*Marine and Freshwater Research*
https://doi.org/10.1071/MF20335_AC


**Supplementary material**

## Rewilding watersheds: using nature's algorithms to fix our broken rivers

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**Table S1. References linking ecosystem functions with rewilding goals, providing supporting evidence for Fig. 1**

| | | Restore natural flow and sediment regime | Mitigate climate warming | Restore riparian vegetation | Re-introduce extirpated species | Improve water quality | Reduce habitat fragmentation |
|---|---|---|---|---|---|---|---|
| 1 | Metabolism | Aristi *et al.* 2014<br>Huang *et al.* 2018 | Song *et al.* 2008<br>Jankowski and Schindler 2019 | | | Wassenaar *et al.* 2010 | |
| 2 | Decomposition | Delong 2010<br>Langhans and Tockner 2006<br>Lin *et al.* 2019 | Perry *et al.* 2011 | Delong 2010<br>Borders *et al.* 2006 | Wenisch *et al.* 2017 | Ferreira *et al.* 2006<br>Kittle *et al*. 1995<br>Duarte *et al.* 2008 | Langhans and Tockner 2006<br>Shumilova *et al.* 2019 |
| 3 | Primary productivity | Amoros and Bornette 2002<br>Jones *et al.* 2020 | McGowan *et al.* 2011 | McInerney and Rees 2017<br>Ou *et al*. 2019 | Rodriguez-Lozano *et al*. 2015 | Parker *et al.* 2012<br>Wassenaar *et al.* 2010 | Jones *et al*. 2020 |
| 4 | Secondary productivity | Iwata *et al.* 2003<br>Heinrich *et al.* 2014<br>Pringle *et al.* 2000<br>Palmer and Ruhi 2019 | Nelson *et al.* 2017 | Stone and Wallace 1998<br>Merten *et al.* 2014<br>Progar and Moldenke 2009<br>Banks *et al.* 2007 | Kemp *et al*. 2011<br>Rodriguez-Lozano *et al*. 2015 | Richmond *et al.* 2016<br>deBruyn *et al.* 2003 | Pringle *et al.* 2000<br>Fausch *et al*. 2010 |
| 5 | Food web complexity | Amoros and Bornette 2002<br>Heinrich *et al*. 2014<br>Palmer and Ruhi 2019 | | Modiba *et al*. 2017<br>Thompson *et al.* 2018<br>Orzetti *et al.* 2010 | Ray *et al.* 2004 | Windsor *et al.* 2019<br>deBruyn *et al.* 2003 | Pringle *et al.* 2000<br>He *et al.* 2019 |
| 6 | Functional redundancy | Amoros and Bornette 2002<br>Oliveira *et al.* 2018<br>Belmar *et al*. 2019 | Bruno *et al.* 2016 | Modiba *et al.* 2017 | Chalcraft and Resetarits 2003 | Laini *et al*. 2019<br>Wu *et al.* 2019 | Liu and Wang 2018 |
| 7 | Habitat provisioning | Pelletier *et al.* 2020<br>Csiki and Rhoads 2013<br>Manfrin *et al.* 2020 | Fullerton *et al.* 2018 | Wohl 2017<br>Thompson *et al*. 2018 | Law *et al.* 2017<br>Wilby *et al.* 2018<br>Thakur *et al*. 2020 | Blettler *et al.* 2019<br>Paredes-Arquiola *et al.* 2014<br>Horn *et al.* 2004.<br>Marsili-Libelli *et al.* 2013 | Barbarossa *et al.* 2020<br>East *et al.* 2015<br>Bellmore *et al.* 2019<br>AMBER Consortium 2020 |
| 8 | Nutrient cycling | Amoros and Bornette 2002 | Palmer and Ruhi 2019<br>Wrona *et al*. 2006 Ambio | Osborne and Kovacic 1993 | Garman and Macko 1998<br>Wenger *et al.* 2019<br>Puttock *et al*. 2017 | Mekonnen and Hoekstra 2015<br>Boyer *et al.* 2002. | |
| 9 | Flood attenuation | Galat *et al.* 1998<br>Hering *et al.* 2001<br>Wegener *et al.* 2017 | Moor *et al.* 2015<br>Prudhomme *et al.* 2003<br>Roy *et al.* 2001 | Gilvear *et al*. 2013 | Puttock *et al*. 2017 | | |
| 10 | Water purification | Bai *et al*. 2020<br>Kong *et al*. 2020 | Wu and Ding 2019 | Li *et al.* 2019<br>Zheng *et al.* 2019 | | | |

| | | Restore natural flow and sediment regime | Mitigate climate warming | Restore riparian vegetation | Re-introduce extirpated species | Improve water quality | Reduce habitat fragmentation |
|---|---|---|---|---|---|---|---|
| 11 | Flood/ flow pulse | Weisener *et al*. 2017<br>Grossart and Rojas-Jimenez 2016<br>Zhang *et al*. | Palmer and Ruhi 2019 | | | | |
| 12 | Groundwater recharge | Wang *et al*. 2010<br>Smith *et al*. 2020<br>Buttle 2011<br>Lehr *et al.* 2015 | Libera *et al.* 2019 | | | | |

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**S2**

Potential data sources to support development of indicators of rewilding potential (see Table 1 and text for further details) The data sources listed here can support indicator development for selected ecosystem functions, but the concept could be extended to other functions included in the rewilding framework presented in the text.

**Canada's Hydrometric Station Network**

*Data available*

Real time and historic discharge and water level data with daily time steps

*Extent*

Canada

*URL*

https://wateroffice.ec.gc.ca/mainmenu/station_and_network_data_index_e.html

*Reference*

Water Survey of Canada. National Water Data Archive: HYDAT. Available for download from: http://collaboration.cmc.ec.gc.ca/cmc/hydrometrics/www/

**European AMBER Barrier Atlas**

*Data available*

Spatial database of recorded barriers in rivers in Europe

*Extent*

Europe

*URL*

https://amber.international/european-barrier-atlas/

*Reference*

AMBER Consortium (2020). The AMBER Barrier Atlas. A Pan-European database of artificial instream barriers. Version 1.0. Available at https://amber.international/european-barrier-atlas [Verified 29 June 2020].

**USGS WaterQualityWatch**

*Data available*

Water quality parameters (water temperature, conductivity, pH, dissolved oxygen, turbidity, nitrate, discharge, chlorophyll-*a*, and other surrogates)

*Extent*

United States of America

*URL*

https://waterwatch.usgs.gov/wqwatch/

*Reference*

US Geological Survey (2020). National Water Information System. (USGS Water Data for the Nation). Available at https://waterdata.usgs.gov/nwis/

**Canadian Aquatic Biomonitoring Network (CABIN)**

*Data available*

Macroinvertebrate taxonomic richness and abundance, site assessment in comparison to regional Reference Condition, habitat characteristics

*Extent*

Canada

*URL*

https://cabin-rcba.ec.gc.ca/cabin/login?culture = en-CA

*Reference*

Environment and Climate Change Canada 2020, Canadian Aquatic Biomonitoring Network. URL https://www.canada.ca/en/environment-climate-change/services/canadian- aquatic-biomonitoring-network.html.

Other useful data sources:

**HydroSHEDS**

*Data available*

Georeferenced datasets for river networks, watershed boundaries, drainage directions and flow accumulations, land use and landscape information, climate

*Extent*

Global

*URL*

https://www.hydrosheds.org

*Reference*

Lehner, B., Verdin, K., and Jarvis, A. (2008). New global hydrography derived from spaceborne elevation data. *Eos* **89**(10), 93–94. doi:10.1029/2008EO100001

**EOLakeWatch**

*Data available*

Long-term, satellite-derived, remote sensing data of inland algal blooms

Extent

Regional within Canada (Lake Erie, Lake Winnipeg, Lake of the Woods)

*URL*

https://www.canada.ca/en/environment-climate-change/services/water-overview/satellite-earth-observations-lake-monitoring/remote-sensing-algal-blooms.html

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Environment and Climate Change Canada 2020. EOLakeWatch: Satellite derived daily algal bloom indices. Lake Winnipeg- doi:10.18164/c6df8218-6ac0-4dab-b697-228e318e44ed

Environment and Climate Change Canada (2020). EOLakeWatch: Satellite derived daily algal bloom indices. Lake of the Woods. doi:10.18164/2f2a8706-5436-46d2-b1b3-876edd0db389

**NEON Data Portal**

*Data available*

Meteorological, soil, organismal, biogeochemical, freshwater aquatic and remote sensing data collected from automated instruments, observational field sampling and airborne remote sensing surveys

*Extent*

United States of America

*URL*

https://data.neonscience.org/data-products/explore

*Reference*

National Ecological Observatory Network 2020. Provisional data downloaded from https://data.neonscience.org. Battelle, Boulder, CO, USA.

**National Long-term Water Quality Monitoring Data**

*Data available*

Long-term freshwater quality data including physical-chemical parameters such as temperature, pH, alkalinity, major ions, nutrients and metals; data updated monthly

*Extent*

Canada

*URL*

https://open.canada.ca/data/en/dataset/67b44816-9764-4609-ace1-68dc1764e9ea

*Reference*

Environment and Climate Change Canada 2016–05–02. National long-term water quality monitoring data. Accessed 2020. Available at http://data.ec.gc.ca/data/substances/monitor/national-long-term-water-quality-monitoring-data/

**DataStream**

*Data available*

Water monitoring data

*Extent*

regional for the MacKenzie River Basin, Lake Winnipeg watershed and Atlantic Canada

*URL*

https://gordonfoundation.ca

*Reference*

The Gordon Foundation 2020. DataStream. Accessed 2020. Toronto, ON, Canada. Available at https://gordonfoundation.ca/initiatives/datastream/

**Global Runoff Data Centre**

*Data available*

Multinational and global long-term hydrological data

*Extent*

Global

*URL*

https://www.bafg.de/GRDC/EN/Home/homepage_node.html

*Reference*

Bundesanstalt für Gewässerkunde 2020. Global Runoff Database. Available at http://www.bafg.de/cln_032/nn_266918/GRDC/EN/02 Services/services node.html? nnn=t rue.

**Rivers Network**

*Data available*

webmaps of river basins and watersheds

*Extent*

Global

*URL*

https://www.riversnetwork.org

*Reference*

Tilman, E. 2020. Rivers Network: Sharing knowledge, raising awareness, bridging river's advocates. Waver, Belgium. Available at https://www.riversnetwork.org/rbo/index.php/basin-and-watershed-maps

**S3**

Annotated bibliography of rewilding literature

## Introduction

The purpose of this bibliography is to provide an overview of the scientific literature on rewilding, with a main focus on ecological studies and rewilding freshwater ecosystems. Literature searches were conducted using the Web of Science and Google Scholar search engines with the search term rewild*. This bibliography is organised on the basis of the focus of the article.

## General literature in rewilding

Carroll, C., and Noss, R. F. (2020). Rewilding in the face of climate change. *Conservation Biology* doi:10.1111/cobi.13531.

Carroll and Noss use the Yellowstone-to-Yukon region as a case study to examine the implications of climate change to spatial planning strategies in rewilding projects. They highlight the importance of conserving large protected areas, including microrefugia, macrorefugia and areas that connect current and future suitable climates for biota.

Corlett, R. T. (2016). The role of rewilding in landscape design for conservation. *Current Landscape Ecology Reports* **1**, 127–133 doi:10.1007/s40823-016-0014-9.

In this review article, Corlett looks at different rewilding approaches, the opportunities and challenges of rewilding and how it differs from restoration. Corlett calls for more replicated, large-scale, long-term experiments to inform rewilding practice.

Dandy, N., and Wynne-Jones, S. (2019). Rewilding forestry. *Forest Policy and Economics* **109**, 101996 doi:10.1016/j.forpol.2019.101996.

In this commentary, Dandy and Wynne-Jones look at rewilding forestry and explore the reasons why there is a limited amount of rewilding research in the forestry journals and call for more attention towards rewilding from forest scientists.

Endangered Landscapes Program 'Annual Review 2019'. (Cambridge Conservation Initiative: Cambridge, UK.) Available at https://www.ccihive.org/wp- content/uploads/2020/04/ELPReview2019_web.pdf.

This is the first annual review of the Endangered Landscapes Programme, which is managed by the Cambridge Conservation Initiative in the United Kingdom. The aim of this review is to provide examples of landscape-scale restoration as examples and lessons for future work. This includes rewilding examples from across Europe, including the Greater Côa Valley (Western Iberia), and the Danube Delta (Ukraine, Romania and Moldova).

Fernández, N., Navarro, L. M., and Pereira, H. M. (2017). Rewilding: a call for boosting ecological complexity in conservation. *Conservation Letters* **10**(3), 276–278 doi:10.1111/conl.12374.

Here, Fernández *et al*. argue that a rewilding approach 'focused on preserving and restoring the structural and functional complexity of degraded ecosystems must become a primary component of broad-scale and long-term visions for biodiversity conservation'. They call for unifying rewilding approaches with different restoration baselines and management intensities under one framework that could inform about the costs, benefits and risks of the different approaches.

Foreman, D. (1999). The wildlands project and the rewilding of North America. *Denver University Law Review* **76**(2), 535–553.

This article reviews the rise of conservation biology in North America and The Wildlands Project, its foundation, goals and objectives. The definition of rewilding used in The Wildlands Project focuses on large, strictly protected core reserves, connectivity and keystone species.

Holmes, G. (2015). What do we talk about when we talk about biodiversity conservation in the Anthropocene? *Environment and Society – Advances in Research* **6**(1), 87–108 doi:10.3167/ares.2015.060106.

Here, Holmes looks at Anthropocene and biodiversity conservation. He discusses the definition of Anthropocene, how it is discussed in biodiversity conservation literature and new concepts and strategies for biodiversity conservation, such as rewilding, in the Anthropocene.

Iacolina, L., Lukassen, M. B., Fløjgaard, C., Buttenschøn, R., Nielsen, J. L., and Pertoldi, C. (2020). eDNA and metabarcoding for rewilding projects monitoring, a dietary approach. *Mammalian Biology* **100**(4), 411–418 doi:10.1007/s42991-020-00032-y.

This study uses diet analysis of moose and red deer within a rewilding area of Denmark to examine the impact of their browsing and grazing on vegetation structure. The authors use eDNA metabarcoding of dung and species identification through saliva found on twigs to map the two species' diet and diet overlap, as both provide ecosystem functions fundamental to the rewilding progress.

Jepson, P. (2016). A rewilding agenda for Europe: creating a network of experimental reserves. *Ecography* **39**(2), 117–124 doi:10.1111/ecog.01602.

Here, Jepson discusses European rewilding, its origins, its role and potential in conservation institutions and their modernization. Jepson calls for investment in the creation of a network of experimental rewilding sites in Europe.

Jepson, P. (2019). Recoverable earth: a twenty-first century environmental narrative. *Ambio* **48**(2), 123–130 doi:10.1007/s13280-018-1065-4.

Here, Jepson reviews the origins of twentieth century environmental narratives and discusses a new narrative emerging around rewilding in Europe. He calls this the recoverable earth narrative.

Jepson, P., and Blythe, C. (2020). 'Rewilding: The Radical New Science of Ecological Recovery'. (Icon Books Ltd: London, UK.)

Ecologists Jepson and Blythe present an accessible introduction of rewilding for the public. In their book, they say rewilding is the result of nature conservation taking radical turn in the 21st century, towards self-repairing and self-determined ecosystem processes, rather than nature preserves as 'museum pieces'.

Jepson, P., Schepers, F., and Helmer, W. (2018). Governing with nature: a European perspective on putting rewilding principles into practice. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170434 doi:10.1098/rstb.2017.0434.

Here, Jepson *et al*. review the origins, goals, and principles of the European approach to rewilding. They present six case studies to illustrate the European approach and to inform future research and policy on rewilding.

Lorimer, J., and Driessen, C. (2014). Wild experiments at the Oostvaardersplassen: rethinking environmentalism in the Anthropocene. *Transactions of the Institute of British Geographers* **39**(2), 169–181 doi:10.1111/tran.12030.

In this paper, Lorimer and Driessen develop the concept of a wild experiment and examine environmentalism as a series of wild experiments. They use the Dutch rewilding area Oostvaardersplassen as a case study of a wild experiment.

Noss, R. F. (2003). A checklist for wildlands network designs. *Conservation Biology* **17**(5), 1270–1275 doi:10.1046/j.1523-1739.2003.02489.x.

In this article Reed F. Noss presents a checklist to help in developing wildlands network designs and conservation assessments that are part of the Wildlands Project. The Wildlands Project is based on the goals of biodiversity conservation and rewilding that is defined in the article as 'restoration of wilderness qualities and intact food webs' and follows the concept of large network of connected core reserves.

Pereira, H. M., and Navarro, L. M. (Eds) (2015). 'Rewilding European landscapes.' (Springer International Publishing) doi:10.1007/978-3-319-12039-3

This book looks at rewilding in Europe. The book discusses the theory of rewilding, the consequences it has for biodiversity, and examples of rewilding put in practice.

Perino, A., Pereira, H. M., Navarro, L. M., Fernández, N., Bullock, J. M., Ceaușu, S., Cortés-Avizanda, A., van Klink, R., Kuemmerle, T., Lomba, A., Pe'er, G., Plieninger, T., Rey Benayas, J. M., Sandom, C. J., Svenning, J., and Wheeler, H. C. (2019). Rewilding complex ecosystems. *Science* **364**(6438), eaav5570 doi:10.1126/science.aav5570.

In this review article, Perino *et al*. address criticism presented towards rewilding by proposing a framework for rewilding actions to be used as a guideline in design and evaluation of rewilding projects. They suggest a structured approach to rewilding that can be applied to projects ranging from passive to trophic rewilding. They emphasise the importance of inclusion of all stakeholders in the process for successful rewilding. They apply their framework to four ongoing rewilding projects: restoration of natural flood regime in Germany (Lebendige Luppe Project), non-intervention policy and reintroductions in Swiss National Park, reintroductions of two mammal species to Tijuca National Park, and the abandonment, minimal human intervention and reintroductions in the Chernobyl exclusion zone.

Pettorelli, N., Barlow, J., Stephens, P. A., Durant, S. M., Connor, B., to Buhne, H. S., Sandom, C. J., Wentworth, J., and du Toit, J. T. (2018). Making rewilding fit for policy. *Journal of Applied Ecology* **55**, 1114–1125. doi:10.1111/1365-2664.13082

Here, Pettorelli *et al*. argue that for rewilding initiatives to grow they should consider the constraints and opportunities of the environmental governance policies. They also argue that the concept of rewilding needs a clear definition and more scientific research to inform the initiatives. They define rewilding as 'the reorganisation of biota and ecosystem processes to set an identified social–ecological system on a preferred trajectory, leading to the self-sustaining provision of ecosystem services with minimal ongoing management' and identify five key research areas to guide future rewilding initiatives.

Pettorelli, N., Durant, S. M., and du Toit, J. T. (Eds) (2019) 'Rewilding.' Ecological Reviews. (Cambridge University Press: Cambridge.) doi:10.1017/9781108560962.

This book comprises 20 chapters on the topic of rewilding, including definitions and differences between approaches. It is an interdisciplinary book, discussing current state of ecological knowledge, rewilding objectives, and the role of humans in these initiatives.

Root-Bernstein, M., Gooden, J., and Boyes, A. (2018). Rewilding in practice: projects and policy. *Geoforum* **97**, 292–304 doi:10.1016/j.geoforum.2018.09.017.

Here, Root-Bernstein *et al*. explore the practice and policy transformations around European rewilding. They consider European conservation policy and the context where European rewilding emerged. They use rewilding projects in the UK and the Netherlands, which they call first wave rewilding, and in Denmark, which they call second wave rewilding, as case studies to look at the visions, strategies, and validation for the projects.

Soulé, M. E., and Noss, R. F. (1998). Rewilding and biodiversity: complementary goals for continental conservation. *Wild Earth* **8**(3), 18–28.

This is often cited as the first rewilding article. Here, Soulé and Noss define the concept of rewilding and compare it to older conservation movements in North America. They define rewilding as restoration of large interconnected wilderness areas and large predators. Large strictly protected core reserves, connectivity and keystone species are the centre of this definition of rewilding.

Sweeney, O. F., Turnbull, J., Jones, M., Letnic, M., Newsome, T. M., and Sharp, A. (2019). An Australian perspective on rewilding. *Conservation Biology* **33**(4), 812–820 doi:10.1111/cobi.13280.

Here, Sweeney *et al*. discuss rewilding in Australia. They look at the opportunities and limitations of different types of rewilding in Australia, the past rewilding projects and lessons learned from them, and the perceptions of rewilding among Australians.

Torres, A., Fernández, N., zu Ermgassen, S., Helmer, W., Revilla, E., Saavedra, D., Perino, A., Mimet, A., Rey-Benayas, J. M., Selva, N., Schepers, F., Svenning, J., and Pereira, H. M. (2018). Measuring rewilding progress. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170433 doi:10.1098/rstb.2017.0433.

Here, Torres *et al*. present a framework for measuring rewilding progress. The framework assesses both decrease in material human inputs and output, as well as increase in ecological integrity of ecosystems.

Van Meerbeek, K., Muys, B., Schowanek, S. D., and Svenning, J. (2019). Reconciling conflicting paradigms of biodiversity conservation: human intervention and rewilding. *Bioscience* **69**(12), 997–1007 doi:10.1093/biosci/biz106.

Here, van Meerbeek *et al*. look at rewilding and human intervention, often considered opposing management strategies and argue that these strategies can be complimentary. They propose a framework to help decide between different management strategies along the management spectrum ranging between ecosystem self-management and human management.

## What is rewilding?

Anderson, R. M., Buitenwerf, R., Driessen, C., Genes, L., Lorimer, J., and Svenning, J. (2019). Introducing rewilding to restoration to expand the conservation effort: a response to Hayward *et al*. *Biodiversity and Conservation* **28**(13), 3691–3693 doi:10.1007/s10531-019-01845-1.

In this letter to the editor, Anderson *et al*. respond to Hayward *et al*., who argued that the term rewilding should be eliminated and replaced with the term restoration. Anderson *et al*. explain their view of rewilding and state that rewilding is a subcategory of restoration and should be further clarified but not eliminated.

Carey, J. (2016). Rewilding. *Proceedings of the National Academy of Sciences of the United States of America* **113**(4), 806–808 doi:10.1073/pnas.1522151112.

This text briefly reviews the history of the term rewilding, the rewilding debate and how it has been presented in the media.

Cloyd, A. A. (2016). Reimagining rewilding: a response to Jørgensen, Prior, and Ward. *Geoforum* **76**, 59–62 doi:10.1016/j.geoforum.2016.08.013.

Cloyd answers the calls made by Jørgensen, Prior and Ward for humanities scholars to join the conversation on rethinking rewilding and discusses the importance and relevance of fictional writings on rewilding. He argues for geographical and disciplinary expansion in further conversation. For geographical expansion he offers James Feldman's A Storied Wilderness and Apostle Islands in the United States and for disciplinary expansion he argues for connecting creative and imaginative texts as well as fiction with scientific text.

Corlett, R. T. (2016). Restoration, reintroduction, and rewilding in a changing world. *Trends in Ecology & Evolution* **31**(6), 453–462 doi:10.1016/j.tree.2016.02.017.

In this review article, Corlett is looking at the current, past, and future meaning of the terms 'restoration', 'reintroduction', and 'rewilding'. He outlines the taxonomy of the major terms used in recent conservation literature under tree clusters of umbrella terms: restoration, conservation translocation and rewilding. Rewilding cluster covers four terms: trophic rewilding, Pleistocene rewilding, ecological rewilding, and passive rewilding. He gives a brief history of rewilding, emphasising the different approaches in North America and Europe and explores the roles of baselines and novel ecosystems in conservation.

Derham, T. T. (2019). In defence of 'rewilding' – a response to Hayward *et al.* (2019). *Biological Conservation* **236**, 583 doi:10.1016/j.biocon.2019.05.035.

In this letter to editor, Tristan T. Derham defends the term rewilding by answering to the claims made by Hayward *et al*. that the term rewilding and its definitions are unclear, does not differ from restoration ecology and therefore does not need to be in the ecological lexicon.

du Toit, J. T., and Pettorelli, N. (2019). The differences between rewilding and restoring an ecologically degraded landscape. *Journal of Applied Ecology* **56**(11), 2467–2471 doi:10.1111/1365-2664.13487.

In this commentary paper, du Toit and Pettorelli look at the similarities and differences of rewilding and restoration. To help distinguish this, they provide two metaphors. They also provide a decision pathway to help decide between restoration, active rewilding and passive rewilding of a degraded landscape.

Gammon, A. R. (2018). The many meanings of rewilding: an introduction and the case for a broad conceptualisation. *Environmental Values* **27**(4), 331–350 doi:10.3197/096327118X15251686827705.

In this paper, Gammon explores the definitions of rewilding in and outside of scientific literature and looks at the rewilding concept through the lens of environmental philosophy.

Genes, L., Svenning, J., Pires, A. S., and Fernandez, F. A. S. (2019). Why we should let rewilding be wild and biodiverse. *Biodiversity and Conservation* **28**(5), 1285–1289 doi:10.1007/s10531-019-01707-w.

In this commentary, Genes *et al*. argue that rewilding should maintain its focus on promoting biodiversity conservation instead of recent calls for only promoting certain preferred ecosystem services. They discuss misapplications of rewilding and the risks of the 'domestication' of the term.

Hayward, M. W., Jachowski, D., Bugir, C. K., Clulow, J., Krishnamurthy, R., Griffin, A. S., Chalmers, A. C., Linnell, J. D. C., Montgomery, R. A., Somers, M. J., Kowalczyk, R., Heurich, M., Caravaggi, A., Marnewick, K. A., Di Blanco, Y., Shuttleworth, C. M., Callen, A., Weise, F., Scanlon, R., Moehrenschlager, A., Howell, L. G., and Upton, R. M. O. (2019). The search for novelty continues for rewilding. *Biological Conservation* **236**, 584–585 doi:10.1016/j.biocon.2019.05.041.

In this letter to the editor, Hayward *et al*. respond to Derham's previous response by stating it did not add any clarity to how rewilding differs from restoration and that the term should be removed from the restoration lexicon.

Hayward, M. W., Scanlon, R. J., Callen, A., Howell, L. G., Klop-Toker, K. L., Di Blanco, Y., Balkenhol, N., Bugir, C. K., Campbell, L., Caravaggi, A., Chalmers, A. C., Clulow, J., Clulo, S., Cross, P., Gould, J. A., Griffin, A. S., Heurich, M., Howe, B. K., Jachowski, D. S., Jhala, Y. V., Krishnamurthy, R., Kowalczyk, R., Lenga, D. J., Linnell, J. D. C., Marnewick, K. A., Moehrenschlager, A., Montgomery, R. A., Osipova, L., Peneaux, C., Rodger, J. C., Sales, L. P., Seeto, R. G. Y., Shuttleworth, C. M., Somers, M. J., Tamessar, C. T., Upton, R. M. O., and Weise, F. J. (2019). Reintroducing rewilding to restoration – rejecting the search for novelty. *Biological Conservation* **233**, 255–259 doi:10.1016/j.biocon.2019.03.011.

In this perspective article, Hayward *et al*. argue that rewilding does not distinctively differ from restoration and therefore the use of the term rewilding should be replaced by restoration. They argue that the definitions of rewilding remain 'fuzzy' which makes it hard to translate it to policy framework.

Holmes, G., Marriott, K., Briggs, C., and Wynne-Jones, S. (2020). What is rewilding, how should it be done, and why? A Q-method study of the views held by European rewilding advocates. *Conservation & Society* **18**(2), 77–88 doi:10.4103/cs.cs_19_14.

This study aims to quantify the definition of rewilding by analysing the views of rewilding advocates. They ask what rewilding is, how it should be done and the rationales behind it. They identify two main strains of rewilding perspective one focused on extensive transformation of landscapes and the other a more pragmatic, smaller-scale approach, but overall determine that the rewilding field is less divided than previously thought.

Jones, P., and Comfort, D. (2020). A commentary on rewilding in Europe. *Journal of Public Affairs* **20**(3), e2071 doi:10.1002/pa.2071.

Jones and Comfort provide commentary on rewilding, outlining the variety of definitions and origins of the concept. They also identify the elements of rewilding in Europe, how the process may look and what challenges it faces in relation to public perception.

Jørgensen, D. (2015). Rethinking rewilding. *Geoforum* **65**, 482–488 doi:10.1016/j.geoforum.2014.11.016.

Here, Jørgensen looks at the history and uses of the term rewilding in the ecological scientific discourse and argues it has become 'a plastic word' since being adopted outside of science. This paper started a conversation around the meaning and plasticity of the term rewilding.

Lorimer, J., Sandom, C., Jepson, P., Doughty, C., Barua, M., and Kirby, K. J. (2015). Rewilding: science, practice, and politics. *Annual Review of Environment and Resources* **40**, 39–62 doi:10.1146/annurev-environ-102014-021406.

Lorimer *et al*. review the term rewilding, it's history, meanings, varying benchmarks and approaches, risks, politics, and ethics through four case studies: Oostvaardersplassen in the Netherlands, Yellowstone in the United States, the Pleistocene Park in Russia, and Mauritius and neighbouring islands.

Nogués-Bravo, D., Simberloff, D., Rahbek, C., and Sanders, N. J. (2016). Rewilding is the new Pandora's box in conservation. *Current Biology* **26**(3), R87–R91 doi:10.1016/j.cub.2015.12.044.

In this essay, Nogués-Bravo *et al*. review the meaning of rewilding, its ecological foundations and present examples of failed (re)introductions. They advocate caution, understanding and awareness of the potential consequences of rewilding.

Prior, J., and Brady, E. (2017). Environmental aesthetics and rewilding. *Environmental Values* **26**(1), 31–51 doi:10.3197/096327117X14809634978519.

Here, Prior and Brady look at the implications that rewilding practices may have on environmental aesthetic values, experiences and qualities. They also explore the meaning of rewilding and how it can be understood as a distinctive form of ecological restoration.

Prior, J., and Ward, K. J. (2016). Rethinking rewilding: a response to Jørgensen. *Geoforum* **69**, 132–135 doi:10.1016/j.geoforum.2015.12.003.

Prior and Ward respond to two of Jørgensen's criticisms on rewilding: plasticity of the term and the exclusion of humans in rewilding areas. They answer to the imprecision of the term by defining the core of rewilding as non-human autonomy. They highlight the co-existing of humans and non-humans in rewilding areas and use the Scottish Beaver Trial and the Oostvaardersplassen Reserve in the Netherlands as examples of that.

Rubenstein, D. R., and Rubenstein, D. I. (2016). From Pleistocene to trophic rewilding: a wolf in sheep's clothing. *Proceedings of the National Academy of Sciences of the United States of America* **113**(1), E1 doi:10.1073/pnas.1521757113.

In this comment on the review by Svenning *et al*. on trophic rewilding, Rubenstein and Rubenstein criticise rewilding for the lack of scientific research done on it. They call Pleistocene rewilding a failed conservation strategy and bad science, and claim that it has been repackaged as trophic rewilding.

Svenning, J., Pedersen, P. B. M., Donlan, C. J., Ejrnæs, R., Faurby, S., Galetti, M., Hansen, D. M., Sandel, B., Sandom, C. J., Terborgh, J. W., and Vera, F. W. M. (2016*a*). Reply to Rubenstein and Rubenstein: time to move on from ideological debates on rewilding. *Proceedings of the National Academy of Sciences of the United States of America* **113**(1), E2–E3 doi:10.1073/pnas.1521891113.

In this comment, Svenning *et al*. reply to the criticism from Rubenstein and Rubenstein on Pleistocene and trophic rewilding. They agree with the lack of research on rewilding and instead of burying the topic they call for a move from ideological debates to developing a scientific program for trophic rewilding.

Tanasescu, M. (2017). Field notes on the meaning of rewilding. *Ethics, Policy & Environment* **20**(3), 333–349 doi:10.1080/21550085.2017.1374053.

In this paper, Tanasescu reviews the meaning of the term rewilding in academic literature, how the rewilding organisation Rewilding Europe is implementing rewilding projects in Europe, what difficulties and tensions the organisation has faced during the projects, and how those have contributed to the meaning of rewilding.

### Trophic and top-down rewilding

Andriuzzi, W. S., and Wall, D. H. (2018). Soil biological responses to, and feedbacks on, trophic rewilding. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170448 doi:10.1098/rstb.2017.0448.

In this review article, Andriuzzi and Wall are looking at the possible impact of rewilding on soil and its biota, and the impact of soil processes on rewilded species above-ground. They focus on trophic rewilding and look at large herbivores and their predators, and two groups of soil biota: soil microbes and macroinvertebrates. They emphasise the importance of including soil in the planning of rewilding projects and its part in carbon sequestration. Andriuzzi and Wall bring up the possibility of rewilding soil biota, especially mycorrhizal fungi and dung beetles.

Bakker, E. S., and Svenning, J. (2018). Trophic rewilding: impact on ecosystems under global change. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170432 doi:10.1098/rstb.2017.0432.

In this introduction to the trophic rewilding theme issue, Bakker and Svenning review the impacts of rewilding and how to study them. They state that it's time to move from ideological debates to study the impacts of rewilding. They claim that non-intentional rewilding and species introductions could be used to study the possible impacts of intentional rewilding. According to Bakker and Svenning, this theme issue does that, along with touching on the policy and societal sides of rewilding, and looking at the opportunities of using trophic rewilding as a new restoration tool.

Barbosa, J. M., Pascual-Rico, R., Eguia Martínez, S., and Sánchez-Zapata, J. A. (2020). Ungulates attenuate the response of Mediterranean mountain vegetation to climate oscillations. *Ecosystems* **23**(5), 957–972 doi:10.1007/s10021-019-00449-8.

In this research paper, Barbosa *et al*. look at the top-down and bottom-up controls in long-term vegetation-herbivore interactions and more specifically the role of herbivore ungulates on the response of grasslands and scrublands to climate change in Mediterranean mountain habitats. They discuss the management implications and trophic rewilding with ungulates.

Bull, J. W., Ejrnæs, R., Macdonald, D. W., Svenning, J., and Sandom, C. J. (2019). Fences can support restoration in human-dominated ecosystems when rewilding with large predators. *Restoration Ecology* **27**(1), 198–209 doi:10.1111/rec.12830.

Here, Bull *et al*. look at the impact of fencing on top-down-regulation and human–wildlife conflict within protected areas in human-dominated landscapes. They simulate a hypothetical grey wolf (*Canis lupus*) reintroduction to reserves in their former ranges in the Scottish Highlands and look at how fencing affects their predation of red deer (*Cervus elaphus*).

Cromsigt, J. P. G. M., te Beest, M., Kerley, G. I. H., Landman, M., le Roux, E., and Smith, F. A. (2018). Trophic rewilding as a climate change mitigation strategy? *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170440 doi:10.1098/rstb.2017.0440.

This review article looks at trophic rewilding as a climate change mitigation strategy. Cromsigt *et al*. focus on the impact of terrestrial mammalian megafauna on methane emissions, fire regimes, nutrient availability, vegetation and soil. They then look at the role of trophic rewilding to climate change mitigation on regional and global scales.

Cromsigt, J. P. G. M., Kemp, Y. J. M., Rodriguez, E., and Kivit, H. (2018). Rewilding Europe's large grazer community: how functionally diverse are the diets of European bison, cattle, and horses? *Restoration Ecology* **26**(5), 891–899 doi:10.1111/rec.12661.

In this research paper, Cromsigt *et al*. study the functional diversity of the diets of European bison (*Bison bonasus*), cattle (*Bos taurus*) and horse (*Equus ferus*) in the Kraansvlak trophic rewilding area in the Netherlands where these species have been introduced.

Cunningham, C. X., Johnson, C. N., Hollings, T., Kreger, K., and Jones, M. E. (2019). Trophic rewilding establishes a landscape of fear: Tasmanian devil introduction increases risk- sensitive foraging in a key prey species. *Ecography* **42**(12), 2053–2059 doi:10.1111/ecog.04635.

This research paper examines the impact of trophic rewilding of Tasmanian devil to Maria Island. They specifically examine how the reintroduction influences risk-sensitive foraging and behavioural responses in a major prey species, the common brushtail possum (*Trichosurus vulpecula*).

Derham, T. T., Duncan, R. P., Johnson, C. N., and Jones, M. E. (2018). Hope and caution: rewilding to mitigate the impacts of biological invasions. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20180127 doi:10.1098/rstb.2018.0127.

Derham *et al*. focus this review on the connection of trophic rewilding and biological invasions. They examine the foundations of rewilding, applying an invasion biology theory to rewilding and looking at case studies to identify the risks of rewilding enabling invasions. They use European pine martens, Eurasian otters, dingoes, Tasmanian devils and tule elk as their case studies to demonstrate how reintroductions can mitigate the impacts of biological invasions.

Dugelby, B. L., Foreman, D., List, R., Miller, B., Humphrey, J., and Seidman, M. (2001). Rewilding the Sky Islands region of the southwest. In 'Large Mammal Restoration: Ecological and Sociological Challenges in the 21st Century'. (Eds. D. S. Maehr, R. F. Noss, J. L. Larkin). pp 65–81. (Island Press: Washington, DC, USA.)

This book chapter looks at the use of large mammals in the design and management of the Sky Islands Wildlands Network in Mexico and the United States. The design of the project is based on rewilding and top-down-regulation. They describe the proposed area for the project, the focal species of the area (Mexican wolf, grizzly bear, black bear, jaguar, mountain lion, bighorn sheep, bison and elk) and management recommendations for each of them.

Fielding, M. W., Buettel, J. C., and Brook, B. W. (2020). Trophic rewilding of native extirpated predators on bass strait islands could benefit woodland birds. *Emu–Austral Ornithology* **120**(3), 260–262 doi:10.1080/01584197.2020.1797509.

This perspective paper proposes that trophic rewilding of native extirpated predators (devils and quolls) on Bass Strait Islands, Australia, can benefit endangered woodland birds by controlling populations of invasive species, like cats (*Felis cactus*) and wallabies.

Galetti, M., Pires, A. S., Brancalion, P. H. S., and Fernandez, F. A. S. (2017). Reversing defaunation by trophic rewilding in empty forests. *Biotropica* **49**(1), 5–8 doi:10.1111/btp.12407.

In this commentary, Galetti *et al*. discuss ways to reverse defaunation in tropical forests with trophic rewilding. They look at the Atlantic Forest of South America and suggest a list of candidate species for trophic rewilding within there.

Galetti, M., Root-Bernstein, M., and Svenning, J. (2017). Challenges and opportunities for rewilding South American landscapes. *Perspectives in Ecology and Conservation* **15**(4), 245–247 doi:10.1016/j.pecon.2017.10.002.

In this editorial of a special issue, Galetti *et al*. addresses species extinction and rewilding in South America. They state that 'rewilding projects and debate are still in their infancy' in South America. This issue contributes to the debate about trophic rewilding in South America.

Garrido, P., Edenius, L., Mikusiński, G., Skarin, A., Jansson, A., and Thulin, C. (2021). Experimental rewilding may restore abandoned wood-pastures if policy allows. *Ambio* doi:10.1007/s13280-020-01320-0.

This three-year rewilding experiment examined the impact of horses as an ecological replacement of an extinct wild hose on wood-pastures in Sweden. This trophic rewilding used an endangered Swedish horse breed, *Equus ferus* L. (Gotland Russ) and investigated the cumulative effect of browsing on vegetation structure and composition.

Guyton, J. A., Pansu, J., Hutchinson, M. C., Kartzinel, T. R., Potter, A. B., Coverdale, T. C., Daskin, J. H., da Conceição, A. G., Peel, M. J. S., Stalmans, M. E., and Pringle, R. M. (2020). Trophic rewilding revives biotic resistance to shrub invasion. *Nature Ecology & Evolution* **4**(5), 712 doi:10.1038/s41559-019-1068-y.

This paper describes the long-term effects of loss and later trophic rewilding of large mammals on biotic resistance to an invasive shrub, *Mimosa pigra*, in Gorongosa National Park, Mozambique.

Hall, S. J. G., and Bunce, R. G. H. (2019). The use of cattle *Bos taurus* for restoring and maintaining holarctic landscapes: conclusions from a long-term study (1946–2017) in northern England. *Ecology and Evolution* **9**(10), 5859–5869 doi:10.1002/ece3.5169.

Here, Hall and Bunch report monitoring results on the population dynamics of Chillingham cattle and changes in vegetation between 1946–2017 in Chillingham Park in northern England. They suggest this can provide basic biological knowledge for trophic rewilding projects.

Jarvie, S., and Svenning, J. (2018). Using species distribution modelling to determine opportunities for trophic rewilding under future scenarios of climate change. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170446 doi:10.1098/rstb.2017.0446.

Here, Jarvie and Svenning discuss the applications of using species distribution models to identify suitable habitat for trophic rewilding. They look at climatic suitability of proposed reintroduction areas for 17 large-bodied candidate species across different continents and habitats under current and future climates. They discuss methodological ways to include climate change scenarios in the models.

Johnson, C. N., Prior, L. D., Archibald, S., Poulos, H. M., Barton, A. M., Williamson, G. J., and Bowman, D. M. J. S. (2018). Can trophic rewilding reduce the impact of fire in a more flammable world? *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170443 doi:10.1098/rstb.2017.0443.

In this review article, Johnson *et al*. look at the relationship between large terrestrial herbivores and fire regimes. They explore the possibility of applying trophic rewilding with large herbivores as a tool in controlling fire. They illustrate the impact large herbivores can have on fire regimes with three case studies: recovery of white rhinos and other grazers in southern Africa, restoration of native large herbivore communities in North America, and the impact of swamp buffalo on fire regimes in northern Australia.

Marjakangas, E., Genes, L., Pires, M. M., Fernandez, F. A. S., de Lima, R. A. F., de Oliveira, A. A., Ovaskainen, O., Pires, A. S., Prado, P. I., and Galetti, M. (2018). Estimating interaction credit for trophic rewilding in tropical forests. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170435 doi:10.1098/rstb.2017.0435.

Here, Marjakangas *et al*. propose a framework for identifying the best candidate species and areas for rewilding focusing on seed-dispersal interactions. They use the Atlantic Forest as a case study.

Mittelman, P., Kreischer, C., Pires, A. S., and Fernandez, F. A. S. (2020). Agouti reintroduction recovers seed dispersal of a large-seeded tropical tree. *Biotropica* **52**(4), 766–774 doi:10.1111/btp.12788.

This paper studies the effect of reintroducing agoutis (*Dasyprocta leporina*) on Joannesia princeps, a vulnerable tropical endemic tree, in a reserve in Rio de Janeiro city, Brazil. They compare seed dispersal and seedling establishment in areas where the frugivore population has been reintroduced to a control.

Pedersen, P. B. M., Ejrnæs, R., Sandel, B., and Svenning, J. (2020). Trophic rewilding advancement in anthropogenically impacted landscapes (TRAAIL): a framework to link conventional conservation management and rewilding. *Ambio* **49**(1), 231–244 doi:10.1007/s13280-019-01192-z.

Here, Pedersen *et al*. present a framework to guide the shift from more traditional conservation towards a full trophic rewilding approach. To demonstrate the framework, they apply it to data on Danish rewilding-inspired initiatives.

Grau, H. R., Aráoz, E., Navarro, C. J., Nanni, A. S., and Malizia, A. (2020). Pathways of megaherbivore rewilding transitions: typologies from an Andean gradient. *Elementa* **8**, 19 doi:10.1525/elementa.415.

This review paper covers the different pathways that trophic rewilding of megaherbivores might follow. They base their review on rewilding scenarios studied in subtropical Argentina, which differ according to their ecosystem: rapid rewilding pathway (arid, high elevation plateau), increasing fire pathway (forest-grassland), and connectivity-limited rewilding (lowland montane forests).

Root-Bernstein, M., and Svenning, J. (2016). Prospects for rewilding with camelids. *Journal of Arid Environments* **130**, 54–61 doi:10.1016/j.jaridenv.2016.03.011.

In this paper, Root-Bernstein and Svenning review the evolutionary and paleoecological history of camelids and discuss how camelids could be used in trophic rewilding projects in arid ecosystems.

Sandom, C. J., Middleton, O., Lundgren, E., Rowan, J., Schowanek, S. D., Svenning, J., and Faurby, S. (2020). Trophic rewilding presents regionally specific opportunities for mitigating climate change. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **375**(1794), 20190125 doi:10.1098/rstb.2019.0125.

This paper explores top-down effects of reintroduced herbivores on exacerbating or mitigating climate change. They look at distributional differences across multiple scenarios (including current vs rewilding) and at the differences in effects among functional guilds (e.g. browsers and grazers).

Schweiger, A. H., Boulangeat, I., Conradi, T., Davis, M., and Svenning, J. (2019). The importance of ecological memory for trophic rewilding as an ecosystem restoration approach. *Biological Reviews of the Cambridge Philosophical Society* **94**(1), 1–15 doi:10.1111/brv.12432.

Here, Schweiger *et al*. propose a framework that relates ecological memory – ecosystem's accumulated abiotic and biotic material and information legacies from past dynamics – into trophic rewilding to inform future projects and studies in trophic rewilding and similar restoration forms.

Speed, J. D. M., Austrheim, G., Kolstad, A. L., and Solberg, E. J. (2019). Long-term changes in northern large-herbivore communities reveal differential rewilding rates in space and time. *PLoS One* **14**(5), e0217166 doi:10.1371/journal.pone.0217166.

In this research study, Speed *et al*. look at large herbivore assemblages in Norway and how they have changed in space and time over a 66-year period. They look at the relationship between wild and domestic herbivore biomass and competition.

Svenning, J., and Faurby, S. (2017). Prehistoric and historic baselines for trophic rewilding in the neotropics. *Perspectives in Ecology and Conservation* **15**(4), 282–291 doi:10.1016/j.pecon.2017.09.006.

Here, Svenning and Faurby provide historically informed baselines for trophic rewilding with megafauna in the Neotropical region. They look at two baselines: a historic baseline with megafauna species historically (post-1500 AD) extinct and a prehistoric baseline with megafauna species prehistorically extinct within the last 130 000 years. They identify regions that have rewilding potential based on the missing megafauna species compared to the baselines.

Svenning, J., Pedersen, P. B. M., Donlan, C. J., Ejrnæs, R., Faurby, S., Galetti, M., Hansen, D. M., Sandel, B., Sandom, C. J., Terborgh, J. W., and Vera, F. W. M. (2016*b*). Science for a wilder Anthropocene: Synthesis and future directions for trophic rewilding research. *Proceedings of the National Academy of Sciences of the United States of America* **113**(4), 898–906 doi:10.1073/pnas.1502556112.

In this article, Svenning *et al*. review trophic rewilding literature, looking at what trophic rewilding is and what has been learned from trophic rewilding projects. They also discuss species selection for rewilding and future research priorities.

Tanentzap, A. J., and Smith, B. R. (2018). Unintentional rewilding: Lessons for trophic rewilding from other forms of species introductions. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170445 doi:10.1098/rstb.2017.0445.

Here, Tanentzap and Smith look at studies of intentional and unintentional species introductions to inform future trophic rewilding. They compile a meta-analysis of 51 studies that had 158 different responses of lower trophic levels to the species introduction restoring an extinct trophic interaction. They compare intentional and unintentional introductions and identify data gaps in the empirical knowledge.

van Klink, R., and WallisDeVries, M. F. (2018). Risks and opportunities of trophic rewilding for arthropod communities. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170441 doi:10.1098/rstb.2017.0441.

In this review article, Klink and WallisDeVries look at the impact trophic rewilding with large herbivores can have on arthropod communities. They review the published studies on the subject and identify studies from 10 different reserves in western and central Europe. They list knowledge gaps they found in current literature and suggest approaches to develop monitoring schemes for rewilding projects.

Venter, Z. S., Hawkins, H., and Cramer, M. D. (2017). Implications of historical interactions between herbivory and fire for rangeland management in African savannas. *Ecosphere* **8**(10), e01946 doi:10.1002/ecs2.1946.

Here, Venter *et al*. explore the roles of fire and herbivores in mid-Holocene African savannas. They discuss the possibility of changing rangelands from a fire-dominated to a herbivore-dominated stable alternative state by rewilding them with herbivory and the implications of this for ecosystem processes and services.

### Reintroductions, introductions and translocations

Baker, A. G., Cornelissen, P., Bhagwat, S. A., Vera, F. W. M., and Willis, K. J. (2016). Quantification of population sizes of large herbivores and their long-term functional role in ecosystems using dung fungal spores. *Methods in Ecology and Evolution* **7**(11), 1273–1281 doi:10.1111/2041-210X.12580.

In this research paper, Baker *et al*. investigate whether fossil dung fungal spore abundance could provide quantitative information on herbivore density over time. They determine the relationship of dung fungal spores in modern sediments and known herbivore biomass densities in the study area of rewilded Oostvaardersplassen, Netherlands. They also look at how fungal spores travel into sediments and the relationships between different herbivore species and different spore types.

Berti, E., and Svenning, J. (2020). Megafauna extinctions have reduced biotic connectivity worldwide. *Global Ecology and Biogeography* **29**, 2131–2142 doi:10.1111/geb.13182.

Berti and Svenning investigated how human pressure has affected the natural movement capacity of terrestrial mammals through time and how movement capacity will respond to future extinction and rewilding scenarios. The authors found that 74% of average and 83% of maximum movement capacity of Late Pleistocene mammal assemblages has been lost due to historical extirpations and extinctions. However, models indicate that average and maximum movement capacity of mammal assemblages can be restored to twice their current values if full rewilding scenarios were implemented.

Bogoni, J. A., Navarro, A. B., Graipel, M. E., and Peroni, N. (2019). Modeling the frugivory of a plant with inconstant productivity and solid interaction with relictual vertebrate biota. *Ecological Modelling* **408**, 108728 doi:10.1016/j.ecolmodel.2019.108728.

In this research paper, Bogoni *et al*. look at frugivory of fleshy-fruited Feijoa (*Acca sellowiana*) plant species in Atlantic Forest in South America. They simulate different scenarios of changes in frugivory and productivity after frugivore species loss and reintroduction.

Boonstra, R., Boutin, S., Jung, T. S., Krebs, C. J., and Taylor, S. (2018). Impact of rewilding, species introductions and climate change on the structure and function of the Yukon boreal forest ecosystem. *Integrative Zoology* **13**(2), 123–138 doi:10.1111/1749-4877.12288.

In this article, Boonstra *et al*. review the potential impacts of climate change on native species and the impact of both deliberate and natural species introductions on the existing food web in the boreal forest of Kluane region in Yukon.

Brown, C., Mcmorran, R., and Price, M. F. (2011). Rewilding – A new paradigm for nature conservation in Scotland? *Scottish Geographical Journal* **127**(4), 288–314 doi:10.1080/14702541.2012.666261.

This review article discusses the development and foundations of the rewilding concept and its relevance, meaning and possible applications in Scotland.

DeSilvey, C., and Bartolini, N. (2019). Where horses run free? Autonomy, temporality and rewilding in the Côa Valley, Portugal. *Transactions of the Institute of British Geographers* **44**(1), 94–109 doi:10.1111/tran.12251.

This paper analyses the tensions in human-animal relations and the relationship between autonomy and temporality in rewilding focusing on horse reintroduction project in Portugal.

Ding, J., Chang, Q., Ding, Y., Zhu, L., Liu, H., Jiang, Z., and Li, C. (2017). Seasonal home range patterns of the reintroduced and rewild female Père David's deer *Elaphurus davidianus. Biological Rhythm Research* **48**(3), 485–497 doi:10.1080/09291016.2016.1275396.

In this research paper, Ding *et al*. investigate the home-range size and patterns of reintroduced Père David's deer in the coastal wetlands of Yellow Sea in Dafeng National Nature Reserve in Jiangsu Province, China. They discuss what the home-range size and patterns mean for the management of the reserve and conservation policies.

Edwards, T., Cox, E. C., Buzzard, V., Wiese, C., Hillard, L. S., and Murphy, R. W. (2014). Genetic assessments and parentage analysis of captive Bolson tortoises (G*opherus flavomarginatus*) inform their 'rewilding' in New Mexico. *PLoS One* **9**(7), e102787 doi:10.1371/journal.pone.0102787.

In this research article, Edwards *et al*. look at a captive breeding program of Bolson tortoises in the United States of America. They evaluate the genetic structure of wild and captive populations, assess diversity in the captive population, identify new candidates for the captive breeding program and provide information for future actions to maintain the genetic diversity in captive populations, reintroduction and rewilding programs.

Escobar, H. (2016). Rewilding Rio. *Science* **353**(6295), 113–115 doi:10.1126/science.353.6295.113.

In this feature article, Escobar briefly reviews the history of Tijuca National Park in Rio de Janeiro and the implementation of the reintroductions of red-rumped agoutis and brown howler monkeys to the park.

Estrada, A. (2014). Reintroduction of the scarlet macaw (*Ara macao cyanoptera*) in the tropical rainforests of Palenque, Mexico: project design and first year progress. *Tropical Conservation Science* **7**(3), 342–364 doi:10.1177/194008291400700301.

This paper describes the reintroduction program of scarlet macaws in Mexico from the preparation to the post-release monitoring.

Falcón, W., and Hansen, D. M. (2018). Island rewilding with giant tortoises in an era of climate change. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170442 doi:10.1098/rstb.2017.0442.

Here, Falcón and Hansen present a conceptual framework for tortoise rewilding that takes climate change into account. They discuss how climate change might affect ecological functions (herbivory, seed dispersal, nutrient cycling) facilitated by tortoises and propose strategies to secure these functions.

Fernandez, F. A. S., Rheingantz, M. L., Genes, L., Kenup, C. F., Galliez, M., Cezimbra, T., Cid, B., Macedo, L., Araujo, B. B. A., Moraes, B. S., Monjeau, A., and Pires, A. S. (2017). Rewilding the Atlantic Forest: restoring the fauna and ecological interactions of a protected area. *Perspectives in Ecology and Conservation* **15**(4), 308–314 doi:10.1016/j.pecon.2017.09.004.

In this article, Fernandez *et al*. present the adopted practices, successes, and challenges of the reintroductions of red-rumped agouti and howler monkey in the Tijuca National Park in Rio de Janeiro to restore seed dispersal in the defaunated forest.

Fuhlendorf, S. D., Engle, D. M., Kerby, J., and Hamilton, R. (2009). Pyric herbivory: Rewilding landscapes through the recoupling of fire and grazing. *Conservation Biology* **23**(3), 588–598 doi:10.1111/j.1523-1739.2008.01139.x.

This paper looks at pyric herbivory (‘spatial and temporal interaction of fire and grazing, where positive and negative feedbacks promote a shifting pattern of disturbance across the landscape’) as an alternative for introducing species independent of fire to conserve grassland ecosystems with long history of fire and grazing.

Garrido, P., Mårell, A., Öckinger, E., Skarin, A., Jansson, A., and Thulin, C. (2019). Experimental rewilding enhances grassland functional composition and pollinator habitat use. *Journal of Applied Ecology* **56**(4), 946–955 doi:10.1111/1365-2664.13338.

Garrido *et al*. introduced feral horses to enclosures and studied the response of the plant community, as well as pollinator (bumblebee and butterfly) habitat use in a three-year rewilding experiment. They used plant functional traits to examine the mechanisms behind ecosystem change and plant community diversity.

Gellie, N. J. C., Mills, J. G., Breed, M. F., and Lowe, A. J. (2017). Revegetation rewilds the soil bacterial microbiome of an old field. *Molecular Ecology* **26**(11), 2895–2904 doi:10.1111/mec.14081.

Here, Gellie *et al*. look at the impact of ecological restoration on soil bacterial communities. They use metabarcoding of environmental DNA to look at the changes in soil microbiome of an old field after revegetation with native plants across a 10-year revegetation chronosequence. They compare the revegetated sites with three remnant sites and a site cleared of vegetation in the same area.

Genes, L., Fernandez, F. A. S., Vaz-de-Mello, F. Z., da Rosa, P., Fernandez, E., and Pires, A. S. (2019). Effects of howler monkey reintroduction on ecological interactions and processes. *Conservation Biology* **33**(1), 88–98 doi:10.1111/cobi.13188.

In this research study, Genes *et al*. study the success of howler monkey reintroductions in restoring ecological interactions between howler monkeys, dung beetles, and plants and specifically secondary seed dispersal in Tijuca National Park in Brazil.

Gordon, C. E., and Letnic, M. (2019). Evidence that the functional extinction of small mammals facilitates shrub encroachment following wildfire in arid Australia. *Journal of Arid Environments* **164**, 60–68 doi:10.1016/j.jaridenv.2019.01.015.

This research paper looks at the impact of wildfire and functional extinction of native granivorous rodents and introduced European rabbits (*Oryctolagus cuniculus*) on shrub seedling density in Strzelecki Desert in Australia. Gordon and Letnic compare data from unburned and burned areas with differing densities of rodents and rabbits.

Griffiths, C. J., Hansen, D. M., Jones, C. G., Zuël, N., and Harris, S. (2011). Resurrecting extinct interactions with extant substitutes. *Current Biology* **21**(9), 762–765 doi:10.1016/j.cub.2011.03.042.

This article looks at the impact of introducing exotic Aldabra giant tortoises on the critically endangered large-fruited endemic ebony on a 25-ha island off Mauritius.

Griffiths, C. J., Jones, C. G., Hansen, D. M., Puttoo, M., Tatayah, R. V., Müller, C. B., and Harris, S. (2010). The use of extant non-indigenous tortoises as a restoration tool to replace extinct ecosystem engineers. *Restoration Ecology* **18**(1), 1–7 doi:10.1111/j.1526-100X.2009.00612.x.

This case study looks at the feasibility, versatility and risk of using tortoises in restoration and rewilding programs particularly in island ecosystems like the Mascarene Islands.

Griffiths, C. J., Zuël, N., Jones, C. G., Ahamud, Z., and Harris, S. (2013). Assessing the potential to restore historic grazing ecosystems with tortoise ecological replacements. *Conservation Biology* **27**(4), 690–700 doi:10.1111/cobi.12087.

This research paper looks at the impact of non-native tortoise introductions on native and non- native plant communities on Round Island, Mauritius. Griffiths *et al*. also compared the cost of using introduced tortoises as weeders as compared to manual weeding to control non-native vegetation.

Hansen, D. M. (2015). Non-native megaherbivores: The case for novel function to manage plant invasions on islands. *AoB Plants* **7**, plv085 doi:10.1093/aobpla/plv085.

In this article, Hansen recommends considering introducing non-native island megaherbivores, such as large and giant tortoises, to island ecosystems without native megaherbivores to control invasive plants.

Hansen, D. M., Donlan, C. J., Griffiths, C. J., and Campbell, K. J. (2010). Ecological history and latent conservation potential: large and giant tortoises as a model for taxon substitutions. *Ecography* **33**(2), 272–284 doi:10.1111/j.1600-0587.2010.06305.x.

In this review article, Hansen *et al*. look at taxon substitutions using large and giant tortoises as a model organism. They review the risks, benefits and conservation potential of large and giant tortoises, and tortoise translocation projects worldwide. They suggest that rewilding with large and giant tortoises could be used to study taxon substitutions and gain better understanding of rewilding as a restoration tool.

Hurtado, C. M., Beck, H., and Thebpanya, P. (2018). From exploration to establishment: activity changes of the first collared peccary (*Pecari tajacu*) group reintroduced in South America. *Hystrix* **29**(2), 229–231 doi:10.4404/hystrix-00058-2018.

This research article reports on the behavioural and activity changes of collared peccaries (*Pecari tajacu*) after their reintroduction into Iberá Nature Reserve in Argentina as a part of multi-species rewilding project.

Hurtado, C. M., Beck, H., Thebpanya, P., and Altrichter, M. (2020). Spatial patterns of the first groups of collared peccaries (*Pecari tajacu*) reintroduced in South America. *Tropical Ecology* **61**(3), 400–411 doi:10.1007/s42965-020-00099-1.

This paper studies the reintroduction of the collared peccary (*Pecari tajacu*) to the Ibera National Park in Argentina. They monitored individuals to examine their spatial patterns and choice of habitat. They also examined the interrelationships between individuals (e.g. home-range size, familiarity) to provide recommendations for future introductions.

Ji, S. N., Yang, L. L., Ge, X. F., Wang, B. J., Cao, J., and Hu, D. F. (2013). Behavioural and physiological stress responses to transportation in a group of Przewalski's horses (*Equus ferus prezwalskii*). *Journal of Animal and Plant Sciences* **23**(4), 1077–1084.

This research study looks at the impact transport has on the stress response; behaviour and faecal glucocorticoid metabolites of Przewalski's horses.

Johnson, R., and Greenwood, S. (2020). Assessing the ecological feasibility of reintroducing the Eurasian lynx (*Lynx lynx*) to southern Scotland, England and Wales. *Biodiversity and Conservation* **29**(3), 771–797 doi:10.1007/s10531-019-01909-2.

In this research study, Johnson and Greenwood provide an initial assessment of the ecological feasibility of Eurasian lynx (*Lynx lynx*) reintroduction in southern Scotland, England and Wales.

Lord, C. M., Wirebach, K. P., Tompkins, J., Bradshaw-Wilson, C., and Shaffer, C. L. (2020). Reintroduction of the European bison (*Bison bonasus*) in central-eastern Europe: a case study. *International Journal of Geographical Information Science* **34**(8), 1628–1647 doi:10.1080/13658816.2019.1672876.

In this research study, Lord *et al*. identify suitable sites for European bison (*Bison bonasus*) in central-eastern Europe.

Louys, J., Corlett, R. T., Price, G. J., Hawkins, S., and Piper, P. J. (2014). Rewilding the tropics, and other conservation translocations strategies in the tropical Asia-Pacific region. *Ecology and Evolution* **4**(22), 4380–4398 doi:10.1002/ece3.1287.

Louys *et al*. look at the possibilities and limitations of different conservation translocation strategies defined by IUCN, and rewilding for nine large bodied and endangered taxa in the tropical Asia-Pacific region. They review the general principles, benefits and problems of the different strategies through case studies. They use nine large bodied taxa as their case studies, and score them for feasibility, risk and benefit in a conservation translocation matrix. Four of the taxa had translocation potential for rewilding: elephant, rhinoceros, Malayan tapir, and tiger.

Lundgren, E. J., Ramp, D., Ripple, W. J., and Wallach, A. D. (2018). Introduced megafauna are rewilding the Anthropocene. *Ecography* **41**(6), 857–866 doi:10.1111/ecog.03430.

Here, Lundgren *et al*. assess the global distribution, diversity and threat status of introduced terrestrial megafauna.

Mills, J. G., Brookes, J. D., Gellie, N. J. C., Liddicoat, C., Lowe, A. J., Sydnor, H. R., Thomas, T., Weinstein, P., Weyrich, L. S., and Breed, M. F. (2019). Relating urban biodiversity to human health with the 'holobiont' concept. *Frontiers in Microbiology* **10**, 550 doi:10.3389/fmicb.2019.00550.

This perspective article reviews the impact of industrial urbanization on the holobiont health of human and its microbiota and how it could be improved by microbiome rewilding. They view the health benefit gained by human exposure to diverse microbiota as an ecosystem service provided by biodiverse environments.

Mills, C. H., Gordon, C. E., and Letnic, M. (2018). Rewilded mammal assemblages reveal the missing ecological functions of granivores. *Functional Ecology* **32**(2), 475–485 doi:10.1111/1365-2435.12950.

In this research article, Mills *et al*. examine seed predation by ants and mammals inside and outside a fenced desert ecosystem reserves rewilded with locally extinct mammals. They use areas where native mammals have gone locally extinct to study their role in seed predation, as compared to ants.

Mills, J. G., Bissett, A., Gellie, N. J. C., Lowe, A. J., Selway, C. A., Thomas, T., Weinstein, P., Weyrich, L. S., and Breed, M. F. (2020). Revegetation of urban green space rewilds soil microbiotas with implications for human health and urban design. *Restoration Ecology* **28**, S322–S334 doi:10.1111/rec.13175.

These authors examine the impact of revegetation on urban soil microbiota diversity. They argue that this 'microbiome rewilding' has important implications to human public health in terms of immune training and regulation in urban populations.

Mills, J. G., Weinstein, P., Gellie, N. J. C., Weyrich, L. S., Lowe, A. J., and Breed, M. F. (2017). Urban habitat restoration provides a human health benefit through microbiome rewilding: the Microbiome Rewilding Hypothesis. *Restoration Ecology* **25**(6), 866–872 doi:10.1111/rec.12610.

Here, Mills *et al*. propose the Microbiome Rewilding Hypothesis that suggests that 'restoring biodiverse habitats in urban green spaces can rewild the environmental microbiome to a state that helps prevent human disease as an ecosystem service'. They present a case study of successful soil microbiome rewilding of an old field through active restoration as a supporting example for the hypothesis. They suggest the high-throughput amplicon sequencing of environmental DNA used in the study is a potential way to monitor the success of urban green-space restoration.

Moorhouse, T. P., and Sandom, C. J. (2015). Conservation and the problem with 'natural' - does rewilding hold the answer? *Geography* **100**, 45–50. doi:10.1080/00167487.2015.12093953

In this perspective article, Moorhouse and Sandom discuss rewilding and questions related to what is natural or where to draw the line when deciding on restoration targets. They present rewilding as a restoration solution and define it as addressing human-created conservation issues by restoring lost natural processes. As a case in point, they discuss the reintroduction of beavers and wolves in Great Britain.

Naundrup, P. J., and Svenning, J. (2015). A geographic assessment of the global scope for rewilding with wild-living horses (*Equus ferus*). *PLoS One* **10**(7), e0132359 doi:10.1371/journal.pone.0132359.

In this study, Naundrup *et al*. use species distribution modelling combined with habitat and distribution information to estimate suitable areas worldwide for rewilding with the horse (*Equus ferus*).

Nickell, Z., Varriano, S., Plemmons, E., and Moran, M. D. (2018). Ecosystem engineering by bison (*Bison bison*) wallowing increases arthropod community heterogeneity in space and time. *Ecosphere* **9**(9), e02436 doi:10.1002/ecs2.2436.

Here, Nickell *et al*. look at the relationship between bison wallowing and arthropod community structure in tallgrass prairie at the Tallgrass Prairie Preserve in Oklahoma.

Olofsson, J., and Post, E. (2018). Effects of large herbivores on tundra vegetation in a changing climate, and implications for rewilding. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170437 doi:10.1098/rstb.2017.0437.

In this review article, Olofsson and Post are looking at the ways in which rewilding of large herbivores including reindeer, caribou and muskoxen can influence the arctic tundra vegetation in warming climate. They discuss the risks and benefits of large herbivore introductions and look at Pleistocene as an example of how diverse herbivore assembly would change tundra.

Pires, M. M. (2017). Rewilding ecological communities and rewiring ecological networks. *Perspectives in Ecology and Conservation* **15**(4), 257–265 doi:10.1016/j.pecon.2017.09.003.

This article presents three ways in which ecological network models can benefit rewilding projects. (1) The models could inform about how the introduced species will integrate to the community and about its role in the food web. (2) The models could determine the species that will be affected or will affect the introduced species. (3) The models can also inform about the ways in which the whole network will change enabling more efficient monitoring.

Ramos, A., Manizan, L., Rodriguez, E., Kemp, Y. J. M., and Sueur, C. (2018). How can leadership processes in European bison be used to improve the management of free-roaming herds. *European Journal of Wildlife Research* **64**(2), 18 doi:10.1007/s10344-018-1175-0.

In this research article, Ramos *et al*. study the social relationships, leadership and group movement of European bison (*Bison bonasus*) in Zuid–Kennemerland National Park in the Netherlands. They discuss how this information could be used to manage the herd movements to avoid human–wildlife conflicts.

Root-Bernstein, M., Galetti, M., and Ladle, R. J. (2017). Rewilding South America: ten key questions. *Perspectives in Ecology and Conservation* **15**(4), 271–281 doi:10.1016/j.pecon.2017.09.007.

Here, Root-Bernstein *et al*. present 10 questions for rewilding projects to consider and examples of how they can be applied to rewilding in South America.

Root-Bernstein, M., Guerrero-Gatica, M., Piña, L., Bonacic, C., Svenning, J., and Jaksic, F. M. (2017). Rewilding-inspired transhumance for the restoration of semiarid silvopastoral systems in Chile. *Regional Environmental Change* **17**(5), 1381–1396 doi:10.1007/s10113-016-0981-8.

Here, Root-Bernstein *et al*. discuss a model of transhumant rewilding where wild ungulates are introduced and managed by herding for ecological restoration and sustainable food production in pastoral systems. The wild ungulates would be herded across landscape in a seasonal and cyclical manner in areas that are targeted to be restored through ungulate browsing. They look at reintroductions of guanacos (*Lama guanicoe*) in Chile as a case study and compare the transhumant rewilding scenario with other restoration and agricultural development scenarios in central Chile.

Root-Bernstein, M., and Svenning, J. (2017). Restoring connectivity between fragmented woodlands in Chile with a reintroduced mobile link species. *Perspectives in Ecology and Conservation* **15**(4), 292–299 doi:10.1016/j.pecon.2017.09.001.

Here, Root-Bernstein and Svenning explore the possibility to use transhumant rewilding model to improve connectivity between two different dryland woodland types in Chile. Reintroduced guanacos (*Lama guanicoe*) would be herded following transhumant rewilding model to improve seed and nutrient dispersal and connectivity of the areas. Root-Bernstein and Svenning construct an index of woodland condition and a least cost path for each year for guanaco herding.

Sandom, C. J., Ejrnæs, R., Hansen, M. D. D., and Svenning, J. (2014). High herbivore density associated with vegetation diversity in interglacial ecosystems. *Proceedings of the National Academy of Sciences of the United States of America* **111**(11), 4162–4167 doi:10.1073/pnas.1311014111.

This article looks at beetle macrofossils to study herbivore density and woodland cover over four different time periods: the Last Interglacial, the Last Glacial, the early Holocene and the late Holocene in Great Britain.

Sandom, C. J., Hughes, J., and Macdonald, D. W. (2013*a*). Rewilding the Scottish Highlands: Do wild boar, *Sus scrofa*, use a suitable foraging strategy to be effective ecosystem engineers? *Restoration Ecology* **21**(3), 336–343 doi:10.1111/j.1526-100X.2012.00903.x.

This research study looks at the relationship between wild boar behaviour and vegetation communities between different seasons in the Scottish Highlands.

Sandom, C. J., Hughes, J., and Macdonald, D. W. (2013*b*). Rooting for rewilding: Quantifying wild boar's *Sus scrofa* rooting rate in the Scottish Highlands. *Restoration Ecology* **21**(3), 329–335 doi:10.1111/j.1526-100X.2012.00904.x.

This research paper examines the rooting behaviour of wild boar (*Sus scrofa*) in heather moorland to learn about its potential to help in the restoration projects of Caledonian pine forest in the Scottish Highlands such as rewilding.

Sandom, C. J., and Macdonald, D. W. (2015). What next? Rewilding as a radical future for the British countryside. In 'Wildlife Conservation on Farmland: Managing for Nature on Lowland Farms'. (Eds D. W. Macdonald and R. E. Feber.) pp. 291–316. (Oxford University Press: Oxford, UK.)

This book chapter looks at the history and current state of wild in Britain and the reintroduction of wolves to restore predation to Scotland, wild boar to restore ground disturbance, and beaver to restore river channel and riparian disturbance to increase ecosystem functionality in Great Britain.

Schulze, K. A., Rosenthal, G., and Peringer, A. (2018). Intermediate foraging large herbivores maintain semi-open habitats in wilderness landscape simulations. *Ecological Modelling* **379**, 10–21 doi:10.1016/j.ecolmodel.2018.04.002.

In this study, Schulze *et al*. look at the long-term interactions between intermediate foraging large wild herbivores and vegetation dynamics using Döberitzer Heide, a German wilderness area as their study area. They simulate different future landscape dynamics scenarios.

Seddon, P. J., Griffiths, C. J., Soorae, P. S., and Armstrong, D. P. (2014). Reversing defaunation: Restoring species in a changing world. *Science* **345**(6195), 406–412 doi:10.1126/science.1251818.

In this review article Seddon *et al*. look at different conservation translocation strategies including rewilding. They discuss the meaning of the term of rewilding as a concept and in relation to conservation translocation.

Seddon, P. J., Moehrenschlager, A., and Ewen, J. (2014). Reintroducing resurrected species: Selecting DeExtinction candidates. *Trends in Ecology & Evolution* **29**(3), 140–147 doi:10.1016/j.tree.2014.01.007.

In this paper Seddon *et al*. look at the guidelines the International Union for the Conservation of Nature (IUCN) provide for DeExtinction candidate selection and based on these guidelines they introduce 10 questions to be considered in the early steps of the selection process.

Smit, C., Ruifrok, J. L., van Klink, R., and Olff, H. (2015). Rewilding with large herbivores: the importance of grazing refuges for sapling establishment and wood-pasture formation. *Biological Conservation* **182**, 134–142 doi:10.1016/j.biocon.2014.11.047.

This research paper presents the results of a four-year study looking at the impact of herbivore accessibility (no, partial, or full access), vegetation type (tall roughs or short lawns) and soil- disturbance (undisturbed or soil-tillage) on transplanted sapling survival in the Oostvaardersplassen, Netherlands. Oostvaardersplassen has free-ranging Heck cattle, Konik horses and red deer. The sapling transplants were of six tree and shrub species.

Sobral-Souza, T., Lautenschlager, L., Morcatty, T. Q., Bello, C., Hansen, D., and Galetti, M. (2017). Rewilding defaunated Atlantic Forests with tortoises to restore lost seed dispersal functions. *Perspectives in Ecology and Conservation* **15**(4), 300–307 doi:10.1016/j.pecon.2017.08.005.

In this research article, Sobral-Souza *et al*. explore the possibility of reintroducing tortoises to the Atlantic Forest to restore seed dispersal of large seeded plants. The tortoises would be ecological substitutes for locally extinct larger seed dispersers whose reintroduction is not possible because of the forest areas being defaunated and too small.

Tănăsescu, M. (2019). Restorative ecological practice: The case of the European bison in the Southern Carpathians, Romania. *Geoforum* **105**, 99–108 doi:10.1016/j.geoforum.2019.05.013.

Here, Tănăsescu briefly reviews the history of restorative ecological practice and the history of wisent conservation. Tănăsescu then discusses rewilding with Bison reintroduction in Romania.

Thakur, M. P., Bakker, E. S., Veen, G. F. C., and Harvey, J. A. (2020). Climate extremes, rewilding, and the role of microhabitats. *One Earth* **2**(6), 506–509 doi:10.1016/j.oneear.2020.05.010.

In this commentary, Thakur *et al*. look at how and why rewilding could protect biodiversity under future climate extremes. They suggest that rewilding with diverse group of ecosystem engineers can help the ecosystem to tolerate and recover from climate extremes better.

Thierry, H., and Rogers, H. (2020). Where to rewild? A conceptual framework to spatially optimize ecological function. *Proceedings of the Royal Society B-Biological Sciences* **287**(1922), 20193017. doi:10.1098/rspb.2019.3017

The authors present a conceptual framework (Spore: Spatial Planning of Rewilding Effort) using ecological functions to prioritize where rewilding should be performed. The framework presents ecological function distribution and habitat suitability of species at fine spatial scales, resulting in management units for conservation action. They use the island of Guam as a case study to apply their framework, focusing on the restoration of seed dispersal.

Torres, R. T., Carvalho, J., Serrano, E., Helmer, W., Acevedo, P., and Fonseca, C. (2017). Favourableness and connectivity of a Western Iberian landscape for the reintroduction of the iconic Iberian ibex *Capra pyrenaica*. *Oryx* **51**(4), 709–717 doi:10.1017/S003060531600065X.

Here, Torres *et al*. identify favourable areas in the Iberian Peninsula for the reintroduction of Iberian Ibex (*Capra pyrenaica*) to inform the planning of the reintroduction of the species within the Rewilding Europe project.

van Klink, R., Ruifrok, J. L., and Smit, C. (2016). Rewilding with large herbivores: direct effects and edge effects of grazing refuges on plant and invertebrate communities. *Agriculture, Ecosystems & Environment* **234**, 81–97 doi:10.1016/j.agee.2016.01.050.

In this research paper van Klink *et al*. look at the impact of grazing on plant and invertebrate species richness and diversity. They set up herbivore exclosure areas in the Oostvaardersplassen rewilding area in the Netherlands that is grazed year-round by Heck cattle, red deer and konik horses. They surveyed the centre, edge and outside of the exclosures for three years after the installation.

van Klink, R., Van Laar-Wiersma, J., Vorst, O., and Smit, C. (2020). Rewilding with large herbivores: positive direct and delayed effects of carrion on plant and arthropod communities. *PLoS One* **15**(1), e0226946 doi:10.1371/journal.pone.0226946.

van Klink *et al*. outline that large animal carcasses are a missing nutrient source in the anthropogenic Western-European landscape and experimentally test the effects of red deer (*Cervus elaphus*) carcasses on both vegetation and arthropod functional groups within reclaimed land in the Netherlands. They predict that rewilding with carrion will have a positive, bottom-up effect on the ecosystem.

Vodičková, V., Vrba, P., Grill, S., Bartonova, A., Kollross, J., Potocký, P., and Konvička, M. (2019). Will refaunation by feral horse affect five checkerspot butterfly species (*Melitaea* Fabricius, 1807) coexisting at xeric grasslands of Podyji National Park, Czech Republic? *Journal for Nature Conservation* **52**, 125755 doi:10.1016/j.jnc.2019.125755.

In this research study, Vodičková *et al*. survey the adult demography, mobility patterns and habitat use of five species of checkerspot butterflies in relation to vegetation in Podyjí National Park in Czech Republic before the introduction of Exmoor ponies in the area. On the basis of the survey data, they predict how the introduction of the Exmoor ponies will affect these five butterfly populations.

Whipple, S. D., and Hoback, W. W. (2012). A comparison of dung beetle (Coleoptera: Scarabaeidae) attraction to native and exotic mammal dung. *Environmental Entomology* **41**(2), 238–244 doi:10.1603/EN11285.

This research article looks at the dung beetle preferences for dung from native and exotic herbivores, carnivores and omnivores in the Great Plains of North America. This study can provide information when considering reintroduction rewilding projects.

Wolf, C., and Ripple, W. J. (2018). Rewilding the world's large carnivores. *Royal Society Open Science* **5**(3), 172235 doi:10.1098/rsos.172235.

In this article, Wolf and Ripple identify suitable areas for large carnivore rewilding on a global scale.

Wilder, B. T., Betancourt, J. L., Epps, C. W., Crowhurst, R. S., Mead, J. I., and Ezcurra, E. (2014). Local extinction and unintentional rewilding of bighorn sheep (*Ovis canadensis*) on a desert island. *PLoS One* **9**(3), e91358 doi:10.1371/journal.pone.0091358.

This article looks at fossil dung discovered at Tiburón Island in the Gulf of California. Wilder *et al*. identify the dung to be of bighorn sheep and discover that the island has possibly had a native population of bighorn sheep in the Pleistocene. Bighorn sheep were introduced to the island in 1975 without knowledge of it being native to the island and Wilder *et al*. call this unintentional rewilding.

Zamboni, T., Di Martino, S., and Jiménez-Pérez, I. (2017). A review of a multispecies reintroduction to restore a large ecosystem: the Iberá Rewilding Program (Argentina). *Perspectives in Ecology and Conservation* **15**(4), 248–256 doi:10.1016/j.pecon.2017.10.001.

In this review article, Zamboni *et al*. describe in detail the implementation of the Iberá Rewilding Program (IRP) in Argentina. They go through the reintroduction steps, lessons learned, and future plans for the IRP. The program started in 2007 and has reintroduced four terrestrial and one aerial species that had extirpated from the area: giant anteaters, pampas deer, collared peccaries, tapirs and green-winged macaws as well as started an on-site breeding program for jaguars. IRP is based on the definition of rewilding as 'species reintroduction to restore ecosystem functioning'.

Zeller, U., Starik, N., and Göettert, T. (2017). Biodiversity, land use and ecosystem services-an organismic and comparative approach to different geographical regions. *Global Ecology and Conservation* **10**, 114–125 doi:10.1016/j.gecco.2017.03.001.

In this review article, Zeller *et al*. look at the relationship of land use and biodiversity of grassland ecosystems in temperate Europe and southern Africa. As a part of their review, they discuss the European view of rewilding and successful reintroductions of megaherbivores (white rhinoceros and black rhinos) in southern Africa.

Zielke, L., Wrage-Mönnig, N., Müller, J., and Neumann, C. (2019). Implications of spatial habitat diversity on diet selection of European bison and Przewalski's horses in a rewilding area. *Diversity* **11**(4), 63 doi:10.3390/d11040063.

Here, Zielke *et al*. present 1 year of monitoring results on the diet preferences and habitat distribution of European bison (*Bison bonasus*) and Przewalski's horses (*Equus ferus przewalski*) in a German rewilding area where these animals were introduced to.

### Passive rewilding

Arrondo, E., Morales-Reyes, Z., Moleón, M., Cortés-Avizanda, A., Antonio Donázar, J., and Sánchez-Zapata, J. A. (2019). Rewilding traditional grazing areas affects scavenger assemblages and carcass consumption patterns. *Basic and Applied Ecology* **41**, 56–66 doi:10.1016/j.baae.2019.10.006.

This paper describes the passive rewilding of Mediterranean ecosystems following land abandonment as wild ungulates fill the empty niche left by domestic ungulates. The researchers monitored the species and behaviour of scavengers around the different carcass types, as scavenger community association has important implications for the wider ecosystem.

Barceló, M., and Simonetti, J. A. (2020). Rewilding clearcuts: shrub vegetation as a facilitator of movement of a forest specialist. *European Journal of Wildlife Research* **66**(4), 49 doi:10.1007/s10344-020-01391-0.

This article investigates the role of shrub vegetation on movement and habitat use of the long- haired field mouse (*Abrothrix longipilis*) in young pine plantations after clear-cutting. The authors state that shrub vegetation in young pine plantations contributes to the rewilding of harvested areas, because it increases habitat complexity and edge permeability between contrasting habitat types.

Bauer, N., Wallner, A., and Hunziker, M. (2009). The change of European landscapes: human–nature relationships, public attitudes towards rewilding, and the implications for landscape management in Switzerland. *Journal of Environmental Management* **90**(9), 2910–2920 doi:10.1016/j.jenvman.2008.01.021.

This research paper looks at public attitudes towards nature and rewilding processes in Switzerland through a standardized questionnaire. Rewilding is described in this paper as 'a process in which formerly cultivated landscapes develop without human influence'.

Baumann, M., Kamp, J., Pötzschner, F., Bleyhl, B., Dara, A., Hankerson, B., Prishchepov, A., Schierhorn, V., Müller, F., Hölzel, D., Roland, N., Krämer, R., Urazaliyev, R., and Kuemmerle, T. (2020). Declining human pressure and opportunities for rewilding in the steppes of Eurasia. *Diversity & Distributions* **26**(9), 1058–1070 doi:10.1111/ddi.13110.

This study quantified land-use changes in steppe complexes of Kazakhstan resulting from decreasing human influence, in particular cropland abandonment. Indicators of change in human influence were developed using satellite imagery and historical maps. The decrease in human influence and the resulting land-use change may facilitate passive rewilding and increases the connectivity between steppe habitat and protected areas.

Ceaușu, S., Hofmann, M., Navarro, L. M., Carver, S., Verburg, P. H., and Pereira, H. M. (2015). Mapping opportunities and challenges for rewilding in Europe. *Conservation Biology* **29**(4), 1017–1027 doi:10.1111/cobi.12533.

In this paper, Ceaușu *et al*. present a framework to assess opportunities and challenges for ecological rewilding in areas projected to become abandoned in the future in Europe.

Čugunovs, M., Tuittila, E., Sara-Aho, I., Pekkola, L., and Kouki, J. (2017). Recovery of boreal forest soil and tree stand characteristics a century after intensive slash-and-burn cultivation. *Silva Fennica* **51**(5), 7723 doi:10.14214/sf.7723.

In this research article, Čugunovs *et al*. look at the recovery of boreal forest soil and changes in tree characteristics a century after ending of slash-and-burn practices to find out how effective and how long the recovery of forest soil and tree properties are through passive rewilding. They sampled areas where slash-and-burn cultivation was intensively practiced in the late 1800s and nearby control areas of old-growth forests in eastern Finland.

Donázar, J. A., Cortés-Avizanda, A., Fargallo, J. A., Margalida, A., Moleón, M., Morales-Reyes, Z., Moreno-Opo, R., Pérez-García, J. M., Sánchez-Zapata, J. A., Zuberogoitia, I., and Serrano, D. (2016). Roles of raptors in a changing world: from flagships to providers of key ecosystem services. *Ardeola* **63**(1), 181–234 doi:10.13157/arla.63.1.2016.rp8.

In this review article, Donazar *et al*. look at the role and future of birds of prey in the coming decades from the Mediterranean perspective. As a part of the review, they explore the impact passive rewilding and more specifically, land abandonment would have on raptors.

García-Barón, I., Cortés-Avizanda, A., Verburg, P. H., Marques, T. A., Moreno-Opo, R., Pereira, H. M., and Donázar, J. A. (2018). How to fit the distribution of apex scavengers into land-abandonment scenarios? The Cinereous vulture in the Mediterranean biome. *Diversity & Distributions* **24**(7), 1018–1031 doi:10.1111/ddi.12743.

In this research article, García-Barón *et al*. predict how land abandonment in Iberian Peninsula may affect Cinereous vulture (*Aegypius monachus*).

Guilherme, J. L., and Pereira, H. M. (2013). Adaptation of bird communities to farmland abandonment in a mountain landscape. *PLoS One* **8**(9), e73619 doi:10.1371/journal.pone.0073619.

This study looks at the species richness patterns of bird communities across landscape and regional scales in the Peneda-Geres Mountains in north-western Portugal using nested species/area relationships. Guilherme *et al*. explore the possible consequences of four different land-use scenarios on the regional bird communities, one of them being the end of agricultural activity and rewilding of landscape.

Haller, A., and Bender, O. (2018). Among rewilding mountains: grassland conservation and abandoned settlements in the Northern Apennines. *Landscape Research* **43**(8), 1068–1084 doi:10.1080/01426397.2018.1495183.

Here, Haller and Bender look at land cover changes during 1990–2001 and 2001–2010 in Foreste Casentinesi National Park in Italy. They analyse the changes between grassland and wood or shrubland and identify abandoned settlements on stable grassland.

Hearn, R., Watkins, C., and Balzaretti, R. (2014). The cultural and land use implications of the reappearance of the wild boar in North West Italy: a case study of the Val di Vara. *Journal of Rural Studies* **36**, 52–63 doi:10.1016/j.jrurstud.2014.06.004.

This is a case study on how, why and when the wild boar reappeared in North West Italy based on oral history interviews. Hearn *et al*. explore whether the spread of the wild boar is connected to rural depopulation, unplanned rewilding and land abandonment.

Höchtl, F., Lehringer, S., and Konold, W. (2005). 'Wilderness': what it means when it becomes a reality – a case study from the southwestern Alps. *Landscape and Urban Planning* **70**(1-2), 85–95 doi:10.1016/j.landurbplan.2003.10.006.

This research paper looks at land abandonment or rewilding of terrestrial alpine landscapes in the Val Grande National Park in Italy. Höchtl *et al*. focus on the impacts of land abandonment on the locals, tourists, structural diversity and plant species richness of the landscape.

Hwang, Y. H., and Yue, Z. E. J. (2019). Intended wildness: utilizing spontaneous growth for biodiverse green spaces in a tropical city. *Journal of Landscape Architecture* **14**(1), 54–63 doi:10.1080/18626033.2019.1623548.

This research study looks at intended wildness in Singapore where the landscape is highly managed. Hwang and Yue study the spontaneous growth in unmanaged study areas and public's perception of spontaneous vegetation. They then provide 'design and management strategies to create biodiverse, socially preferred landscapes'.

Hwang, Y. H., Yue, Z. E. J., and Tan, Y. C. (2017). Observation of floristic succession and biodiversity on rewilded lawns in a tropical city. *Landscape Research* **42**(1), 106–119 doi:10.1080/01426397.2016.1210106.

This research paper looks at urban rewilding in Singapore where 'highly controlled and homogeneous greenery' dominates the green spaces. Hwang *et al*. set up three study plots on manicured lawn and left them unmaintained for 18 months. They then study the changes in the flora and fauna in the plots.

Keesstra, S., Nunes, J., Novara, A., Finger, D., Avelar, D., Kalantari, Z., and Cerdà, A. (2018). The superior effect of nature based solutions in land management for enhancing ecosystem services. *The Science of the Total Environment* **610–611**, 997–1009 doi:10.1016/j.scitotenv.2017.08.077.

Keesstra *et al*. review nature-based solutions in land management through case studies. One of the case studies is rewilding in Slovenia. Agricultural hinterland was left to reforest naturally for 30–50 years. They look at the impact this had on the soil and landscape.

Kintisch, E. (2015). Born to rewild. *Science* **350**(6265), 1148–1151 doi:10.1126/science.350.6265.1148.

In this feature article Kintisch tells the story of Pleistocene Park in Chersky, Russia.

Koshida, C., and Katayama, N. (2018). Meta-analysis of the effects of rice-field abandonment on biodiversity in Japan. *Conservation Biology* **32**(6), 1392–1402 doi:10.1111/cobi.13156.

In this meta-analysis, Koshida and Katayama look at the impacts of rice-field abandonment on biodiversity in Japan considering multiscale factors such as landscape context and climate.

Kowarik, I. (2018). Urban wilderness: supply, demand, and access. *Urban Forestry & Urban Greening* **29**, 336–347 doi:10.1016/j.ufug.2017.05.017.

Here, Kowarik proposes a framework for viewing urban wilderness as a social-ecological system. Kowarik identifies three major overlapping dimensions and their challenges: the supply of wilderness areas in cities (ecological dimension), the community's demand and preferences for wilderness areas (social dimension) and the access to the urban wilderness areas (planning dimension). Kowarik discusses rewilding and how it can increase opportunities for wilderness in urban areas.

Kowarik, I., Hiller, A., Planchuelo, G., Seitz, B., von der Lippe, M., and Buchholz, S. (2019). Emerging urban forests: opportunities for promoting the wild side of the urban green infrastructure. *Sustainability* **11**(22), 6318 doi:10.3390/su11226318.

In this research study, Kowarik *et al*. study successional forests emerging on previously open land in Berlin. They study the biodiversity patterns of these forests on a city scale: looking at the area of successional forest and dominant tree species and on a local scale: looking at the species richness of native and alien plants and of invertebrates.

Krauß, W., and Olwig, K. R. (2018). Special issue on pastoral landscapes caught between abandonment, rewilding and agro-environmental management. Is there an alternative future? *Landscape Research* **43**(8), 1015–1020 doi:10.1080/01426397.2018.1503844.

In this editorial to a special issue, Krauß and Olwig discuss the alternative futures of pastoral land. They argue that the rewilding and environmental management of pastoral lands causes losses to the local population while the populations from the core areas benefit. Focus of the special issue is on the Alps, and Krauß and Olwig emphasise the cultural meaning of the Alps.

Li, L., Tietze, D. T., Fritz, A., Lü, Z., Bürgi, M., and Storch, I. (2018). Rewilding cultural landscape potentially puts both endemism at risk: a Tibetan Plateau case study. *Biological Conservation* **224**, 75–86 doi:10.1016/j.biocon.2018.05.008.

In this research article, Li *et al*. study the diversity and endemism distribution of Tibetan avifauna. They discuss how restoration projects like the rewilding of eastern Qinghai–Tibetan Plateau aimed at improving the water retention capacity of the area might affect the diversity and endemism of local avifauna.

Malaney, J. L., Lackey, C. W., Beckmann, J. P., and Matocq, M. D. (2018). Natural rewilding of the Great Basin: genetic consequences of recolonization by black bears (*Ursus americanus*). *Diversity & Distributions* **24**(2), 168–178 doi:10.1111/ddi.12666.

In this research paper, Malaney *et al*. looks at the genetic consequences of the recolonization of black bears (*Ursus americanus*) in the Great Basin area.

Marrs, R. H., Lee, H., Blackbird, S., Connor, L., Girdwood, S. E., O'Connor, M., Smart, S. M., Rose, R. J., O'Reilly, J., and Chiverrell, R. C. (2020). Release from sheep-grazing appears to put some heart back into upland vegetation: a comparison of nutritional properties of plant species in long-term grazing experiments. *Annals of Applied Biology* doi:10.1111/aab.12591.

This study tests the 'Wet Desert' hypothesis, which speculates that livestock grazing from sheep has reduced plant species diversity, resulting in biotic homogenisation in the British uplands. They simulate removal of sheep with long-term exclusion experiments to test the effectiveness of sheep removal for future rewilding plans and to estimate the potential recovery time of focal species.

Marrs, R. H., Sánchez, R., Connor, L., Blackbird, S., Rasal, J., and Rose, R. (2018). Effects of removing sheep grazing on soil chemistry, plant nutrition and forage digestibility: lessons for rewilding the British uplands. *Annals of Applied Biology* **173**(3), 294–301 doi:10.1111/aab.12462.

Here, Marrs *et al*. compare the soil properties and nutritional properties of vegetation between areas with sheep grazing and areas that are fenced off to exclude sheep for 48–62 years at Moor House National Nature Reserve in British uplands.

Martínez, D., and García, D. (2015). Changes in the fruiting landscape relax restrictions on endozoochorous tree dispersal into deforested lands. *Applied Vegetation Science* **18**(2), 197–208 doi:10.1111/avsc.12135.

This 2-year study looks at tree seed dispersal from forested areas to surrounding deforested montane pastures in Cantabrian Range, Spain. Martínez and García study whether landscape context (forest cover extent, isolated trees) affect seed arrival at pasture and whether tree fruit availability, frugivorous bird activity and abundance change during the study period.

Martin-Díaz, P., Cortés-Avizanda, A., Serrano, D., Arrondo, E., Sánchez-Zapata, J. A., and Donázar, J. A. (2020). Rewilding processes shape the use of Mediterranean landscapes by an avian top scavenger. *Scientific Reports* **10**(1), 2853 doi:10.1038/s41598-020-59591-2.

This paper studies the impact of ecological rewilding in the Mediterranean biome on foraging behaviour of griffon vultures. This study covers a gradient of rewilding progress, aka succession, which, consequently, have varying population levels of wild ungulates and livestock.

Mensing, S., Schoolman, E. M., Palli, J., and Piovesan, G. (2020). A consilience-driven approach to land use history in relation to reconstructing forest land use legacies. *Landscape Ecology* doi:10.1007/s10980-020-01079-5.

The authors use pollen analysis and historical narratives to reconstruct landscape use and rewilding history over centuries in the Italian Apennines, examining the relationships between societal factors and climate change (here associated with the Medieval Climate Anomaly) on pathways of ecological change. They focus, in particular, on how the loss of human population/ management from the Black Death plague led to forest rewilding.

Merckx, T., and Pereira, H. M. (2015). Reshaping agri-environmental subsidies: from marginal farming to large-scale rewilding. *Basic and Applied Ecology* **16**(2), 95–103 doi:10.1016/j.baae.2014.12.003.

Merckx and Pereira look at the assumptions behind European Union agro-forestry subsidies supporting farming in less favoured areas, arguing for an approach that would support intensive and sustainable farming with high yields on fertile agricultural lands at local scale and at regional scale less productive lands to be 'ecologically restored into 'wild' and resiliently functioning ecosystems'.

Milligan, G., Rose, R. J., and Marrs, R. H. (2016). Winners and losers in a long-term study of vegetation change at Moor House NNR: effects of sheep-grazing and its removal on British upland vegetation. *Ecological Indicators* **68**, 89–101 doi:10.1016/j.ecolind.2015.10.053.

In this study Milligan *et al*. look at the impacts of removal of sheep-grazing on British upland vegetation based on data collected between 1954 and 2000 at Moor House National Nature Reserve in Great Britain.

Morel, L., Barbe, L., Jung, V., Clément, B., Schnitzler, A., and Ysnel, F. (2020). Passive rewilding may (also) restore phylogenetically rich and functionally resilient forest plant communities. *Ecological Applications* **30**(1), doi:10.1002/eap.2007.

In this research study, Morel *et al*. compare the taxonomic, functional, and phylogenetic diversity of herbaceous forest plant communities of ancient forests and recent woodlands to assess how they are affected by temporal forest continuity.

Morel, L., Dujol, B., Courtial, C., Vasseur, M., Leroy, B., and Ysnel, F. (2019). Spontaneous recovery of functional diversity and rarity of ground-living spiders shed light on the conservation importance of recent woodlands. *Biodiversity and Conservation* **28**(3), 687–709 doi:10.1007/s10531-018-01687-3.

Here, Morel *et al*. compare ground spider communities in ancient and recent forests to study the effect of temporal forest continuity on taxonomic and functional composition of these communities.

Moreno-de-las-Heras, M., Lindenberger, F., Latron, J., Lana-Renault, N., Llorens, P., Arnáez, J., Romero-Díaz, A., and Gallart, F. (2019). Hydro-geomorphological consequences of the abandonment of agricultural terraces in the Mediterranean region: key controlling factors and landscape stability patterns. *Geomorphology* **333**, 73–91 doi:10.1016/j.geomorph.2019.02.014.

In this review, Moreno-de-las-Heras *et al*. look at the impact of land abandonment of Mediterranean agricultural terraces on the local hydro-geomorphological processes. They explore non-intervention and stewardship of rewilding processes as a land management option for these landscapes.

Navarro, C. J., Izquierdo, A. E., Aráoz, E., Foguet, J., and Grau, H. R. (2020). Rewilding of large herbivore communities in high elevation puna: geographic segregation and no evidence of positive effects on peatland productivity. *Regional Environmental Change* **20**(4), 112 doi:10.1007/s10113-020-01704-8.

This paper discusses the rewilding progress of the Argentine Puna, an ecosystem that has been transitioning from rural communities and livestock to peatlands through increases in large wild herbivore populations, such as vicuñas. Navarro *et al*. explore the ecological consequences in peatland vegetation productivity associated with this transition, and link the changes to distance from human settlement and spatial patterns of wild herbivores and livestock.

Navarro, L. M., and Pereira, H. M. (2012). Rewilding abandoned landscapes in Europe. *Ecosystems* **15**(6), 900–912 doi:10.1007/s10021-012-9558-7.

This article looks at the opportunities, challenges and benefits of rewilding abandoned landscapes for ecosystems and people in Europe.

Petrova, S. (2014). Šumava: Rewilding and its discontents. In 'Communities in Transition: Protected Nature and Local People in Eastern and Central Europe'. pp. 127–149. (Routledge: London, UK.) doi:10.4324/9781315572949

This book chapter focuses on Šumava National Park in the Czech Republic and rewilding related to non-intervention management of bark beetle outbreaks. Petrova goes through the approach to and history of bark beetle outbreak management in the park.

Regos, A., Domínguez, J., Gil-Tena, A., Brotons, L., Ninyerola, M., and Pons, X. (2016). Rural abandoned landscapes and bird assemblages: winners and losers in the rewilding of a marginal mountain area (NW Spain). *Regional Environmental Change* **16**(1), 199–211 doi:10.1007/s10113-014-0740-7.

This research paper looks at land use and vegetation changes and their effects on breeding bird occurrence and distribution in abandoned mountain landscape in north-western Spain over 10 years. Regos *et al*. analyse satellite and bird survey data to tell whether and how the vegetation, land use, and bird community change over the study period. They discuss the benefits and disadvantages of land abandonment and rewilding as a land use strategy.

Sitzia, T., Campagnaro, T., Gatti, E., Sommacal, M., and Kotze, D. J. (2015). Wildlife conservation through forestry abandonment: responses of beetle communities to habitat change in the eastern Alps. *European Journal of Forest Research* **134**(3), 511–524 doi:10.1007/s10342-015-0868-0.

This study looks at the impact of habitat changes occurred after the ending of forest management on the species richness, abundance and composition of ground, longhorn and bark beetles. Sitzia *et al*. studied longhorn, ground and bark beetles in ten managed and ten abandoned forest plots in north-eastern Italy.

Stronen, A. V., Iacolina, L., and Ruiz-González, A. (2019). Rewilding and conservation genomics: how developments in (re)colonization ecology and genomics can offer mutual benefits for understanding contemporary evolution. *Global Ecology and Conservation* **17**, e00502 doi:10.1016/j.gecco.2018.e00502.

In this perspective article Stronen *et al*. explore how conservation genomics can benefit from rewilding and wildlife (re)colonization and *vice versa*. They use the definition of rewilding from Rewilding Europe. They examine four mammalian species in Europe as their case studies: wolf, golden jackal, raccoon dog and

European mink. Stronen *et al*. suggest that reintroductions and (re)colonisation create opportunities to study contemporary evolution as species are responding to climate change and exploring new areas.

Thers, H., Bøcher, P. K., and Svenning, J. (2019). Using lidar to assess the development of structural diversity in forests undergoing passive rewilding in temperate northern Europe. *PeerJ* **6**, e6219 doi:10.7717/peerj.6219.

In this research study, Thers *et al*. use lidar methodology to study and compare the structural characteristics and development of unmanaged forest, spontaneously regenerated forest on former agricultural land, and nearby managed forest of similar age in Denmark.

van Berkel, D. B., and Verburg, P. H. (2014). Spatial quantification and valuation of cultural ecosystem services in an agricultural landscape. *Ecological Indicators* **37**, 163–174 doi:10.1016/j.ecolind.2012.06.025.

In this paper, van Berkel *et al*. present a method for mapping and quantifying the provision of cultural services on a regional scale. They simulated three different landscape changes: increased residential infill, the removal of landscape elements for improved agricultural production and rewilding due to agricultural abandonment.

van der Zanden, E. H., Verburg, P. H., Schulp, C. J. E., and Verkerk, P. J. (2017). Trade-offs of European agricultural abandonment. *Land Use Policy* **62**, 290–301 doi:10.1016/j.landusepol.2017.01.003.

Here, van der Zanden *et al*. look at the effects of agricultural land abandonment in Europe in the next decades focusing on eight indicators that they chose based on their central role in the land abandonment debate. These indicators are carbon sequestration and emission, forest fire vulnerability, outdoor recreation, habitat suitability of large mammals, alien species risk, crop area, farmland species richness and cultural heritage.

Zhao, X., Xu, T., Ellis, J., He, F., Hu, L., and Li, Q. (2020). Rewilding the wildlife in Sangjiangyuan National Park, Qinghai–Tibetan Plateau. *Ecosystem Health and Sustainability* **6**(1), 1776643 doi:10.1080/20964129.2020.1776643.

This narrative provides an overview of the gradual recovery and rewilding success within Sanjiangyuan National Park, located on the Qinghai–Tibetan Plateau, China, as well as outlines current pressures still facing the park.

### Pleistocene rewilding

Donlan, C. J., Berger, J., Bock, C. E., Bock, J. H., Burney, D. A., Estes, J. A., Foreman, D., Martin, P. S., Roemer, G. W., Smith, F. A., Soulé, M. E., and Greene, H. W. (2006). Pleistocene rewilding: An optimistic agenda for twenty-first century conservation. *American Naturalist* **168**(5), 660–681 doi:10.1086/508027.

In this review article, Donlan *et al*. advocate for Pleistocene rewilding in North America. They discuss the challenges and the evolutionary, conservation, cultural and economic benefits of Pleistocene rewilding through eight exemplar taxa: North American peregrine falcon, California condor, Bolson tortoise, equids, camelids, cheetahs, elephants, Holarctic lions as well as describe possible implementation scenarios.

Fuhlendorf, S. D., Dayis, C. A., Elmore, R. D., Goodman, L. E., and Hamilton, R. G. (2018). Perspectives on grassland conservation efforts: should we rewild to the past or conserve for the future? *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170438 doi:10.1098/rstb.2017.0438.

Here, Fuhlendorf *et al*. look at grassland conservation in North America through three herbivore focused perspectives: Pleistocene rewilding, bison rewilding and restoration of herbivory patterns and processes not fixed into one species. They discuss each of these perspectives in relation to changes in a human domain, a herbivore domain and a biophysical domain.

Oliveira-Santos, L. G. R., and Fernandez, F. A. S. (2010). Pleistocene rewilding, Frankenstein ecosystems, and an alternative conservation agenda. *Conservation Biology* **24**(1), 4–5 doi:10.1111/j.1523-1739.2009.01379.x.

In this letter, Oliveira-Santos and Fernandez state that evolutionary history should get more attention in rewilding. They discuss the risks of introducing exotic species outside of their indigenous ranges including unwanted interactions and unpredictability. They instead propose refaunation through restoration as an alternative conservation goal.

Richmond, O. M. W., McEntee, J. P., Hijmans, R. J., and Brashares, J. S. (2010). Is the climate right for Pleistocene rewilding? Using species distribution models to extrapolate climatic suitability for mammals across continents. *PLoS One* **5**(9), e12899 doi:10.1371/journal.pone.0012899.

This research article uses Pleistocene rewilding as an example to address challenges of using species distribution models for extrapolating modelled relationships outside native ranges. The species of focus were proposed proxy species Asian elephant, African cheetah and African lion and a native species *Oryx gazelle*. The area of focus was the American south-west and Great Plains.

### Societal perspectives on rewilding

Arnds, P. (2020). Rewilding the world in the postcolonial age: on the nexus between cultural production and species politics. *Journal of Postcolonial Writing* **56**(4), 568–582 doi:10.1080/17449855.2020.1764203.

This article describes the concept of dewilding – stripping nature of its healthy ecosystem and its various species – and rewilding, using the extermination and reinstitution of wolves as a case study. Specifically, the author argues that a switch in environmental and cultural politics towards demythologizing the wolf's bad reputation might help in reinstating it as an apex predator within an ecosystem.

Arts, K., Fischer, A., and van der Wal, R. (2016). Boundaries of the wolf and the wild: a conceptual examination of the relationship between rewilding and animal reintroduction. *Restoration Ecology* **24**(1), 27–34 doi:10.1111/rec.12309.

Arts *et al*. take a theoretical approach to look at the relationship between rewilding and animal reintroduction. They identify three common rewilding elements from the literature: ecological functioning, wilderness experience and natural autonomy. They use hypothetical wolf reintroduction to Scotland as their case study to look at contributions and tensions it would have in relation to each of these elements.

Bone, J. (2018). Rediscovering the 'noble savage': the rewilding movement and the re-enchantment of the Scottish Highlands. *Scottish Affairs* **27**(4), 465–485 doi:10.3366/scot.2018.0258.

Bone uses this paper to explore the political and socio-economic issues surrounding the rewilding of apex predators (e.g. lynx, boar and wolf) in the Scottish Highlands.

Brook, I. (2018). Restoring or re-storying the Lake District: applying responsive cohesion to a current problem situation. *Environmental Values* **27**(4), 427–445 doi:10.3197/096327118X15251686827750.

In this article, Brook looks at the role of ethics in rewilding culturally rich landscapes. Brook compares the cultural narrative and the rewilding narrative using the English Lake District as a case study.

Buck, H. J. (2015). On the possibilities of a charming Anthropocene. *Annals of the Association of American Geographers* **105**(2), 369–377 doi:10.1080/00045608.2014.973005.

In this perspective, Buck presents and discusses possible answers to the question: 'If the Anthropocene was not an anthology of scary tales, drawn from an awkward bricolage of science and preternatural fears, what else could it be?' Buck offers four ideas for a different Anthropocene: rewilding, biophilic cities, planetary gardening, and smart landscapes.

Crossley, É. (2020). Ecological grief generates desire for environmental healing in tourism after COVID-19. *Tourism Geographies* **22**(3), 536–546 doi:10.1080/14616688.2020.1759133.

The author makes the case that phenomena such as the climate change movement in 2019 as well as the COVID-19 pandemic in 2020 were associated with an increased desire of people to 'heal' the environment. 'Ecological grief' was expressed by an increased presence of rewilding case studies (e.g. animal reclamation of urban areas) in social media.

Deary, H., and Warren, C. R. (2017). Divergent visions of wildness and naturalness in a storied landscape: practices and discourses of rewilding in Scotland's wild places. *Journal of Rural Studies* **54**, 211–222 doi:10.1016/j.jrurstud.2017.06.019.

In this article, Deary and Warren look at different views and practices of rewilding among rewilding practitioners in the Scottish uplands. They identify areas where practitioners agree and areas where they disagree.

Deary, H., and Warren, C. R. (2019). Trajectories of rewilding: A taxonomy of wildland management. *Journal of Environmental Planning and Management* **62**(3), 466–491 doi:10.1080/09640568.2018.1425134.

In this article, Deary and Warren explore the objectives, priorities, and practices of wildland managers in Scottish uplands and develop a taxonomy of these approaches.

De Cózar-Escalante, J. M. (2019). Rewilding. A pragmatist vindication. *Ethics, Policy & Environment* **22**(3), 303–318 doi:10.1080/21550085.2019.1652234.

In this perspective article, De Cózar-Escalante applies pragmatic approach to rewilding and the dichotomy of wild and tamed and looks at the main objections to argued advantages of rewilding.

Drenthen, M. (2015). The return of the wild in the Anthropocene. Wolf resurgence in the Netherlands. *Ethics, Policy & Environment* **18**(3), 318–337 doi:10.1080/21550085.2015.1111615.

In this paper, Drenthen looks at spontaneous rewilding. Drenthen discusses the reactions of the Dutch public to the return of the wolf to the Netherlands as a case study.

Drenthen, M. (2018*a*). Rewilding in cultural layered landscapes. *Environmental Values* **27**(4), 325–330 doi:10.3197/096327118X15251686827697.

In this editorial, Drenthen analyzes the relationship between cultural landscapes, land history and rewilding.

Drenthen, M. (2018*b*). Rewilding in layered landscapes as a challenge to place identity. *Environmental Values* **27**(4), 405–425 doi:10.3197/096327118X15251686827732.

Here, Drenthen looks at 'what is morally at stake' in rewilding debates between the proponents of rewilding and the proponents of cultural landscapes.

Jamieson, D. (2008). The rights of animals and the demands of nature. *Environmental Values* **17**(2), 181–199 doi:10.3197/096327108X303846.

As a part of this essay, Jamieson discusses the view of an anti-speciesist on rewilding animals.

Linnell, J. D. C., Kaczensky, P., Wotschikowsky, U., Lescureux, N., and Boitani, L. (2015). Framing the relationship between people and nature in the context of European conservation. *Conservation Biology* **29**(4), 978–985 doi:10.1111/cobi.12534.

Linnell *et al*. look at how humans and nature are managed and framed in the practice of conservation in Europe and how it differs from the academic debate around it. They explore whether people and nature are viewed as integrated or dualistic in European conservation and consider rewilding to be an expanding dualistic practice and view in Europe.

Lorimer, J. (2017). Probiotic environmentalities: rewilding with wolves and worms. *Theory, Culture & Society* **34**(4), 27–48 doi:10.1177/0263276417695866.

Here, Lorimer examines the 'probiotic turn' in the management of environmental and human health. He describes the probiotic turn as the response to the concerns of degrading biodiversity in the human body and in nature caused by previous antibiotic approaches to health and environmental management. He compares the 'probiotic turn' in ecologies of human bodies and natural landscapes through examples from rewilding projects restoring ecological processes and functions and reintroduction of parasitic worms to the human body to treat autoimmune and inflammatory diseases.

Lorimer, J., and Driessen, C. (2013). Bovine biopolitics and the promise of monsters in the rewilding of Heck cattle. *Geoforum* **48**(8), 249–259 doi:10.1016/j.geoforum.2011.09.002.

This paper looks at the frictions between different modes of bovine biopolitics, using the rewilding of Heck cattle at Oostvaardersplassen as a case study. They identify rewilding as a fifth mode of bovine biopolitics in addition to four prevalent modes: agriculture, conservation, welfare and biosecurity.

Lorimer, J., and Driessen, C. (2016). From 'Nazi cows' to cosmopolitan 'ecological engineers': specifying rewilding through a history of Heck cattle. *Annals of the Association of American Geographers* **106**(3), 631–652 doi:10.1080/00045608.2015.1115332.

In this article, Lorimer and Driessen review the history of Heck cattle as a part of 'genealogy of rewilding'. They discuss what and where is considered to be wild and who has the power to decide this.

Loth, A. F., and Newton, A. C. (2018). Rewilding as a restoration strategy for lowland agricultural landscapes: stakeholder-assisted multi-criteria analysis in Dorset, UK. *Journal for Nature Conservation* **46**, 110–120 doi:10.1016/j.jnc.2018.10.003.

Here, Loth *et al*. present the results of their survey assessing the perceptions of stakeholders towards five different rewilding approaches in Dorset, Great Britain: species reintroductions, farmland abandonment, naturalistic grazing large herbivores, river restoration, and passive management. Four species were proposed for introductions in the survey: European beaver (*Castor fibre*), European wildcat (*Felis silvestris silvestris*), wild boar (*Sus scrofa*), and pine marten (*Martes martes*). They look at the suitability of the rewilding approaches with multi-criteria analysis based on the survey results and their suitability within the study area.

Murray, M. (2017). Wild pathways of inclusive conservation. *Biological Conservation* **214**, 206–212 doi:10.1016/j.biocon.2017.08.028.

In this perspective article, Murray proposes a strategy for reviving the wild in different landscapes and bringing together different conservation narratives. Murray frames this strategy in four questions: What do we mean by the wild? Why should humans pursue wild-life conservation? If they do, what pathways to the wild may be pursued? What kinds of outcomes result from different conservation strategies? On the basis of these questions, Murray presents pathways that lead to an increase or decrease in wildness.

Olwig, K. R. (2016). Virtual enclosure, ecosystem services, landscape's character and the 'rewilding' of the commons: the 'Lake District' case. *Landscape Research* **41**(2), 253–264 doi:10.1080/01426397.2015.1135320.

Here, Olwig discusses the meaning, importance and science of landscape enclosures, using Lake district in England as a case study. Olwig also discusses rewilding compared to semi-natural pastoral environments.

Pascual-Rico, R., Martín-López, B., Sánchez-Zapata, J. A., and Morales-Reyes, Z. (2020). Scientific priorities and shepherds' perceptions of ungulate's contributions to people in rewilding landscapes. *The Science of the Total Environment* **705**, 135876 doi:10.1016/j.scitotenv.2019.135876.

This research article looks at natures' contribution to people (NCP) provided by wild ungulates in peninsular Spain. More specifically they compare the scientific priorities and the shepherds' perceptions of NCP provided by wild ungulates in rewilding landscapes.

Pettersson, H. L., and de Carvalho, S. H. C. (2020). Rewilding and gazetting the Iberá National Park: using an asset approach to evaluate project success. *Conservation Science and Practice* **258**, doi:10.1111/csp2.258.

This paper applies the Protected Area Asset Framework to a rewilding and national park project in the Ibera Wetlands, Argentina, in order to determine and describe societal values derived from the public. These can inform management of how to best communicate conservation and rewilding projects to the public.

Sandom, C. J., Dempsey, B., Bullock, D., Ely, A., Jepson, P., Jimenez-Wisler, S., Newton, A., Pettorelli, N., and Senior, R. A. (2019). Rewilding in the English uplands: policy and practice. *Journal of Applied Ecology* **56**(2), 266–273 doi:10.1111/1365-2664.13276.

In this perspective paper, Sandom *et al*. discuss rewilding in post-Brexit upland England. They discuss different practitioner perspectives, risks, opportunities, obstacles, future approaches and funding of rewilding in England.

Takacs, D. (2020). Whose voices count in biodiversity conservation? Ecological democracy in biodiversity offsetting, REDD+, and rewilding. *Journal of Environmental Policy and Planning* **22**(1), 43–58 doi:10.1080/1523908X.2019.1661234.

Here, Takacs discusses ecological democracy, conflicts and commonalities in Biodiversity Offsetting, REDD+, and the rewilding movement. Takacs considers the roles of scientists and non-scientists and asks questions such as ‘who should have the right to be heard when protecting biodiversity?’.

Theunissen, B. (2019). The Oostvaardersplassen fiasco. *Isis* **110**(2), 341–345 doi:10.1086/703338.

In this essay, Theunissen explores the background and reasons leading to the ending of Dutch rewilding project Oostvaadersplassen.

van der Zanden, E. H., Carvalho-Ribeiro, S. M., and Verburg, P. H. (2018). Abandonment landscapes: user attitudes, alternative futures and land management in Castro Laboreiro, Portugal. *Regional Environmental Change* **18**(5), 1509–1520 doi:10.1007/s10113-018-1294-x.

In this research article, van der Zanden *et al*. study the attitudes of locals, visitors and experts towards land abandonment in northern Portugal.

Vasile, M. (2018). The vulnerable bison: practices and meanings of rewilding in the Romanian Carpathians. *Conservation & Society* **16**(3), 217–231 doi:10.4103/cs.cs_17_113.

This research article looks at the social dynamics and local narratives of rewilding and European bison (*Bison bonasus*) reintroduction in the Romanian Carpathians. The article is based on data, surveys and interviews collected in two communities; one where bison had been introduced and one where it was going to be introduced in the future.

Wynne-Jones, S., Strouts, G., and Holmes, G. (2018). Abandoning or reimagining a cultural heartland? understanding and responding to rewilding conflicts in Wales – the case of the cambrian wildwood. *Environmental Values* **27**(4), 377–403 doi:10.3197/096327118X15251686827723.

Here, Wynne-Jones *et al*. analyse the conflicts and tensions in rewilding debates, how they rise and unfold and why. They use the Cambrian Wildwood project in Wales as a case study.

### Rewilding applied in freshwater ecosystems

Bakker, E. S., Pagès, J. F., Arthur, R., and Alcoverro, T. (2016). Assessing the role of large herbivores in the structuring and functioning of freshwater and marine angiosperm ecosystems. *Ecography* **39**(2), 162–179 doi:10.1111/ecog.01651.

In this review paper, Bakker *et al*. identify large herbivores that are fully aquatic, semi-aquatic, (live both on land and in water) or resident semi-aquatic (live in water and forage on land) and are important consumers of submerged vascular plants. They also look at the ecosystem functions of these herbivores and their impact on submerged plant abundance and species composition.

Bump, J. K. (2018). Fertilizing riparian forests: nutrient repletion across ecotones with trophic rewilding. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170439 doi:10.1098/rstb.2017.0439.

This research paper looks at the functional role of moose in repletion of nutrients across ecotones and how its predators and climate change affect this nutrient flow. The study area was Isle Royale in Michigan and north-eastern Minnesota, USA.

Brown, A. G., Lespez, L., Sear, D. A., Macaire, J., Houben, P., Klimek, K., Brazier, R. E., Van Oost, K., and Pears, B. (2018). Natural vs anthropogenic streams in Europe: history, ecology and implications for restoration, river-rewilding and riverine ecosystem services. *Earth-Science Reviews* **180**, 185–205 doi:10.1016/j.earscirev.2018.02.001.

Here, Brown *et al*. review the literature on the history of European rivers and floodplains from Holocene to 2018 and critically review the current model behind most channel restoration projects. They explore how the state of these landscapes has changed by human activity and discuss how this information can guide river restoration and management efforts, carbon sequestration and maximizing riverine ecosystem services. They discuss river rewilding, potential keystone species to be rewilded in European rivers and identify European beaver as the most impactful one.

Law, A., Gaywood, M. J., Jones, K. C., Ramsay, P., and Willby, N. J. (2017). Using ecosystem engineers as tools in habitat restoration and rewilding: beaver and wetlands. *The Science of the Total Environment* **605–606**, 1021–1030 doi:10.1016/j.scitotenv.2017.06.173.

In this research paper, Law *et al*. present the results of a 12-year study monitoring the changes in vegetation after a planned beaver-assisted restoration of agriculturally degraded fen in eastern Scotland. They discuss the possibilities of using beaver to restore agriculturally degraded wetlands.

Law, A., Levanoni, O., Foster, G., Ecke, F., and Willby, N. J. (2019). Are beavers a solution to the freshwater biodiversity crisis? *Diversity & Distributions* **25**(11), 1763–1772 doi:10.1111/ddi.12978.

Here, Law *et al*. assess the differences in plant and water beetle species composition, rarity, and native status and plant growth strategies between wetlands created by beavers and other wetlands to determine whether reintroducing beavers could increase freshwater biodiversity at the landscape scale. The study took place in Sweden, where beavers were reintroduced between 1922 and 1939.

Moss, B. (2015). Mammals, freshwater reference states, and the mitigation of climate change. *Freshwater Biology* **60**(9), 1964–1976 doi:10.1111/fwb.12614.

Brian Moss discusses the reference states used to assess current freshwater habitat condition, and the role of large mammals in restoration of freshwater habitats and climate change mitigation.

Thompson, M. S. A., Brooks, S. J., Sayer, C. D., Woodward, G., Axmacher, J. C., Perkins, D. M., and Gray, C. (2018). Large woody debris 'rewilding' rapidly restores biodiversity in riverine food webs. *Journal of Applied Ecology* **55**(2), 895–904 doi:10.1111/1365-2664.13013.

Here, Thompson *et al*. compare river reaches without large woody debris (control), reaches with naturally felled trees (target) and reaches 'restored' during the study with manually felled trees (restored) across five British rivers in a multiple before-after control-impact framework. They look at the impact of restoring with large woody debris on the riverine food webs with a focus on algae, invertebrates and fish.

Willby, N. J., Law, A., Levanoni, O., Foster, G., and Ecke, F. (2018). Rewilding wetlands: beaver as agents of within-habitat heterogeneity and the responses of contrasting biota. *Philosophical Transactions of the Royal Society of London – B. Biological Sciences* **373**(1761), 20170444 doi:10.1098/rstb.2017.0444.

Here, Willby *et al*. compare the environmental conditions, diversity of wetland plants and water beetles between active beaver ponds and other wetlands in southern Sweden to see how introducing beavers might affect freshwater biodiversity in affected landscapes.