



*Knut och Alice
Wallenbergs
Stiftelse*



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Rewilding as a new paradigm for nature conservation?

Tobias Kuemmerle
Henrik Smith

Programme for today

Welcome!

- 09:20 Rewilding – concepts, scientific background, and current state of the science (Jens-Christian Svenning)
- 09:40 Rewilding in Sweden – history and practice (Carl-Gustaf Thulin)
- 10:00 Rewilding in cultural landscapes – conflict or opportunity? (Regina Lindborg)

Coffee break

Programme for today

- 10:50 Growing wildlife populations and trophic rewilding in Sweden (Joris Cromsigt)
 - 11:10 Rewilding taking place – reflections from European experiences for a Swedish outlook (Linnéa Falk)
 - 11:30 Joint discussion: Moving forward – which role should rewilding play in Swedish conservation policy and practice?
 - 12:30 End of seminar
- Joined lunch (and continued discussion)**

Rewilding – a new idea?



RESEARCH

REVIEW SUMMARY

REWILDING

Rewilding complex ecosystems

Andrea Perino¹, Henrique M. Pereira², Lætitia M. Navarro¹, Néstor Fernández, James M. Bullock³, Silvia Caezanu⁴, Alana Cortés-Avendaño⁵, Roel van Klink⁶, Tobias Kuenemundt⁷, Angela Lomba⁸, Guy Pe'er⁹, Tobias Pfenniger¹⁰, José M. Rey Benayas¹¹, Christopher J. Sandom¹², Jens Christian Svenning¹³, Helen C. Wheeler¹⁴

BACKGROUND: Rapid global change is creating fundamental challenges for the persistence of natural ecosystems and their biodiversity. Conservation efforts aimed at the protection of landscapes have had mixed success, and there is an increasing awareness that the long-term protection of biodiversity requires inclusion of flexible restoration along with protection. Rewilding is one such approach that has been both promoted and criticized in recent years. Proponents emphasize the potential of rewilding to tap opportunities for restoration to while creating benefits for both ecosystems and societies. Critics discuss the lack of a consistent definition of rewilding and insufficient knowledge about its potential outcomes. Other criticisms arise from the mistaken notion that rewilding actions are planned without considering societal acceptability and benefits. Here, we present a framework for rewilding actions that can serve as a guideline for researchers and managers. The framework is applicable to a variety of rewilding approaches, ranging from passive to trophic rewilding, and aims

to promote beneficial interactions between society and nature.

ADVANCES: The concept of rewilding has evolved from its initial emphasis on protecting large, connected areas for large carnivore conservation to a process-oriented, dynamic approach. On the basis of concepts from resilience and complexity theory of social-ecological systems, we identify trophic complexity, stochastic disturbances, and dispersal as three critical components of natural ecosystem dynamics. We propose that the restoration of these processes, and their interactions, can lead to increased self-sustainability of ecosystems and should be at the core of rewilding actions. Building on these concepts, we develop a framework to design and evaluate rewilding plans. Alongside ecological restoration goals, our framework emphasizes people's perceptions and experiences of wildness and the regulating and material contributions from restoring nature. These societal aspects are important outcomes and may be critical factors for the success of

rewilding initiatives (see the figure). We further identify current societal constraints on rewilding and suggest actions to mitigate them.

OUTLOOK: The concept of rewilding challenges us to rethink the way we manage nature and to broaden our vision about how nature will respond to changes that society brings, both

OUR OWNERSHIP

Read the full article at <http://doi.org/10.1016/j.science.2015.05.010>

critical to anticipate these effects and to take appropriate management actions. In addition, the decision of whether a rewilding approach is desirable should consider stakeholders' needs and expectations. To this end, structured restoration planning—based on participatory processes involving researchers, managers, and stakeholders—that includes monitoring and adaptive management can be used. With the recent designation of 2020–2030 as the “Decade of ecosystem restoration” by the United Nations General Assembly, policy and decision-makers could push rewilding topics to the forefront of discussions about how to reach post-2020 biodiversity goals. ■

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See this article at <http://doi.org/10.1016/j.science.2015.05.010>

TOMORROW'S EARTH
Read this article online at scimago.tomorrowearth.org

Ecological state
Restoration of ecological processes can positively influence their interactions—e.g., species diversity and trophic complexity can be increased if dispersal in new ecosystems is possible.

Rewilding actions and outcomes are framed by societal and ecological context. Rewilding can be assessed by representing the state of ecosystems in a three-dimensional space where each dimension corresponds to an ecological process. The difference in volume between the restored (yellow pyramid) and the degraded ecosystem (orange pyramid) is a proxy for the effects of rewilding on the self-sustainability of

Contributions from nature

Societal outcomes can be assessed by mapping positive and negative impacts on nonmaterial, regulating, and material contributions from nature.

the ecosystem. The dashed line within the yellow pyramid represents the societal boundaries that determine to what extent ecological processes can be restored. Rewilding actions can help push societal boundaries toward the ecological potential (orange arrow) by promoting societal support and opportunities for people to experience the autonomy of ecological processes in enjoyable ways.

Pleistocene: Synthesis and rewilding research

William F. Rausmus, Rasmus Ejrnæs, Søren Faaborg, J. S. Sandom, John W. Terborgh

and accepted by the Editorial Board August 5, 2015 (received

uses species introductions to restore top-down self-regulating biodiversity ecosystems and their widespread losses and rewilding megafauna. Trophic rewilding is controversial. Here, we provide a synthesis of the key conceptual framework, discussing systematically reviewing the current literature, wildlife corridors as undisturbed sources of trophic cascades may be restored via species introductions. However, that megafauna effects may be affected by interactions with landscape settings, which on trophic rewilding is still rare, fragmentary, and opinion pieces. We highlight the need for evidence-based monitoring, and outline priorities, interplay with landscape settings, and tools for rewilding and tools to optimize benefits. We develop a decision framework for species introductions with attention to the potential contribution

phic cascades, the propagation of consumer effects downward through food webs (6, 7). Their widespread losses have led to trophic downgrading on a global scale, with negative effects on ecosystem biodiversity (6–8). These observations have inspired a new restoration approach that we here refer to as “rewilding.” The rewilding concept was introduced in the late 20th century as a large-scale conservation

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Editorial Board.

doi.org/10.1016/j.science.2015.05.010

www.pnas.org/cgi/doi/10.1073/pnas.1502020112

the ecosystem state in New Mexico

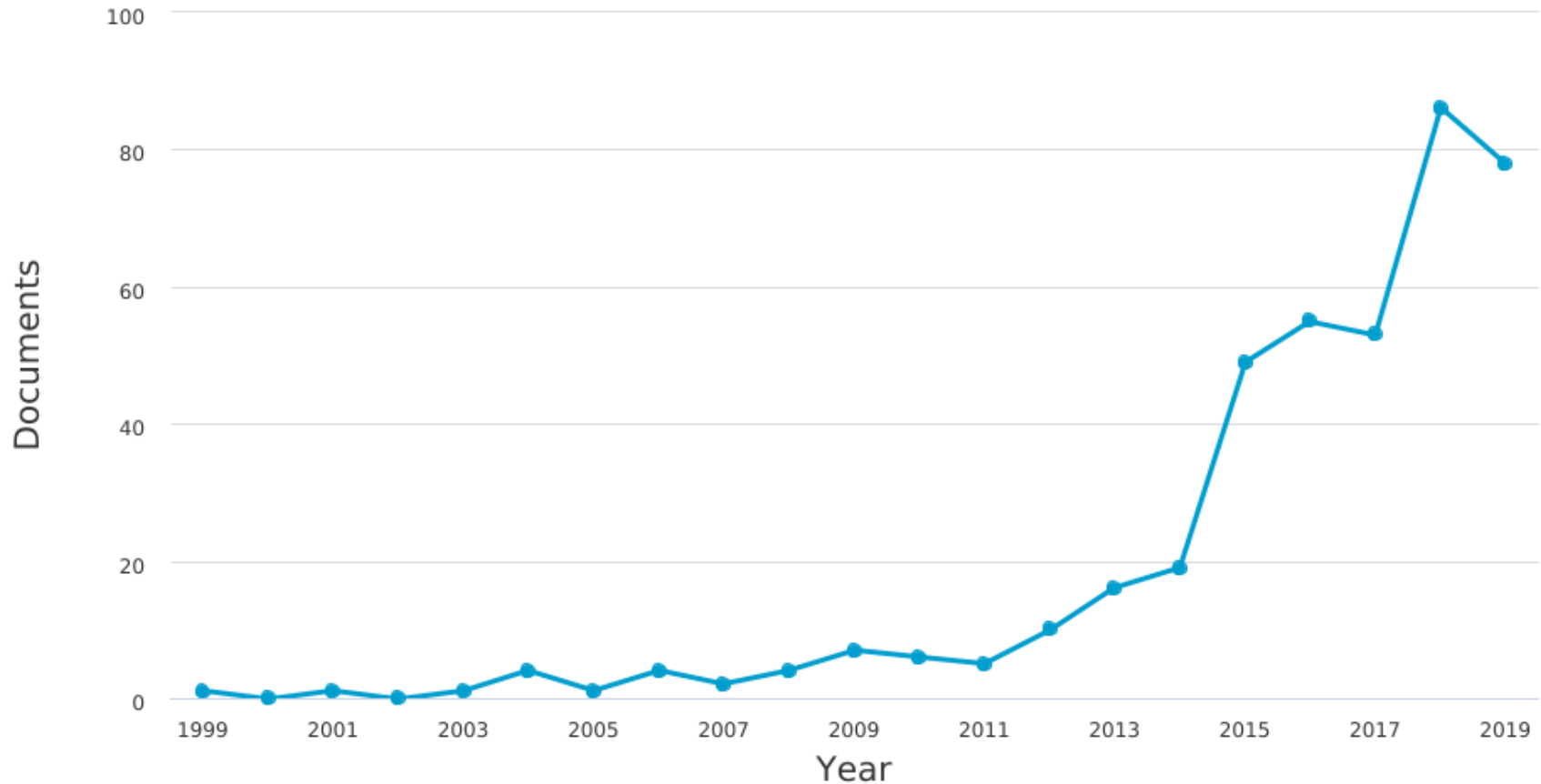
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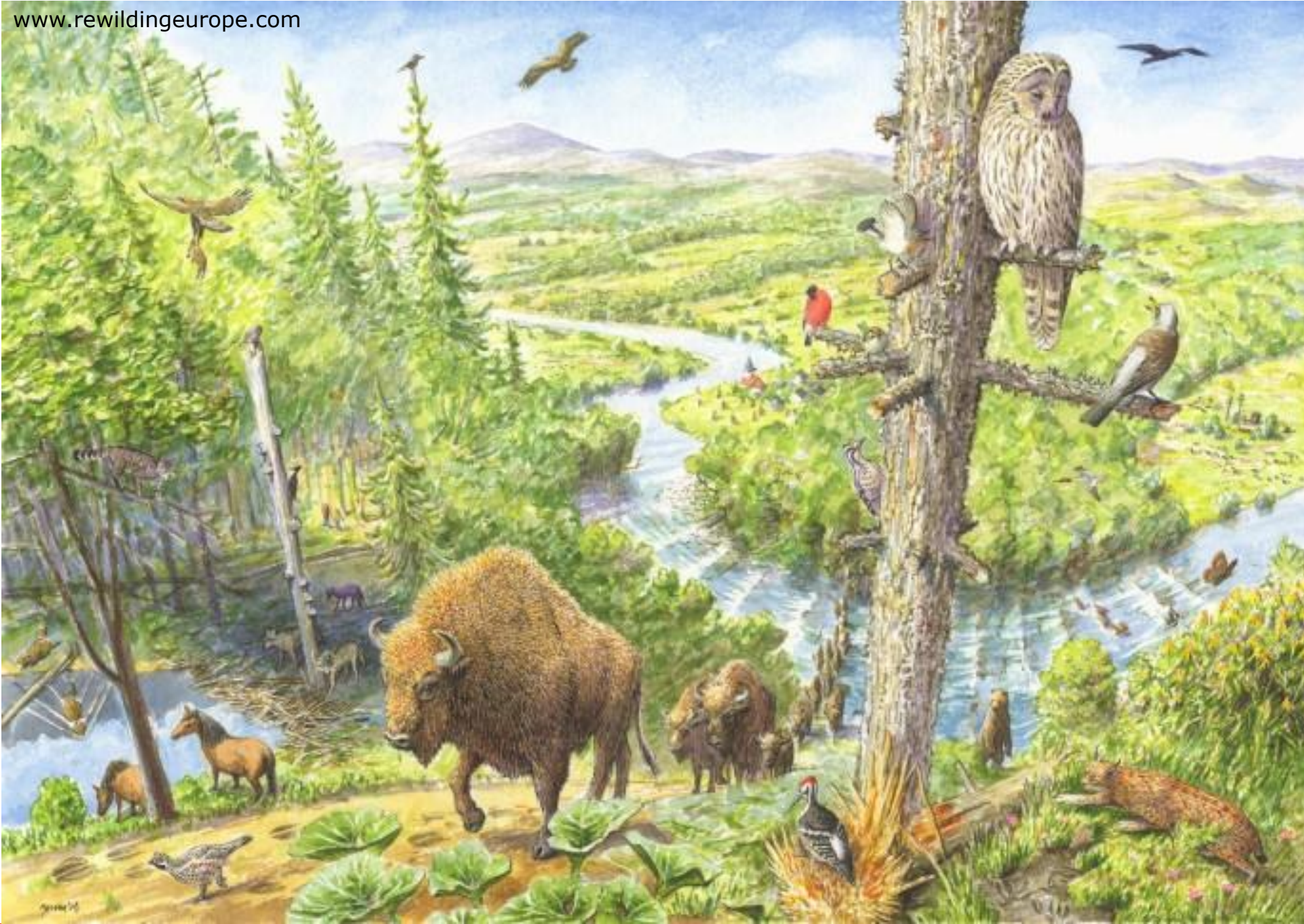
ETT VILDA RE LIV
En bok om det vildas återkomst

Rewilding – a new idea?

Documents by year

Scopus





Rewilding – more than fauna restoration!

- Originally: strong focus on bringing back large mammals
- Today: broader focus on restoring ecosystem complexity



Source: Pachyornis (DeviantArt)

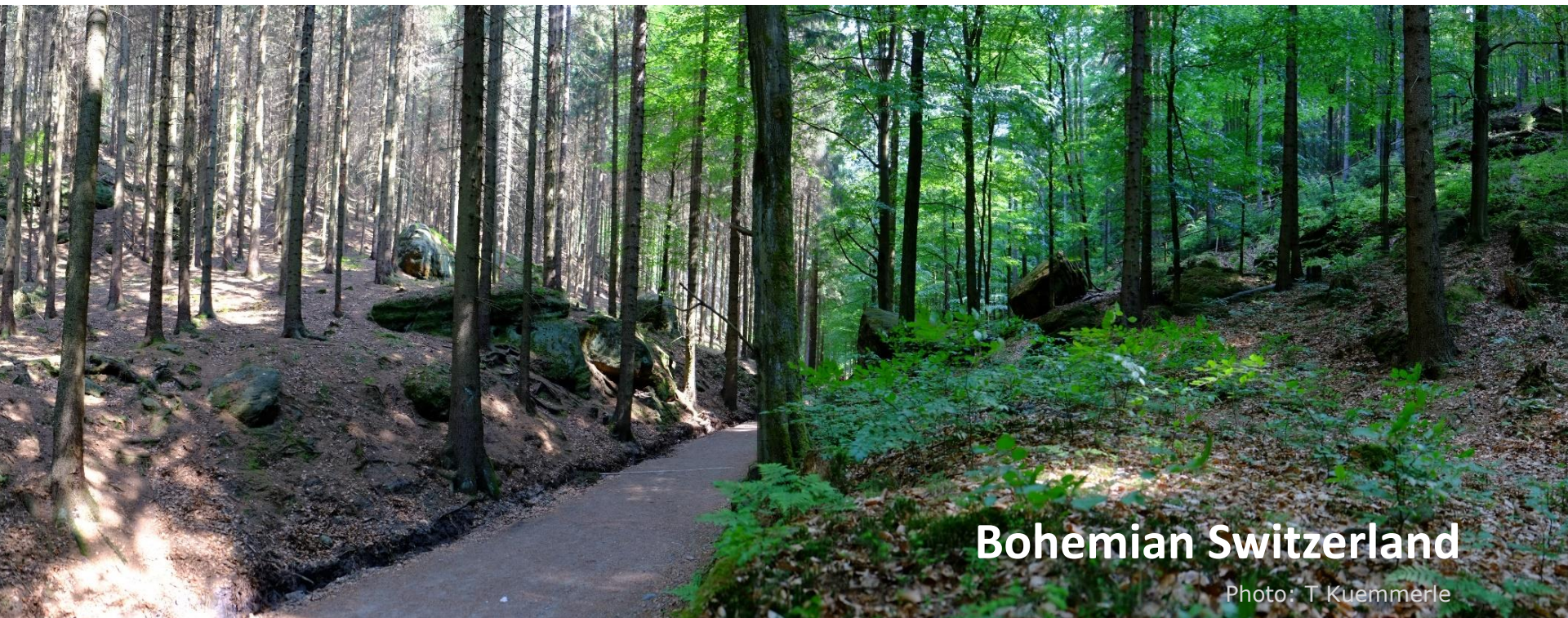
Rewilding – more than large wilderness areas!

Chernobyl exclusion zone



Rewilding – more than large wilderness areas!

- Originally: focus on large, wild places
- Today: rewilding approaches thought to be useful to address many spatial scales

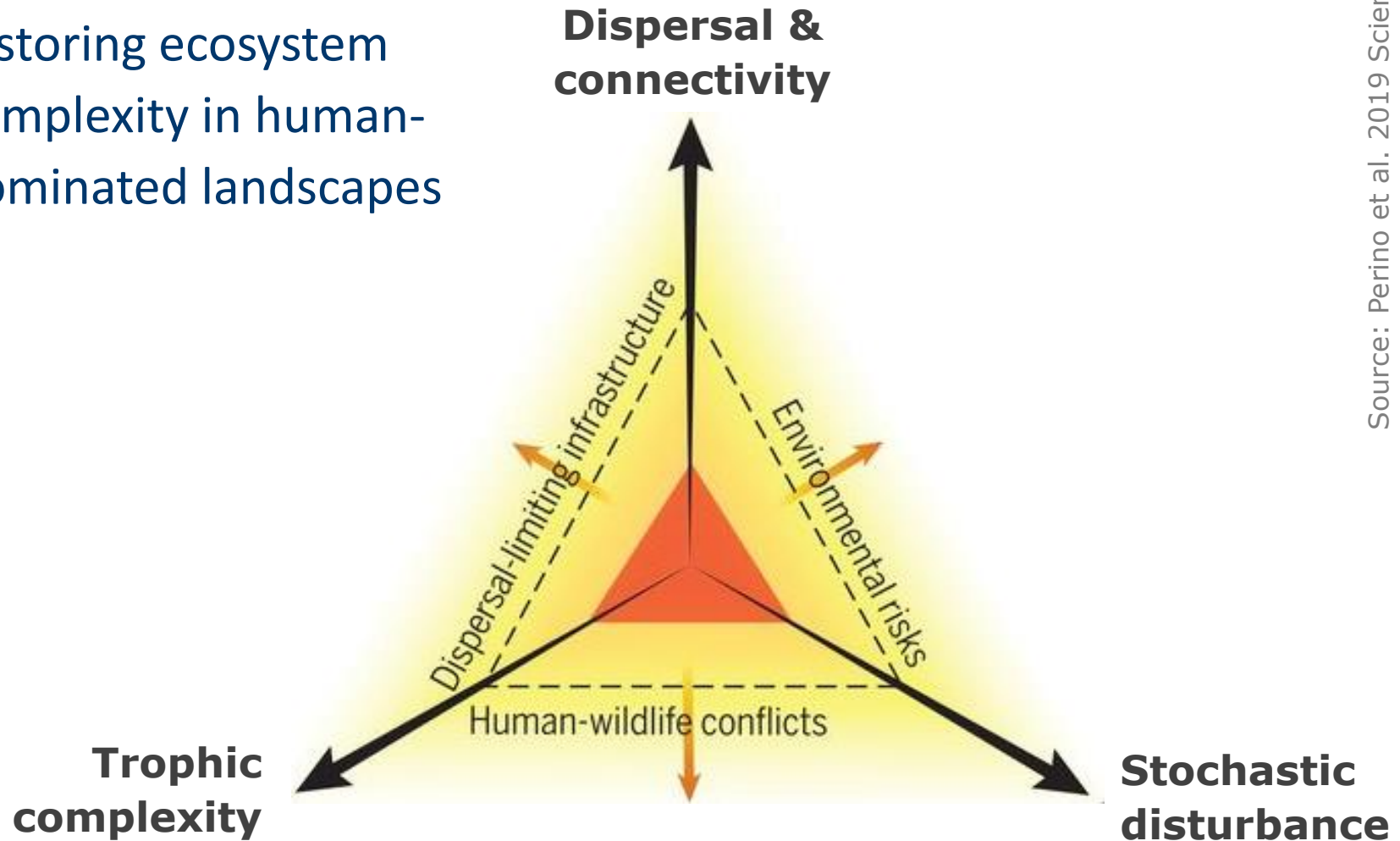


Bohemian Switzerland

Photo: T Kuemmerle

Returning 'wildness' to our landscapes

- Increasingly focus on restoring ecosystem complexity in human-dominated landscapes



Source: Perino et al. 2019 Science

Rewilding – rising criticism?

Trends in Ecology & Evolution

CellPress

Review

Restoration, Reintroduction, and Rewilding in a Changing World

Richard T. Corlett^{1,*}

The increasing abandonment of marginal land creates new opportunities for restoration, reintroduction, and rewilding, but what do these terms mean in a rapidly and irreversibly changing world? The 're' prefix means 'back', but it is becoming clear that the traditional use of past ecosystems as targets and criteria for success must be replaced by an orientation towards an uncertain future. Current opinions in restoration and reintroduction biology range from a defense of traditional definitions, with some modifications, to acceptance of more radical responses, including assisted migration, taxon substitution, de-extinction, and genetic modification. Rewilding attempts to minimize sustained intervention, but this hands-off approach is also threatened by rapid environmental change.

Trends
Abandonment of agricultural land provides an opportunity for creating new ecosystems, but the traditional use of past ecosystems as targets is likely to be inappropriate in a world of rapid environmental change.
There is disagreement among conservationists about how to replace the historically based 'reference' frame, with options ranging from minor modification to the acceptance of nonindigenous

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Current Biology Magazine

Essay

Rewilding is the new Pandora's box in conservation

David Noqu s-Bravo^{1,2}, Daniel Simberloff³, Carsten Rahbek^{1,2},

LETTER

From Pleistocene to trophic rewilding: A wolf in sheep's clothing

Dustin R. Rubenstein^{a,1} and Daniel I. Rubenstein^b

Nearly 10 y ago, we (1) critiqued the idea of Pleistocene rewilding (2), a misguided attempt to resurrect bygone ecosystems. Much has happened to the Earth's biodiversity over the decade since the term "Pleistocene rewilding" was coined, most of it bad. More than half a billion people have been added to the world's population, and ecosystems continue to be degraded at an alarming rate. A sixth mass extinction is underway, and poaching of megafauna has increased across sub-Saharan Africa. Unfortunately, nothing that has not

reinstated—can alter ecosystem function, often for the better, even if the mechanism is incompletely understood. However, using proxy species when mechanisms are uncertain to recreate ancient ecosystems could have many unintended consequences (1). Simply repackaging Pleistocene rewilding as trophic rewilding does nothing to change this fact. Without good science, such large-scale reintroductions could be as untested as dumping iron into the sea, or placing

restoration of ecosystems through the (re-)introduction as a way to stem the loss of biodiversity and the diversity provides to humanity. In addition, rewilding engagement and enthusiasm for biodiversity. But is it based on sound ecological understanding? A worrying lack of consensus about what rewilding is stifles a clearer account of rewilding's aims, benefits. We also point out that scientific support for the main rewilding, such as top-down control of ecosystems, systems are dynamic and ever-evolving, which makes consequences of introducing novel species. We also discuss reintroductions that have failed, provoking questions, and highlight that the control and extirpation of species has been shown to be extremely challenging and rewilding's loudest proponents might argue that we are scared, but we are not; we are only advocating caution and awareness of what is unknown about rewilding, especially ecological consequences, might be.

Rewilding – so what is it?

➤ **Definition of rewilding?**

- ❖ Increasingly less clear what is meant by rewilding?

➤ **Relationship to other fields quite unclear**

- ❖ Including: restoration ecology, landscape ecology, agroecology, ecosystem ecology, ...

➤ **Links to ‘classic’ conservation science and practice?**

- ❖ Including: protecting wilderness areas, reintroductions

➤ **Risk of rewilding?**

- ❖ E.g. unintended consequences of introductions

➤ **Targets and endpoints for rewilding?**

- ❖ For example: what is wild and wilderness?

Polish/Czech borderland around 1820



What is wild?



[Kompass](#) >... > [Inspiration](#) > Inmitten der skandinavischen Wildnis: Wandern in ...

Inmitten der skandinavischen Wildnis: Wandern in Schweden

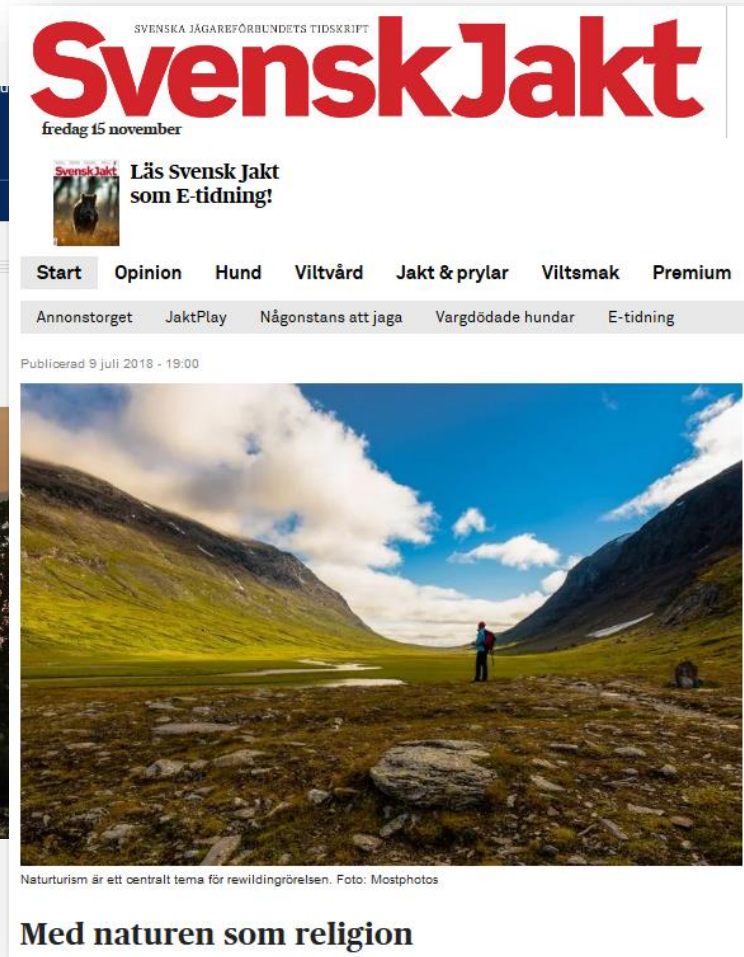
Rewilding – public perception?

➤ Public perception of rewilding?



Wildlife Energy Pollution

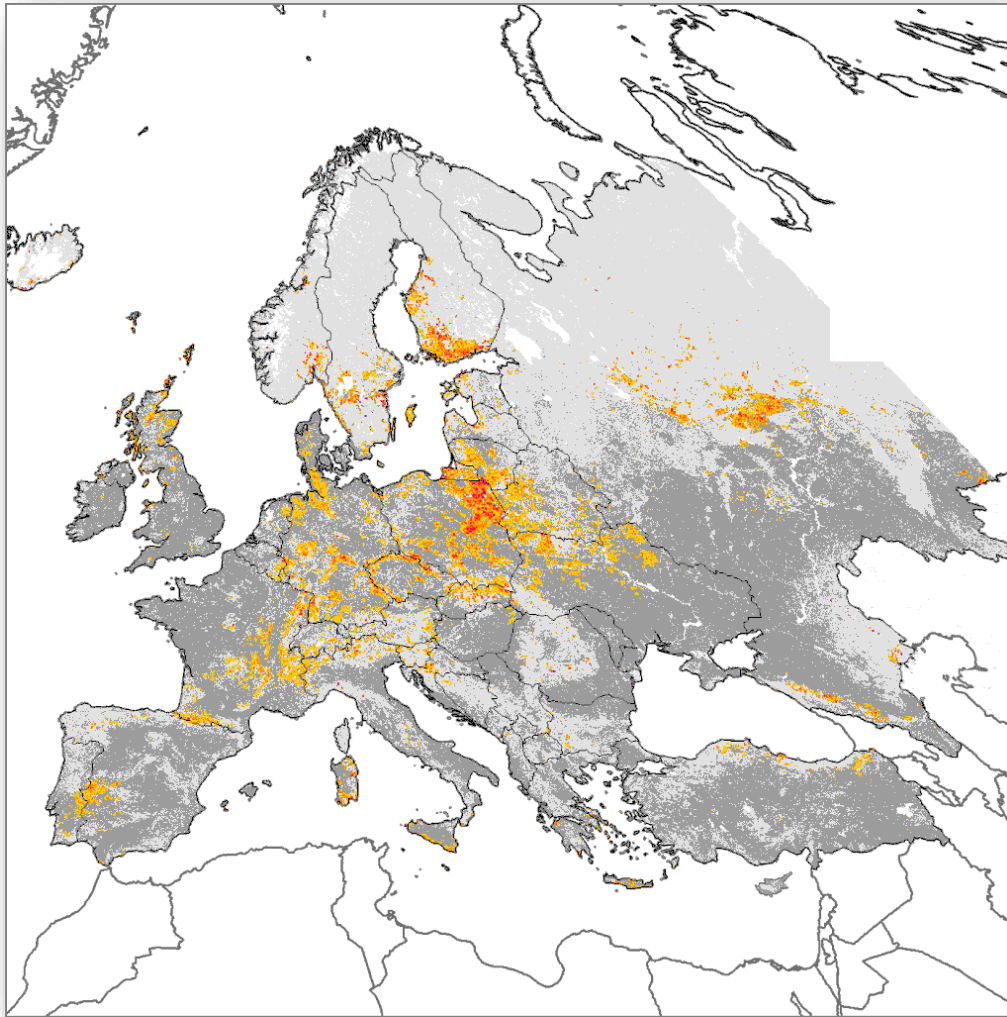
'It is strange to see the British struggling with the beaver': why is rewilding so controversial?



Conflicts with other forms of conservation?

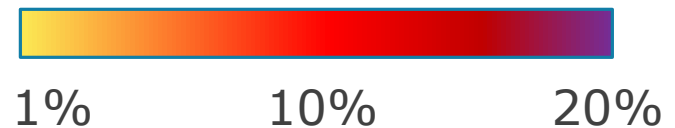


Opportunities for rewilding!



- Declining agricultural areas across Europe
- Since 2006 alone: >20,000 km²

Agricultural abandonment
between 2001-2012



Rewilding is happening!



Some guiding questions

➤ **Relevance for Sweden?**

- ❖ Where? How?
- ❖ Which scales should be targeted?

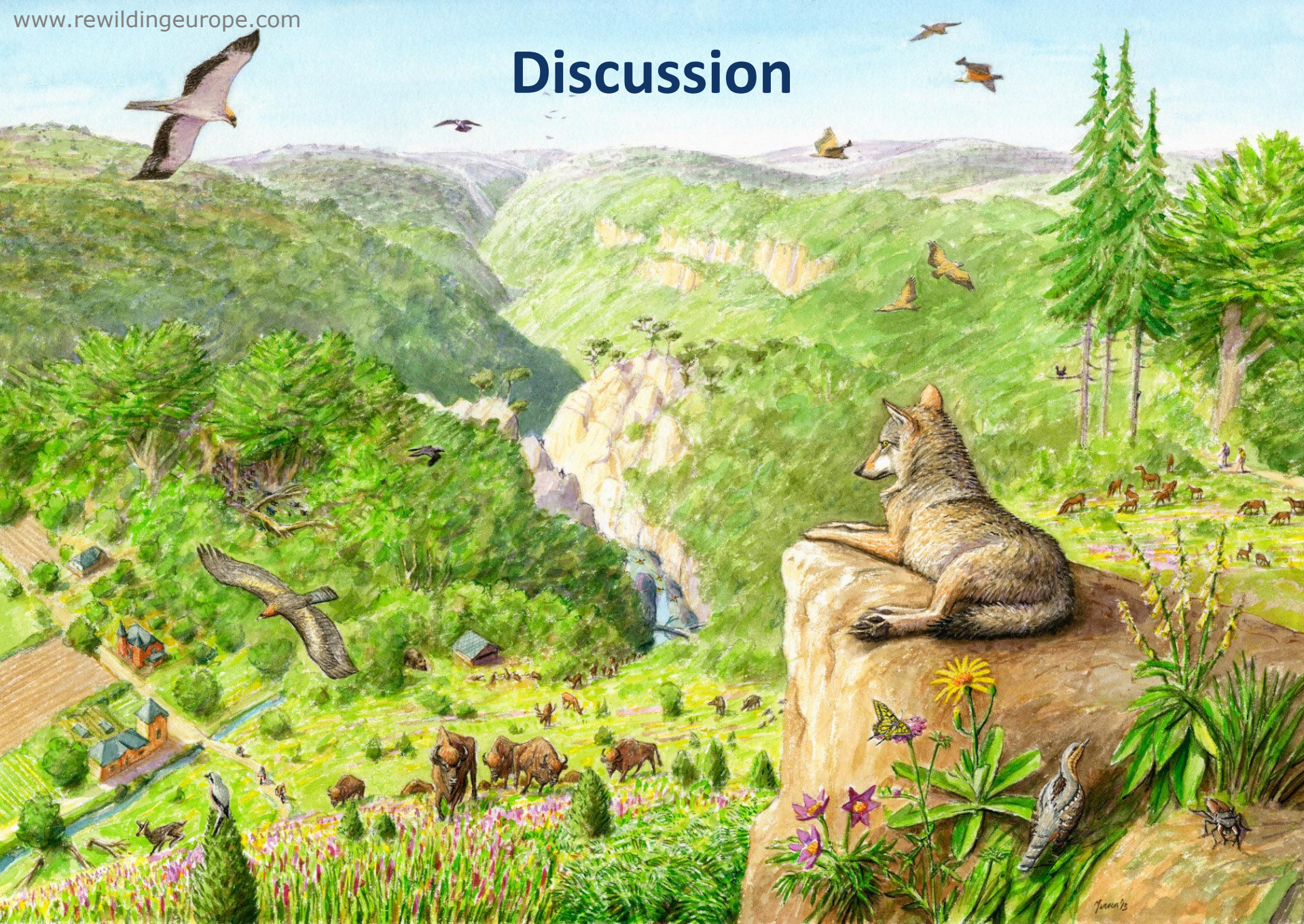
➤ **What is rewilding?**

- ❖ Do we need a clear definition?
- ❖ Distinction from other conservation approaches?
- ❖ General principals applicable across scales?

➤ **What are appropriate baselines?**

- ❖ Appropriate baselines?
- ❖ Goals and endpoints?
- ❖ Risks and unwanted outcomes?

Discussion



Moving forward – which role should rewilding play in Swedish conservation policy and practice?



Some guiding questions

➤ **Relevance for Sweden?**

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➤ **What are appropriate baselines?**

- ❖ Appropriate baselines?
- ❖ Goals and endpoints?
- ❖ Risks and unwanted outcomes?

A brown bear is sitting on the forest floor, surrounded by tall, slender trees with green foliage. The bear is facing right, and the forest floor is covered in fallen leaves and low-lying vegetation.

Thank you for joining us today!



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