

# Reflecting on two and a half decades of restoration ecology in *Applied Vegetation Science* (1998–2023)

## 1 | REFLECTION

The inaugural issue of *Applied Vegetation Science* in 1998 included a Special Feature focused on plant species diversity and restoration ecology. This thematic focus emerged from a conference on vegetation management, where biodiversity theory was linked to the applied concept of restoration. At the time, ecological restoration was frequently practiced but the science of restoration ecology was still in its infancy. In this Editorial, we aim to reflect on the evolution of restoration ecology since the Journal's inception in 1998. The restoration of vegetation has remained a central theme for the Journal, and here we reflect on the advancements in restoration ecology by drawing comparisons between the inaugural issue and the key topics discussed in the articles published in *Applied Vegetation Science* in 2023.

In the first issue, a primary theme revolved around reintroducing plant species to degraded sites. This included discussions on the species pool, fragmentation, and traits associated with dispersal and longevity (Ehrlén & van Groenendael, 1998; Zobel et al., 1998). Notably, these themes demonstrated a focus extended beyond the patch or site scale to include landscape-scale processes. These large-scale processes were linked to restoration in terms of the capacity for natural regeneration after the removal of the degrading force. For example, restoration was more successful when the species pool was diverse and colonization could occur. The strong focus on regional processes reflected the interest at the time in diversity theory at large scales.

In 1998, philosophical inquiries pondered whether restoration necessitates the return of all species or whether some are functionally equivalent (vanandel, 1998). This overlaps with ideas raised regarding the determination of reference sites in relation to desired vegetation states, such as semi-natural vegetation (Poschlod et al., 1998). One paper explored how restoration success should be measured (van Duren et al., 1998), reporting on the failure of a restoration project that could nowadays be interpreted as the presence of strong thresholds to recovery. The authors suggest a reconsideration of restoration targets, aligning with more recent concepts such as novel ecosystems. In essence, these discussions considered what constitutes restoration, a theme that is still relevant today. The papers highlighted the need to actively reintroduce species while recognizing the limitations of focusing on species alone as a restoration target. The exploration of these early themes serves as a valuable

foundation for understanding the trajectory of restoration ecology within *Applied Vegetation Science*.

In 2023, articles published in *Applied Vegetation Science* explored longer-term trajectories and showed a notable shift towards a more comprehensive examination of restoration success and the resilience of restored sites over decadal scales. For example, Cowan et al. (2023) found that the resilience of restored sites to disturbances such as fire increased with restoration age. The 2023 articles also continued to explore the reintroduction of plant species to degraded sites, highlighting the enduring challenges associated with restoring various species. Notably, there was a shift towards more active techniques; for example, sequential sowing to facilitate the establishment of subordinate species (Durbecq et al., 2023).

The 2023 articles provided a critical examination of what constitutes restoration success, indicative of the field's maturation towards nuanced assessments of project outcomes. However, the ideas link with the philosophical considerations that were explored in 1998. Functionality emerged as another notable theme with a focus on functional traits as key indicators of restoration success. For example, Chollet et al. (2023) explored the occurrence of typical species, beta-diversity and functional traits as indicators of restoration success in the absence of a suitable reference site. They argued that beta-diversity and functional analyses are good indicators of success while acknowledging the difficulty of achieving the return of all typical species at their study sites—echoing ideas presented in 1998. Similarly, Kaul and Wilsey (2023) used functional traits to compare restored sites with reference sites and seed mixes. Their findings revealed functional disparities driven by higher proportions of non-native species with a distinct functional composition at restored sites. The integration of functional traits into the assessment of restoration success represents a shift in the field that builds upon earlier considerations of functionality.

The papers published in 2023, demonstrate a maturation of restoration ecology but also highlight many enduring themes related to assessing restoration success and determining appropriate restoration targets, many of which arise from the recognized difficulties in returning species. Looking ahead, the persistent challenges and evolving perspectives presented in these articles suggest that the field of restoration ecology will continue to grapple with defining success, exploring innovative techniques, and balancing the restoration of plant diversity with the realities of complex ecosystems.

For more than 25 years, our Journal has provided an international platform for the exchange of ideas on ecological restoration, and we will continue to do so in the years to come. This commitment is increasingly important because advancements in restoration science are needed to support the objectives of the United Nations Decade on Ecosystem Restoration.

## 2 | EDITORS' AWARD FOR 2023

Each year, the Chief Editors of *Applied Vegetation Science* select an article for the Editors' Award, also considering recommendations from Co-ordinating Editors. The award for 2023 goes to Aure Durbecq for the article "Using priority effects for grassland restoration: Sequential sowing can promote subordinate species" (Durbecq et al., 2023). This article explores the sequential sowing of dominant and subordinate plant species to answer the question of whether the order of arrival influences the establishment of restored communities. Overall, the authors found subordinates benefited from being sown first, challenging the conventional approach of seeding all target species simultaneously, which limits the establishment of subordinate species. This approach, asking the age-old question of how to re-establish plant communities, used community assembly theory on priority effects to explore restoration success. The authors also found some species-specific effects, emphasizing the need for a better understanding of the predictability of priority effects.





Selecting a single award-winning article is not easy, and thus, we are pleased to announce two highly commended articles. The first was an article by Monika Janišová and others, titled "Grazing hay meadows: History, distribution, and ecological context" (Janišová et al., 2023). This article was prepared for the Special Issue "Grazing and Vegetation", edited by Péter Török, Regina Lindborg, David Eldridge, and Robin Pakeman. The authors navigate through the long history of human management of grazing hay meadows in the Carpathian Mountains, highlighting the pivotal role of disturbances (grazing and mowing) in fostering species diversity in grasslands. They also highlight the important social and cultural implications of this management, representing "a precious living archive of knowledge and resources that has been lost in much of Europe." The authors integrate various perspectives and sources of knowledge into a contemporary discussion on grassland conservation and restoration.

The second highly commended article was authored by Yasmine Kindlund and Torbjörn Tyler, titled "Magnitude and drivers of plant diversity loss differ between spatial scales in Scania, Sweden 1957–2021" (Kindlund & Tyler, 2023). In this study, the authors analyzed plant species presence/absence data using repeat surveys from the period 1957–2021 across various scales. The key finding revealed that the magnitude of biodiversity loss and drivers behind the loss exhibited scale-dependent patterns. At larger scales, total richness remained stable because losses were offset by gains in non-native

species. At the smallest scale, changes in land use were implicated in species loss. The study highlights the importance of considering spatial scales when addressing complex causes of biodiversity change over time.

## 3 | JOURNAL NEWS

We welcome the new Associate Editors who joined *Applied Vegetation Science* in 2023: Cameron Carlyle (CA), Regina Lindborg (SE), Anaclara Guido (UY), and Simona Maccherini (IT). At the same time, we thank Erwin Bergmeier (DE), who is stepping down as Associate Editor. We also thank all the reviewers who helped evaluate and improve the manuscripts submitted during the past year (Appendix A).

Jodi N. Price<sup>1</sup>   
 Viktoria Wagner<sup>2</sup>   
 Valério D. Pillar<sup>3</sup>   
 Milan Chytrý<sup>4</sup> 

<sup>1</sup>Gulbali Institute, Charles Sturt University, Albury, New South Wales, Australia

<sup>2</sup>Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada

<sup>3</sup>Department of Ecology, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

<sup>4</sup>Department of Botany and Zoology, Faculty of Science, Masaryk University, Brno, Czech Republic

### Correspondence

Jodi N Price, Gulbali Institute, Charles Sturt University, Albury, New South Wales, Australia.  
 Email: [joprice@csu.edu.au](mailto:joprice@csu.edu.au)

### ORCID

Jodi N. Price  <https://orcid.org/0000-0003-2899-7693>  
 Viktoria Wagner  <https://orcid.org/0000-0002-2665-9888>  
 Valério D. Pillar  <https://orcid.org/0000-0001-6408-2891>  
 Milan Chytrý  <https://orcid.org/0000-0002-8122-3075>

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## APPENDIX A

### LIST OF REFEREES

We thank the referees who served *Applied Vegetation Science* from 1 December 2022 to 30 November 2023. Those who reviewed more than twice are indicated by asterisks.

Scott Abella	Ove Eriksson	Emma Ladouceur
Josu Alday*	Michael Ewald	Eric Lamb
Hamada Elsayed Ali	Don Faber-Langendoen	Pedro Leitao
Aitor Ameztegui	Edy Fantinato	Attila Lengyel
Ignacio Barberis	Mohammad Farzam	Felipe Lezama
Isabel Barrio	Rod Fensham	Ryan Limb
Peter Bellingham	Maxmiller Ferreira	María Lipoma
Idoia Biurrun	Alessandra Fidelis	Javier Loidi
Bérenger Bourgeois	Felícia Fischer	Priscilla Loiola
Alessandro Bricca	Francois Florens	Luis López-Mársico
Andrea Britton	Hudson Fontenele	Zdeňka Lososová
James Brock	Xiulin Gao	Jeremy Lundholm
Rebecca Brown	Peter Gausmann	Tuija Maliniemi
Jörg Brunet	Hamid Gholizadeh	Carolina Martínez-Ruiz
Philip Burton	Riccardo Guarino	Joao Meira-Neto
Luigi Cao Pinna	Anaclara Guido	Richard Michalet
Leonor Calvo	Claudia Gumaraes-Steinicke	Fraser Mitchell
Giandiego Campetella	Melinda Halassy	Ruth Mitchell
Cameron Carlyle	Caroline A Havrilla	John Morgan
Jorge Castro	John Healey	Jaime Moyano
Ghassen Chaieb	Alison Hester	Ondřej Mudrák
Martha Charitonidou	Thomas Ibanex	Gerhard Overbeck
Clémence Chaudron	Jutta Kapfer	Robin Pakeman
Timo Conradi	Janez Kermavnar	Ana Palma
Connor Crouch	Becky Kerns	Sean Eng Howe Pang
Daniele Da Re	Sarah Kiefer	Shinyeong Park
Jürgen Dengler*	Ingeborg Klarenberg	Cord Peppeler-Lisbach
Martin Diekmann	Valentin Klaus	Laura Perez
Thierry Dutoit	Johannes Kollmann	Gwendolyn Peyre
Mary Edwards	Dominik Kopec	Valério Pillar
Carsten Eichberg	Anna Kuzemko	Natashi Pilon

Jeanne Portier  
Karel Prach  
Elisabeth Prangel  
Kathleen Quigley  
Inayat ur Rahman  
Tara Rajaniemi  
J Leighton Reid  
Carlo Ricotta  
Kersti Riibak  
Cassy Rodrigues  
Bruce Roundy  
Daniel Sánchez-Mata  
Benito Schöpke  
Nick Schultz

Efrat Sheffer  
Mária Šibíková  
Urban Šilc  
Daniel Slodowicz  
Grégory Sonnier  
Diego Souza  
Marta Gaia Sperandii  
Ingmar Staude  
Tomasz Szymura  
Malin Talle  
Didier Técher  
Pedro Tognetti  
Csaba Tölgyesi  
Sofia van Moorsel

Frederike Velbert  
Pedro Villa  
Nacho Villar  
Pascal Vittoz  
Catharina Vloon  
Denys Vynokurov  
Markus Wagner  
Karsten Wesche\*  
Rodney Will  
Wolfgang Willner  
Brian Wilsey  
Jianshuang Wu  
Truman Young