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Bachelor in International Relations

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The EU Biodiversity Strategy for 2030 and the Rewilding of Horses in the European Territory:

Benefits and Risks

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Abstract

The European Commission has shown its commitment to the conservation of nature and wild habitats in the EU Biodiversity Strategy for 2030. Driven by this strategy, various associations such as Rewilding Europe have promoted rewilding projects with animals, including horses. The rewilding of horses has a scientific basis that demonstrates the benefits of these animals on biodiversity, such as fire prevention and excess of carbon dioxide control, among others. Therefore, by combining insights from ecology, ethics, veterinary science, and conservation biology, this research offers an understanding of the multifarious facets of horse rewilding in the context of the EU Biodiversity Strategy for 2030 and offers an international comparative analysis of different strategies used in by some EU countries. The study contributes to the ongoing discourse surrounding rewilding and biodiversity conservation while providing a valuable resource for policymakers, conservationists, and researchers striving to strike a balance between the imperatives of ecological restoration and ethical responsibility.

Keywords: Rewilding, conservation, restoration, biodiversity, EU, horses.

Resumen

Con la Estrategia de Biodiversidad de la UE para 2030, la Comisión Europea ha mostrado su compromiso con la conservación de la naturaleza y los hábitats silvestres. Impulsadas por esta Estrategia, varias asociaciones, como Rewilding Europe, han promovido proyectos de rewilding con animales, incluidos los caballos. El rewilding de caballos tiene una base científica que demuestra los beneficios de estos animales para la biodiversidad, como la prevención de incendios y el control del exceso de dióxido de carbono, entre otros. Así, combinando conocimientos de ecología, ética, veterinaria y biología de la conservación, esta investigación ofrece una comprensión de las múltiples facetas del rewilding de caballos en el contexto de la Estrategia de Biodiversidad de la UE para 2030 y ofrece un análisis comparativo internacional de las diferentes estrategias utilizadas en algunos países de la UE. El estudio contribuye al discurso actual en torno a la renaturalización y la conservación de la biodiversidad, al tiempo que constituye un valioso aporte para responsables políticos, organizaciones conservacionistas e investigadores que tratan de encontrar un equilibrio entre los imperativos de la restauración ecológica y la responsabilidad ética.

Palabras Clave: Renaturalización, conservación, restauración, biodiversidad, UE, caballos.

1. Introduction

Much before humanity spread, horses were roaming around Earth grazing and flourishing their surroundings. In Europe, ecosystems were not like the ones we have now. The biodiversity of species was greater, forests were even more breathtaking, and land was filled of green grasslands. However, the start of the Holocene and therefore the increase in human population and techniques gradually started to cause harm. Many species got extinct and with that the European wild horse. Since then and added to the high pressures of associated with the Holocene and Anthropocene, our biosphere is in decay.

To try to reverse this situation, policy makers around the world have reunited, in the form of conventions, declarations and multilateral agreements, to set the goals to avoid further environmental degradation. Parallelly, scientists have come up with different techniques to tackle these goals such as those related to restoring our ecosystems, among others. This paper particularly focuses on rewilding for restoration purposes although it does give importance to conservation goals as well.

Rewilding aims to bring back the ecosystems we used to have, before human actions slowly worsened them, through the reintroduction of keystone species. Although this technique is conscious that the animals that used to live around that Era are mostly extinct, it does try to search for the ideal species for it looking at which ones are most like the originals.

About international regulations and goals, this paper focuses on the European territory and analyzes the main EU directives and strategies for biodiversity restoration. More concretely, it pays special attention to the EU Biodiversity Strategy for 2030 and how rewilding with horses can help restore many of the European ecosystems. Furthermore, it also briefly analyzes variables like horse social behavior, their morphology, level of domestication and genetics to try to see if any horse breed is fit for rewilding or if there is a need to use specific breeds. Furthermore, it will look at the benefits and risks of horse rewilding and, lastly, it will respond to the question as to whether rewilding, and particularly horse rewilding, can help fulfill the goals of the EU Biodiversity Strategy for 2030.

2. Purpose and Motives

This research aims to reflect on the importance of rewilding in the fulfillment of biodiversity restoration and conservation at a global scale, but more concretely at a European scale and with the use of horses to help achieve many of the goals of the European Union. For centuries, horses have been useful to humans, whether in work, sport, or entertainment. In other

words, they have been trained to serve humanity somehow, and they were not very commonly seen as animals with functions in our ecosystem. However, through rewilding studies, it has been shown that horses have an outrageous potential to protect, restore and make certain ecosystems flourish.

By paying close attention to the EU Biodiversity Strategy for 2030 and following the Safe and Just Earth System Boundaries (ESBs), one could hypothesize that rewilding has been considered and put into consideration to fulfill some of the goals of said frameworks. However, although rewilding has been a restoration technique largely studied, it seems to have been surprisingly forgotten in the creation of contemporary legislation surrounding these topics, even if the UN has recently declared the "Decade on Ecosystem Restoration" (UN Decade on Restoration, n. d.). Because of this, the following academic research aims to highlight the efforts of rewilding, and more concretely, rewilding done with horses, to help achieve the goals of the EU Biodiversity Strategy for 2030.

3. Methodology

This investigation will consist of an extensive analysis of the studies surrounding rewilding and the different theories and branches attached to it. Moreover, it consists of an historical review of the different conventions and agreements done on environmental sustainability, conservation, and restoration accompanied by a critical relation-based comparative analysis between these conventions and rewilding. Furthermore, there will be an analysis of the role of horses in rewilding efforts, followed by the exposition of three examples of horse rewilding in the European territory, looking at what has gone well and what hasn't.

It must be noted that during this research, artificial intelligence was used under the supervision of the director of the work. This has made it possible to improve the quality of the investigation as well as the optimization of time in the analysis of extensive conventions and agreements. Moreover, it has contributed to the optimal translation and paragraph cohesion in cases where it has been necessary, always as a complementary tool to improve the quality of this writing.

4. State of the Art and Theoretical Framework

4.1. The safe and just Earth System Boundaries (ESBs)

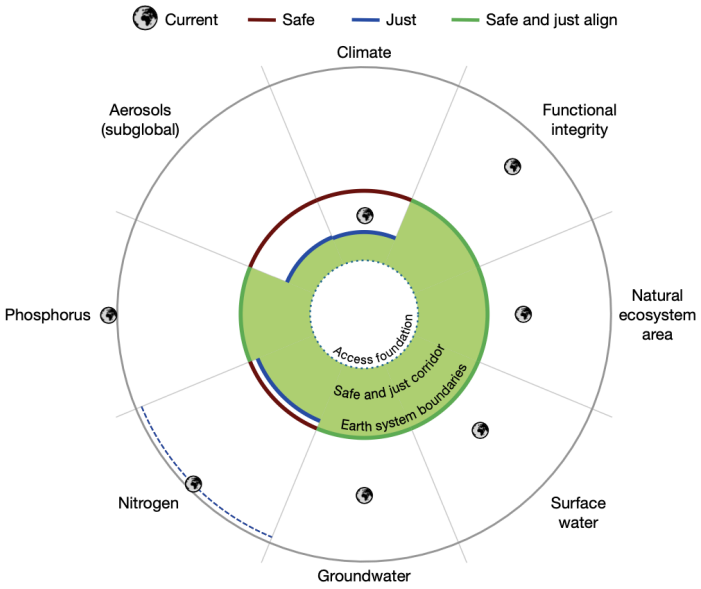

Figure 1. Safe and just Earth system boundaries, p. 104, Nature, vol 619, 2023.

The safe and just Earth system boundaries (ESBs) is a framework created to measure the impact of the era of the Anthropocene done to the environment and to set the boundaries of what is considered safe and just for the Earth. Proposed by Johan Rockström and many more researchers in the field, it "accounts for Earth system resilience and human well-being in an integrated framework" (ESBs, p.103). One of the key aspects of this concept is that it includes both planetary and social concerns, resulting in a set of limits that ensure humanity develops and operates whilst minimizing the harm done to Earth.

The ESBs use a set of variables, or domains, with their respective boundary to measure whether we are overpassing said limits or not, which would result in unwanted and sometimes irreversible harm done to our planet. These domains are climate, biosphere, fresh water, nutrients, and air pollution. According to the article, these domains were selected for the following reasons: they refer to the fundamental elements of the Earth system, such as the atmosphere, hydrosphere, geosphere, biosphere, and cryosphere, as well as their interrelated processes (carbon, water, and nutrient cycles), which underpin the planet's life support systems and thus human well-being on Earth (p. 103). In the picture above it is possible to see where the limits of safe ESBs are (dark red) as well as the just ESBs (blue). The green areas represent the alignment of safe and just ESBs and the small Earth figures show where we stand in comparison to these boundaries. Also, the dotted green line represents a minimum access to basic goods such as water, food, energy, and infrastructure for the human population.

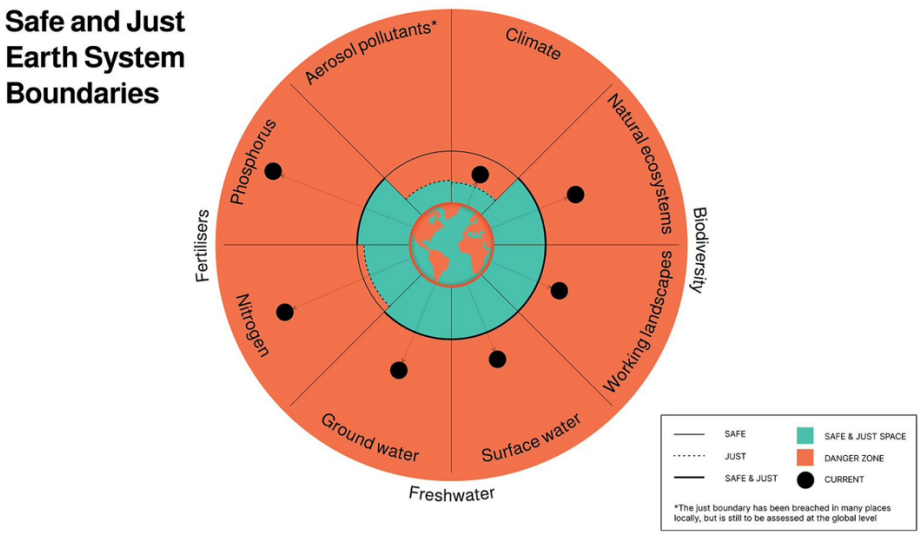

Figure 2. ESBs with danger zone marks, Earth Commission, 2023.

This visual representation of the ESBs shows how we have reached the danger zone in most of the boundaries. In the words of Johan Rockström (2023) himself, “this means that unless a timely transformation occurs, it is most likely that irreversible tipping points and widespread impacts on human well-being will be unavoidable”.

4.2. Rewilding

4.2.1. What is Rewilding

The first person to use and come up with the term “rewilding” was David Foreman (1946-2022) in 1992. For him, this theory was mainly centered on “wilderness and apex carnivore recovery” (Rewilding Earth, n.d). He was the founder of The Rewilding Institute and he mainly described rewilding with three core adjectives “Big, Wild, and Connected” (Davis, The Global Rewilding Alliance, n.d). He was commonly described as a radical activist who supported the *deep ecology* philosophy, which was later developed by Arne Naess and George Sessions in 1984. *Deep ecology* is a philosophy that is guided by eight fundamental values which advocate that nature has intrinsic value by itself and aside from the human being, and that policies must be created to prevent unbridled population growth and human intervention in the "non-human world" (Khalfaoui, Earth.org, 2023). Going back to rewilding, Michael Soulé and Reed Noss were the ones to further develop and highlight the importance of rewilding in their text “Rewilding and Biodiversity: Complementary Goals for Continental Conservation” by describing the three C’s rule: Cores, Corridors and Carnivores. The reason for specifying the appearance of carnivores in biodiversity conservation and rewilding is hand to hand with the

term “keystone species”, as normally carnivores are the ones generating a greater positive impact in the functions of an ecosystem, meaning that trophic cascade interactions are leaded by them. Since Soulé and Noss came up with the three C’s rule, this element became the basis for the definitions that came after, although each of them was different from the other.

Nowadays, the definition of rewilding has gradually developed and, when searching for the definition on the internet, it is highly common to notice how this term has moved from exclusively mentioning carnivore recovery to including other elements like “progressive approach to conservation”, which is the one used by Rewilding Europe, one of the main research institutes of rewilding in the region. To further develop, the full definition says that “it’s about letting nature take care of itself, enabling natural processes to shape land and sea, repair damaged ecosystems and restore degraded landscapes. Through rewilding, wildlife’s natural rhythms create wilder, more biodiverse habitats*”* (Rewilding Europe, n.d). On the other hand, and as an example of a more complete definition, The Rewilding Thematic Group, a dedicated research and working group which has created a comprehensive universal definition that goes beyond what explained above describes it as:

> “The process of rebuilding, following major human disturbance, a natural ecosystem by restoring natural processes and the complete or near complete food-web at all trophic levels as a self-sustaining and resilient ecosystem using biota that would have been present had the disturbance not occurred. This will involve a paradigm shift in the relationship between humans and nature. The ultimate goal of rewilding is the restoration of functioning native ecosystems complete with fully occupied trophic levels that are nature-led across a range of landscape scales. Rewilded ecosystems should - where possible - be self-sustaining requiring no or minimum-intervention management (i.e. *natura naturans* or “nature doing what nature does”), recognizing that ecosystems are dynamic and not static” (IUCN CEM Rewilding Thematic Group, n.d).

4.2.2. Types of Rewilding

With the years, many authors such as Nathalie Pettorelli, Sarah M. Durant and Johan T. du Toit in “Rewilding” (2019), as well as Jordi Palau in “Rewilding Iberia. Explorando el potencial de la renaturalización en España” (2020), have developed the definition and classified rewilding into different types depending on its focus, its timing, and its dimension.

According to Palau, if we divide rewilding with the classification of time, there are two subcategories of rewilding: firstly, Pleistocene rewilding, which focuses on bringing back the ecosystems that existed before the extinctions in the Pleistocene Era. Secondly, Holocene

rewilding, which aims to restore the ecosystems that existed in the Holocene Era, which started around 11.000 years ago and is the one that englobes the start of human civilization. The key idea around these two classifications is: what kind of ecosystems should we bring back? Those that existed tens of thousands of years ago, or those more recent to our present time (before humans started to alter them)?

Moving on to the second classification, the spatial one divides rewilding in terms of size, creating a micro, meso and macro scale. Micro-scale rewilding involves the restoration of native vegetation by removing invasive species or implementing certain habitats for particular species. This is done in places like farms, small parks, or individual plots of land. Meso-scale rewilding includes the introduction of large herbivores, restoring rivers and forests, and connecting non-identical habitat fragments. This is done in bigger areas like natural reserves, watersheds, or natural parks. Lastly, macro-scale rewilding covers the reintroduction of large carnivores, such as the wolf, in large areas thus allowing free motion of wildlife in generated ecological corridors.

The third and last classification of rewilding according to Palau, is based on the way the action of rewilding is taken. In his book, he talks about seven ways of approaching rewilding, being passive, active, hydrological, pyric, cultural, genetic, and landscape rewilding. Although all of them are relevant depending on the objectives of each rewilding project, for the purpose of this investigation, only active and passive will be described. As Cristian Moyano puts it, “rewilding is based on the premise that nature knows well (usually better than we do) what it is doing” (Moyano, 2022, p. 102). In the case of passive rewilding, as the word indicates, it means removing the human print in a certain ecosystem thus allowing it to restore, passively, in its own natural cycle. For example, by ceasing the cultivation of agricultural land and letting native vegetation grow by itself. On the contrary, active rewilding refers to specific actions taken by us, such as the reintroduction of specific species or restoring certain habitats to promote these ecological changes.

These numerous classifications allow for rewilding to be approached from more than one angle, adapting to the wishes of every environment and community. Each sort of rewilding has its personal targets and methods, however all of them share the goal of restoring healthy and functional natural ecosystems, just as what we used to have before. However, this segregation of rewilding can also bring light to possible controversies and difficulties to its application, which will be discussed later in the course of this paper.

4.2.3. Why is it important?

In terms of relevance, this conservation technique can be a key element to fight biodiversity loss, restoring our ecosystems and climate change mitigation.

To start, and very related to what was explained before, rewilding is important because it changes the shift from seeing the Earth and all living beings as human servants and through an anthropocentric point of view, to giving nature an intrinsic value and as an element that follows its natural course with its own balance aside from human intervention. This change of mindset in the intellectual and scientific sphere shows a gradual change in paradigm that is worth taking into consideration.

Secondly, rewilding is key to creating ecosystems. Through trophic rewilding, which is the branch of rewilding that focuses on the introduction of keystone species in a selected geographical area, it is possible to reintroduce a top-down processes in the animal food chain, balancing thus the natural equilibriums of species in an ecosystem.

Thirdly, rewilding not only restores the natural food chain of animals but also develops an improvement in the ecosystem where the animal has been introduced, even changing in consequence the geographical shape of the area. An example of this is the Yellowstone Wolf Project, which took place in 1995 when the first wolf was reintroduced in the Yellowstone National Park. Before the U.S. government removed these predators, wolves used to roam the park for thousands of years (Yellowstone Wolf Project, n.d). This initiative has shown how the reintroduction of these creatures has not only reactivated a moderate predation pressure, but that it has unlocked a chain effect to the extent that vegetation in certain areas (previously eliminated by the overpopulation of elks), such as valleys, has been reactivated. This phenomenon is attributed to the predation of the wolves, as they are the ones responsible for displacing these herds to more selected areas of the park where the preys feel safer. Furthermore, it is important because it represents a shift from seeing animals and ecosystems as functional elements for our disposal, to conceiving them as beings with freedom (Moyano, 2022, p. 100). Although it may seem rather irrelevant, taking into consideration that animals and vegetation have freedom to be themselves and the liberty to exercise their capabilities to the fullest is a symptom of a slight change in a society where the norm was to see animals as work tools, entertainment or trophy, and the land as something to exploit rather than protect.

4.2.4. The ESBs and Rewilding

Having explained both the theoretical framework to measure the environmental impact of human beings and the functioning of rewilding and its objectives, there is one question that

arises: how does rewilding relate with the big social and environmental contemporary challenges? Firstly, it is important to acknowledge the common goal of standing against climate change and human-caused harm. Having said this, indirectly, rewilding can be related to all the domains of the ESBs. However, it can closely impact biodiversity, water, and climate.

Biodiversity and Rewilding

When analyzing the relation between biodiversity and rewilding in the ESBs framework, it is important to bear in mind that rewilding aims to restore natural processes and habitats, which is fundamental to preserving biodiversity and ecosystem health. These boundaries are designed to ensure the stability and resilience of the Earth system, which in turn reduces significant harm to humans and other species. Rewilding, as a conservation strategy, directly supports these goals by increasing the capacity of the biosphere to sustain diverse life forms. Furthermore, the ESBs's article shares that for the biosphere domain, the researchers identified safe ESBs for two main biodiversity measures: the intact natural area of ecosystems (both urban and agricultural) and their respective functional integrity. Firstly, they enhance the importance of maintaining at least 50% of the area of global natural ecosystems. And secondly, in relation to functional integrity, the authors empathize that "about two thirds of human-dominated land area (approximately 40% of total land area) has insufficient functional integrity (Supplementary Methods), and large areas are showing symptoms of resilience loss, requiring regenerative practices to restore local and Earth system functions" (Rockström et al., 2023, p.106). As of today, both thresholds have been exceeded, indicating significant ecosystem degradation and biodiversity loss. Rewilding could be a possible solution that could help reverse these trends by restoring degraded lands, reintroducing native species, and allowing natural processes to re-establish themselves, thus moving towards these safe and just thresholds (International Environment Forum, 2023).

Water and Rewilding

In relation to freshwater, the authors propose two secure spatially defined ESBs based on subglobal boundaries that can be incorporated at the global scale: a flow alteration ESBs for surface waters and a flow reduction ESBs for groundwater (p. 107). In relation to this, it is important to note that river flow alteration is one of the main drivers of freshwater biodiversity loss. Through the reestablishment of natural landscapes and ecosystems, rewilding is essential for the maintenance and restoration of healthy water systems. This procedure optimizes

groundwater recharge, regulates surface water flows and reduces the effects of droughts and floods thanks to the restoration of wetlands, rivers, and floodplains. Ecosystems act as natural water filters, optimizing water quality by trapping pollutants and sediments. In addition, by fostering biodiversity, restoring nature provides critical ecosystem services for water regulation, ensuring consistent water flow and quality. Forests, for example, intercept rainfall, reduce runoff and allow groundwater infiltration. Rewilding helps mitigate climate change by increasing carbon sequestration in natural habitats, which contributes to stabilizing the climate and decreasing the frequency of extreme weather events, preserving water availability and quality.

Climate and Rewilding

In the article, and with respect to climate, the authors conclude that stabilization at or below a safe ESB of 1.5 °C of warming avoids the most severe climate impacts on humans and other species (p. 104). Given this information, how can rewilding mitigate the increase warming that is taking place nowadays? The response is that rewilding contributes significantly to climate regulation. During the process of restoring natural ecosystems, such as forests, wetlands and grasslands, carbon sequestration increases. More specifically, forests and wetlands store large amounts of carbon in their biomass and soils, while grasslands sequester carbon in their root systems and soil. Rewilding also improves ecosystem resilience by increasing biodiversity and maintaining hydrological cycles, which contributes to recovery and recovery from climate-related disturbances. It also minimizes extreme weather events by restoring floodplains and wetlands to absorb excess rainwater and maintain soil moisture to prevent droughts (Stewart-Koster et al., 2023).

4.3. Historical review: Conventions and Declarations

With the objective of understanding how the environmental issue has become a global concern and a priority for many international institutions and organizations, it is important to briefly review the main and most groundbreaking advances taken in the field of policymaking from a global perspective, moving to a thematic one focused on biodiversity, and ending with a regional one. Alternatively, there will be an analytical review of the importance of rewilding in this process. In other words, we will see if rewilding is ever referenced or mentioned, or not.

4.3.1. United Nations Conference on the Human Environment, 5-16 June 1972, Stockholm

Also known as The Stockholm Declaration, this United Nation's conference was the first ever world conference on environmental issues. Containing 26 principles, it strongly prioritized environmental issues and was the catalyst of the ongoing dialogue between countries (more or less developed) surrounding matters of economic growth, air pollution, water (including oceans) and the well-being of people around the world (United Nations, n.d). Moreover, the United Nations Environment Programme was created as a result of the Stockholm conference.

This Declaration contained both recommendations and obligations for the participating nations. On one hand, the recommendations pointed out the relevance of establishing effective environmental laws and policies, sharing environmental impact information, and collaborating to combat environmental challenges worldwide. Nations were recommended to manage their own natural resources responsibly to ensure their sustainable use and preservation, and to address poverty as a major contributor to environmental pollution through more efficient resource allocation and land management practices. On the other hand, among the obligations was the cancellation of nuclear, biological, and chemical weapons production and research, considering them to be significant threats to the natural environment. States were also required to inform each other about activities that could have an impact on the environment, encouraging transparency and collaboration to reduce adverse effects. Countries were also expected to implement the Declaration's principles and guidelines by integrating environmental issues into their national policies and development plans. These measures were intended to promote a comprehensive and collaborative approach to environmental protection, addressing both the physical and social dimensions of environmental problems (Report of the United Nations Conference on the Human Environment, 1972).

Regarding the term rewilding and its relevance in this Declaration, it is important to highlight that, as explained before, the term rewilding first appeared in 1992. Because of this, there is no reference of it in the text. However, in principle 3, which declares that "the capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved" (p. 4) Therefore, although the world rewilding is not textually referenced, it does encourage states to restore. Also, this Declaration served as the basis to then create more ambitious declarations and conventions with more specific themes and objectives in the future. In other words, the activities of rewilding are too specific to have been reflected in this Declaration.

4.3.2. The United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992

"Recognizing the integral and interdependent nature of the Earth, our home" (1992), the Rio Declaration of 1992, or Earth Summit, was a step forward in the struggle to fight against global environmental degradation. It took place for in the 20th anniversary of Stockholm 1972, bringing together political leaders, diplomats, scientists, media representatives and non-governmental organizations (NGOs) from 179 countries (United Nations, n.d). Within the events of the Earth Summit, The Rio Declaration on Environment and Development contained the 27 principles that showed bigger commitment toward these matters than the Stockholm declaration. Some of these advances are, the appearance of precautionary principles, advocating for preventive action when there is uncertainty of how certain actions might impact the environment. Secondly, the polluter pays principle. Before this Conference, nations had no responsibility to respond to environmental harms caused by them. Thirdly, the Rio Declaration brought up the importance of applying environmental impact assessments (EIAs) to actions that were likely to affect negatively the environment. Lastly, the focus on intergenerational equity, which consists of prioritizing fairness in the relationships between different generations (United Nations Environment Programe, n.d). If this idea is put into practice, there is a heavier commitment to minimize negative environmental impact, as doing otherwise would mean harming future generations and leaving a world worse off than we found it.

Although there is no reference to the term rewilding, the Earth Summit also resulted in the creation of other different agreements aside from the mentioned Declaration, such as the Convention on Biological Diversity (CBD) which will be analyzed later in the course of this paper, and the UN Framework Convention on Climate Change. Therefore, although it did not explicitly referenced rewilding or anything related to its processes and peculiarities, it did set the basis and framework, alongside the Stockholm Declaration, for the development of rewilding as we know it nowadays.

4.3.3. The 2030 Agenda for Sustainable Development, New York, 25 September 2015

The 2023 Agenda could be considered the most ambitious adopted resolution addressing the end of poverty, inequality, climate change, and environmental degradation as global challenges. Passing through a range different topics and concerns in the social, economic, political and environmental spheres, it consists of 17 Sustainable Development Goals (SDGs) and 169 targets to make it possible. The following picture briefly exposes the SDGs:

Figure 3. The 17 Goals, United Nations Development Programe, n.d.

In the Agenda 2030, the idea of co-dependence between social, economic and environmental sustainable development is fundamental. In other words, there can be no social justice without environmental and economic sustainability and vice versa. Therefore, although it targets each goal in an individual and personalized way, this agenda does not lose sight of the general view and seeks a perfect alignment of the three main parameters previously mentioned.

So, how could rewilding relate to the 2030 Agenda? Although the term rewilding is not mentioned in it, there are several elements that directly relate to the objectives and doings of rewilding. For instance, the Goal 15 directly aligns by aiming to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" (Transforming our world: the 2030 Agenda for Sustainable Development, 2015, p. 24). More concretely, the section 15.5 advocates for taking "urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species" (p. 25). The Goal 6, which "encourages countries to Ensure availability and sustainable management of water and sanitation for all", and more concretely the 6.6 that sets the objective that "by 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes" (p. 18), this is one of the main results and consequences of the actions taken by rewilding as, by restoring ecosystems and allowing wild

life to flourish there is a direct improvement of rivers, wetlands and all water related elements in the biosphere. Also, the Goal 14, “conserve and sustainably use the oceans, seas and marine resources for sustainable development” is closely related to rewilding efforts because oceans are part of the target ecosystems that rewilding tackles. More indirectly but also relevant to relate it to, the Goal 13, “take urgent action to combat climate change and its impacts”, is also addressed in rewilding because, through the improvement of wildlife and fighting desertification among others, this results in better climate regulation.

4.4. Tackling Biodiversity: International Sphere

After mentioning three of the main agreements that put the topic of the environment on the table and lay the general foundations for the fight against environmental threats (among others), it is now convenient to narrow the focus of attention to one of the main themes among which rewilding would fall, which is biodiversity. But, what is biodiversity? According to World Wildlife Fund,

> “biodiversity is all the different kinds of life you’ll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life. Biodiversity supports everything in nature that we need to survive: food, clean water, medicine, and shelter”.

In the following paragraphs there will be a description of the main international agreements signed surrounding the matter of biodiversity, where rewilding is most identified.

4.4.1. The Convention on Biological Diversity (CBD), Rio de Janeiro, 1992

The CBD, designed at the 1992 Rio Earth Summit, is an international document focused on the preservation and sustainable use of wildlife. Its purpose is to encourage the preservation of ecosystems, species, and genetic diversity. It provides an opportunity for countries to collaborate in the preservation of natural habitats and the protection of endangered creatures. Although it was not the first Convention to tackle the concern for biodiversity conservation (this matter was introduced by the Ramsar Convention and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) back in the 70s), it was the first to address, in a holistic manner, ecosystems, species, and genetic diversity altogether in a legally binding international treaty.

In relation to rewilding, the article 8 section f of the CBD encourages states to "rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, *inter alia*, through the development and implementation of plans or other management strategies" (p. 29). This directly aligns with the objectives and actions of rewilding by restoring and recovering endangered ecosystems and species. Furthermore, the article 9 section c, to "adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions" (p. 30). By reintroducing species into their natural habitats there is an action to rewild, which directly serves the purpose of rewilding. Moreover, the article 10 section d aims to "support local populations to develop and implement remedial action in degraded areas where biological diversity has been reduced" (p. 31). Within organizations such as Global Rewilding Alliance, citizens can volunteer and learn about rewilding through educational programs and help their local rewilding associations. To sum up, these articles all relate to the objectives, actions, and purposes of rewilding, meaning that, since 1992, rewilding has been a reliable and adequate tool to fulfill said goals.

4.4.2. The Conference of the Parties (COPs) on the CBD

The countries that signed the CBD reunite periodically to review and advance in the implementation of the Convention. Since the creation of the CBD, the COPs, which is the "governing body of the Convention", there has been 15 COPs meetings in 15 different countries (Background and Status, Conference of the Parties (COP), nd). The last meeting, chaired by China and with Canada as host, took place in Montreal (Canada) on December 19th, 2022 (United Nations Environment Program, n.d).

The COP 15 held in Canada, which could be considered the most ambitious of all, resulted in the creation of the Kunming-Montreal Global Biodiversity Framework (GBF). One of the main aspects to highlight of the GBF are the 2030 mission and 2050 vision. The section F number 10 sets the goal that "by 2050, biodiversity is valued, conserved, restored, and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people" (COP 15, p.12). Within this general goal, the GBF sets four main goals that relate to genetic diversity, extinction rate reduction, maintenance of ecosystems, equal distribution of benefits in genetic resources especially with local communities, and the guarantee all parties (specially the least developed) have the means to implement said Framework (p. 13). When referring to the targets for 2030, the framework sets 23 targets to be fulfilled that are significantly more specific than the 2050 goals, and refer to topics such as

financing, the private sector (for example, large companies), policymaking and regulations, impact assessment and sustainability, among others (p.14-17). In other words, it is a multifaced and ambitious approach to tackling biodiversity at a local, national, regional, and global scale.

However, the term rewilding is still not mentioned, although it does refer to restoration in numerous fragments, and therefore complies with the objectives of rewilding. In relation to the branding surrounding the GBF, the positioning of this framework is that it will be presented as relevant for many biodiversity initiatives and supportive of the United Nations Decade on Ecosystem Restoration (p. 138). Rewilding efforts are directly involved in this framework as well as in the UN Decade.

4.5. Tackling Biodiversity: The European Union

After having mentioned the international most important conventions related to environment, followed by the main agreements on biodiversity, this section will briefly expose the measures the European Union has taken in order to address this matter, such as the EU directives and proposals, the Natura 2000 Network and, more specifically, the EU Biodiversity Strategy for 2030, among others.

4.5.1. The Birds Directive and the Habitats Directive

These two directives serve as "the cornerstones of EU biodiversity policy" (European Commission, n.d). On one hand, all wild bird species found in the EU are protected under the Birds Directive. A framework for the protection, management, and control of bird species. This Directive is more specific on birds. However, the Habitats Directive englobes more species, habitats, and ecosystems. Consequently, the European Union's conservation efforts revolve around the Habitats Directive. It aims to encourage the preservation of natural environments and wild fauna and plants in Europe. This Directive works towards species protection, habitat protection and reporting the conservation status of both. The Directive also stablishes network of protected areas called Natura 2000, which includes Special Areas of Conservation (SACs), under the Habitats Directive, and Special Protection Areas (SPAs), under the Birds Directive, designated for the preservation of natural environments and species of European significance (European Environment Agency, n.d)(European Commission, n.d).

4.5.2. Natura 2000

A mentioned above, the Natura 2000 is a supranational network of protected areas, both terrestrial and marine, in the European Union. In total, in protects around 18% of land and 8% of marine territory (Directorate-General for Environment, 2023). Although each EU Member State manages and protects their own Natura 2000 areas, the EU provides financial funding to help manage these sites. This ambitious project relates directly with the objectives of rewilding. However, it does focus more on conservation rather than restoration, although it does contain restoration elements as well.

4.5.3. The EU Biodiversity Strategy for 2030

This strategy is the plan adopted by the European Union to tackle biodiversity loss and work towards the restoration and conservation of European territory. It is divided in four main pillars which are: protecting nature, restoring nature in the EU, enabling transformative change, and deploying EU external action to support biodiversity globally (EU Biodiversity Strategy for 2030, 2021, p. 8). Although all these pillars closely relate to rewilding, the following section focuses on pillar number two, which directly refers to restoration.

The EU Biodiversity Strategy for 2030. Pillar 2. Restoring nature in the EU

The second pillar of the strategy contains key elements, or targets, that harmoniously align with the purpose of rewilding. Some of these targets are that Member States "ensure 30% of EU protected species and habitats are in favorable conservation status or have positive trends by 2030" (p. 15). Also, to "increase the quantity of forests and improve their health and resilience" (p. 17). Moreover, the restoration of soil ecosystems, including "soil fertility, reduce soil erosion and increase soil organic matter" (p. 16). Furthermore, "reverse the decline of pollinators" such as bees, as "around 84% of crop species and 78% of wild flowering species depend, at least in part, on animal pollination" (p. 17). And the importance of restoring marine ecosystems "to ensure that marine resources are harvested sustainably, that carbon-rich ecosystems and important fish spawning and nursery areas are restored, and that there is zero-tolerance for illegal practices" (p. 19). These are some of the 12 targets that conform the second pillar and that could be tackled through the techniques and practices of rewilding.

5. Objectives and Questions

The main objective of this research is to highlight the relevance of horse rewilding in achieving the restoration targets of the EU Biodiversity Strategy for 2030. Subsequently, it also aims to acknowledge and share recognition on rewilding efforts to restore our ecosystems. Moreover, this research serves the purpose of exposing a brief overview of the research done on horse rewilding in the European territory with its benefits and risks. Parallelly, it intends to share the level of success of these projects through the analysis of three cases of horse rewilding in three different European countries.

The following questions have been raised with their respective hypothesis:

1. Is horse rewilding beneficial and how? The first hypothesis would be a clear yes, as horses are grazer creatures that influence grassland and therefore ecosystems, creating a chain of several consequences that can impact our landscapes positively. Furthermore, this hypothesis further defends that the use of horses for restoration purposes can be more effective than using other herbivores such as sheep.
2. Does horse rewilding align with the goals of the EU Biodiversity for 2030? Horse rewilding is englobed within rewilding and, at the same time, rewilding shares many of the goals with the EU Strategy.
3. Can any horse be used for rewilding? Although there are hundreds of different types of horses, one could hypothesize they could all be used for rewilding efforts as their physiological functioning and social behaviors are, in principle, the same. However, it must be noted that wild horses might not behave the same way as domesticated ones.
4. Are there any risks with using rewilded horses? The risks are most likely related to rewilding horses that have been previously domesticated, as they might not have adopted the necessary “wildness” to survive on their own.

6. Analysis and Discussion

6.1. Analysis: Horse Rewilding, theory and examples.

The following pages will analyze the use of the horse as a keystone species for the restoration and conservation of European territory. The explanation is a collection of the studies done by Rewilding Europe and European independent authors mostly in the field of horse ethology, ecology, and conservation. To criticize as to whether the horse is suitable and beneficial for rewilding, even more than other species, it is important to explain the relation of

European horses with wildness from the beginning to the horses we now know and how this evolution might affect the process of ecosystem restoration.

6.1.1. The Horse Nowadays

When we reflect on the horse species, we picture a horse such as the English thoroughbred for horse racing, the Hanoverian horse for jumping and the Andalusian (also known as Pure Spanish Horse) for dressage. However, more than five thousand years ago, horses did not look like that. Truth is these breeds mentioned above, among many others, are the result of human selection seeking specific traits resulting from numerous breeding processes for entertainment or work purposes, such as the draft horse for carrying people or goods (Linnartz et al, p. 13, 2023). Specially since the 19th century, enforcement of artificial breeding processes has encouraged inbreeding in order to find a specific color, behavior or tameness making certain horses unfit for rewilding but perfect for large flows of income from betting in a sport that involves horses (p. 14). For example, the English thoroughbred is the result of European heritage native mares with the three Arabian stallions imported to England from the Middle East known as Darley Arabian, Byerley Turk and Godolphin Arabian (Bower et al, 2011, p. 316). However, the DNA of the mares has proven to be very difficult to track due to the numerous crossings taken before the 17th century between the Iberian and Berber horse in North Africa, among many others (Bower et al, 2011, p. 319).

So, where do these horses come from? Regardless of the specific cases that are the result of artificial crossing, horse existing breeds have their own characteristics that differentiate them from each other. Nowadays, these variations are consequences of the changes coming from pre-domestic horses based on variables such as landscape, climate, and the nutrients they found in their own specific ecosystems during thousands of years. In other words, a horse does not look the same coming from a mountainous ecosystem than from a large and open landscape (p. 11). Therefore, the physical and psychological constitution of each breed depending on the ecosystem they have lived in will be a variable to consider when assessing if certain horses are suitable for specific rewilding projects.

6.1.2. Are wild horses truly wild?

The term rewilding does refer to reintroducing species to the wild thus making them “wild” again. Under these pretenses, we could assume horses used to be wild before domestication took place with the development of humanity around 11.000 years ago. But do these horses still exist? Is there any trace of wild horses in the European territory? And can we

just take domesticated horses and throw them into the wild and, in consequence, "(re)wild" them?

Extinction of the European wild horse

In the years of the last Ice Age and before that, wild horses used to roam the European territory in cohabitation with animals such as elephants and lions (animals that we now associate mostly with the African continent) (Linnartz et al, 2023, p.10) However, years before the start of the Holocene period, the density of these animals started to decrease, much influenced by the evolution of humanity mainly due to their newly hunting and technical skills such as fire or the use of dogs (Shipman, 2015). This continued during the start of the Holocene and while wild horses were roaming the open and grassy Northwest Europe, human population kept growing, gradually depleting the biggest herds of herbivores because, the larger the species were, the easier they were to kill (Crees, 2013). In addition to this, the end of the nomadic era and the beginning of sedentarism caused herbivores that lived in flat lands to move to more unfamiliar and less suitable habitats, such as forests and mountains with little pasture. Because of the removal of these herbivores, in which the wild horse was included, the "Europe's early Holocene grasslands and savannah woodlands transformed into a tree-dominated landscape" (Linnartz et al, 2023, p.12).

It is believed that extinction of the European wild horse happened 4000 years ago (Librado et al, 2021). Therefore, since then, all horses that were roaming free were somehow domestic herds, which started to exist after 3000 BC and the crossing of breeds between domestic and wild resulted in the final disappearance of the horse that was truly wild (Linnartz et al, 2023, p. 13). A thousand years later, agricultural demands caused humans to cut trees and gradually end with part of the forests in the continent, bringing back open landscapes for herbivores to roam, but these were not wild anymore but domestic species like sheep, goats, pigs, cattle and horses (Linnartz et al, 2023, p. 13).

Preservation of wild horse DNA

However, up until our days, there is still some remaining DNA of the European wild horses. According to Rewilding Europe, investigations surrounding Mitochondrial DNI have proven that domestic horses come from at least 77 mare bloodlines, which are the ones that have preserved the wild DNA. This means that wild domestic herds were moving around Europe, these herds mixed with the still existing local wild horses, maintaining the genes through generations. Now, why have the mares maintained the wild gene while stallions

haven't? Although stallions did cover domestic mares occasionally and sometimes even included them in their wild harem, studies have shown that foals resulting from wild stallions and domestic mares came with a specific character that made them impossible to control by humans, resulting in the gradual disappearance of the wild DNA, possibly because they were slaughtered or somehow untraceable. Therefore, as foals coming from wild mares and domestic stallions showed a more plausible character, these have been the ones to preserve the wild horse DNA.

Therefore, as a summary, it is important to understand that, although it is almost certain that wild horses disappeared, domestication started much before with the arrival of human sedentarism and agricultural demands. Since then, domesticated herds started to crossbreed with the local existing wild horses that were roaming around them. This most likely caused the extinction of the latter, added to the preservation of their DNA through the mares that were covered by domesticated stallions. Because of this, although nowadays there are "wild" horses roaming and grazing in the European territory, none of these horses is considered truly wild but feral horses, as they come from the crossings of domestic and wild horses throughout time. However, and as it will be explained in the following pages, there is one horse breed that is considered the last wild horse breed existing, which is the Przewalski.

Feral horses

Horse breeds such as mustangs (see figure 3 below) in the United States are often referred to as wild when, in fact, they are not. A feral horse is the term that refers to a domesticated horse that has escaped or left behind by its owner and that lives free in nature. The example of mustangs is the perfect illustration of this, as Spanish colonizers brough them during colonization. During that period, these horses were often stolen and freed by Native Americans tribes and then these creatures stayed in the territory, long after colonization disappeared (Horse Illustrated, 2023).

Figure 4. Picture of mustangs, photo by Bob Langrish, Horse Illustrated, 2023.

Therefore, any time we consider any horse breed for rewilding, it is usually feral horses. Also, the main difference between feral and domestic horses is that domestic ones are maintained by humans whereas feral horses are self-sustained and roaming free (American Museum of Natural History, n. d). This makes them suitable for rewilding because, to make restoration effective, these horses need to survive through the nutrition and behavior found in the selected ecosystem. If we place feed, e.g., feed or straw, in areas of the pasture, the horses will see their grazing habit altered and therefore influence the soil in a different way.

The social structure of free roaming horses

To understand the social dynamics of a pack of horses, it is important to briefly describe the way in which they are grouped. Although it is a very extensive topic with various facets depending on the age and the gender of each creature, the following paragraph will focus on the harems, which are the most typical form of packs seen in adult horses.

Wild (or feral) horses usually group in packs consisting of one stallion, which takes the role of the leader and protector of the harem, between 1 to 10 mares, and their respective foals (Chodkiewicz, 2019, p. 3). In total, harems normally consist of 6 to 16 individuals, although some rewilding examples in Europe show harems up to 25 horses, which is the case of the Konik horse in Oostvaardersplassen, Netherlands. (Linnartz et al, 2023, p. 6)

6.1.3. Horse rewilding examples

Once having explained how horses behave, interact, and where do they come from and why, it is important to take into account that not every horse breed is fit for rewilding. As

rewilding aims to restore ecosystems based on how they used to be or at least how they would be nowadays if there was no human intervention, not any horse is ideal because, precisely, human intervention has also modified many of the horse natural and original characteristics. Therefore, domestic horses with too much genetic diversity might not influence ecosystems in the most "natural" way, like wild horses used to do it. So, how should horses used for rewilding be like? According to Rewilding Europe (2023), the best "fit-for-rewilding" breeds comply with specific characteristics in the way they look, their DNA, etc.

Rewilding horses look quite different from domestic ones. For example, they are more similar to the horses found in cave paintings in Altamira than to thoroughbreds. Therefore, domestic horses are not usually recommended for rewilding. Also, it is important to highlight usually domestic breeds usually have low diversity in their genetic level (as they share the same phenotype), and that is also not appropriate for rewilding. The next criteria to take into account is how tamed the horses are. To be as "wild" as possible, it is important for horses to be as untamed as possible. This is why Przewalskis are ideal for rewilding, due to their lack of docility (a trait common in domestic horses). Next is how tall horses are. The more similar horses are to the original wild horses, the smaller they look. The anatomy of a less domesticated breed fits better for rewilding, and it is important to avoid breeds with large bones, muscles and ligaments, like the horses used for jumping. In reference to the coat, European wild horses were characterized by their variety of colors, which usually are bay, bay dun, black and black dun. Also, the coat has to be resistant thus contain thick and multiple layers to prepare them for the weather adversities of the selected ecosystem. The last two variables relate to social behavior and adaptation to wildlife. Firstly, it is important to select horses that have a clear and "primitive" social structure adapted to defend themselves from predators. Secondly, it is important to bear in mind that rewilding takes time and horses need years to adapt to their environment. Therefore, the wilder they are, the less time it will take for horses to adapt (Linnartz et al, 2023, p. 18-23).

Because of these characteristics, there are six breeds very suitable for rewilding, which are the Przewalskis, Pottokas, Hucul, Konik Polski, Yakut Pony and the Exmoor Pony.

Konik Horses in The Netherlands

The Konik horse breed was introduced in the 1980s in the Netherlands for a rewilding project in the National Park of Oostvaardersplassen. When referring to the origin of these horses, it is speculated that Konik horses come from the now extinct Tarpan breed, although this is yet to be fully confirmed (Lovász, 2021, p. 3). They were brought to the Netherlands

from Poland and, according to Lovász's paper quoting Dynowski (2006) and Pasicka (2013), the typical features of these horses are:

> "primitive body conformation, low heights (110-130 cm at the withers), mouse-grey coat colour, a black stripe along the back, longevity, vivacity connected with gentle character, resourcefulness in looking for food, modest requirements in terms of periodic feed shortage and their maintenance, good fertility and straightforward foaling without human involvement, resistance to infections and parasites, unique abilities allowing them to adapt to local environmental conditions and high tractive force in relation to body weight".

Figure 5. Konik horses in Oostaardersplassen, Netherlands, photo taken by Varia, Equnews, 2019.

They were introduced in this Dutch area to tackle extinct megafauna, biodiversity loss and to promote landscape heterogeneity. From then on, Konik horses have enhanced biodiversity creating sets of different habitats thus supporting a large range of new flora and fauna. An example of this is the natural reintroduction of many bird species that were not present in the area before this rewilding project took place (Kopina et al, n.d). Furthermore, horse grazing has also helped control vegetation growth which consequently also prevents wildfires to take place. Among many other specified benefits derived from this project, as a summary, three of the most important to highlight are: firstly, the creation of a self-sustained ecosystem thanks to the reintroduction of natural processes. Secondly, the strengthening of this ecosystem so that it withstands the different diversities that may develop due to climate change plus efficiently protecting the species that live there. Thirdly, the rewilding of Konik horses.

According to Rewilding Europe, which has monitored this project, these Konik horses came from Polish stables having previously been maintained by humans. Because of this, the first years of living in Dutch soil meant a challenge, as they were not used to being "wild". Nevertheless, these semi-feral horses (which refers to horses that roam free but still maintain contact with humans) have shown a splendid adaptation to the ecosystem in these past decades, to the extent that they are now fully embedded in the area (Linnartz et al, 2023, p. 33).

Regardless, this rewilding project has also been one of the most controversial of all, as it did not fully comply with the requirements of Rewilding partly due to the uncertainty on how the project would impact the species introduced and the ecosystems. The main problems that derived from this initiative were the lack of predators (which are necessary to balance the population of herbivores) and the fact that the territory is fenced instead of "unlimited" (Mahiques, 2022).

Przewalski Horses in France

These horses, also known as Takhi, are said to be the last wild horse native to Central Asia, and they are protected species which makes them perfect for rewilding as they can occupy the functional role that the extinct European wild horses used to have, instead of using domesticated animals for that purpose (Linnartz et al, 2023, p. 25). These past decades there have been many rewilding projects with these horses in countries like Mongolia, Ukraine, France or Spain.

In France, and more concretely the Department of Lozère, there is a herd of Przewalski horses that roam free shaping vegetation and opening the landscape (Mutillod et al., 2024). The Takh Association works to protect and preserve this herd in both France and Mongolia and is the one in charge of the rewilding project in the *Causse Méjean* plateau, situated in the National Park *des Cévennes* and protected by the EU project Natura 2000. With the purpose of finding the role of wild horses in this region, the author Clémentine Mutillod, among others, developed a research and experimental study comparing the impact of domestic horses, sheep and wild horses in rewilding of ecosystems.

Figure 6. Przewalski horses in the National Park *des Cévennes,* photo taken by Bruno Descaves*, Parc National des Cévennes,* 2021.

The comparative research concluded that Takhi's grazing impact is by far the richest in comparison with domestic horses and sheep, partly because these wild horses have developed (or never lost) their natural, or "wild", behaviors. This, summed to lack of human intervention (no vaccination, special treatments, deworming or feeding) has led to an increase in biodiversity, which is in continuous study by Scientifics in the field with the aim of protecting said biodiversity that has been built naturally. In addition to this, this area of the Natural Park and these Przewalski horses have called people's attention thus ecotourism is starting to take flourish (TAKH Association, n.d.).

Przewalski Horses in Spain

In May 2023 nine Przewalski horses arrived in Spain, followed by 19 more that arrived later in November. They arrived at Villanueva de Alcorón, Guadalajara, and the objective is to prevent wildfires, forest regeneration and biodiversity increase (Ruiz, 2023). Additionally, their feeding habits and movements enhance the quality of the grass for other herbivores in the area, such as deer, roe deer, and fallow deer (López, 2024). These animals have 5,700 hectares to roam around, and due to the positive reaction of the people involved in this project and the neighbors living around the area, expanding the area to include 6,000 more hectares is being considered (López, 2024). As "it is much cheaper to have animals opening and cleaning forests than to have to do it mechanically. Institutions spend millions and millions on cleaning, thinning, pruning removal... while we propose a more natural and economical solution"

(translated from Spanish) (Schapira, 2024). In relation to horses, Pablo Shapira (2024), the Director of the Southern Iberian Chain, says that

> "it is very interesting to see how, little by little, they are trying different foods and different environments. At the beginning it was funny to see them, since they did not know the forest, so you saw that they stayed only in open areas, and they were afraid to go into the forest. Now they love it." (translated from Spanish)

Figure 7. Przewalski horses arrive in Spain, photo by Neil Aldridge, Rewilding Spain, 2024.

It is also worth noting that these horses and the horse paintings found in the Altamira cave in Spain look very much alike (López, 2024). This may mean that both creatures have aspects in common beyond the superficial, and that is maybe partly the reason why they are adapting so well to the Iberian climate.

6.2. Discussion: Benefits, Risks and the EU Biodiversity Strategy for 2030

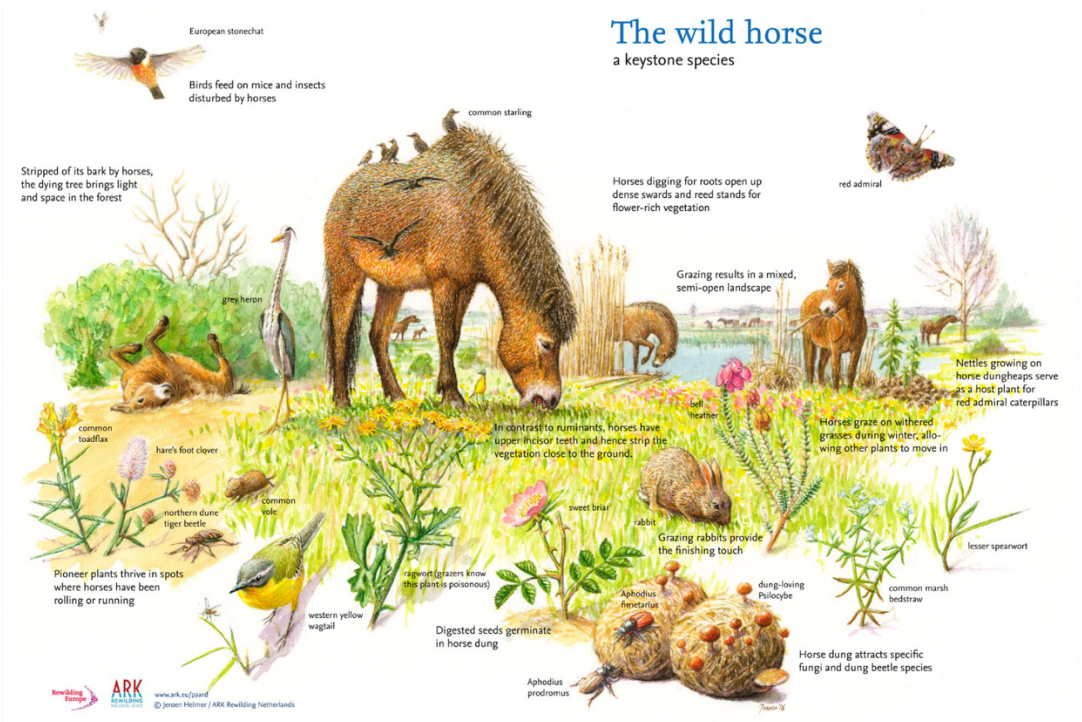

Figure 8. Illustration of the role of wild horses in ecosystems, by Jeroen Helmer, ARK Rewilding Netherlands, 2023.

6.2.1. Benefits of rewilding with horses

After giving a thorough description of the most important information about horses and horse rewilding, it is imperative to reflect on the concrete benefits that come from using this animal for restoration purposes. Throughout the whole paper it has been clear that horse rewilding is indeed beneficial for biodiversity conservation, among others. But, more concretely, how is horse rewilding benefiting ecosystem restoration?

As seen in the examples, horse grazing has shown to increase biodiversity by restoring plant species that, due to environmental and anthropogenic reasons, were disappearing or had already disappeared. More concretely, through their grazing process horses control the growth of grasslands not letting them get significantly tall. In consequence, horses are strengthening the quality of forage of these plants through regrowth stimulation whilst creating larger number of mosaics compared to other species like cattle or sheep. This means that the amount of grass in each sward increases thanks to horses such as the Koniks, as they comply with many of the characteristics of a great horse for rewilding.

Also, and in terms of nutrition, horses graze on a higher number of species than cattle, making them a more suitable option for the control of more diverse ecosystems. According to Anna Chodkiewicz (2020), the effects of Koniks grazing in different habitats is the following:

in wetlands, decomposition of grass and sedge tussocks and an increase in species richness are observed, although with a risk of decline of taxa typical of wet habitats and grazing-resistant species. On heaths and calcareous grasslands, grazing increases species richness, rejuvenates Calluna and limits shrub encroachment. In coastal dunes and dry sandy grasslands dominated by *Calamagrostis epigejos*, there is an increase in species richness, areas of bare ground and promotion of open habitat-dependent birds. In forests, grazing changes species composition, increases diversity in soil layers and shrubs, and prevents shrub expansion, although there is a risk of grassland degradation due to the promotion of coniferous forests and deciduous habitats. Also, horses' droppings are significant substrate for different organisms and might play giant function for invertebrates' variety at the pasture which includes beetles, among others. Lastly, horses don't need to feed on nutrient rich grasses, and, in fact, they eat dead grasses most of the time, which helps to eliminate unwanted plants.

Furthermore, and as seen in the example about rewilding in Spain, horses create routes in territories where it is difficult to access, allowing other animals to roam around the forest.

Moreover, using horses for rewilding helps maintain certain breeds that have been close to the extinction and need to be protected, which is the case of Przewalski horses.

Lastly, horse rewilding promotes ecotourism, as these animals have a lot of popularity, more so than other species. The combination of both wild nature and horses may attract people to participate in rewilding projects or only by visiting the rewilding areas.

6.2.2. Risks of rewilding with horses

Although grazing is tremendously useful and beneficial for restoration purposes, it also has its disadvantages when it is done by horses, especially on the top layers of the soil. As horses behave within their social group, the harems, they move in packs. This can provoke the creation of paths, which can dry the surface of the soil.

Also, it must be noted that moving harems from place to place can disorient the horses and it will slow down the process of rewilding because they are probably not used to that climate. As seen in the example of Spain, after a year, horses are still adapting to the Spanish climate and the process is slow. Therefore, patience is necessary. Also, Koniks in the Netherlands suffered from climate adaptation, as some of them were not able to survive Dutch winters. This, in consequence, leads to a reputational problem because rewilding associations need to be careful on how these events can affect the citizens, and specially activists advocating for animal welfare.

Furthermore, when using herbivores for restoration purposes, it is important to make sure the harem is controlled, as it may lead to over population of horses. This, and added to a lack of predators in the area, can have the contrary effect on the ecosystem. Therefore, it is important to balance the population of herbivores with some predators.

Also, one of the risks or disadvantages of using horses for rewilding is that, precisely because not every horse qualifies for it, it is important to have a deep knowledge about these animals. If an association were to rewild ten horses from an equestrian center and leave them in an open field or a mountain, there would be a high possibility that these horses would not survive or behave in the ideal way. This could be a possible outcome because domesticated horses sometimes have been raised living in stables, being fed and cleaned periodically and without the concern of being hurt by a predator. Therefore, these horses will most probably not have developed enough instinct of survival to be able to live in the wild without human intervention.

6.2.3. Horse rewilding and the EU Biodiversity Strategy for 2030

The EU Biodiversity Strategy for 2030 and horse rewilding are closely intertwined because horse rewilding can help fulfill some of the EU targets through its functional role as keystone species.

Mainly through horse grazing, rewilding can help achieve the protection and maintenance of up to 10% of land in the European Union, in which grasslands and wetlands are included. These types of landscapes have proven to be very successful with horses in countries like the Netherlands and France. Not only can help preserve a great amount of territory in the EU, but it can also increase biodiversity in said territories also through deposition and trampling.

Another of the goals of this strategy is to integrate ecological corridors so that animals can migrate, and genetic isolation is avoided. Horse rewilding can indeed create these corridors because it not only fulfills one of the main objectives of rewilding (connecting corridors) but it also improves the quality of life of these animals by allowing them to move freely in more extensive territories and therefore influencing more ecosystems and landscapes generating, in consequence, greater biodiversity.

Moreover, the strategy aims to raise awareness on the importance of taking care of our ecosystems and biodiversity. Horses are often used as ambassadors for many brands and projects in different fields because of the popular admiration they receive. By using horses, it might be possible to attract more supporters and therefore letting people know what the EU Strategy does.

However, it is important to note that these connections are exclusively for horse rewilding. In terms of rewilding in general, as has been explained through the course of this investigation, this restoration and conservation technique can be used to fulfill many of the objectives and targets of this strategy in a broader way than if the focus was solely put on horses.

7. Conclusion and proposals

Throughout this research, it has been possible to extract information from a global sphere, passing to a thematic, then regional and ending with a local level of analysis giving concrete examples in different countries. This overview has made it possible to identify the presence of rewilding in the most relevant frameworks for action on environmental issues, such as the CBD, the 2030 Agenda and the Stockholm and Rio Declarations, as well as the European Union main directives and projects on biodiversity. Surprisingly, rewilding is not mentioned anywhere, although the publications do insist on the importance of restoring ecosystems and biodiversity, which are two of the main objectives of rewilding. This leads to the conclusion that rewilding has not yet been stablished in the field of policymaking, even though it has been studied by many researchers in the field of environmental conservation and biodiversity restoration. In relation to the latter, the present investigation does acknowledge that rewilding is still a complicated topic due to the lack of consensus between authors on matters as simple as finding a common definition and setting the approaches for its application. Also, it is important to highlight that rewilding is relatively new, and it takes time to see the long-term results from rewilding experiments.

Parallelly, the research has been answering the questions presented throughout this work. Firstly, is horse rewilding beneficial and how? The first hypothesis was that horse rewilding is extremely beneficial for our ecosystems. Indeed, this research has proven that the hypothesis was right and horse rewilding does influence, very positively, to biodiversity conservation and ecosystem restoration through actions like wildfire prevention and connecting green corridors through grazing and other horse-related characteristics. Secondly, does horse rewilding align with the goals of the EU Biodiversity Strategy for 2030? Horse rewilding is indeed perfectly fit for the promotion and achievement of many of the goals and targets of the EU Biodiversity Strategy for 2030. Thirdly, can any horse be used for rewilding? After an extensive bibliographic review analyzing the impact of domesticated and wild horses on the ecosystem, the answer is that horse breeds do matter and not every horse is fit for rewilding. Variables such

as size, DNA, color, coat, hooves, and other elements related to the social behavior of these creatures are key to decide which horses will be used for rewilding or not. This slightly differs from the original hypothesis because, although it recognized domesticated and wild horses don't behave the same way in the wilderness, it did suggest that all horses would perform well when put into a rewilding initiative. Lastly, are there any risks with using rewilded horses? The answer is "yes" because uncontrolled overpopulation of horses might lead to unbalances in ecosystems and landscapes. Also, the hypothesis did mention the importance of being conscious of the impact it may have, not only the environment but the horses as well, if the horses that are being used for rewilding don't have the minimum survival characteristics needed for the initiative. However, truth is there are other risks that were not considered in the beginning that complement the information surrounding this matter, such as the impact of horse social behavior by moving in packs or the different consequences that may arise from considering horses without prior knowledge of these animals.

Moreover, this research has allowed the reader to get a basic understanding on the importance of horses in matters regarding sustainability, restoration and conservation. The popular mental association when we think of horses is that they are mostly used for sport competitions, work and entertainment. But, this paper, along with the many others that have been written on matters surrounding horses and animal welfare, reflect on the idea that horses have a functional purpose in the cosmos we live in, and that they are in fact, keystone species. Partly thanks to rewilding we can start considering horses as creatures with a very important role in our environment, a role that was there way before humanity appeared on this planet.

The paper has also acknowledged the history behind horses and the ethological aspects that intervene in the process of biodiversity restoration with these animals. Although the European wild horse disappeared thousands of years ago, we still have the chance to protect and preserve the last wild horse species in the world, which are the Przewalski horses. Regarding this matter, is it admirable to learn about the initiatives developed by Rewilding Europe, which works to fulfill the strategies of the EU Biodiversity Strategy for 2030 even if this term is not mentioned in the publication.

Nonetheless, this research has allowed us to reflect on other research related to this topic. For example, it would be very interesting to do a case study on a specific herd of horses, such as the Pottokas herd coordinated by Lucy Rees. In this study we could study the evolution of the ecosystem in Extremadura (where they are) since their arrival, presenting different adversities such as the introduction of different predators, and the arrival of new herds. Through this, we could analyze how these horses would manage the appearance of adversities and if this

would affect the ecosystem or not. Therefore, the following question would arise: do horse social behavior sand psychological adversities affect their surroundings as well, or not at all? Furthermore, it would be interesting to work towards allowing domesticated horses to gradually adapt to the wilderness. Aside from animal welfare purposes, allowing domesticated horses to roam as freely as they could would gradually release pressure on the less domesticated ones, as they are the ones to carry all the weight in all rewilding projects. Lastly, it would be interesting to compare what American rewilding associations are doing to rewild North America and protect feral horses such as the mustangs, what Asian rewilding associations are doing (if there is any association related to this matter), and what European rewilding associations are doing. It would be a great opportunity to learn about different ways of approaching horse rewilding through different cultural backgrounds.

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