HUSZPO HRVATSKA UDRUGA STRUČNJAKA ZAŠTITE PRIRODE I OKOLIŠA

TREĆA REGIONALNA KONFERENCIJA O PROCJENI UTJECAJA NA OKOLIŠ
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Goran LONČAR / Domagoj VRANJEŠ / Ivana TOMAŠEVIĆ / Katarina ČOVIĆ / Ivana BUJ / Goran DAŠIĆ / Lovorka KORICA

# POSSIBILITIES OF MITIGATING THE EFFECTS OF REGULATORY AND FLOOD CONTROL STRUCTURES ON AQUATIC ECOSYSTEMS

## MOGUĆNOSTI UBLAŽAVANJA UTJECAJA REGULACIJSKIH I ZAŠTITNIH VODENIH GRAĐEVINA NA VODENE EKOSUSTAVE

**Goran Lončar**, mag.oecol., mag.geogr. • VITA PROJEKT d.o.o., Ilica 191, Zagreb • goran.loncar@vitaprojekt.hr
**Domagoj Vranješ**, mag.ing.prosp.arch.,univ.spec.oecoing. • VITA PROJEKT d.o.o., Ilica 191, Zagreb • domagoj.vranjes@vitaprojekt.hr
**Ivana Tomašević**, mag.ing.prosp.arch. • VITA PROJEKT d.o.o., Ilica 191, Zagreb • ivana.tomasevic@vitaprojekt.hr
**Katarina Čović**, mag.ing.prosp.arch. • VITA PROJEKT d.o.o., Ilica 191, Zagreb • katarina.covic@vitaprojekt.hr
**Ivana Buj**, doc.dr.sc. • PMF, Biološki odsjek, Rooseveltov trg 6, Zagreb • ivana.buj@biol.pmf.hr
**Goran Dašić**, dipl.ing.građ. • Geokon – Zagreb d.d., Starotrnjanska 16/a, Zagreb • goran.dasic@geokon.hr
**Lovorka Korica**, dipl.ing.građ. • Geokon – Zagreb d.d., Starotrnjanska 16/a, Zagreb • lovorka.korica@geokon.hr

# Introduction

- Opći tehnički uvjeti za radove u vodnom gospodarstvu (Hrvatske vode, 2010.): 25 types of regulation and protection water structures.
- Revetments – sloping structures placed on the river banks. Function: defense from soil erosion, stabilization of the river banks.
- "hard" materials used for construction: stone, concrete (gabions, rip-rap, slab)

**FIGURE 1. Sava Revetment, Županja**
http://www.vodoprivredavinkovci.com/

# Riparian zone

- Transitional semi terrestrial areas regularly influenced by fresh water, normally extending from the edges of water bodies to the edges of upland communities.
- Importance:
  - provide shade, food and shelter
  - improve water quality
  - control erosion and sedimentation
  - slow the water flow
- Impact of revetments on riparian zone:
  - removal of riparian vegetation
  - reduced habitat quality
  - invasive alien species

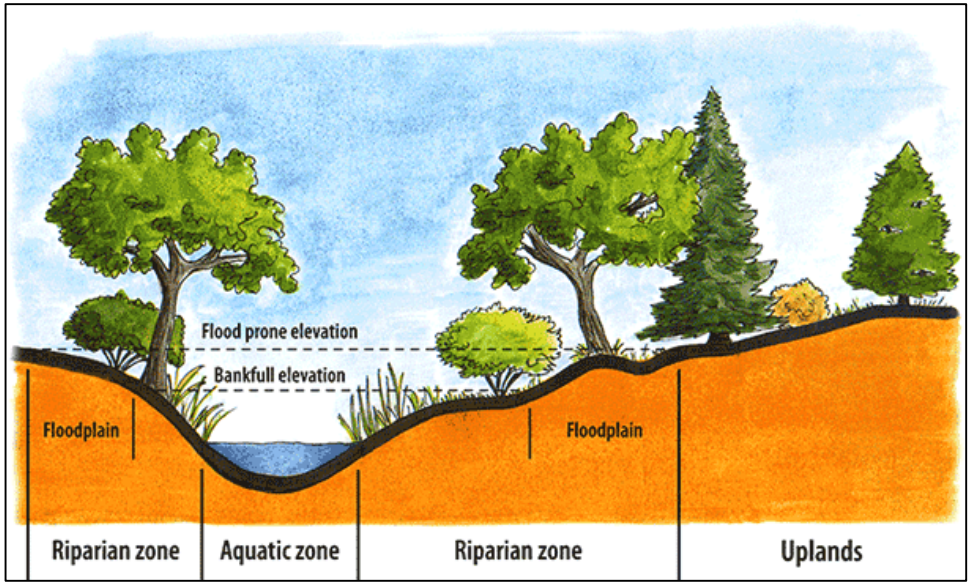



**FIGURE 2. Riparian zone**
http://slco.org/watershed/streams-101/the-riparian-zone/

**FIGURE 3. Dretulja river**

# Bioengineering

- Whole plants or their parts are used as construction materials
- „soft" vs „hard" revetment:

  Ecological advantages:
  - regulation of temperature and humidity
  - soil & water improvement
  - improvement of habitats

  Economic advantages:
  - reduction of construction and maintenance cost

  Aesthetic advantages:
  - landscape is more appealing
- Multidisciplinary approach is required in planning phase (construction, biology, landscape architecture)

**FIGURE 4. Gloucester Business Park**
https://www.salixrw.com/solution/gloucester-business-park-balancing-pond/

# Bioengineering

- **Vegetated geogrids**
- Natural or synthetic geotextile materials are wrapped around each soil lift between the layers of live branch cuttings.

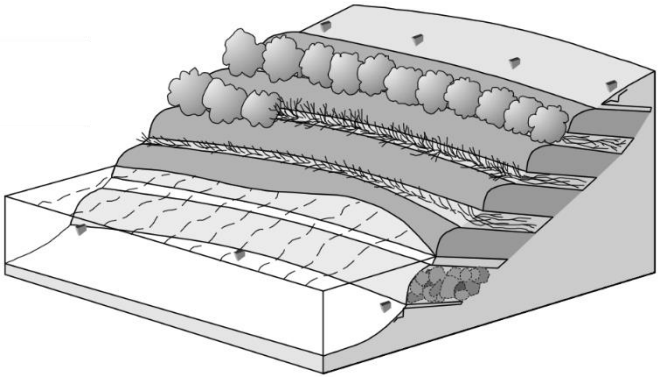


**FIGURE 5. Bassett Creek**
http://www.goldenvalleymn.gov/stormwater/stream-bank-stabilization.php

# Bioengineering

- **Brush mattress**
- A brush mattress system consists of live branch cuttings, live stakes, and live fascines installed to cover and stabilize the entire streambank/shoreline and secured in place. This method provides immediate protective coverage of the bank.

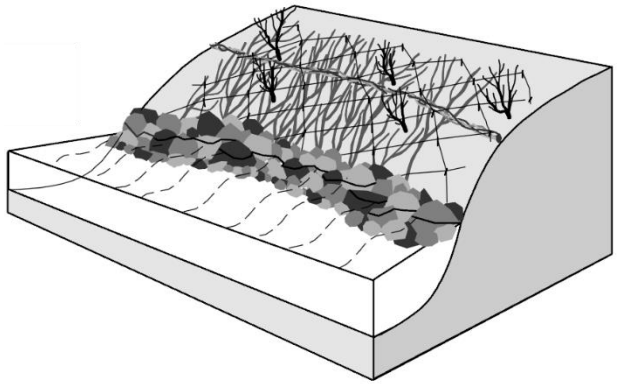


**FIGURE 6. River Rhiw Bank Protection**
https://www.salixrw.com/solution/river-rhiw-bank-protection/

# Bioengineering

- **Coconut fiber roll**
- A coconut fiber roll is a flexible "log" made from coconut hull fibers, staked at the toe of the bank. The technique is often used in conjunction with native plants to trap sediment and encourage plant growth

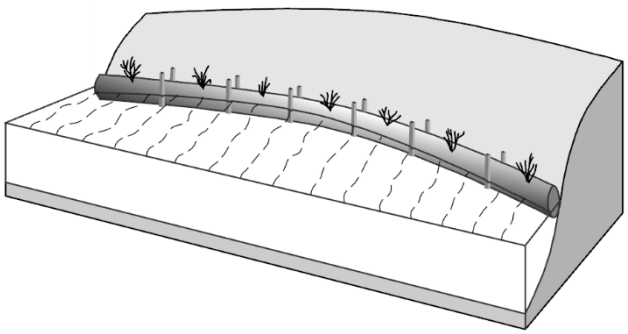


**FIGURE 7. River Wey**
https://www.salixrw.com/solution/river-bank-erosion-management-wisley-golf-course/

# Bioengineering

- **Joint planting or vegetated riprap**
- Involves tamping live stakes into joints or open spaces in rocks that have been placed on a slope. Vegetation, especially deep rooting species, planted above and immediately behind the rock will greatly increase the stability of the slope.

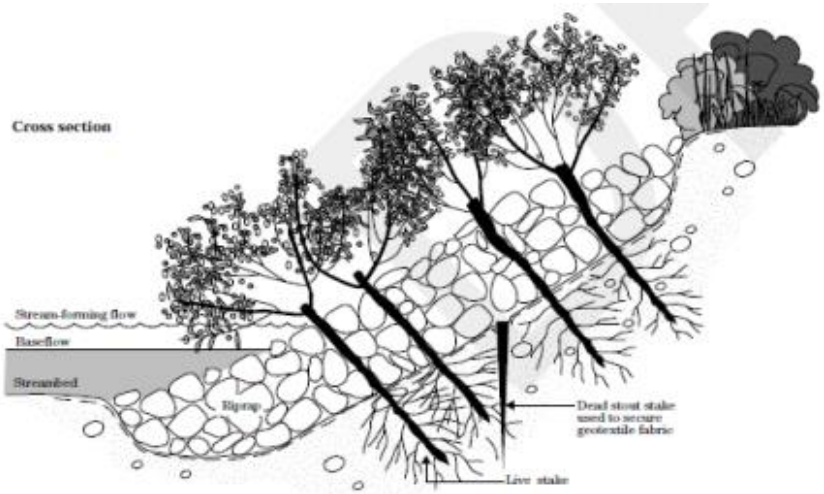


**FIGURE 8.** North Saskatchewan River
http://www.terraerosion.com/CityofEdmonton-Outfall101.htm

# Bioengineering

- LIFE Project LIFE09 NAT/IE/000220 BLACKWATER SAMOK - Restoration of the Upper River Blackwater SAC for the Freshwater Pearl Mussel, Atlantic Salmon, European Otter and Kingfisher
- NATURA 2000 area – Blackwater River (Ireland)
- Reducing bank erosion implementing bioengineering solution and improving river habitat
- *Margaritifera margaritifera, Salmo salar, Lutra lutra*
- Willow spiling
- *Salmo salar* population increased

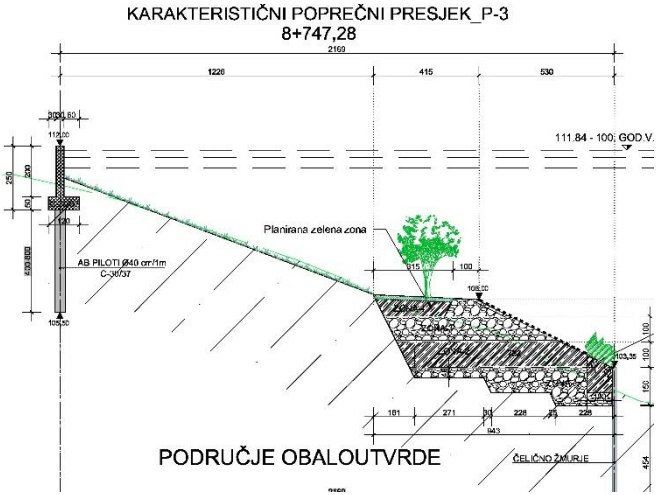
**FIGURE 9. Allow River**
http://www.duhallowlife.com/

# Bioengineering

- Brodarci, Kupa, revetment length 600 m

**FIGURE 10. Kupa revetment, Brodarci**

- Vodostaj, Kupa, revetment length 1 km



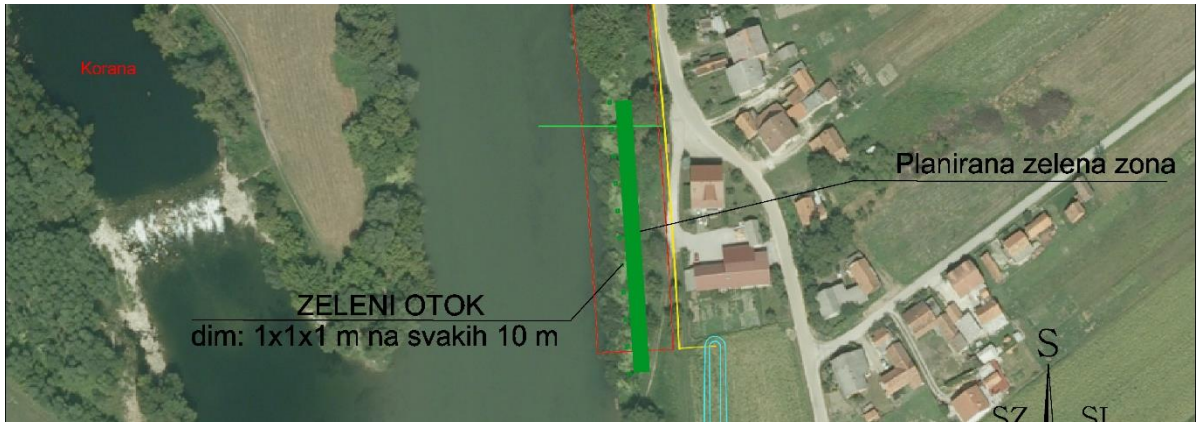




**FIGURE 11. Kupa revetment, Vodostaj**

# Conclusions

- Strategic impact assessment "Višegodišnji program gradnje regulacijskih i zaštitnih vodnih građevina i građevina za melioracije (Hr. vode, 2015)" – revetment impacts recognized, bioengineering not mentioned as mitigation measure for ecological network.
- Bioengineering should be considered in the initial stages of project design and implemented in standard revetment building techniques.
- Results:
  - Less significant impact on environment and ecological network or even improved habitat quality.
  - Shorter time needed to carry out EIA and/or Appropriate assessment.

**FIGURE 12. Foss Dyke Bank Stabilization**
https://www.salixrw.com/

# Thank you for your attention!