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NATURE RESTORATION LEGISLATION, IMPLEMENTATION AND
ENFORCEMENT: STATUS, CHALLENGES AND SOLUTIONS

REVIEW ARTICLE

Ecological restoration in rights-of-nature laws and restoration as a substantive right of nature: challenges and opportunities

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Introduction: A growing number of countries have adopted legislation that recognizes nature as a subject of rights. The purpose of many rights-of-nature laws is linked to restoring biodiversity and ecosystems. Consequently, an ecosystem's right to restoration has emerged as a substantive right of nature.

Objectives: This study examines the extent to which rights-of-nature laws and restoration as a substantive right of nature build on principles and practices of ecological restoration.

Methods: This article presents the results of a comparative analysis of four legal decisions, six legislative acts, and two resolutions on the rights of nature in relation to criteria based on principles and practices in ecological restoration.

Results: The general aim of ecological restoration is reflected in the analyzed cases. However, ecosystem restoration as an ecological concept is challenging to the judiciary, which in many cases does not identify what the right to restoration means, even in cases in which ecological restoration is a substantive right of nature. Central aspects of ecosystem restoration are not reflected in the reviewed cases, including the principle that environmental change and historical trajectory are considered in restoration.

Conclusions: The courts' and legislators' lack of a clear definition of restoration and of specific measures regarding what restoration means for a particular ecosystem likely affects enforcement of restoration as a right. In line with previous research, the right to restoration could be paired with flexible standards for implementation. Principles in environmental restorative justice could inform the development of ecosystem restoration as a substantive right of nature.

Implications for Practice:

- The general aim of ecological restoration is reflected in rights-of-nature legislation and case law. Central aspects of ecological restoration do not inform restoration as a substantive right of nature.
- Lack of clarity as to the definition of restoration likely affects the implementation and enforcement of restoration as a right.
- In line with previous research, the right to restoration could be paired with flexible standards for implementation. Further research within this field is needed to identify the legal and institutional conditions that enable ecological restoration in the jurisdictions that have introduced restoration as a substantive right of nature.

Key words: Earth jurisprudence, ecological restoration, governance, law, rights of nature

Introduction

The international community broadly acknowledges the importance of restoring ecosystems to reverse the alarming rate at which they are being degraded by human activity (Montanarella et al. 2018). Reversing ecosystem degradation is also essential to mitigate climate change, halt biodiversity loss, and ensure food security (Dickson et al. 2021, Becoming #GenerationRestoration). Research suggests that new legal innovations are required for ecological restoration governance (Richardson 2016), and various policies and legislation to promote ecological restoration have been adopted at the international level over the past 10 years. In 2019, the United Nations (UN) General Assembly declared 2021–2030 as the UN Decade on Ecosystem Restoration. Moreover,

regionally, in 2024, the European Union (EU) adopted a nature restoration regulation that establishes binding restoration targets and obligations that cover at least 20% of its land and sea areas

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by 2030 and all ecosystems in need of restoration by 2050 (Regulation [EU] 2024/1991 on nature restoration, Chapter 1, Article 1, para. 2).

Research shows that law is important to enabling ecological restoration (Hamman et al. 2020) but also identifies significant barriers to the implementation of restoration practices in policy and governance (Cortina-Segarra et al. 2021). Many researchers support foundational-level instruments with broad objectives, accompanied by flexible standards to incorporate detail about implementation so as to facilitate restoration (Foster & Bell-James 2024). Furthermore, legal actors and courts at the international level share no uniform understanding or usage of the term *restoration*, and this inconsistency hampers efforts to combat biodiversity loss and achieve restoration targets (Mendes et al. 2023). Researchers suggest that the international community should work toward an international definition that draws on authoritative scientific principles, standards of ecological restoration, and legal principles (Mendes et al. 2023).

The urgency of reversing biodiversity loss and restoring ecosystems has also contributed to the elaboration of Earth jurisprudence and the rights of nature. Over the past 10 years, legal scholars and social scientists have examined the legal (Boyd 2017; Moutrie 2021; Pain & Pepper 2021), legal-philosophical (Tănăsescu 2022), political (Kauffman & Martin 2018), and socio-legal (Berros 2021) implications of Earth jurisprudence and rights of nature laws. Research has also focused on the post-human theoretical aspects of the rights of nature (Celermajer & O'Brien 2021; Harvey & Vanderheiden 2021; Jones 2021).

Amidst this expanding body of interdisciplinary scholarship, the term rights of nature has come to embrace both Earth jurisprudence and the specific legal provisions that aim to codify Earth jurisprudence (Kauffman 2020). Earth jurisprudence may be defined as the field of law that seeks to develop a philosophy and practice of law that gives greater consideration to nature by recognizing the interconnectedness of Earth's natural systems, the inherent rights and value of nature, and the dependence of humanity and all living beings on a healthy Earth (Brondizio et al. 2019). As such, Earth jurisprudence implies moving away from a purely human-centered to an Earth-centered system of law and governance (Koons 2009). Through the codification of Earth jurisprudence principles into law, ecosystems and nature across the globe have been recognized as subjects of rights, including in the Constitution of Ecuador in 2008, through the Te Awa Tupua (Whanganui River Settlement Act) passed by the New Zealand Parliament in 2017, and the law granting legal personhood to the Mar Menor lagoon and its basin (Law 19/2022, Senate of Spain, 2022). The ontological basis of Earth jurisprudence emerged from both Indigenous peoples, who have played leading roles in the protection of rights of nature, and from Western scholars (O'Donnell et al. 2020).

To date, research has not considered the implications of rights of nature laws for ecological restoration, even though the right to restoration is a substantive right of nature in many of these legal frameworks (see Constitution of Ecuador 2008, Article 72; Universal Declaration for the Rights of Mother Earth 2010, Article 2 [1j]; Law 19/2022 2022, Article 2, 2[d]). Furthermore,

in instances in which rights of nature laws have been enacted for ecosystems harmed by anthropogenic activity, such as for the Mar Menor, the purpose of granting rights, including the right to restoration, is to address the damage to the ecosystems and communities (Law 19/2022 2022, Preamble, para. 1). Therefore, ecosystem restoration not only emerges as a substantive right of nature, but it can also be tied to the rationale for enacting laws that recognize nature as a subject of rights.

There is also some acknowledgment of the rights of nature at the international legal level. In 2022, the Kunming-Montreal Global Diversity Framework (GBF) under the Convention on Biological Diversity recognized the rights of nature as a concept and value system for the GBF's implementation (Kunming-Montreal GBF n.d., section C, point 7[b]).

However, to what extent do rights of nature laws—and the recognition of restoration as a substantive right of nature—actually build on the principles and practices of ecological restoration? Answering this question is important to elucidating whether the purpose of rights of nature laws is achieved as well as whether rights of nature laws actually contribute to achieving biodiversity targets. This paper examines ecological restoration as a substantive right of nature by analyzing legal decisions, legislative acts and two nonbinding resolutions that recognize nature as a subject of rights. The analysis applies criteria derived from the principles and practices of ecological restoration, and considers both the opportunities and challenges these legal frameworks present.

Ecological Restoration: Definitions and Principles

Many definitions of ecosystem restoration in ecology include the idea of reversing negative ecosystem developments through human interaction (van Andel & Aronson 2006). The Society for Ecological Restoration (SER) defines ecological restoration as “the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.” (Palmer et al. 2016). The UN defines it as the process of halting and reversing degradation, resulting in recovered biodiversity and better ecosystem services (Dickson et al. 2021). The goal of ecological restoration is to return a degraded ecosystem to its historic trajectory, not necessarily to its exact historic condition. This distinction acknowledges that ecosystems may not fully recover their previous state and that the current ecological realities, including climate change, can lead them to follow an altered trajectory (SER 2025).

Ecosystem restoration encompasses a wide continuum of practices shaped by local conditions and societal choices (Dickson et al. 2021). Typically, the process of restoring an ecosystem starts by diagnosing the problem and then identifying a trajectory to repair the damage (van Andel & Aronson 2006). Once the diagnosis is made, the next step is to remove or reduce the causes of degradation. In some cases, the ecosystem may recover on its own—an approach known as passive restoration (Palmer et al. 2016). In most cases, however, passive restoration is insufficient, so active restoration actions are required through process-based restoration that aims to restore the underlying processes that create and maintain ecological systems (Palmer et al. 2016). Importantly, the cultural, spiritual, and knowledge traditions of stakeholders

connected to the site should inform the design of any restoration project, and projects involving Indigenous peoples must respect the rights enshrined in the 2007 UN Declaration on the Rights of Indigenous Peoples (Nelson et al. 2024).

The SER has developed standards and principles that draw on established practices in ecological restoration (Gann et al. 2019). They include, among others, the principles that ecosystem restoration engages stakeholders and draws on many types of knowledge (principles 1 and 2), that ecological restoration is informed by native reference ecosystems while considering environmental change (principle 3), that ecosystem restoration is assessed against clear goals and objectives (principle 5), and that ecological restoration is part of a continuum of restorative activities (principle 8).

Restoration ecology, instead, refers to the scientific discipline that informs the practice of restoring ecosystems (van Andel & Aronson 2006). The aim of restoration ecology is, first, to describe and quantify departures from a characteristic ecosystem state, including spatial and temporal variation; second, to understand what drives those departures; and, finally, to prescribe how ecosystems can be moved to a less disturbed state (Palmer et al. 2016). While the field has traditionally been dominated by the natural sciences, some scholars have argued that this focus has led to a neglect of broader social and cultural questions—particularly regarding how people live in and with restored landscapes. Moreover, they contend that the purpose of ecological restoration should be critically examined through greater public engagement in its planning, design, and implementation (Usher 2022).

Methods

This study employed a comparative analysis of four legal decisions, six legislative acts, and two resolutions according to which aquatic ecosystems have been declared legal subjects with rights, including the right to restoration. These are analyzed in relation to criteria regarding ecosystem restoration as an ecological concept. The cases include the Atrato River judgment (Constitutional Court of Colombia 2016), the Bangladesh case on the rights of rivers (Supreme Court of Bangladesh 2019), the Nga Wai o Maniapoto (Waipa River Act) 2012, Aotearoa/New Zealand, the Machángara River judgment (Tribunal de garantías penales, 21 August 2024, Ecuador), the Marañón River judgment (Corte Superior de Justicia Loreto, 29 August 2024, Peru), Law 2415 on the rights of the Rancheria River (Congress of Colombia 8 August 2024) Te Awa Tupua (Whanganui River Claims Settlement) Act 2017 in Aotearoa/New Zealand, the Menominee Tribe resolution recognizing the rights of the Menominee River (Menominee Indian Tribe 2020, the USA), the law granting Mar Menor lagoon and its basin status as a legal person (Law 19/2022 2022) Senate of Spain 2022, and the Ponca Nation Resolution no. 51-07062022 (Ponca Tribe of Oklahoma 2022, the United States of America). In addition, two soft laws are considered: the Universal Declaration of the Rights of Rivers (Earth Law Center 2017) and the Universal Declaration for the Rights of Mother Earth (2010).

The cases were selected using the Eco Jurisprudence Monitor, a database and online platform that compiles ecological

jurisprudence initiatives and which is co-implemented by the UN's Harmony with Nature Knowledge network and other civil society actors (Eco Jurisprudence Monitor, 2025 n.d.-a, About us). As of January 2025, aquatic ecosystems, specifically freshwater bodies, made up the vast majority of ecosystems that have been granted rights. Thus, examining cases in which aquatic ecosystems have rights can form the basis of a comprehensive understanding of how the rights of nature relate to ecosystem restoration as an ecological concept. The cases have been selected to reflect the diverse kinds of legal decisions and legislation (resolutions, court judgments, acts) in which nature is granted rights as well as to highlight the differences and similarities between Indigenous and non-Indigenous models of rights of nature. Furthermore, the cases were selected because each, to varying degrees, addresses the issue of ecosystem health restoration. This choice was made after an initial review of the case content. However, they should not be considered fully representative of how legislation is enacted, enforced, and interpreted in their respective jurisdictions. The court judgments include decisions by both lower courts (the Machángara River judgment [Tribunal de garantías penales 2024] and Marañón River judgment [Corte Superior de Justicia Loreto 2024]) and higher courts (the Atrato River judgment [Constitutional Court of Colombia 2016] and the Bangladesh case regarding rights of rivers [Supreme Court of Bangladesh 2019]). Indigenous models of rights of nature can be defined as initiatives for rights of nature that are led by Indigenous persons and that are based on Indigenous epistemologies and ontologies (Eco Jurisprudence Monitor n.d.-b, Indigenous Model Archive).

The cases are analyzed using four criteria developed specifically for this study, grounded in key principles and concepts of ecological restoration: (A) Does the ecosystem restoration aim to reverse negative ecosystem developments through human intervention? (B) Does the restoration engage with the cultural, spiritual, and knowledge traditions of the stakeholders connected to the restoration site? (C) Does the restoration aim to return the ecosystem to its historic trajectory, considering environmental change? (D) Does the restoration as a process aim to describe and quantify the departures from a characteristic ecosystem state, understand what drives those departures, and understand how ecosystems can be moved to a less disturbed state?

Criterion A was chosen to determine whether the overall definition of ecosystem restoration in ecology (reverse negative ecosystem developments) is reflected in the legal decisions. Criterion B examines whether and how restoration, as addressed in the legal decisions, incorporates stakeholder knowledge, including traditional and Indigenous knowledge. Criterion C corresponds more generally to the ecological restoration goal of returning an ecosystem to its historic trajectory, while accounting for environmental change. Criterion D aims to highlight the extent to which the legal decisions include principles in restoration ecology (Table 1).

Results

(A) Does the ecosystem restoration aim to reverse negative ecosystem developments through human interaction?

Table 1. Overview of rights of nature cases and ecosystem restoration criteria. Criterion (A) Does the ecosystem restoration aim to reverse negative ecosystem developments through human interaction? Criterion (B) Does the restoration engage with the cultural, spiritual, and knowledge traditions of the stakeholders connected to the site of restoration? Criterion (C) Does the restoration aim to return the ecosystem to its historic trajectory, while accounting for environmental change? Criterion (D) Does the restoration as a process aim to describe and quantify the departures from a characteristic ecosystem state, understand what drives those departures, and understand how ecosystems can be moved to a less disturbed state?

<i>Legal decision</i>	<i>Criterion A</i>	<i>Criterion B</i>	<i>Criterion C</i>	<i>Criterion D</i>
Atrato River judgment (Constitutional Court of Colombia 2016)	Yes	No	No	No
Bangladesh case regarding the rights of rivers, concerning the Turag River and all rivers in Bangladesh (Supreme Court of Bangladesh 2019)	Yes	No	No	No
Waipa River Act of Aotearoa/New Zealand (Indigenous model) (Nga Wai o Maniapoto 2012)	Yes	Yes	No	No
Machángara River judgment (Tribunal de garantías penales 2024)	Yes	No	No	No
Marañón River judgment (Corte Superior de Justicia Loreto 2024)	Yes	No	No	No
Law on the rights of the Rancheria River (Law 2415 2024)	Yes	Yes	No	No
The Whanganui River Settlement Act concerning the Whanganui river (Indigenous model) (Te Awa Tupua 2017)	Yes, although the explicit purpose of the law is not linked to repairing ecosystem health	Yes	No	No
Resolution recognizing the rights of the Menominee River (Indigenous model) (Menominee Indian Tribe of Wisconsin 2020)	Yes	Yes	No	No
Law 19/2022 granting Mar Menor and its basin status as a legal person (Law 19/2022 2022)	Yes	No	No	No
Resolution no. 51-07062022 concerning the Ni'ska and Ni'zi'de, also known as the Arkansas and Salt Fork rivers, and all Ponca waterbodies (Indigenous model) (Ponca Tribe of Oklahoma 2022)	Yes	Yes	No	No
Universal Declaration of the Rights of Rivers (Earth Law Center 2017)	Yes	No	No	No
Universal Declaration for the Rights of Mother Earth, Bolivia (2010)	Yes	No	No	No

The primary reason cited in the analyzed cases for recognizing aquatic ecosystems as subjects of rights is their degraded health and the need to reverse this deterioration. All of the cases attribute the degradation to human activities. In this context, restoring the ecosystem by improving its health is one of the key goals of the examined decisions and legislation. The exception is the Te Awa Tupua (Whanganui River Claims Settlement) Act, whose primary purpose is to formalize the acknowledgments and apology given by the Crown to Whanganui Iwi in Ruruku Whakaturua, and to implement the settlement of the iwi's claims to the Whanganui River (Te Awa Tupua [2017](#), Part 1, Purpose).

However, the cases do not explicitly clarify whether restoration should be passive or active. For example, one common issue addressed in these cases is the negative impact of human activities on water flow and the connectivity of aquatic ecosystems and their tributaries. There are varying approaches to restoring the flow of aquatic ecosystems. In the Atrato judgment, the court mandated active measures to restore the river's original channel and flow (Constitutional Court of Colombia [2016](#), section IV, Order 4). Similarly, in Nga Wai o Maniapoto ([2012](#)), the law centers on restoring and maintaining the water quality and integrity of the Waipa River, ensuring its care and protection for present and future generations (Nga Wai o Maniapoto [2012](#), section 3). Another approach is to recognize the right of aquatic ecosystems

to flow naturally, as highlighted in the Universal Declaration of the Rights of Rivers, which states that flow must follow natural patterns and be sufficient to maintain the ecosystem's health (Earth Law Center [2017](#), Article 3, p. 1, footnote 13), as well as in the Menominee tribe resolution recognizing the rights of the Menominee River (Menominee Indian Tribe [2020](#), preamble) and the Marañón River judgment (Corte Superior de Justicia Loreto [2024](#), section 1, point 2). These approaches are sometimes combined, as seen in the Machángara judgment (Tribunal de garantías penales [2024](#), section 5.2.1; Public policy for the comprehensive repair of the Machángara River, point 3).

Additionally, in some cases, ecosystem restoration is recognized as a substantive right of the aquatic ecosystem. Examples include the Atrato River judgment, the Machángara River judgment, the Marañón River judgment, the law on the rights of the Rancheria River, the Menominee tribe resolution acknowledging the rights of the Menominee River, Law 19/2022 granting Mar Menor and its basin legal personhood, as well as the Universal Declaration of the Rights of Rivers (Earth Law Center [2017](#)) and the Universal Declaration for the Rights of Mother Earth ([2010](#)). In other cases, courts have determined that the restoration of an ecosystem's health can be achieved by appointing a guardian responsible for its protection and conservation, as seen in the Bangladesh case

regarding river rights (Supreme Court of Bangladesh 2019, Order 3).

- (B) Does the ecosystem restoration engage with the cultural, spiritual, and knowledge traditions of the stakeholders connected to the site of restoration?

All the reviewed cases are based on local communities' initiatives to protect the ecosystem. In all the court judgments, the plaintiffs were either local populations or Indigenous peoples who lived by and with the aquatic ecosystem. In the court judgments in which restoration is declared a right, the representation of the rights of the ecosystem is vested in a guardianship that includes representatives of the local community and/or Indigenous peoples.

The Atrato River judgment (Constitutional Court of Colombia 2016, section IV), the Machángara River judgment (Tribunal de garantías penales 2024, section 5.5.3), and the Marañón River judgment (Corte Superior de Justicia Loreto 2024, Declaration 2, Order 1) do not include references or guidelines referring to the cultural, spiritual, and knowledge traditions of the communities in designing and developing the restoration measures. The law on the rights of the Rancheria River differs slightly in this aspect, as the ruling refers to the International Labour Organization (ILO) Convention 169, Indigenous and Tribal Peoples Convention (1989), in relation to the action plan developed by the guardianship to restore the river (Law 2415 2024, Article 3, para.3).

There is also no mention of the stakeholders' knowledge traditions in Law 19/2022 (2022) granting Mar Menor and its basin status as a legal person. The monitoring of the lagoon's rights is assigned to the Monitoring Commission, which in the first case must consider the indicators defined by the reports drawn up by the Scientific Committee to analyze the ecological state of the Mar Menor (Law 19/2022 2022, Article 3.3).

The rights of nature that build on Indigenous models differ in this regard, as Indigenous models of rights of nature are based on Indigenous epistemes (Eco Jurisprudence Monitor, 2025, n.d.-b, Indigenous Model Archive). Although the restoration measures are not explicitly detailed in these cases, the recognition of the ecosystem's rights—including the right of restoration—is informed by the cultural, spiritual, and knowledge traditions of the Indigenous community. For example, the Menominee River rights resolution is grounded in the tribe's stewardship and in the Menominee River's status as an ancestral land with historical and cultural significance to the tribe and water as a source of life (Menominee Indian Tribe of Wisconsin 2020, para 8–11). The Ponca Nation resolution declares that all Ponca waterbodies are living entities with whom the Ponca have an inherent relationship under customary law and which possess fundamental rights in accordance with longstanding Ponca beliefs and practices; furthermore, it specifies that the Ponca have always lived in kinship and reciprocity with the rivers (Ponca Tribe of Oklahoma 2022, para 3–5).

In the same vein, Te Awa Tupua (2017) establishes the human representatives of the Whanganui River, called Te Pou Tupua, which is tasked with acting in the name of Te Awa Tupua. Its functions include acting and speaking for and on behalf of Te Awa Tupua and promoting and protecting the

health and well-being of Te Awa Tupua (Te Awa Tupua 2017, Subpart 3). All actions taken by the human representative must align with Tupua te Kawa, which embraces the intrinsic values that represent the essence of Te Awa Tupua (Te Awa Tupua 2017, Subpart 2, para. 13). The act also establishes the strategy group Te Kōpuka to collaborate and advance the well-being of Te Awa Tupua (Te Awa Tupua 2017, Subpart 4) and to develop and approve the Te Heke Ngahuru ki Te Awa Tupua, a strategy document that identifies the issues, strategies, and actions relevant to the health and well-being of Te Awa Tupua (Te Awa Tupua 2017, Subpart 4, para. 36).

In the Waipa River Act (Nga Wai o Maniapoto 2012), restoration involves restoring economic, social, cultural, and spiritual relationships and the ability of future generations to continue restoring the river (Nga Wai o Maniapoto 2012, Vision, 3 [a–d]). Restoration in the Waipa River Act is guided by the vision of “a healthy Waikato River that sustains abundant life and prosperous communities who, in turn, are all responsible for restoring and protecting the health and well-being of the Waikato River, and all it embraces, for generations to come” (Nga Wai o Maniapoto 2012, Vision, 1 [2]). It specifies that restoration will be informed by a “whole river” approach, which includes “the development, recognition, and promotion of best practice methods for restoring and protecting the health and well-being of the Waikato River” (Nga Wai o Maniapoto 2012, Strategy, 2 [i]).

- (C) Does the restoration aim to return the ecosystem to its historic trajectory, while accounting for environmental change?

In the vast majority of cases, the courts or legislators do not define or outline what restoration entails for the aquatic ecosystem. The exceptions are the Machángara judgment (Tribunal de garantías penales 2024), Law 19/2022 (2022) (granting Mar Menor and its basin the status of a legal person), and the Nga Wai o Maniapoto (2012). These, however, make no reference to the historical trajectory of the aquatic ecosystem and do not indicate whether environmental change is accounted for in the ecosystem restoration process. In the Atrato River judgment (Constitutional Court of Colombia 2016, section IV, Order 4), the Marañón River judgment (Corte Superior de Justicia Loreto 2024, Order 1), and the law on the rights of the Rancheria River (Law 2415 2024, Article 3), the courts refer to expert bodies, such as a monitoring agency or council of guardians, to determine the specific restoration actions to be undertaken.

In the Machángara judgment, an indirect baseline of the health of the river can arguably be inferred from the orders issued by the court. The orders include the establishment of permanent monitoring and analysis points along the Machángara and its tributaries with the purpose of detecting water quality, identifying sources of contamination, and evaluating the effectiveness of restoration measures (Tribunal de garantías penales 2024, section 5.5.2, para. 2, h).

In Law 19/2022 (granting Mar Menor and its basin the status of a legal person), the definition of restoration hinges on an assessment of what is natural for the lagoon. According to the law, the right to restoration requires that once damage has occurred, remedial actions be undertaken in the lagoon and its

catchment area to restore natural dynamics and resilience as well as associated ecosystem services (Law 19/2022 2022, Article 2 d). The assessment of what is “natural” for Mar Menor is based on a scientific committee’s analysis of its ecological state (Law 19/2022 2022, Article 3.3). Moreover, the law declares that Mar Menor is governed by a natural order or ecological law that enables it to exist as a lagoon ecosystem and as a terrestrial ecosystem in its basin (Law 19/2022 2022, Article 2.2).

- (D) Does the restoration as a process aim to describe and quantify the departures from a characteristic ecosystem state, understand what drives those departures, and understand how ecosystems can be moved to a less disturbed state?

In none of the cases does the legislator or court specify the principles or guidelines for implementing ecosystem restoration. In the cases in which a guardianship or expert body is tasked by a court to identify the restoration measures, however, a first step typically includes developing a decontamination plan for the aquatic ecosystem and stopping the damaging anthropogenic activities. This is the case in the Machángara River Judgment (Tribunal de garantías penales 2024, section 5.5.2), the Atrato River judgment (Constitutional Court of Colombia 2016, section IV, Order 5), the Marañón River judgment (Corte Superior de Justicia Loreto 2024, Order 3), and the law on the rights of the Rancheria River (Law 2415 2024, Article 3, Action Plan).

Similarly, in the Bangladesh case on the rights of rivers (Supreme Court of Bangladesh 2019), the court tasked the National River Conservation Commission with determining the activities required to conserve the river, remove the pollution, and develop the river. It also ordered some of the respondents to pay for the removal of the encroachment and prescribed the return of the river to its earlier condition without clarifying the process of how it should be restored (Supreme Court of Bangladesh 2019, Order 6). Likewise, Law 19/2022 (granting Mar Menor and its basin the status of a legal person) declares that the Guardianship of Mar Menor (the monitoring commission tasked with monitoring the rights of Mar Menor) must consider the reports of the Scientific Committee, which is tasked with analyzing the ecological state of the Mar Menor (Law 19/2022 2022, Article 3.3).

Discussion

The results of the comparative analysis show that nearly all the cases analyzed aim to counter the negative effects of anthropogenic activities, which is the main reason to declare aquatic ecosystems as subjects of rights. Moreover, all of the cases are the result of the efforts of local communities to protect the ecosystems. Specifically, restoring the flow of the water is a central aspect of the cases. In some cases, such as the Atrato River judgment (Constitutional Court of Colombia 2016), restoring the aquatic ecosystem’s flow to previous levels is a specific goal of the ecosystem restoration.

Furthermore, this study shows that when restoration is explicitly recognized as a right, the primary objective is to repair the health of the ecosystem. In cases where restoration is not formally declared a right—such as the Bangladesh case on the rights of rivers (Supreme Court of Bangladesh 2019)—other

rights, such as the right to conservation or protection, serve a similar restorative purpose.

Restoration in the reviewed cases appears to include both active and passive measures. However, except for restoring the flow of water, none of the cases outline to which state or reference point the aquatic ecosystem is to be restored, and neither do they include references to the aquatic ecosystem’s historic trajectory. Furthermore, none of the cases analyzed outline the precise process of ecological restoration to implement, leaving it unclear whether the principles of restoration ecology form the basis of legally required restoration interventions.

Moreover, very few of the legal decisions provide details on specific restoration activities or offer a clear definition of the right to restoration—even in cases involving large aquatic ecosystems such as the Atrato River Basin and the Machángara River. This lack of specificity can pose a significant barrier to effective implementation. This concern is shared by scholarship, as research indicates that successful large-scale restoration efforts often depend on the design and level of details of legal instruments (Hagen et al. 2013). Furthermore, in several court decisions where restoration is recognized as a right, the courts refer to guardianship or expert bodies to determine the necessary restoration measures. For example, in the Machángara judgment (Tribunal de Garantías Penales 2024), the court relied on expert knowledge in ecological restoration to mandate specific restoration activities. A similar approach is reflected in legislative provisions concerning the rights of nature examined in this study—for example, Law 19/2022, which grants legal personhood to the Mar Menor and its basin (Article 3.3). This tendency by the courts and legislators to avoid detailing restoration methodologies likely stems from the fact that such determinations fall outside their institutional responsibilities. In administrative law, the creation of guidelines and regulatory standards is generally the responsibility of executive agencies, including specialized scientific and technical bodies. Therefore, Criterion D can be assessed by examining the standards, guidelines, and recommendations issued by these administrative and expert entities responsible for defining restoration measures. This implies that the effectiveness of restoration efforts hinges on whether these expert bodies are properly resourced, possess the required expertise, as well as other factors related to public administration structure. These elements could be explored in a study that also examines the challenges and opportunities expert authorities face in relation to the right to restoration.

Building on this perspective, research indicates that integrating flexible standards into laws governing ecological restoration is essential, as restoration ecology is an evolving field. Codifying overly specific or rigid concepts risks rendering the law obsolete over time (Foster & Bell-James 2024). In the context of restoration as a fundamental right of nature, this implies that the right to restoration should be informed by broad principles, but the law should avoid excessive detail that could quickly become outdated. If legislation on the right to restoration is not grounded in established principles and standards of ecosystem restoration, there is a risk that concepts will be introduced that are based neither in jurisprudence nor in ecological restoration. For example, the notion of “natural” in Law 19/2022—which

grants legal personhood to the Mar Menor and its basin—would benefit from reformulation to align with contemporary ecological restoration thinking. A related concept is “natural variability,” an established term in ecology that refers to “the ecological conditions, and the spatial and temporal variation in these conditions, that are relatively unaffected by people, within a period of time and geographical area appropriate to an expressed goal” (Landres et al. 1999).

Moreover, previous research indicates that precision in legal terminology and language can help to direct outcomes by defining restoration, including when and how ecological restoration should take place (Richardson 2015; Foster & Bell-James 2024). Hence, legal decisions and laws that do not define restoration and instead assign it to an expert body or guardianship bring the risk that compliance with the decision may be challenging, as the meaning of the right to restoration is unclear.

Furthermore, the emergence of restoration as a substantive right in rights of nature laws—as distinct from ecological restoration framed purely as a biodiversity target—arguably places a more comprehensive responsibility on legislators and courts to define what restoration entails for ecosystems recognized as legal subjects. Without such an assessment, it can be challenging to enforce restoration as a substantive right of nature. For instance, although the Atrato River has had legal rights since 2016, including the right to restoration, the ruling that the Atrato is a subject of rights has still not been implemented, and the guardianship is struggling to defend it from illegal gold mining and armed groups. Research attributes these difficulties to factors such as inadequate cooperation between the stakeholders and a lack of support from state institutions (Mosquera-Guerrero & Krueger 2024).

At this point, an instructive analogy can be drawn from international human rights law. The Universal Declaration of Human Rights was adopted by the UN General Assembly in 1948, and the European Convention on Human Rights was adopted in 1950 with the aim of enforcing the rights set out in the Declaration (European Convention on Human Rights, Preamble). The challenge of enforcing human rights law remains ongoing—particularly as states with poor human rights records often ratify international treaties without ensuring compliance (Hafner-Burton et al. 2008). Under Article 46 of the European Convention on Human Rights, the European Court of Human Rights may, in certain circumstances, suggest to a respondent state the type of action needed to address the situation that led to the violation (see European Court of Human Rights 2024, section VI, para. 656, B). This approach could also be applied to the rights of nature, allowing for similar measures to be implemented by courts when evaluating potential violations of these rights.

However, while this approach may offer an avenue for the judicial enforcement of the rights of nature, its implementation alone will not account for the diverse forms of stakeholder knowledge that should guide the design of restoration projects. This study has found that the cases that build on non-Indigenous models typically do not include references to how the various types of knowledge, including the spiritual, cultural, and traditional knowledge of the stakeholders, will be included in the restoration.

For example, the law granting Mar Menor and its basin legal personhood mandates that the guardianship tasked with

protecting the rights of the aquatic ecosystem consider primarily scientific findings (Law 19/2022 2022, Article 3.3). By contrast, the legal decisions and laws that build on Indigenous models incorporate these aspects to a greater degree. In addition to considering the stakeholders’ traditional, spiritual, and cultural knowledge as part of the restoration, the Indigenous models view restoration as more than repairing or reversing negative ecosystem developments. For example, in *Nga Wai o Maniapoto* (2012), restoration is relational and involves socio-cultural and spiritual ties to an ecosystem. Similar perspectives about relationality are central in restorative justice processes, which are processes of justice that are rooted in Indigenous dispute-resolution traditions (Haluska 2023). Furthermore, there are several examples of restorative justice processes that have addressed harm to the more-than-human world (prominently in Aotearoa/New Zealand, Australia and Canada), and research suggests that restorative justice conferences can be used to enforce rights of nature laws (Haluska 2023). In this context, environmental restorative justice may provide a meaningful framework for articulating and advancing the right to restoration as a substantive right of nature. This is particularly pertinent given that several legal decisions that this study has reviewed explicitly recognize the interrelationship between human rights and environmental rights. Notably, courts have affirmed that the human rights of the local communities—including the right to a healthy environment—have been infringed through the degradation of the aquatic ecosystems (Marañón River judgment [Corte Superior de Justicia Loreto 2024, section 3, para. 30–31]; the Atrato judgment [Constitutional Court of Colombia 2016, para 9.20]).

Furthermore, the jurisprudence emphasizes that the restoration of damaged ecosystems requires a fundamental shift in how all stakeholders—including those responsible for ecological harm—relate to and interact with the environment. This approach is evident in the *Machángara* judgment (Tribunal de Garantías Penales 2024, section 5.5.2, point 1, subsection 1) and the Bangladesh case regarding river rights (Supreme Court of Bangladesh 2019, Order 10–11) where the courts ordered public awareness campaigns aimed at fostering societal engagement with river health and ecological stewardship.

Future research in the fields of Earth jurisprudence and ecological restoration could use theories of environmental restorative justice to develop the notion of ecosystem restoration as a substantive right of nature and potentially expand on the central principle that ecological restoration is part of a continuum of restorative activities (Gann et al. 2019). This could be done by exploring the synergies between the literature on ecosystem restoration, which explores how communities can live with restored landscapes (Usher 2022), post-humanist research on rights of nature (Harvey & Vanderheiden 2021), and environmental restorative justice so as to expand “notions of harm and victimhood” to include epistemic harm, more-than-humans, future generations, the climate and atmosphere, the Earth, and the environment (Pali et al. 2022). Studies on how legal barriers to ecological restoration can be overcome (Bell-James 2023) could inform such research. Furthermore, specific case studies are needed (akin to the research of Mosquera-Guerrero et al. 2024) that interrogate how and to what extent the right to restoration is upheld by courts, legislators, and stakeholders across

jurisdictions. Finally, further research is needed to explore how environmental restorative justice processes can more effectively engage stakeholders and incorporate their traditional knowledge in ecological restoration.

Conclusion

This paper finds that the general aim of ecosystem restoration—to reverse negative ecosystem developments—is reflected in the cases examined. However, other core aspects of ecological restoration, such as accounting for an ecosystem's historic trajectory and environmental change, are largely absent. The principle that restoration should incorporate diverse forms of knowledge—including spiritual, traditional, and cultural perspectives—is present primarily in legal decisions and frameworks grounded in Indigenous models of the rights of nature.

Moreover, this paper concludes that ecosystem restoration as an ecological concept is challenging to judiciaries, which in many cases do not identify what the right to restoration entails, even in cases in which ecological restoration is a substantive right of nature. This lack of clarity likely hinders both implementation and enforcement. To uphold restoration as a right, the legal principle according to which ecosystems have a fundamental right to restoration in foundational level laws could be paired with standards in ecological restoration, an approach supported in the literature (Foster & Bell-James 2024). Finally, the notion of ecosystem restoration as a right of nature could be developed by considering the concepts and practices of the field of environmental restorative justice.

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