Restoration of the Vindel river: the linkage between science and practice

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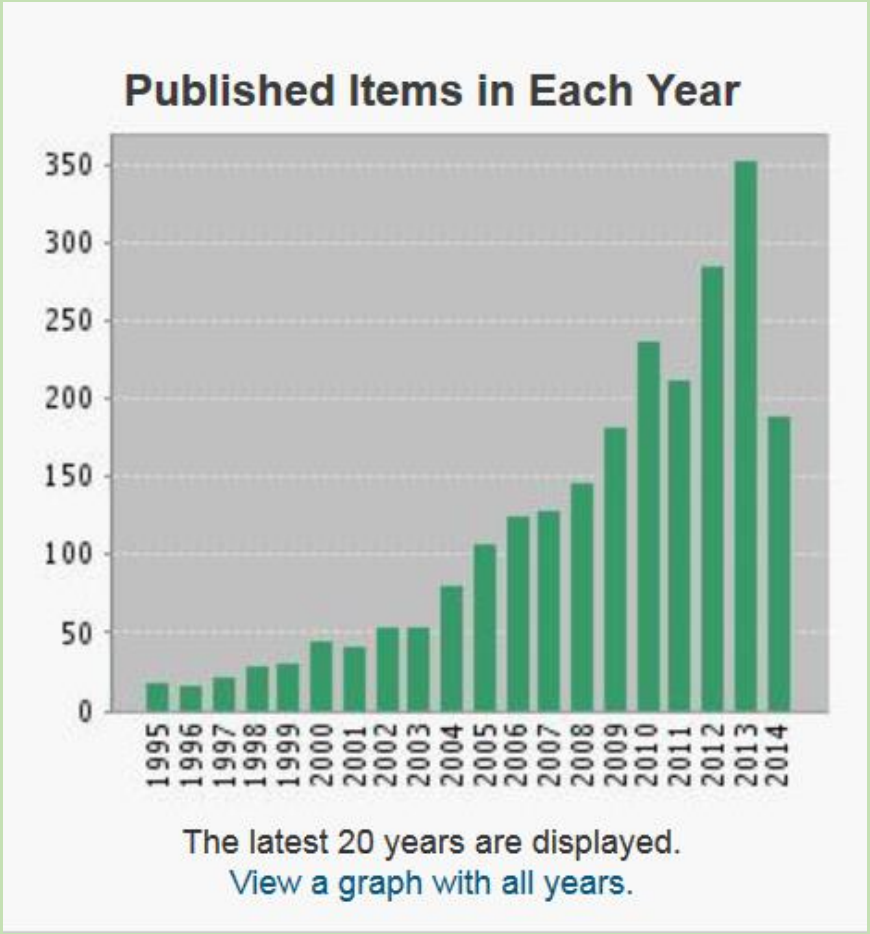
The practice

Ecological restoration: the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed

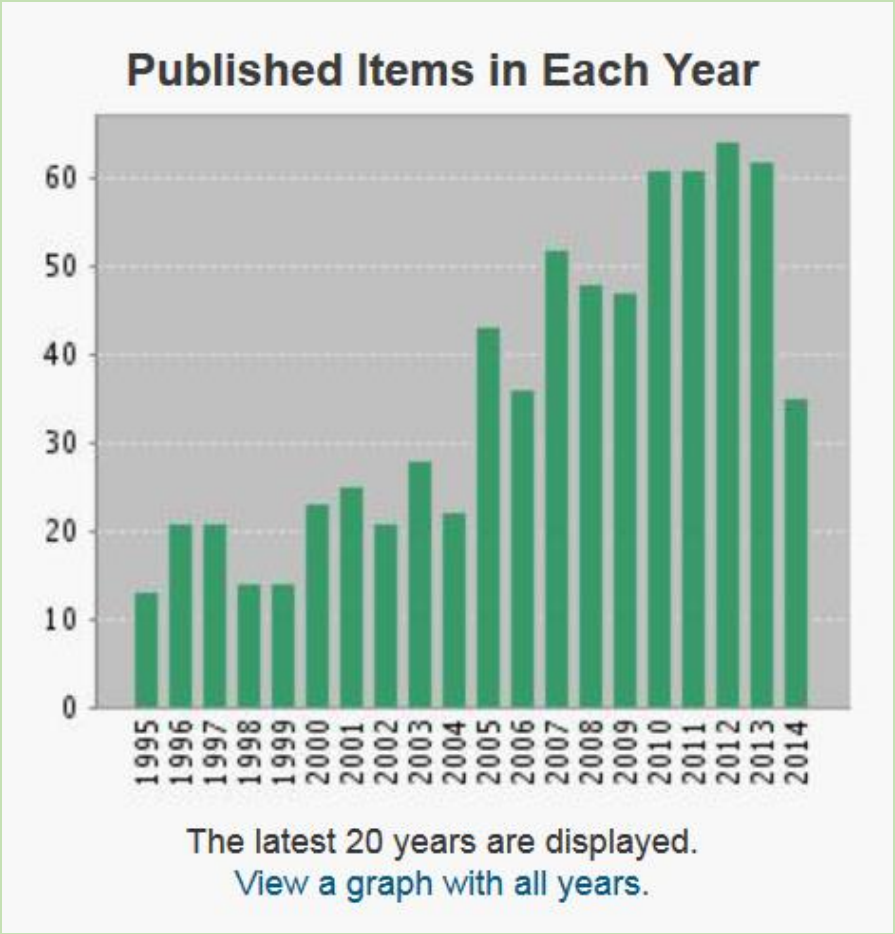
The science

Restoration ecology: the science upon which ecological restoration is based

THE PRACTICE
Ecological restoration



THE SCIENCE
Restoration ecology



Degraded state

Ecological restoration

Evaluation

Restored state

Evaluation

Natural state

A common view of ecological restoration

The problems restoration ecologists might face:

Finding restoration objects:

- of appropriate type, size, distribution and number
- for which pre-restoration data can be collected
- for which restoration methods are well described
- for which post-restoration monitoring is possible

Vindel River LIFE

Restoration of tributaries of the Vindel River

http://vindelriverlife.se/

The Vindel River – a Swedish national river











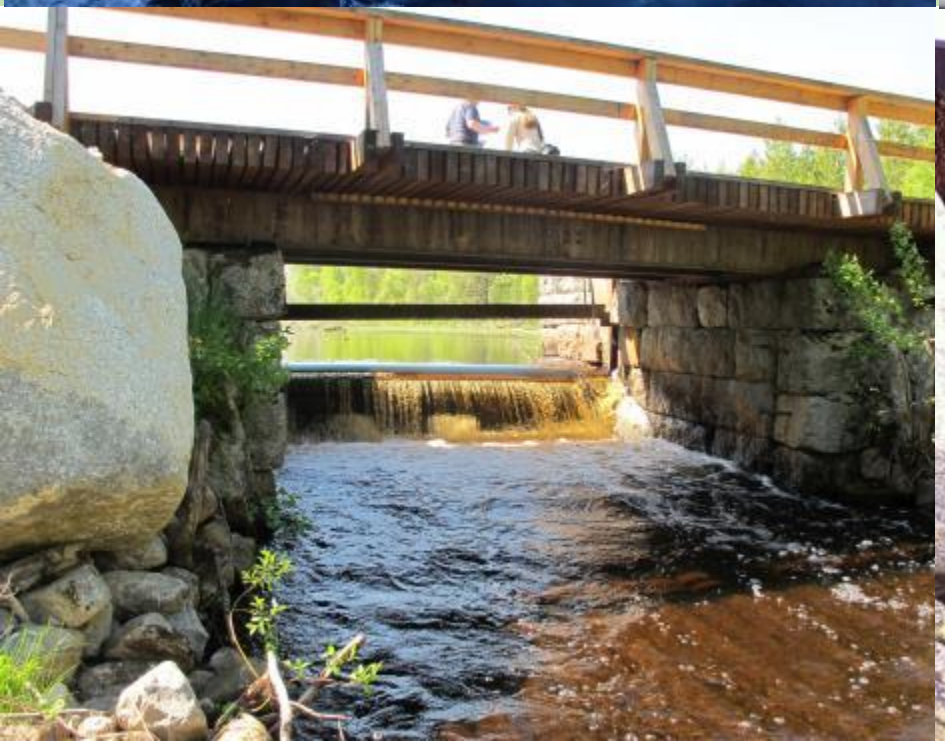


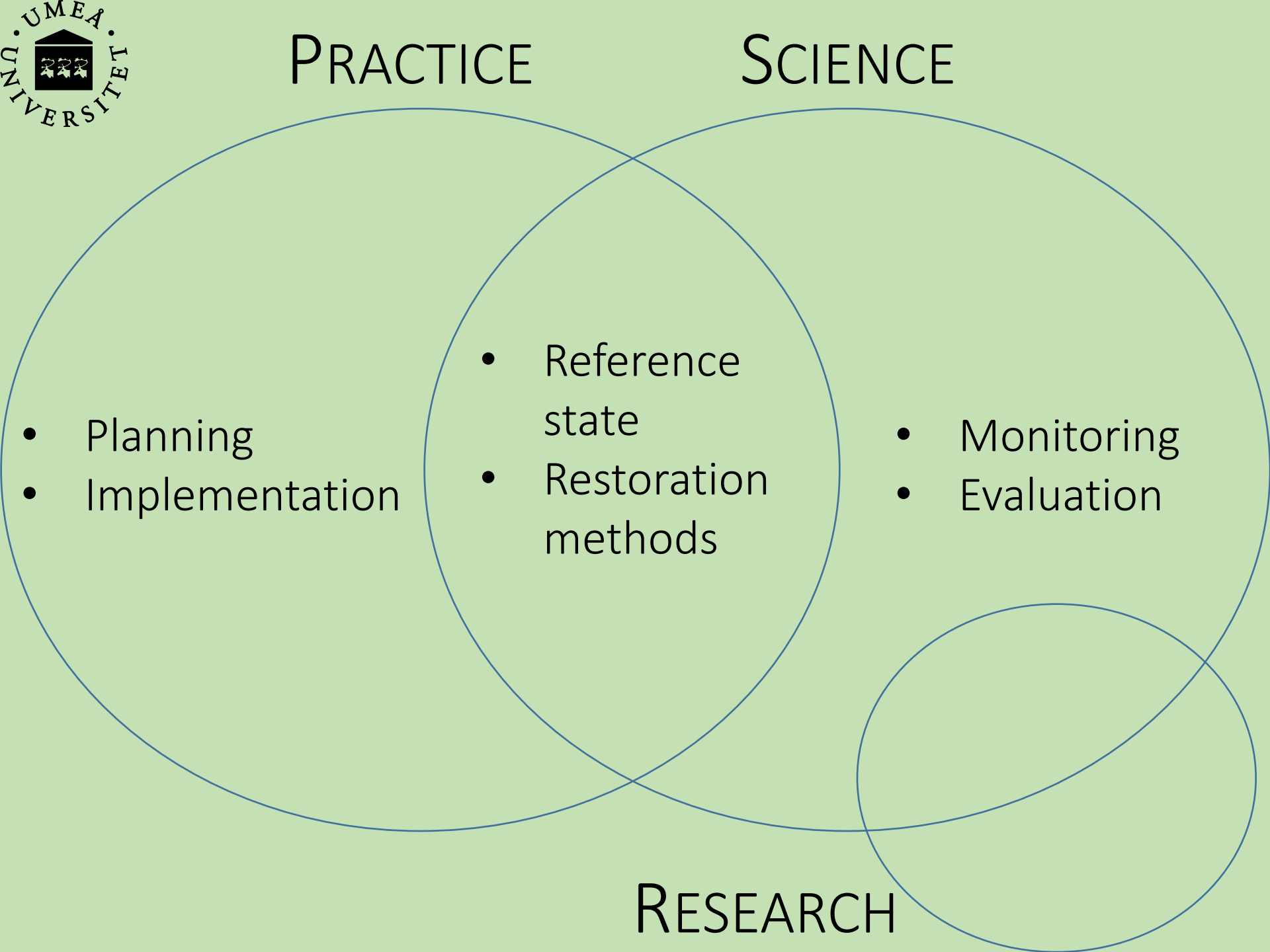

Before


After


Before


After




PRACTICE
SCIENCE
• Planning
• Implementation
• Reference state
• Restoration methods
• Monitoring
• Evaluation
RESEARCH

The Vindel river sites – a unique infrastructure of differently restored sites

- The hydrogeomorphology changes quickly
- The organisms show a very slow response
- Similar results have been found in other systems

ECOHYDROLOGY
Ecohydrol. (2014)
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Riparian and in-stream restoration of boreal streams and rivers: success or failure?

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WHY DO RESEARCHERS FAIL TO FIND RESPONSES?

- Restoration had ill-defined **objectives** (Palmer *et al.* 2010) or poor **design** (Bellmer 2001)
- Standardized **follow-up methods** not available or used (Jähnig *et al.* 2011)
- Different **organism groups** react differently; chosen species did not represent the entire community (Rakosy & Schmitt 2011)
- **Colonist pools** not available (Brederveld *et al.* 2011, Sundermann *et al.* 2011)
- **Time** since restoration too short (Wilkins *et al.* 2003)
- **Recovery** has already taken place (Louhii *et al.* 2011)

Geomorphic complexity matters

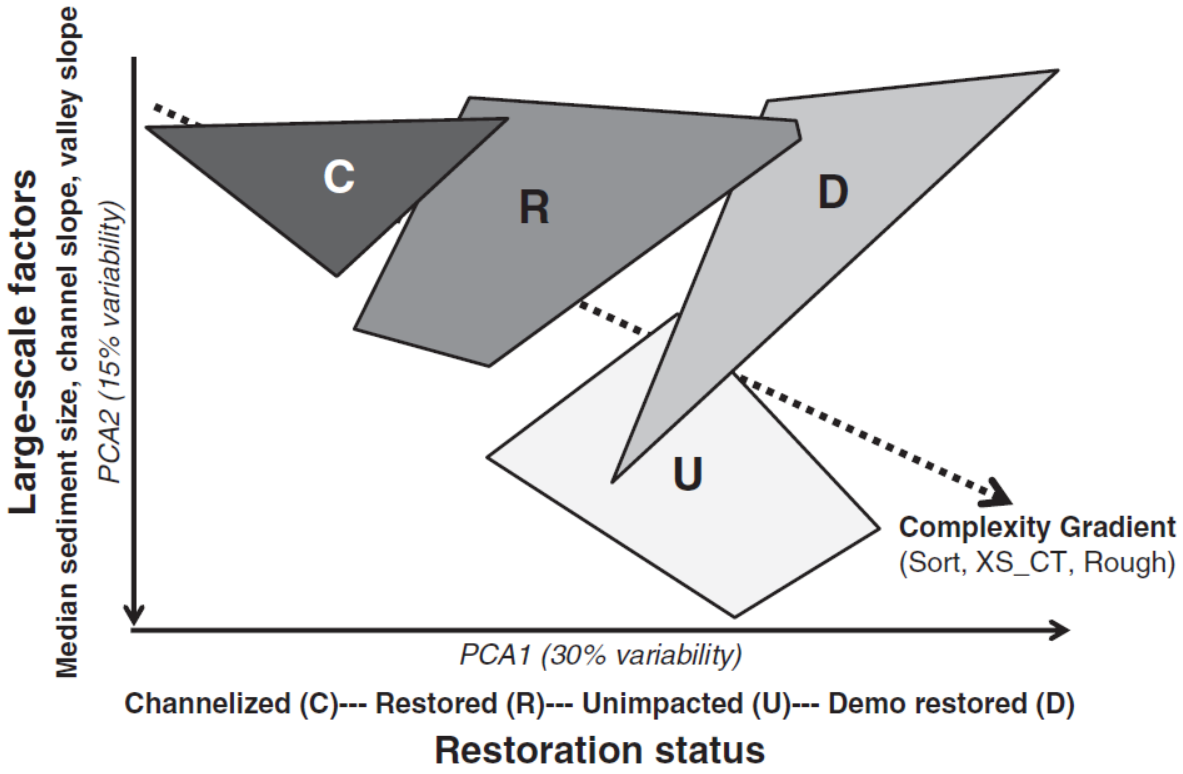

Fig. 11. Summary figure of multivariate analysis of reach-scale controls on complexity metrics. Four polygons show the extent of variation of reaches of each restoration status (C: channelized, D: demonstration, R: restoration, U: unimpacted) in complexity metric space. Variables along the vertical axis are reach-scale variables that control the degree of complexity. The variable that most strongly controls the distribution of reaches along the horizontal axis is the restoration status. The overall complexity gradient is shown by the dotted line with the three most important complexity metrics in relating to the reach-scale variables. Sorting (*Sort*) is the standard deviation of the sediment distribution; the Chain and Tape (*XS_CT*) is the ratio of topographic distance to straight line distance of cross section; and the longitudinal roughness (*Rough*) is based on the proportionally weighted deviations from the predicted elevation along the longitudinal profile.

Polvi *et al.* (2014) Geomorphology

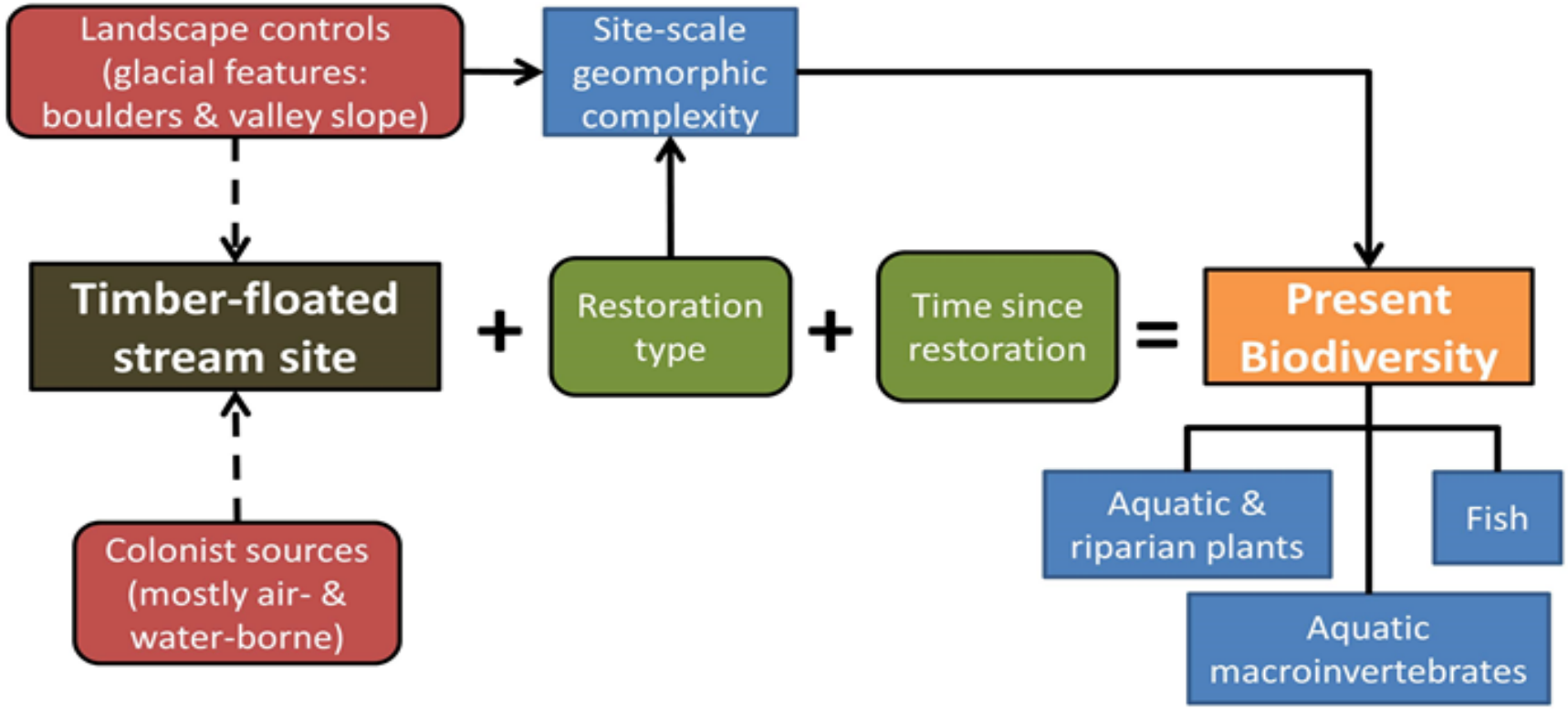

Fig. 2. *Conceptual model of project design. Red boxes show landscape-scale abiotic and biotic controls on the restoration site, which will vary throughout the catchment. The green boxes represent what is done to the site in terms of the type of restoration and time since restoration. The result is the present-day biodiversity, as measured by aquatic and riparian plants, aquatic macroinvertebrates, and fish. All the blue boxes represent components of each restored site that will be measured in the field, where the site-scale geomorphic complexity is represented by the complexity gradient in Fig. 1. The red boxes will be quantified remotely using GIS, digital elevation models, and land-use data.*


Thank you
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