

# Restaurering i utloppskanaler



Jani Ahonen, doktorand SLU

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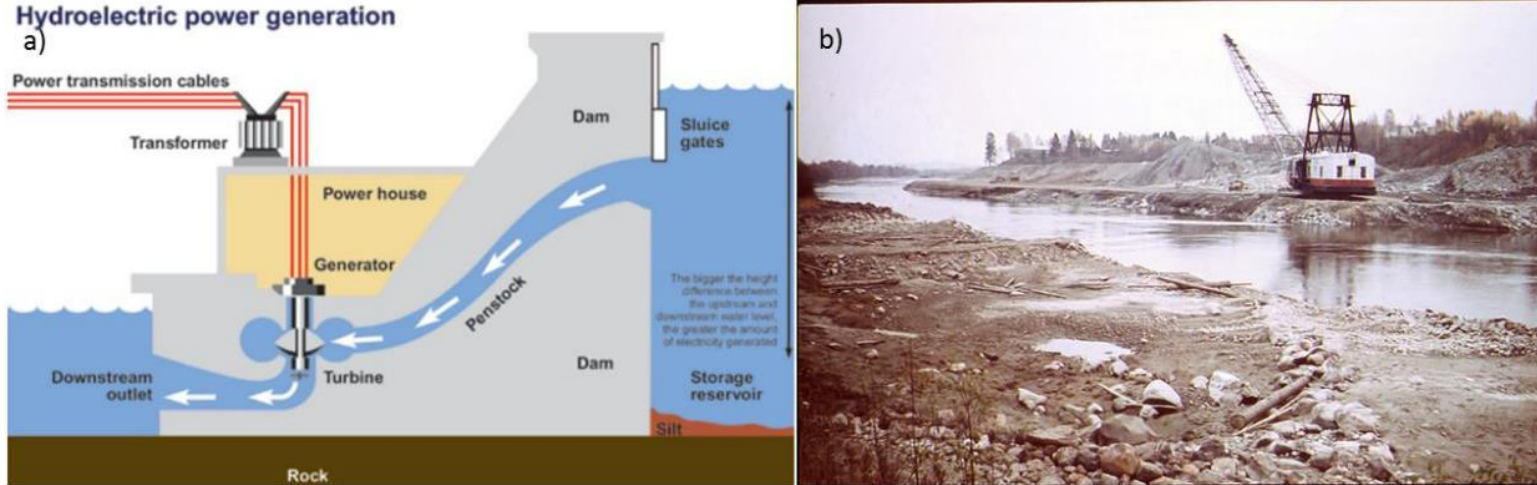


Figure 2. Simplified drawing over a typical impoundment type hydropower plant (a). The greater the height difference between the upstream and downstream water levels is, the more energy can be harvested. The river bed at the downstream outlet should therefore be as deep and as free from obstacles as possible. From Environment and Climate Change Canada 2010. The photograph (b) shows a Marion 7400 dragline excavator in the process of channelizing the river bed at Kvistforsen in Skellefte River (by Skellefteå museum, distributed under a CC-BY 3.0 license. <http://skellefteamuseum.se/>).

# Strömhabitat före och efter

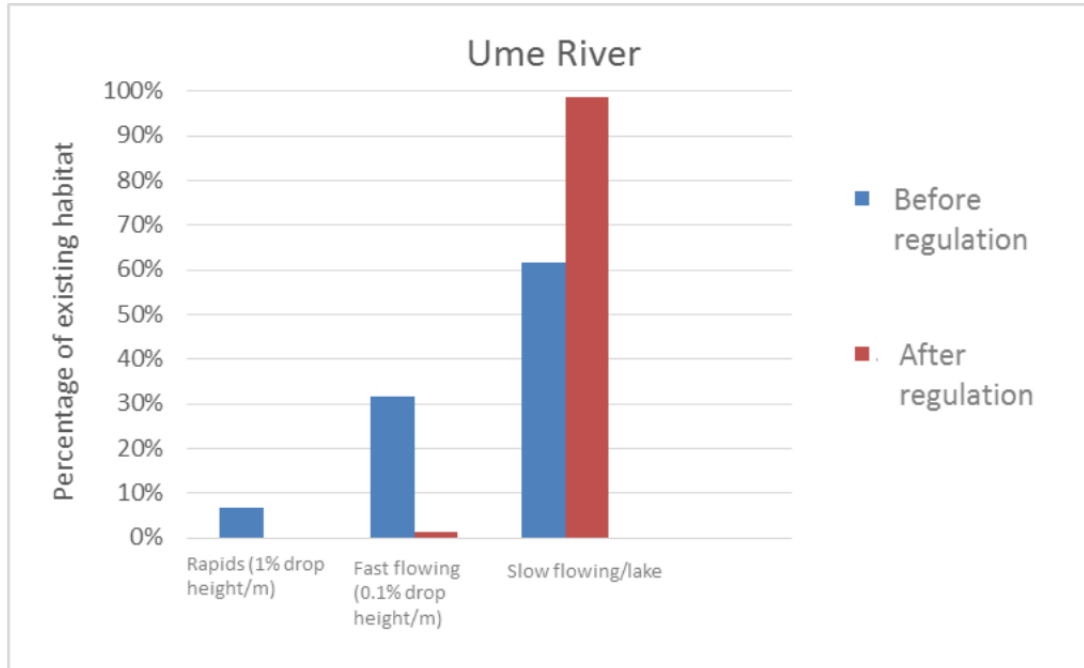


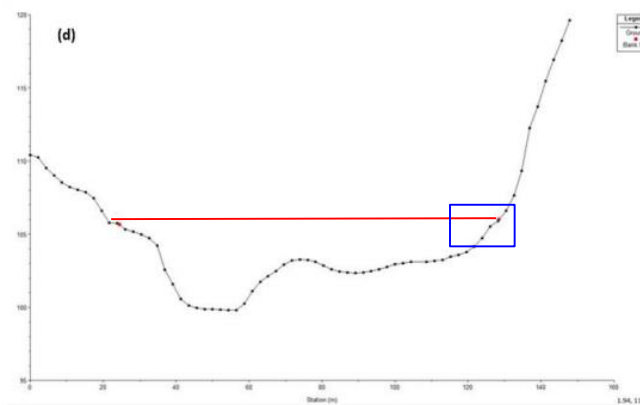
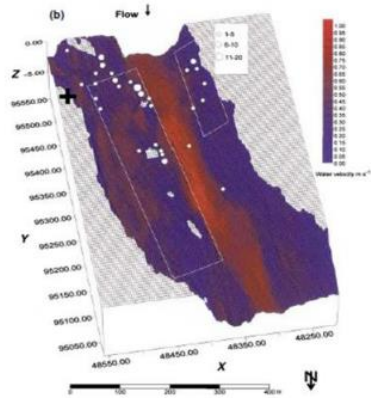
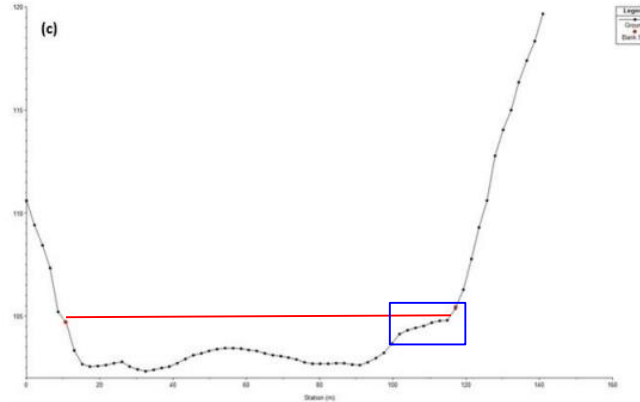
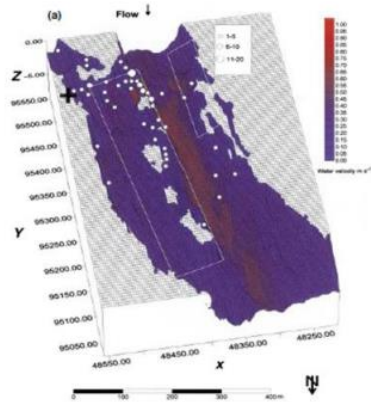
Figure 1. Percentages of existing habitat types before and after regulation in Ume River. Modified from Renöfält et al. 2017.

# Behov av heterogenitet

Table 1: Grayling habitat preferences during different seasons and life stages. From Gönczi (1989), Nykänen et.al. (2001), Nykänen and Huusko (2003) and Nykänen (2004a and b).

Season	Life stage	Water depth (cm)	Bottom substrate	Water velocity (cm/s)
Spring	Larvae (17-21mm)	10-30	Sand	<10
Spring	Larvae (22-25 mm)	30-90	Sand	<10
Spring	Larvae (26-31 mm)	50-110	Sand and boulders	10-50
Spring	Adult (Spawning)	30-50	Gravel	23-90
Summer	Adult (Foraging)	100-300	Sand	30-110
Autumn/ Winter	Adult (Wintering)	150-400	Small rocks and boulders	20-80

# Kvarvarande heterogenitet



# Återskapande av heterogenitet

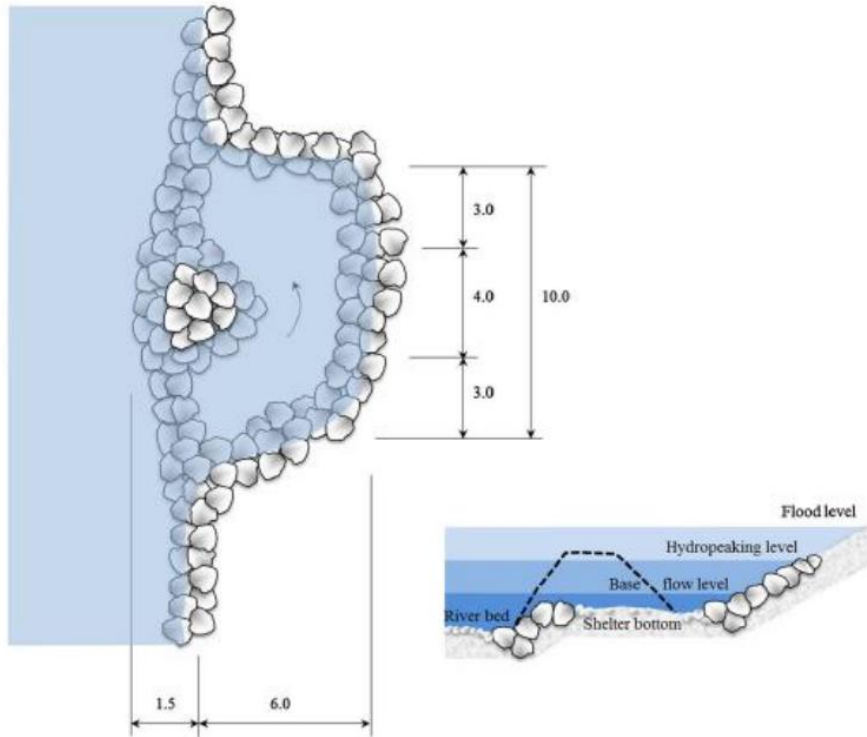
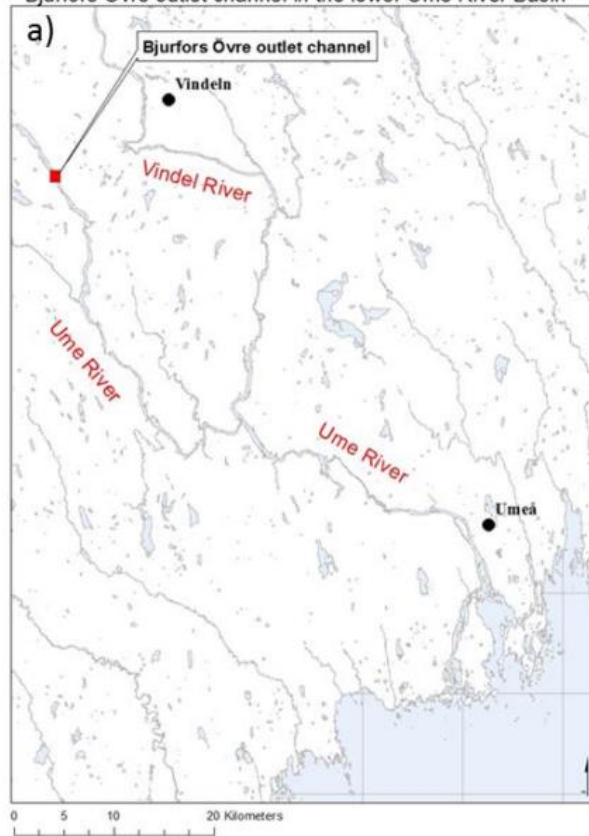


Figure 3: Recommended design and minimum dimensions (m) of a lateral shelter for juvenile trout shown from above (left) and as a cross-section (right). From Ribí et al. 2014.

# Modellering av återställning

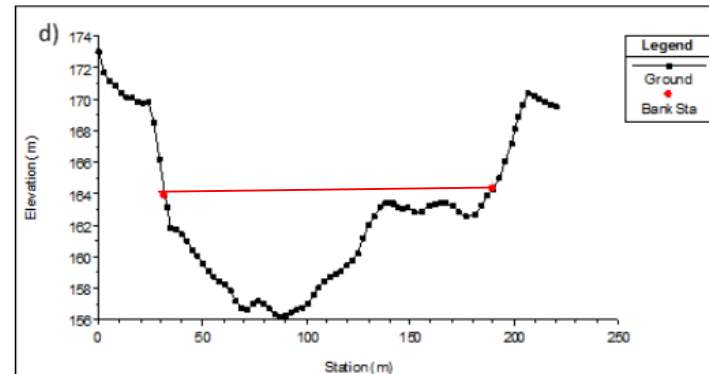
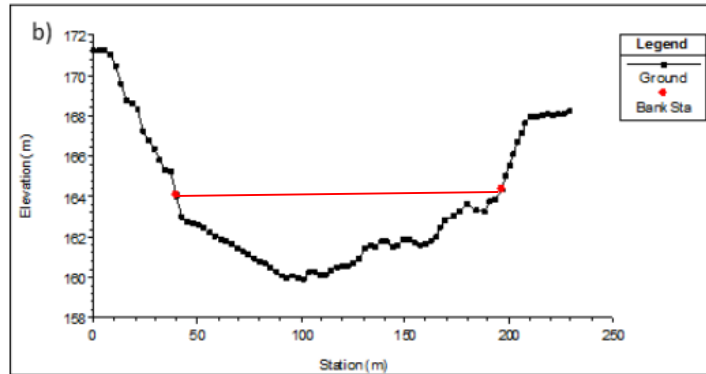
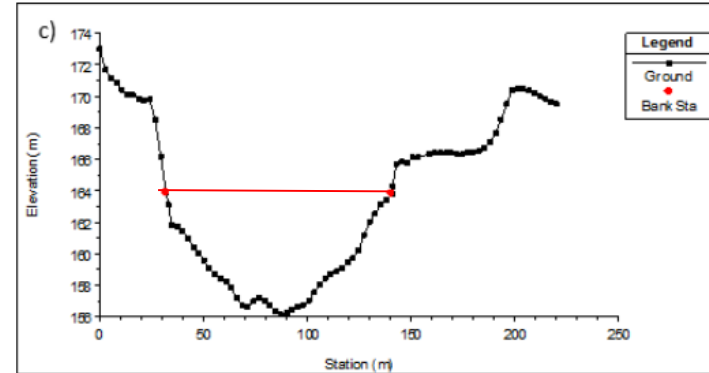
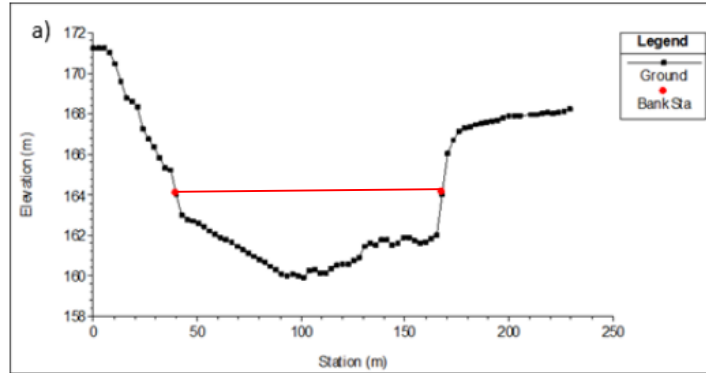
Bjurfors Övre outlet channel in the lower Ume River Basin



Bjurfors Övre outlet channel



# Återskapande av heterogenitet i stor skala





# Skillnader i områden med lämpliga djup och hastigheter

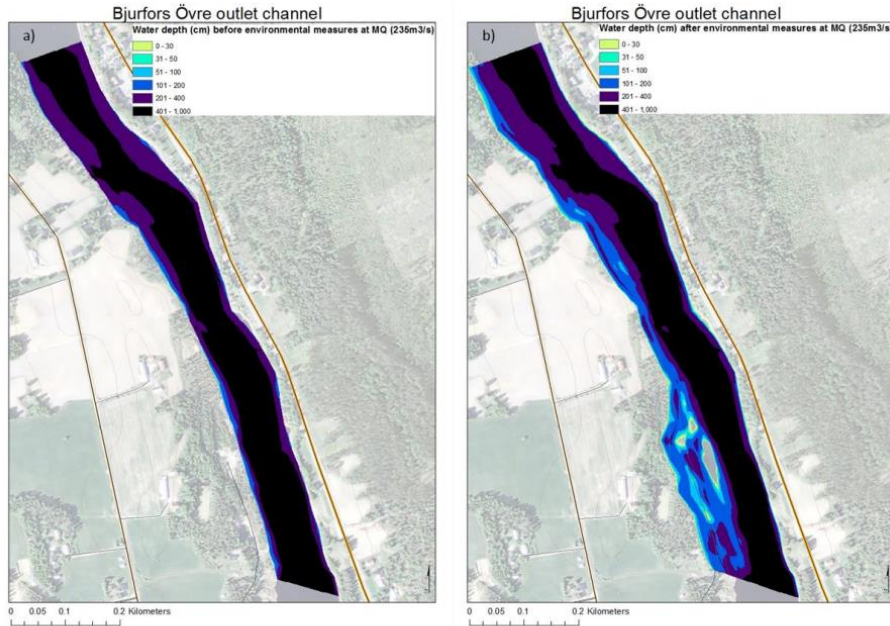


Figure 17: Map of the Bjurfors Övre outlet channel showing modelled water depth (cm) at MQ=235m<sup>3</sup>/s before (a) and after (b) environmental measures. Maps created from Ortofoto and Terrängkartan © Lantmäteriet.

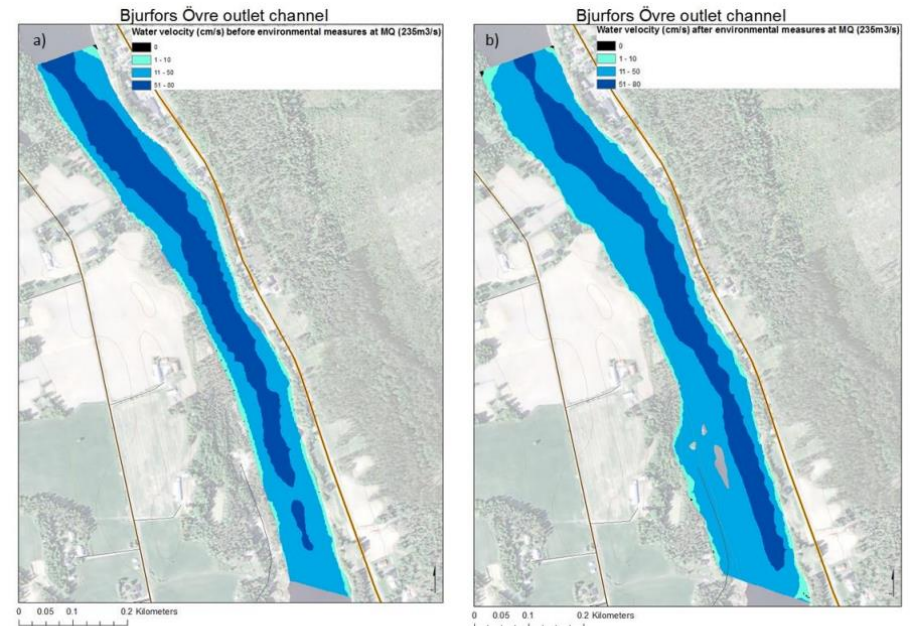
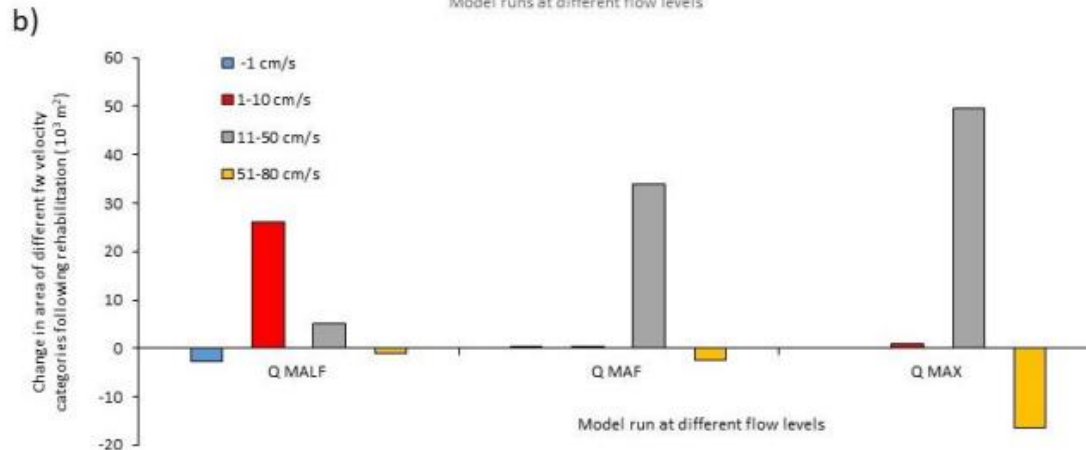
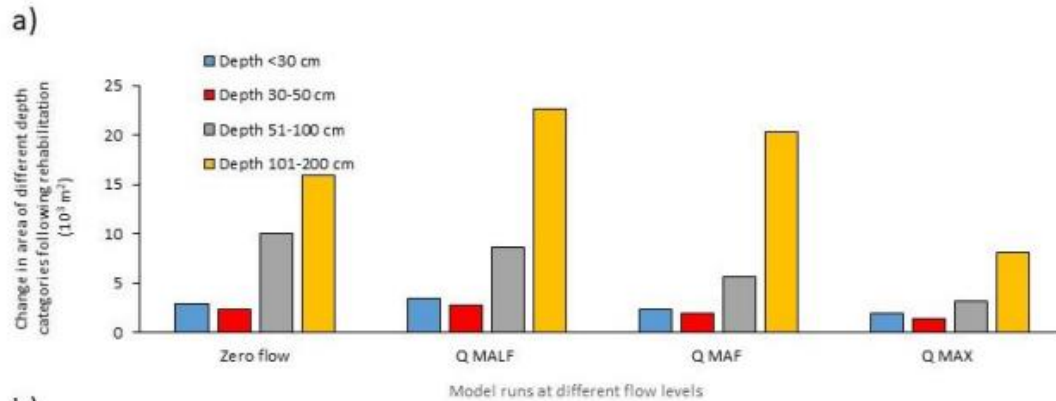
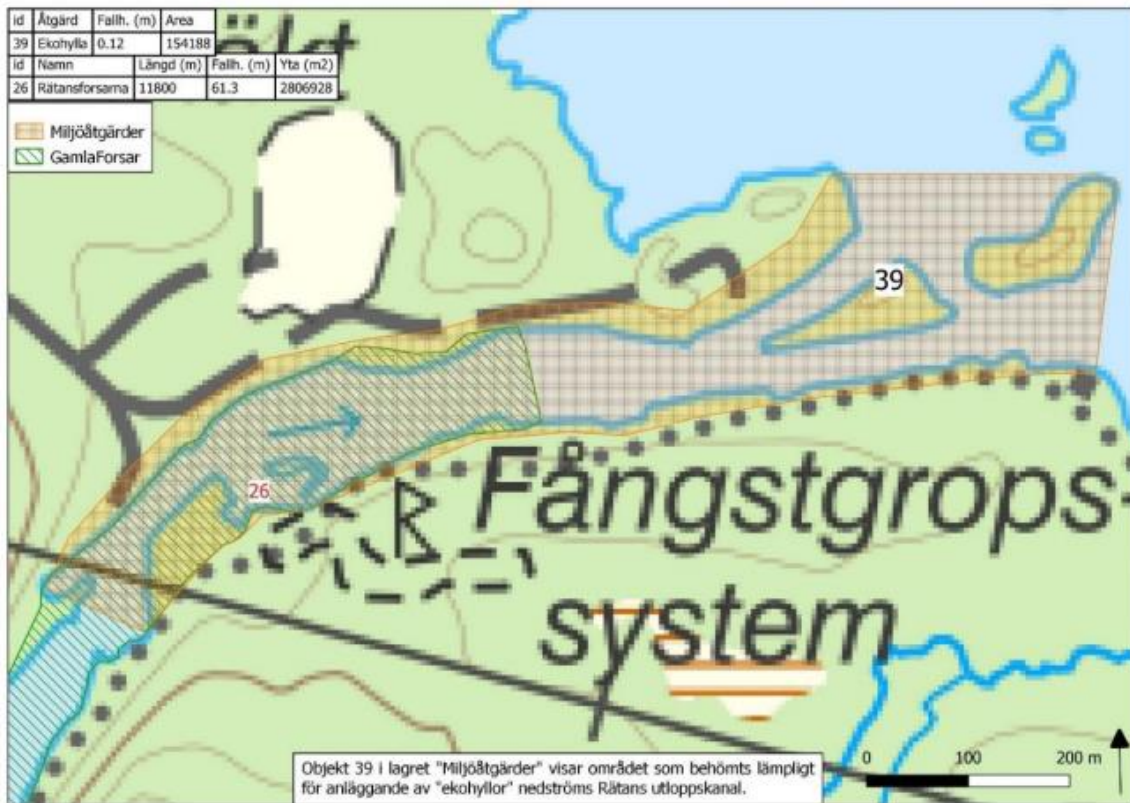


Figure 16: Map of the Bjurfors Övre outlet channel showing modelled water velocities (cm/s) at MQ=235m<sup>3</sup>/s before (a) and after (b) environmental measures. Maps created from Ortofoto and Terrängkartan © Lantmäteriet.

# Förändring i områdesstorlek med olika djup (a) och strömshastighet (b) efter åtgärder



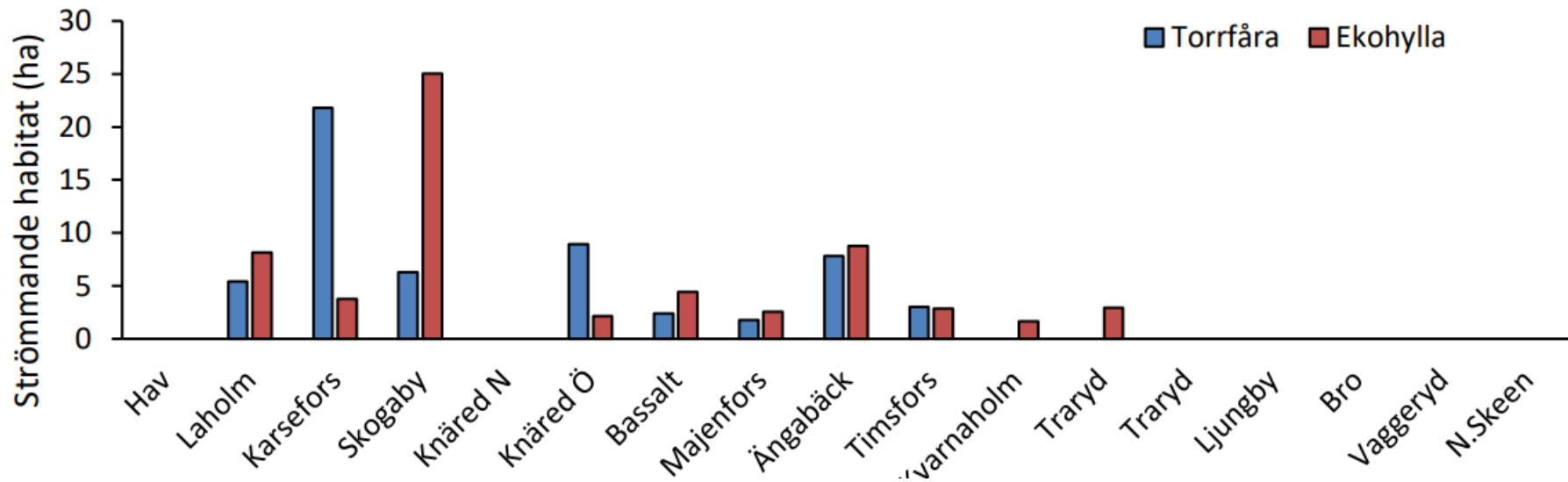
## Potential för ekohyllor i Ljungan - skapa 289.5 ha strömmande habitat nedströms 12 kraftverk (Widén et al. 2022)



Figur 3.20. Objekt 39 i lagret "Miljöåtgärder" vid Rätans utloppskanal beskriver området som bedömts lämpligt för anläggande av "ekohyllor".

Lagan - torrfåror (57 hektar) och ekohyllor nedströms kraftverken (62 hektar) (Widén et al. 2023).

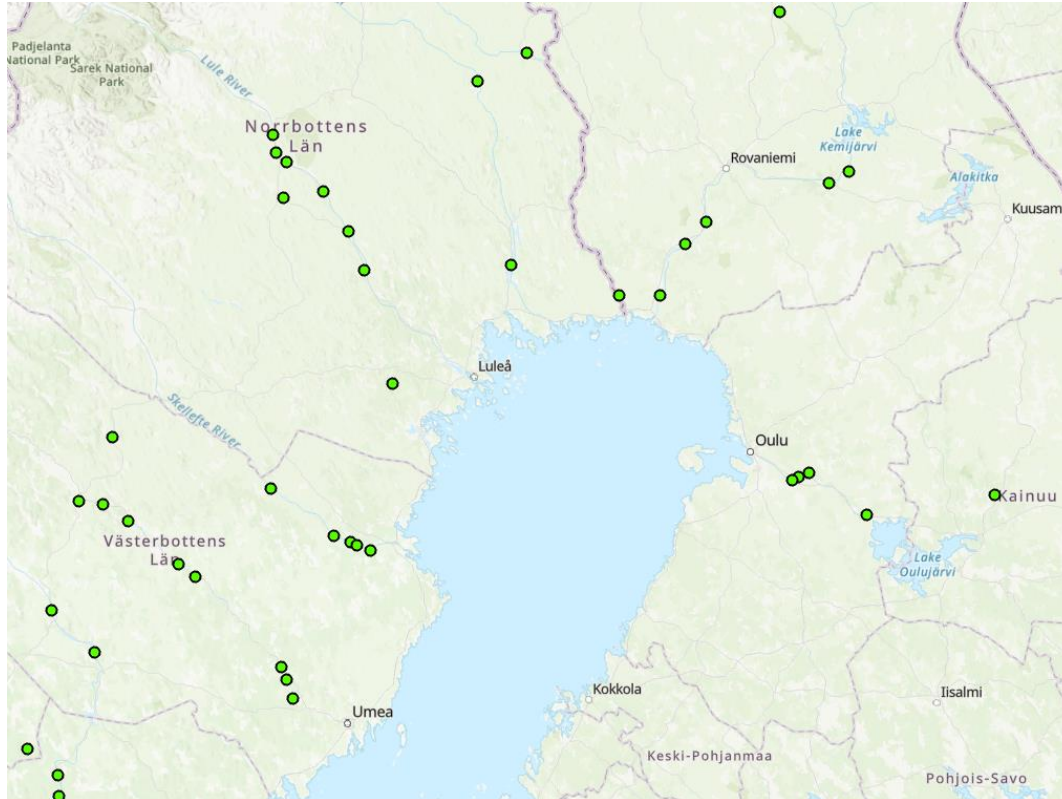
## Miljönytta strömmande habitat nytt



# Ekohyllors potential?

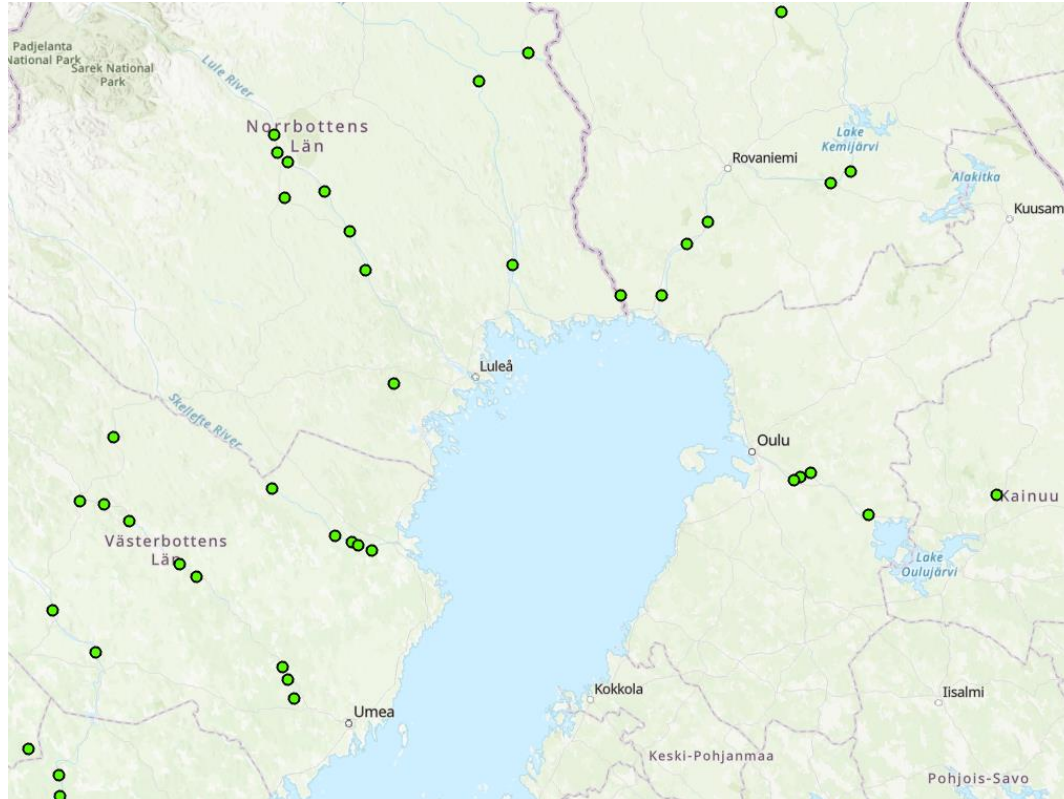
- Utloppskanaler i varje reglerad älv
- Stora arealer
- Få intressekonflikter
- Men...
  - Flödesberoende
  - Bottenmorfologi
  - Magasinstorlek?
  - Biflöden i närområde?
  - Kvarvarande fallhöjd?
  - ?

## REHYDRO – Bring hydropower management to the 21st century



- Interreg Aurora projekt
- Möta klimat- och miljömål samtidigt utan motverkan
- Samarbete mellan Oulu Universitet, LTU & SLU
- 2023-2027
- SLU
- Handledare Navinder Singh
- Doktorand Jani Ahonen

## REHYDRO - 36 potentiella värdekärnor i närheten till utloppskanaler i 6 älvar (+ 6 oreglerade referenser)



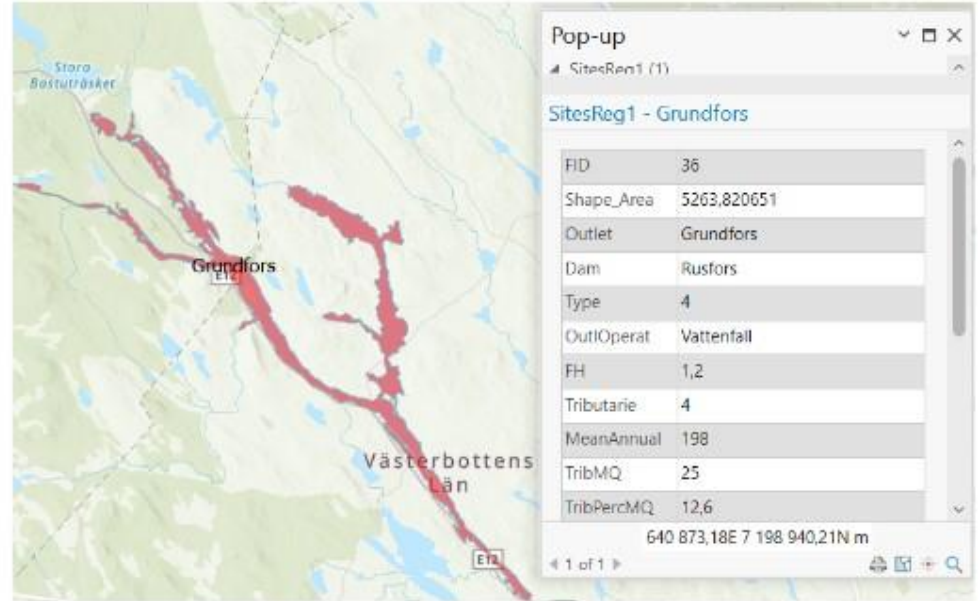
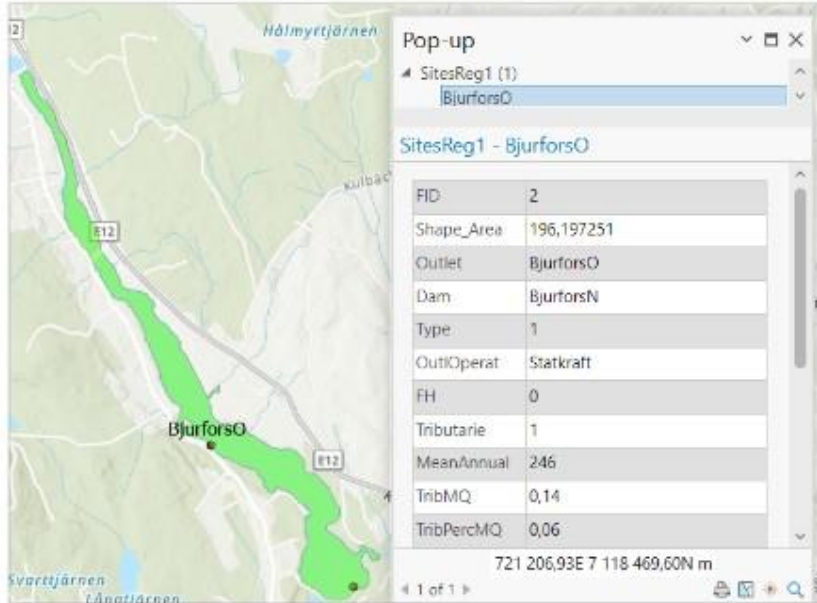
- drönarfoton
  - strand
  - älvbotten
- jord-eDNA
  - djur
- vatten-eDNA
  - djur
  - harr & FPM
- akustisk sensor
  - fladdermöss
- existerande biodata
- flödesdata
- vad skapar skillnader?

# Ekohyllors potential?

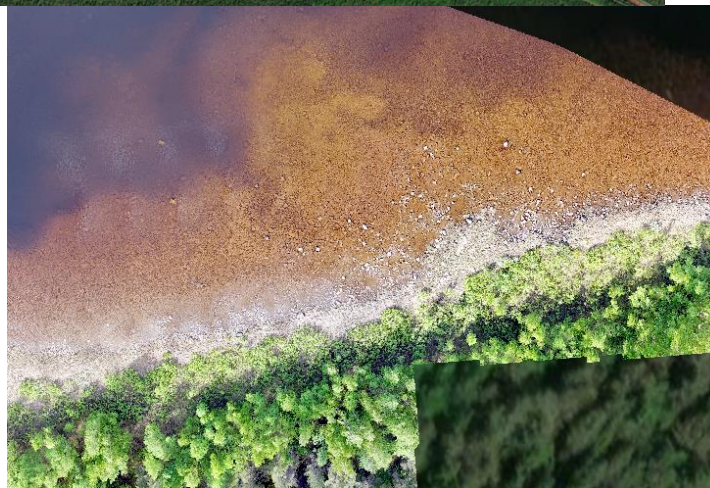
- Utloppskanaler i varje reglerad älv
- Stora arealer
- Få intressekonflikter
- Men...
  - Flödesberoende
  - Bottenmorfologi
  - Magasinstorlek?
  - Biflöden i närområde?
  - Kvarvarande fallhöjd?
  - ?



# Extremer bland mina objekt i Umeälven



# Rusfors utloppskanal (Bålforsmagasinet i Umeälven, ~3 km)



# Tack för att ni lyssnat!



Jani Ahonen  
Vilt, fisk & miljö, SLU Umeå  
[jani.ahonen@slu.se](mailto:jani.ahonen@slu.se)