COST CONVERGES WG1 Workshop
MONITORING AND ASSESSMENT OF RIPARIAN VEGETATION IN EUROPEAN COUNTRIES

Riparian zones - Riparian vegetation: Concepts and definitions

S. Dufour & P.M. Rodríguez González, Madrid, 10th July 2018

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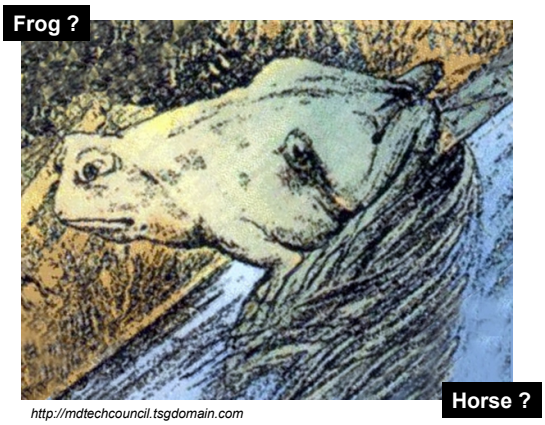
Funded by the Horizon 2020 Framework Programme of the European Union

Introduction

- To share knowledge => mutual understanding



http://mdtechcouncil.tsgdomain.com

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Introduction : diversity of words

- names given to the vegetation that colonize river margins are numerous
  - “riparian vegetation”, “floodplain forests”, “alluvial swamp forests”, “gallery forests”, etc. in English,
    - Fischer et al 2001 : 36 terms
  - “ripisylve”, “forêt alluviale”, “boisement riverain”, etc, in French
  - “bosque de ribera”, “bosque ribereño”, “Soto”, “bosque en galería”, etc. in Spanish
- Same object but different name ; same name different object
- This diversity of terms
  - generate some misunderstanding and some tensions between actors
  - related to the variability of geographical contexts, studied topics, goals, etc.

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Plan

A. Sources of similarity

B. Sources of variability

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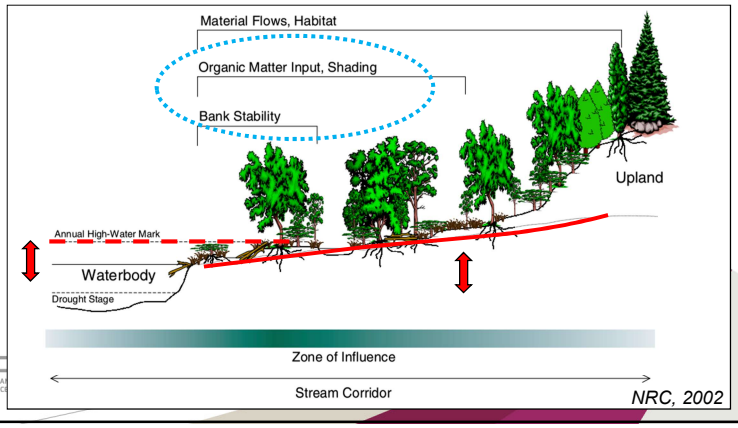
A. Sources of similarity

- land along
  - fluvial system (in the COST CONVERGES ACTIONS)
    - be careful, riparian zones can concern all kinds of aquatic systems (lake, etc.)
  - influences the river
  - and is influenced by the river



NRC, 2002

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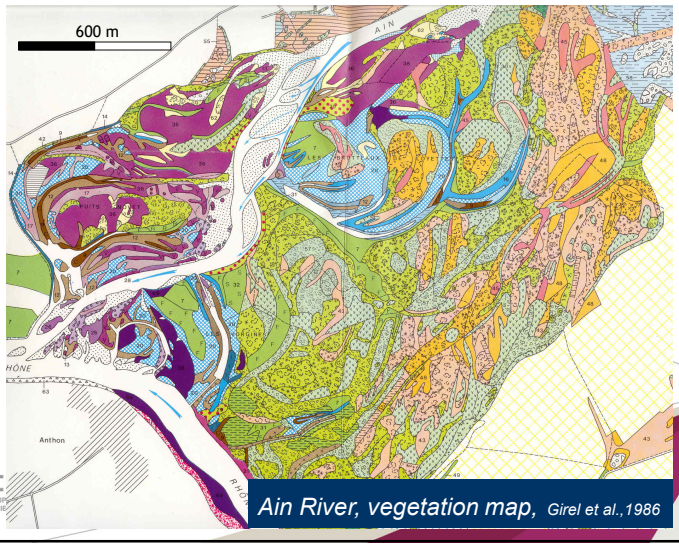
A. Sources of similarity

- **riparian vegetation** = complex of communities present in the riparian zone



Ain River, vegetation map, Girel et al.,1986

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A. Sources of similarity

- **riparian vegetation** = complex of communities present in the riparian zone
  - riparian zone = "transitional between terrestrial and aquatic ecosystems and are distinguished by gradients in biophysical conditions, ecological processes, and biota
    - Also called riparian "area", "ecotone", "system" or "land"
  - […] areas through which surface and subsurface hydrology connect water bodies with their adjacent uplands" (National Research Council, 2002)
    - For river systems, the medium of the interactions is mainly water through lateral runoff, floods and groundwater dynamic.
  - Most of the definitions
    - functional approach
    - two-way influences between aquatic and terrestrial systems in terms of hydrological, morphological, chemical or/and biological processes

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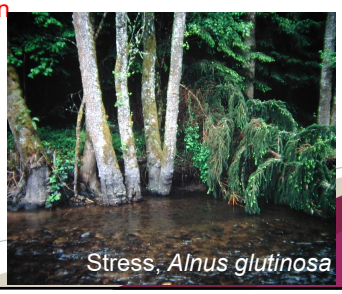
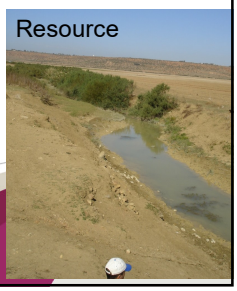
  - […] areas through which surface and subsurface hydrology connect water bodies with their adjacent uplands" (National Research Council, 2002)
    - For river systems, the medium of the interactions is mainly water through lateral runoff, floods and groundwater dynamic.
  - => specific vegetation

Disturbance, *Salix* sp.


Stress, *Alnus glutinosa*


Resource

Plan

A. Sources of similarity
B. Sources of variability

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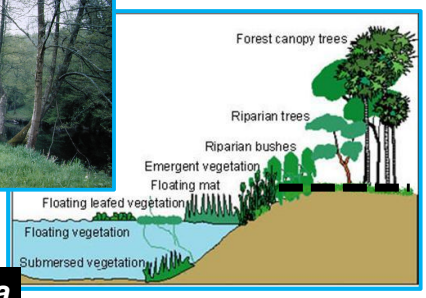
B. Sources of variability

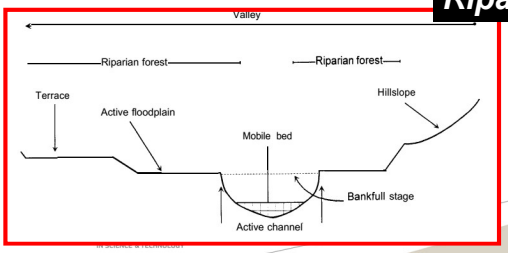
- But

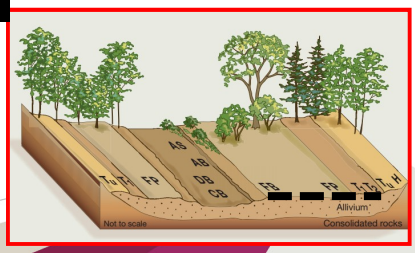
Riparian ➔ bank ? or
Riparian ➔ floodplain ?



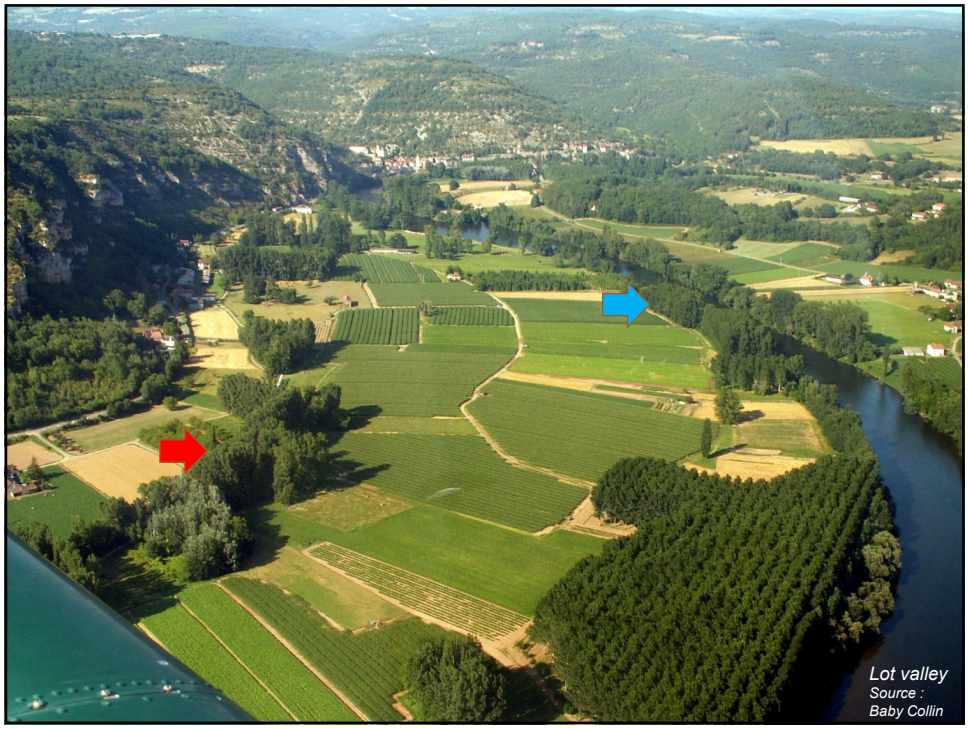
Riparius = of or helonging to the bank of a river

Ripa





Naiman et al 1998 ; Hupp and Osterkamp in Naiman et al 2005 ; www.limpopo.riverawarenesskit.org



B. Sources of variability

1. Variability of the representations
   - The (sub)discipline
   - The way to study it
   - The goal
2. Variability of the object = structure and ecological functioning vary from one geographical context to another
   - Bioclimatic
   - Morphological pattern
   - Land uses

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Sources of variability (1)

discipline => "Riparian zone"

- Hydrology, geomorphology, WR Osterkamp, 2008

Part of the fluvial landscape **inundated or saturated by flood flows**; it consists of all surfaces of active fluvial landforms up through the flood plain including channel, bars, shelves, and related riverine features

- Ecology, R. Naiman and H. Décamps, 1997

Encompasses the stream channel between the low and high water marks and that portion of the terrestrial landscape from the high water mark toward the uplands where **vegetation** may be influenced by elevated water tables […] and by the ability of the soils to hold water. [...] **Vegetation** outside from the zone […] that contributes organic matter to the floodplain or channel, or that influences the physical regime of the floodplain or channel by shading, may be considered part of the riparian zone.

- Geochemistry, hydrology, Ledesma et al., 2018

Area between the edge of the stream and the **characteristic transition between organic and mineral soils**.

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Sources of variability (1)

way to study it => delineation

- Riparian zone boundaries
  - Biological : Thomas et al. (1979) : can be delineated by identifying the vegetation that requires free or unbound water or conditions that are more moist than normal (=> species, habitats, formation)
  - Physical : Ilhardt (1999) and Verry (2004) : approaches mainly based on topographic information (*i.e.* valley shape)

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Sources of variability (1)

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- Example riparian zone width for headwater streams (NE, USA) (Perkins and Hunter, 2006 - Hagan et al. 2006) :
  - No clear limit using trees and shrubs
  - 5 m using herbaceous vegetation
  - 80 m using amphibians

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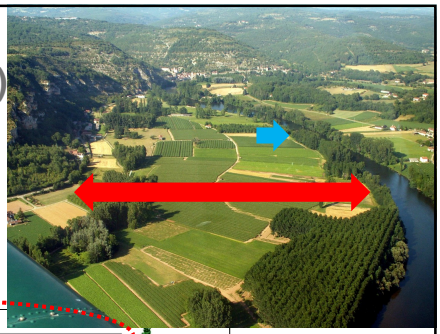
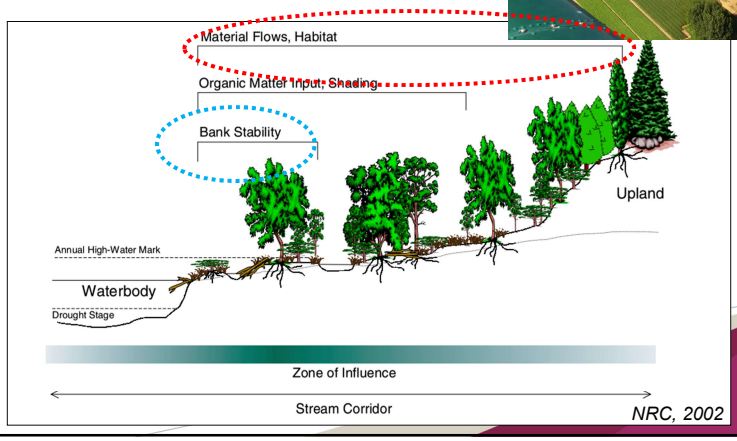
Sources of variability (1)

goal => studied functions



Lot valley
Source : Baby Collin



NRC, 2002

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B. Sources of variability

1. Variability of the representations
   - The (sub)discipline
   - The way to study it
   - The goal
2. Variability of the object = structure and ecological functioning vary from one geographical context to another
   - Bioclimatic
   - Morphological pattern
   - Land uses

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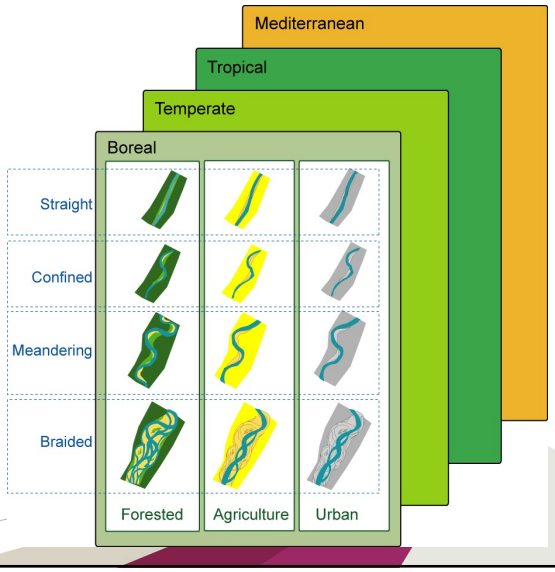
Sources of variability (2)

Variability of the object = structure and ecological functioning vary

Geographical context

1. Bioclimatic
2. Morphological pattern
3. Land uses

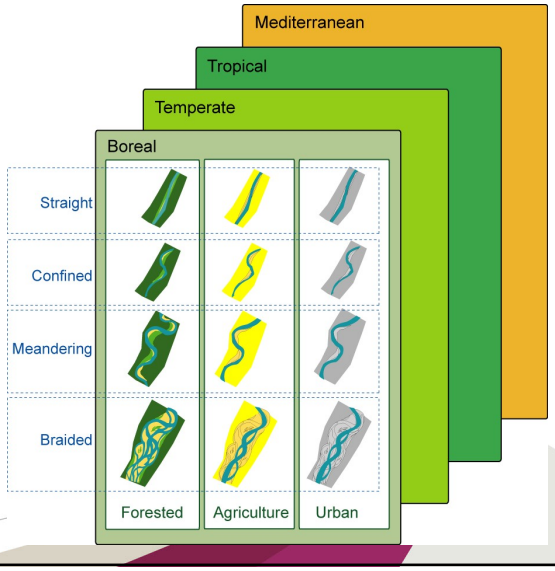


Sources of variability (2)

Variability of the object = structure and ecological functioning vary

Geographical context

1. **Bioclimatic**
2. Morphological pattern
3. Land uses



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Morocco
http://perso.orange.fr/pierre.sonzogno/index

France
N. Landon SM3A

Sources of variability (2)

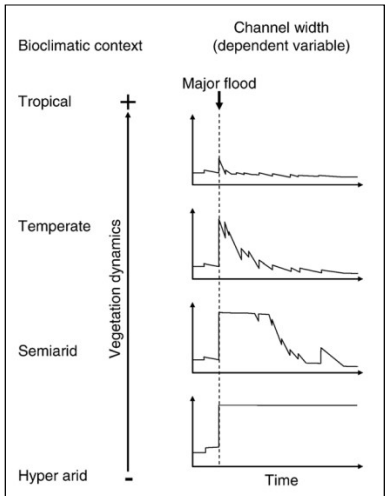

Fig. 4. Simplified model of potential channel response (channel width) after a major flood in four different bioclimatic contexts (modified from Knighton, 1998).

Corenblit et al., 2007

Ex. different relaxation times

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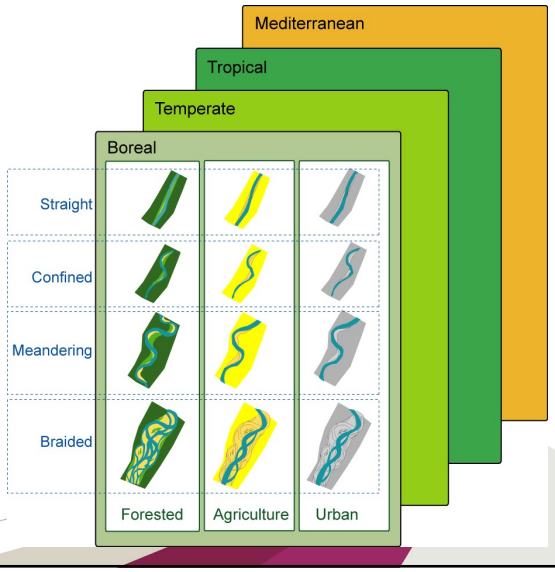
Sources of variability (2)

Variability of the object = structure and ecological functioning vary

Geographical context

1. Bioclimatic
2. **Morphological pattern**
3. Land uses



Sources of variability (2)

Morphological pattern

- Geological setting
- Fluvial pattern
- Dams, embankments, etc.

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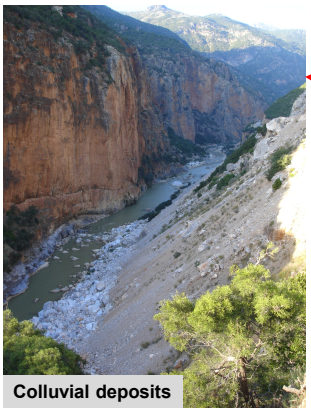
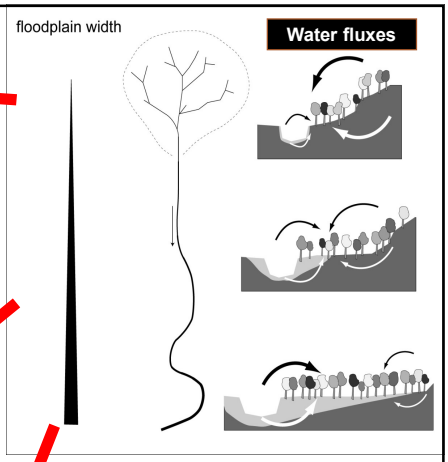
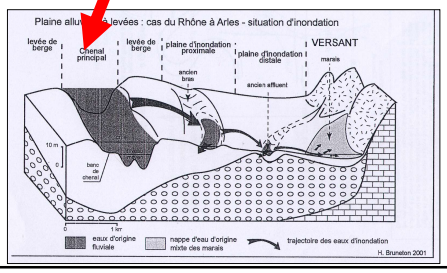


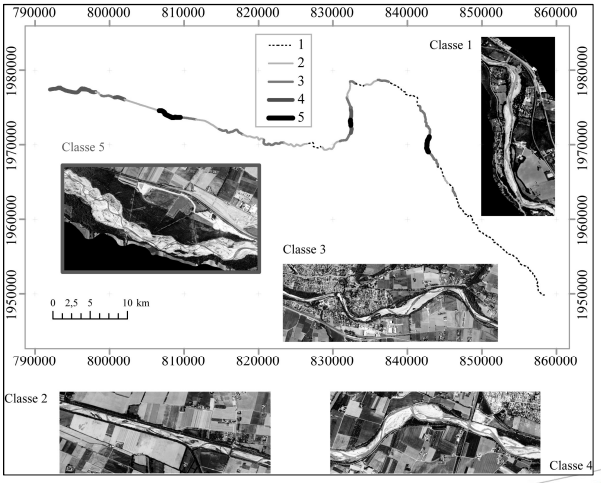
Colluvial deposits

Alluvial deposits





Sources of variability (2)



Wiederkehr et al., 2010

But it is discontinuous !

- Drome river
- 80 km
- 5 fluvial patterns
- 1 = confined
- 5 = braided

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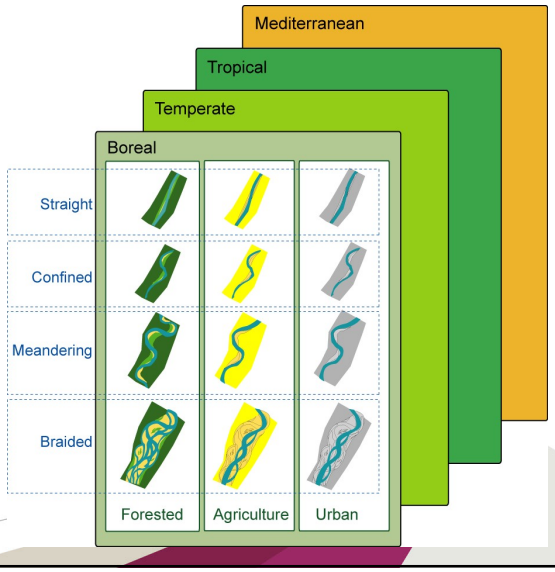
Sources of variability (2)

Variability of the object = structure and ecological functioning vary

Geographical context

1. Bioclimatic
2. Morphological pattern
3. **Land uses**



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Sources of variability

Meandering reaches in temperate area across different land uses context

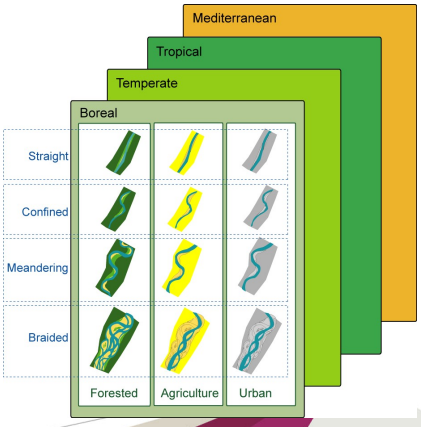
Sources of variability (2)

Variability of the object = structure and ecological functioning vary

Human activities

Geographical context

1. Bioclimatic
2. Morphological pattern
3. Land uses



=> Co-construction

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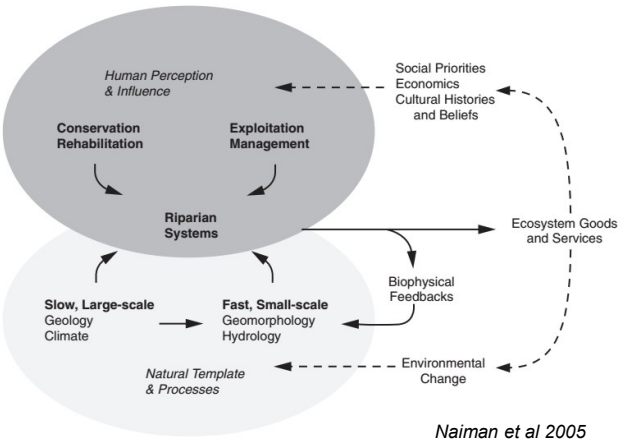
Sources of variability (2)

Variability of the object = structure and ecological functioning vary

=> Co-construction



Naiman et al 2005

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Sources of variability (2)

Variability of the object = structure and ecological functioning vary

Co-construction is …
=> more or less obvious

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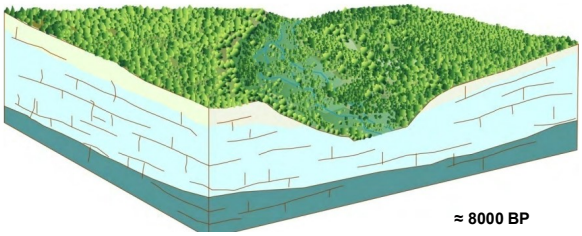
Sources of variability (2)

Variability of the object = structure and ecological functioning vary

Co-construction is …
=> old

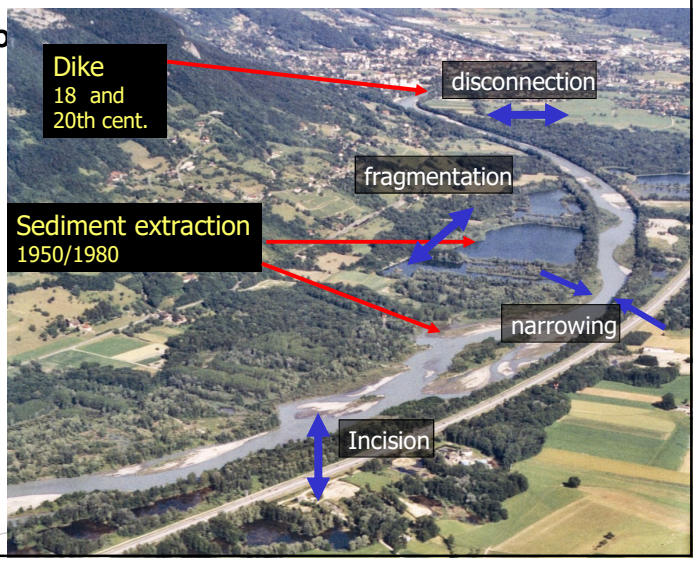


Mue River
France, NW
Lespez 2012

Sources of variability (2)

Variability of the object = structure and ecological functioning are variables

Co-constructio
=> complex



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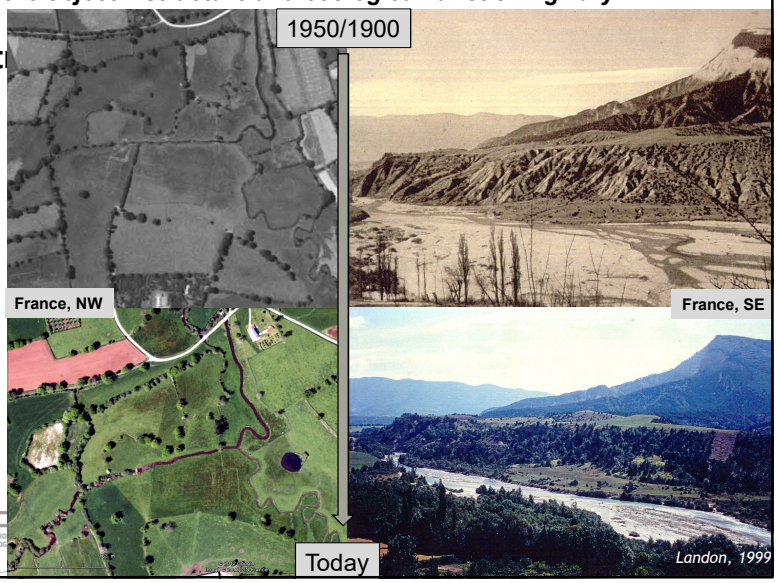
Sources of variability (2)

Variability of the object = structure and ecological functioning vary

Co-const
=> variable



=> different trajectories

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Conclusion

1. Riparian vegetation = all vegetation units present in the riparian area, whatever its physiognomy or origin, and functionally related to the other components of the fluvial systems (main river, side channel, groundwater)
   - Beyond the term => explicit the object and the goal
   - Definition (gradient) ≠ delineation (discontinuous)
2. Co-constructed systems
   - Each basin/reach follows a complex trajectory
   - Need for place-based approach
3. Some contexts are understudied
   - So some issues are less studies

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Conclusion

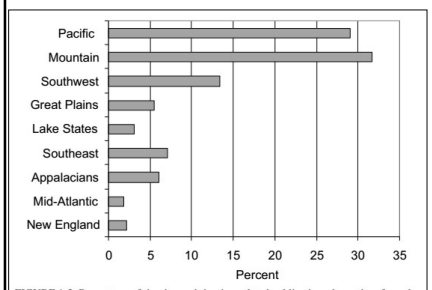

FIGURE 1-2 Percentage of riparian and riparian-related publications, by region, from the U.S. Forest Service and University of Washington (College of Forest Resources) database as of December 2000.

NRC, 2002 ; Bendix and Stella 2013

Some systems are more studied …

… it influences the studied issue

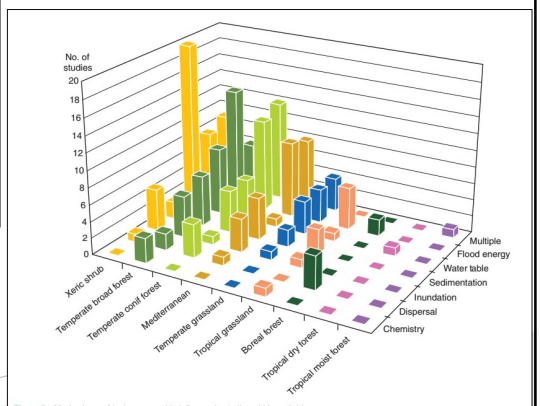

Figure 6 Mechanisms of hydrogeomorphic influence in studies within each biome.

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