Environmentally friendly drainage measures

The use of two-stage profiles to improve diversity and water quality in agricultural streams

The problem

- Adverse impacts of agricultural drainage in waterbodies:
  - Problems with water quality in dredged streams and in water bodies below them
    - Nutrient loading, suspended solids
  - Decreased diversity
  - Problems with erosion, sedimentation and overgrowth
  - Changes in hydrology
  - Expensive maintenance
Ecological values of agricultural brooks

- Important breeding and living environments for many species, even threatened migratory fish
- Upgrade landscape diversity
- Act as significant ecological corridors for wildlife
What is environmentally friendly drainage?

- Functioning agricultural drainage + improved ecological, morphological and hydrological state of the agricultural streams

- Main methods:
  - 2-stage channel profiles
    - Low flow channel to maintain the ecological and morphological diversity
    - Flood terraces to improve the water conveyance
  - Submerged weirs, sand traps and sedimentation pools
  - Constructed wetlands to stop the nutrient loading and suspended solids
Juottimenoja brook in Southern Finland before and after environmentally friendly dredging
Ritobäcken - a case study from Southern Finland

- Ritobäcken is a stream used as a drainage channel
  - Length 12 km
  - Catchment area 10m²
  - Some parts of the stream a part of Natura
  - Habitat for vulnerable migrating sea trout (*Salmo trutta* m. *trutta* L.)

- Problems:
  - Frequent flooding to the surrounding fields during the summer
  - How to increase the conveyance of the channel with minimal damage to the Natura area and sea trout population?
A two stage channel profile was tested
  ○ The conveyance capacity was increased by digging a flood terrace
  ○ The existing channel stayed intact and works as a low flow channel
  ○ The cohesive sediment dynamics in a vegetated two-stage drainage channel
Benefits for the 2-stage channel in Ritobäcken (Kaisa Västilä, Aalto University)

- Decreased channel erosion during the excavation and after that
- No more flooding to the fields
- Developing of bank vegetation
  - decreased the channel erosion
  - Increased sedimentation to the flood terrace
- Improved water quality
- Ecological benefits when low flow channel stays intact
- Increasing biodiversity of the agricultural environment
  - Ecological corridors
- Channel more stable => less maintenance
  - Cost-effectiveness
  - Ecological benefits
Further questions

- Comparison of examples in different circumstances
- Monitoring of fish and vegetation of flood terrace
- Maintenance of the two-stage channels
  - Vegetation
  - Increasing diversity for fish
References: