Habitat restoration in small rivers using artificial materials

Symposium Ecology and restoration under global change

Bianca Veraart – Dienst Integraal Waterbeleid
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Topics

1. Characteristics of rivers under our management
   -> natural versus less natural streams

1. Stream restoration
   -> from passive to active
   -> type of materials
Characteristics of rivers
Characteristics of our rivers & streams

Province of Antwerp -> manages over more than 2400 km streams

- Upstream and middle stream rivers (small rivers)
  - Width: range between 2 m and 10 m
  - Depth: range between 25 cm to 2 m

- Some typical streams with a good ecological status
- More strongly artificial, straightened and overdimensioned streams
More natural streams

In different kind of landscapes: closed, mixed and more open
More natural streams

brook lamprey (*Lampetra planeri*) ©Vilda -R. Verlinde

the chub (*Squalius cephalus*)

burbot (*Lota lota*) © A. Dillen

Typical fish species for waters with more flow (rheophylic)

the common dace (*Leuciscus leuciscus*) © Vilda -R. Verlinde
More natural streams

**IMPORTANT OBJECTIVE = Natura 2000 habitat 3260**
(water courses with well developed vegetation such as Ranunculus and Callitriche species)
Less natural streams

Result of optimizing in function of agricultural activities:

- Straightened
- Broadened
- Overdimensioned
- Constructions like weirs
- …
Less natural streams

stone loach (Barbatula barbatula)

spined loach (Cobitis taenia)

gudgeon (Gobio gobio gobio) ©Jan Jacobs

• Nutrient rich, aquatic vegetations like Sparganium sp, Sagittarias sp, Reed, ...
• disturbance vegetations on the banks and borders
  -> more frequent management
Stream restoration
Challenges due to global change

Two extremes occur:
1. Drought during longer periods with
   - lower water levels
   - less flow
   - less oxygen
2. More and intense rain (including summer storms) resulting in more frequent floodings
Goals

• Getting higher waterlevels during baseflow
  ➔ to narrow streams resulting in more flow and higher waterdepth during baseflow

• Getting more habitat variation
  ➔ differentiation in depth, flow, hiding places, ...
Stream restoration?

Passive

- Adjusted management: doing nothing ➔ mowing a few times a year (in patterns)
- Leaving dead wood
- Using stream deflectors
- Removing unnatural embankments (∼ management)
- Remeandering

More active

Provincie Antwerpen
Adjusted management

Years of mowing in patterns -> narrower watercourse with higher waterlevels and flow during baseflow

View beneath waterlevel during overpumping
Stream deflectors

Changing the watercourse by bringing in:

- Stones
- Natural roots
- Tree stumps or logs from the project site
- Other materials

Result of using stones alternating left and right bank
Stream deflectors in created flooding plains: tree stumps or logs
Stream deflectors: a mixture of materials to built one
Creating a summer bed or narrowing the stream

By inserting a stretch of materials on both sides of the river bed near the toe zone:

- woody material: ex. branches in Grote Nete and Kleine aa
- biodegradable cylinders (kokos) in Kleine aa
Narrowing the stream
Narrowing the stream using branches
Remeandering

= Digging out a new piece of watercourse

Very often temporary bank fixation is required to stabilise the new meander

- bare soil (unstable due to rain and groundwater)
- between the river bed and the toe zone
- the border/banks

Witch kind of natural materials?

- Biodegradable textiles (kokos, jute)
- Mats or cylinders
- With or without vegetation/seeds
Remeandering
Remeandering

Bank and border fixation using

- Biodegradable textiles (kokosmats)
- Biodegradable cylinders
Conclusion of river restoration

**THEORY**
just digging out and/or filling up

**PRACTICE**
artificial materials often necessary for temporary fixation