Rewilding - det manglende led i naturgenoppretningen?

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General framework for rewilding as a restoration approach

- **Rewilding**
  - Ecological restoration to promote self-regulating biodiverse (complex) ecosystems
  - Key aspects
    - Reducing human control
    - Restoring ecological integrity (natural processes)
  - Design and implementation

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**REWILDLING**

Rewilding complex ecosystems

Three key ecological components

- Trophic complexity
- Natural disturbances
- Connectivity/Dispersal

Trophic rewilding

- **Definition**
  - Species introductions to restore top-down trophic interactions and associated trophic cascades to promote self-regulating biodiverse ecosystems (Svenning et al. 2016 PNAS)

- **Mostly megafauna-based, due to**
  - Ecological importance
  - Size-biased defaunation

Idea: Megafauna promotes biodiversity via top-down trophic processes

Increase diversity capacity of natural and semi-natural areas

Abiotic & passive rewilding

- Abiotic rewilding
  - Restoration of natural physical processes

- Passive rewilding (=Passive management)
  - Spontaneous ecological dynamics without any, even initial management
  - Always an important aspect

Marselisskovene

Vorsø, Horsens Fjord
Why is rewilding needed?

1) Evolutionary perspective on biodiversity
2) Wildness as a value
3) Overcome shifting baselines
4) Scaling
5) Dynamic
1: EVOLUTIONARY PERSPECTIVE
Current species are ancient = evolved & persistent in wild ecosystems

Extant species
Mammals Beetles Trees Vascular

Cultural landscape

Evolutionary background of ecological adaptations even deeper

Skylark (*Alauda arvensis*)
Beech (*Fagus sylvatica*)
Current species diversity evolved in megafauna-rich ecosystems

Rich megafaun as the evolutionary norm (an evolutionary base-line)

Rich megafaunas have been the standard for millions of years

England (Trafalgar Square) 125,000
Rich megafaunas have been the standard for millions of years

Germany (Dorn-Dürkheim), 8 million years ago (Wolfgang Weber)
De store dyr er vigtige

Frahegning i Yellowstone National Park

Foto: JCS
De store dyr er vigtige

**Tabel 4.2. Oversigtstabel over faglige skøn og vurderinger af biodiversitetseffekter ved forskellige plejemetoder. Jo flere +’er, jo større positiv effekt.**

<table>
<thead>
<tr>
<th>Type af effekt</th>
<th>Maskinel biomassehøst</th>
<th>Intensiv sommersgræsning</th>
<th>Sommergræsning</th>
<th>Rotationsgræsning</th>
<th>Vintergræsning</th>
<th>Helårsgræsning</th>
<th>Vildgræsning</th>
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Fløjgaard, Bladt & Ejrnæs 2017 Naturpleje og arealstørrelser med særligt fokus på Natura 2000 områderne DCE
Process problem

- Negative eller manglende processer


Foto: JCS
2: Wildness as a value

"There are no words that can tell the hidden spirit of the wilderness, that can reveal its mystery, its melancholy, and its charm"

–Theodore Roosevelt, 1858-1919
Yellowstone National Park
3: Shifting baseline

- Critically assess ecological integrity
  - Especially relative to evolutionary conditions

- Active restoration may be needed to not get locked into biodiversity-poor degraded persistent states
  - Especially as societally relevant time scales are decades, not millenia

William Stout, 2005; Wikipedia
3: Shifting baseline

Rewilding as tool to increase our understanding of nature

Photo: Lascaux (www)
4: Scaling

- Functional area for nature/biodiversity is the biggest need to encounter the biodiversity crisis

- **Upscaling** crucial
  - Only practical & effective if strongly based on **autonomous** natural processes
    - Cost/labor
    - Value for biodiversity

Selfsown oak (*Quercus robur*)
5: Dynamic

Future changes in major climate types

Fig. 7. Time series of the percentage of the global land area (60°S–90°N) assigned different climate types compared to the present day condition (1961–90). The black (green) lines are the temporal variations based on the dataset from the University of Delaware (UD) and CPC, respectively. Thick blue (red) lines are the ensemble average of the 20 models from historical/ RCP8.5 (RCP4.5) simulations. The gray shading denotes one standard deviation of the 20 models from historical/RCP8.5 simulations. Blue (light blue) dashed line is the temporal variation based merely on the temperature (precipitation) changes from historical/RCP8.5 simulations. Pink (pink dashed) line is the temporal variations based merely on the temperature (precipitation) changes from the UD dataset. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)
Comparison to past climate

Temperature anomalies are relative to 1961–1990 global means and are composited from five proxy-based reconstructions, modern observations, and future temperature projections for four emissions pathways. Pal, Paleocene; Mio, Miocene; Oli, Oligocene.

Burke *et al.* 2018 PNAS 115:13288-13293
Comparison to past climate

Ellesmere Island, 3.4 mio years ago

https://www.nationalgeographic.com/science/phenomena/2013/03/05/the-giant-camels-of-the-prehistoric-high-arctic/
IMPLEMENTATION
Framework for design & implementation

- **Design:**
  - Trophic complexity
  - Natural disturbances
  - Dispersal/Connectivity

- **Implementation**
  1) Ecosystem status assessment
  2) Social-ecological constraints
  3) Adaptive management

Framework for measuring rewilding progress

Rewilding score (R)

- Initial state
- Alternative management

Human inputs and outputs (H)

Ecological integrity (E)

Restored megafauna species

A trophic rewilding scale to guide terminology and management

Pedersen et al. & Svenning, accepted, AMBIO
Socio-ecological context

Pedersen et al. & Svenning, accepted, *AMBIO*
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Thanks

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