbon storage capacity and prevents emissions from deforestation and land degradation. Projects such as the REDD+ (Reducing Emissions from Deforestation and Forest Degradation) mechanism aim to incentivize forest conservation and sustainable management practices in tropical regions, thereby reducing greenhouse gas emissions and promoting biodiversity conservation (UNFCCC, 2021).

The effectiveness of rewilding as a climate change mitigation strategy depends on various factors, including land-use policies, conservation priorities, and stakeholder engagement (Corlett et al., 2018). Achieving carbon sequestration goals

through rewilding requires careful planning and management to maximize ecological benefits while minimizing potential conflicts with human activities (Strassburg et al., 2020). Additionally, monitoring and evaluation frameworks are essential to assess the carbon sequestration potential of rewilding projects and track their long-term impacts on climate change mitigation (Bullock et al., 2011).

SOME EXAMPLES OF REWILDING PROJECTS AROUND THE WORLD

Yellowstone National Park (United States)

The reintroduction of wolves in Yellowstone National Park in the United States led to a cascade of ecological effects, including changes in the behavior of prey species and vegetation dynamics. Following the extirpation of wolves in the early 20th century, elk populations soared, leading to overgrazing of vegetation and subsequent degradation of riparian habitats. However, with the reintroduction of wolves in the mid-1990s, the park experienced a trophic cascade—an ecological phenomenon in which changes at one trophic level cascade down to affect lower trophic levels. Research conducted by Ripple and colleagues (2014) documented the far-reaching effects of wolf reintroduction on Yellowstone's ecosystem. As wolves began to regulate elk and deer populations by predation, the browsing pressure on vegetation decreased. This reduction in herbivory allowed vegetation, particularly woody plants and saplings, to recover and thrive. Consequently, the regenerated vegetation facilitated the sequestration of carbon dioxide through photosynthesis, contributing to carbon storage in forest ecosystems.



Figure 7: The Druid grey wolf pack trot across the snow filled Lamar Valley in Yellowstone National Park Source:

<https://www.muchbetteradventures.com/magazine/yellowstone-wolves-rewilding-1995-history-books/2024>

Oostvaardersplassen Nature Reserve (Netherlands)

The Oostvaardersplassen nature reserve in the Netherlands serves as a compelling case study of rewilding as a nature-based climate change mitigation strategy. Initially, the reserve was a former agricultural area, but it underwent a remarkable transformation through rewilding efforts. The project focused on restoring the area into a dynamic and self-sustaining ecosystem that closely resembled its natural state before human intervention. One of the key components of the rewilding project at Oostvaardersplassen was the reintroduction of large herbivores, including red deer, Heck cattle, and Konik horses. These herbivores played a crucial role in mimicking the natural processes of grazing and browsing that historically shaped the landscape (Vera et al., 2010). Through their presence and activities, such as grazing and trampling, these herbivores helped to create a mosaic of habitats within the reserve. The restoration of diverse habitats, including grasslands, wetlands, and woodlands, has been a significant outcome of the rewilding efforts at Oostvaardersplassen. These habitats now support a wide range of plant and animal species, contributing to increased biodiversity and ecosystem resilience. The reestablishment of natural processes and the creation of diverse habitats have also enhanced the overall ecological functioning of the reserve.



Figure 8: Oostvaardersplassen Nature Reserve Source: <https://rewilding.org/european-experiments-in-rewilding-oostvaardersplassen> 2024

The Reintroduction of Beavers in Various Locations Across Europe and North America

Beavers are considered ecosystem engineers due to their remarkable ability to create and maintain wetland habitats through their dam-building activities. By reintroducing beavers to degraded river systems, rewilding projects have successfully facilitated the restoration of wetland ecosystems, leading to a myriad of ecological benefits. One notable outcome of the beaver reintroduction projects is the restoration of degraded river systems and the improvement of water quality. Beavers create complex networks of dams and ponds that slow down the flow of water, allowing sediment and pollutants to settle out. This process helps to improve water quality by reducing sedimentation and filtering out pollutants, ultimately benefiting aquatic habitats (Nummi et al., 2015).



Figure 9 : Beavers

Source:

<https://www.nhm.ac.uk/discover/news/2021/april/record-numbers-of-beavers-are-being-introduced-to-the-uk.html> 2024

In addition to enhancing water quality, beaver reintroduction has also led to an increase in biodiversity within restored wetland ecosystems. The creation of wetland habitats by beavers provides crucial habitat for a variety of plant and animal species, including amphibians, fish, and waterfowl. These habitats support diverse communities of organisms and contribute to overall ecosystem health and resilience (Nummi et al., 2015). Furthermore, the presence of beaver dams in freshwater environments acts as natural carbon sinks. Beaver dams trap sediment and organic matter, which accumulates over time and results in the sequestration of carbon in wetland soils (Pollock et al., 2017). This process helps to mitigate climate change by removing carbon dioxide from the atmosphere and storing it in wetland ecosystems. Research by Nummi et al. (2015) and Pollock et al. (2017) provides valuable

insights into the ecological benefits of beaver reintroduction projects and their contributions to rewilding efforts. These studies highlight the importance of considering beavers as keystone species in ecosystem restoration and climate change mitigation strategies, as they act as natural carbon sinks by trapping sediment and organic matter, thereby sequestering carbon in freshwater environments.

The Great Green Wall Initiative in Africa

The Great Green Wall initiative in Africa stands as a prominent example of a large-scale rewilding effort with far-reaching ecological and social impacts. Spearheaded by the African Union, the initiative aims to combat desertification and land degradation across the Sahel region by planting millions of trees and restoring degraded



landscapes. Through the restoration of vegetation cover and enhancement of soil fertility, the Great Green Wall serves as a multifaceted approach to addressing environmental challenges while promoting sustainable development. The initiative's primary focus is on restoring degraded ecosystems and creating a mosaic of natural habitats and agricultural land along the southern edge of the Sahara Desert. By increasing vegetation cover, the Great Green Wall helps to stabilize soils, prevent erosion, and improve water retention, thereby combating desertification and land degradation (UNCCD, 2021). These efforts contribute to the restoration of ecosystem services and the preservation of biodiversity in the region.

Moreover, the Great Green Wall initiative offers numerous co-benefits beyond environmental restoration. By creating sustainable livelihood opportunities for local communities, such as agroforestry and sustainable land management practices, the initiative supports economic development and poverty alleviation (UNCCD, 2021). Additionally, the restored landscapes provide habitat for a variety of plant and animal

species, contributing to biodiversity conservation efforts in the Sahel region. Research by the United Nations Convention to Combat Desertification (UNCCD) (2021) underscores the importance of the Great Green Wall initiative in addressing climate change, promoting environmental sustainability, and fostering resilience to climate extremes. By harnessing the power of rewilding at a landscape scale, the initiative demonstrates the potential for nature-based solutions to mitigate environmental degradation and enhance human well-being in vulnerable regions.



Figure 10: Staff of the National Agency for Great Green Wall inspecting seedlings at a nursery site in Nigeria

Source: <https://humanglemedia.com/great-green-wall-a-glance-at-nigerias-line-of-defence-against-the-sahara/> 2024

The Iberian Lynx Conservation Program (Spain)

The Iberian Lynx Conservation Program in Spain represents a significant rewilding effort aimed at conserving the critically endangered Iberian lynx (*Lynx pardinus*) and its habitat. The program involves various conservation measures, including habitat restoration, captive breeding, and reintroduction of lynx individuals into the wild. The primary goal of the program is to reverse the decline of the Iberian lynx population and restore its ecological role in the ecosystem. Through habitat restoration efforts, such as reforestation, land management practices, and the creation of protected areas, the Iberian Lynx Conservation Program aims to enhance the quality and availability of suitable habitats for lynx populations. These efforts not only benefit the lynx but also contribute to the conservation of other species and ecosystem functions.

Research on the Iberian Lynx Conservation Program has highlighted its success in increasing lynx populations and expanding their range. According to studies (Rodríguez & Delibes, 2003), reintroduced lynx individuals have successfully established breeding territories and reproduced in the wild, indicating the program's effectiveness in restoring lynx populations. Furthermore, the presence of lynx individuals has been shown to have positive cascading effects on ecosystem dynamics. Lynx are top predators in their ecosystem, and their reintroduction has led to changes in prey behavior and population dynamics, which in turn influence vegetation structure and biodiversity (Gil-Sánchez et al., 2009). By restoring lynx populations and their ecological interactions, the Iberian Lynx Conservation Program contributes to ecosystem health and resilience.



Figure 11: An Iberian lynx

Source: <https://www.earthisland.org/journal/index.php/articles/entry/lynx-wild-horses-and-vultures-return-to-eastern-spain-in-latest-rewilding-project/> 2024

ETHICAL CONSIDERATIONS IN REWILDING PROJECTS

Ethical considerations play a crucial role in guiding rewilding projects as nature-based approaches to climate change mitigation. These considerations are paramount in guiding rewilding projects as nature-based approaches to climate change mitigation. They encompass a range of principles and values that ensure the responsible and sustainable implementation of rewilding initiatives. Ethical considerations provide a framework for balancing conservation goals with social, cultural, and ecological values, guiding rewilding projects towards outcomes that are equitable, sustainable, and beneficial for both people and nature. By integrating ethical principles

into rewilding initiatives, we can ensure that nature-based approaches to climate change mitigation contribute to the long-term health and resilience of ecosystems, while also promoting social justice and environmental stewardship. Ethical considerations in relation to rewilding projects include:

Intrinsic Value of Biodiversity

This perspective recognizes that all living beings and natural systems have inherent worth and deserve protection and respect (Callicott, 1989). By prioritizing the preservation and restoration of natural systems, rewilding initiatives seek to uphold the intrinsic value of biodiversity and promote the flourishing of diverse life forms (Sandøe et al., 2018). This approach aligns with the principles of environmental ethics, which emphasize the moral obligation to protect and preserve the integrity of ecosystems and their inhabitants (Leopold, 1949).

Moreover, recognizing the intrinsic value of biodiversity underscores the interconnectedness of all living beings and the importance of maintaining ecological balance (Taylor, 1986). Therefore, ethical rewilding practices prioritize the conservation and restoration of ecosystems not only for their instrumental value to humans but also for their inherent value as components of the natural world (Soulé & Noss, 1998). Ultimately, by upholding the intrinsic value of biodiversity, rewilding projects contribute to the preservation of Earth's ecological heritage for future generations (Rolston, 1988).

Welfare of Reintroduced Species

Ensuring the welfare of reintroduced species is a critical ethical consideration in rewilding projects, reflecting the moral imperative to minimize harm to individual animals (Sandler, 2012). The process of reintroducing species into their native habitats carries inherent risks and challenges, including potential stress, injury, and mortality (Griffith et al., 2018). Ethical rewilding practices prioritize the well-being of reintroduced species by implementing careful planning and management strategies (Caro, 2010). This may involve conducting comprehensive assessments of habitat suitability, population dynamics, and potential threats to ensure that reintroduction efforts are conducted in a manner that minimizes harm to individual animals (Seddon et al., 2019).

Additionally, ongoing monitoring and adaptive management are essential components of ethical rewilding initiatives, allowing for the timely identification and mitigation of any adverse

impacts on reintroduced species (IUCN, 2013). By prioritizing the welfare of reintroduced species, rewilding projects demonstrate a commitment to ethical stewardship and conservation principles, ultimately contributing to the long-term success and sustainability of reintroduction efforts (Griffith et al., 2018).

Community Engagement and Participation

Community engagement and participation are essential components of ethical rewilding projects, reflecting a commitment to inclusive decision-making and social justice (Sandbrook et al., 2013). Meaningful engagement with local communities and stakeholders is crucial for understanding their perspectives, concerns, and traditional knowledge regarding rewilding initiatives (Holmes et al., 2013). Indigenous peoples and local communities often possess valuable insights into ecosystems and biodiversity, making their involvement essential for the success and sustainability of rewilding efforts (Sandbrook et al., 2013). By consulting with communities, rewilding projects can promote transparency, equity, and mutual respect, fostering collaborative relationships built on trust and shared stewardship (Holmes et al., 2013). Furthermore, community engagement facilitates the integration of local knowledge and cultural values into rewilding strategies, enhancing the relevance and effectiveness of conservation efforts (Sandbrook et al., 2013). Empowering communities to actively participate in decision-making processes empowers them to become stewards of their local environments, fostering a sense of ownership and responsibility for conservation outcomes (Holmes et al., 2013). Additionally, community involvement can contribute to the development of innovative solutions to conservation challenges, drawing on the diverse expertise and perspectives of local stakeholders (Sandbrook et al., 2013).

Ecosystem Integrity and Resilience

Ethical rewilding practices prioritize the integrity and resilience of ecosystems, recognizing the interconnectedness of species and habitats (Seddon et al., 2014). This approach emphasizes the restoration of natural processes and functions, such as predator-prey dynamics, trophic interactions, and habitat connectivity, to support ecosystem health and stability (Seddon et al., 2014; Navarro & Pereira, 2012). By restoring ecological processes that have been disrupted by human activities, rewilding projects aim to promote the self-regulating capacity of ecosystems and enhance their ability to withstand environmental stressors

(Navarro & Pereira, 2012). One key aspect of ecosystem integrity in rewilding projects is the restoration of keystone species and ecological processes that play critical roles in maintaining ecosystem structure and function (Seddon et al., 2014). Keystone species, such as top predators or ecosystem engineers, exert disproportionate influence on ecosystem dynamics and biodiversity, making their conservation essential for ecosystem resilience (Seddon et al., 2014). By reintroducing keystone species and restoring their ecological roles, rewilding projects can enhance the stability and productivity of ecosystems, contributing to their long-term health and sustainability (Navarro & Pereira, 2012).

Furthermore, ethical rewilding practices recognize the importance of preserving and restoring habitat connectivity to facilitate species movement and genetic exchange across landscapes (Seddon et al., 2014). Maintaining functional connectivity allows populations to disperse, colonize new areas, and adapt to changing environmental conditions, enhancing their resilience to habitat fragmentation and climate change (Navarro & Pereira, 2012).

Adaptive Management and Monitoring

Ethical rewilding projects embrace adaptive management approaches and continuous monitoring to assess the effectiveness and impacts of reintroduction efforts (Pettorelli et al., 2018). Adaptive management involves iteratively adjusting management strategies based on new information and feedback from monitoring efforts (Runge et al., 2011). This approach recognizes the uncertainty inherent in ecological systems and the need for flexible, responsive management strategies to address emerging challenges and opportunities (Carver et al., 2020). Continuous monitoring is essential for evaluating the ecological, social, and economic outcomes of rewilding projects over time (Pettorelli et al., 2018). Monitoring efforts may include collecting data on species populations, habitat conditions, ecosystem processes, and stakeholder perceptions (Carver et al., 2020). By systematically monitoring key indicators, rewilding projects can assess their progress toward conservation goals, identify emerging issues or threats, and inform adaptive management decisions (Runge et al., 2011). Adaptive management and monitoring also enable rewilding projects to learn from both successes and failures, improving their effectiveness and minimizing unintended consequences (Pettorelli et al., 2018). By integrating feedback from monitoring efforts into decision-making processes,

rewilding projects can refine their strategies, optimize resource allocation, and enhance project outcomes (Carver et al., 2020).

II. CONCLUSION

This paper has shed light on the ethical dimensions of rewilding as a nature-based approach to climate change mitigation. Through the exploration of case studies and a comprehensive literature review, we have uncovered the multifaceted ethical considerations inherent in rewilding projects. It is evident that rewilding initiatives have the potential to contribute significantly to climate change mitigation by restoring ecosystems, enhancing biodiversity, and sequestering carbon. However, ethical dilemmas arise in the process, including issues related to indigenous rights, land tenure, socio-economic equity, and animal welfare. These ethical considerations underscore the importance of adopting a participatory and inclusive approach to rewilding, engaging with local communities, indigenous peoples, and other stakeholders in decision-making processes. Moreover, proactive measures should be taken to address potential conflicts and mitigate negative impacts, ensuring that rewilding projects uphold ethical principles of justice, equity, and respect for nature. Moving forward, it is imperative for researchers, practitioners, policymakers, and civil society to collaborate in navigating these ethical challenges and advancing rewilding as a sustainable and ethical strategy for addressing climate change. By integrating ethical considerations into rewilding practices, we can harness the transformative potential of nature-based solutions while upholding our moral obligations to present and future generations.

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