



DAM REMOVAL SWEDEN

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Karlstad University – River Ecology and Management Research Group (REcMa)

Johan Andreasson (Hudiksvall municipality)

Johan Tielman (Uniper)

Erik Degerman & Leonard Sandin (Swedish Agricultural University)



Outline

1. Why are we removing dams?
2. Case-studies
 1. River Mörrumsån – Johan Tielman
 2. River Gnarpsån – Johan Andreasson
 3. *River Nianån – Johan Andreasson (Lissie)*
 4. Örebro
3. Summary



Swedish rivers are not pristine...

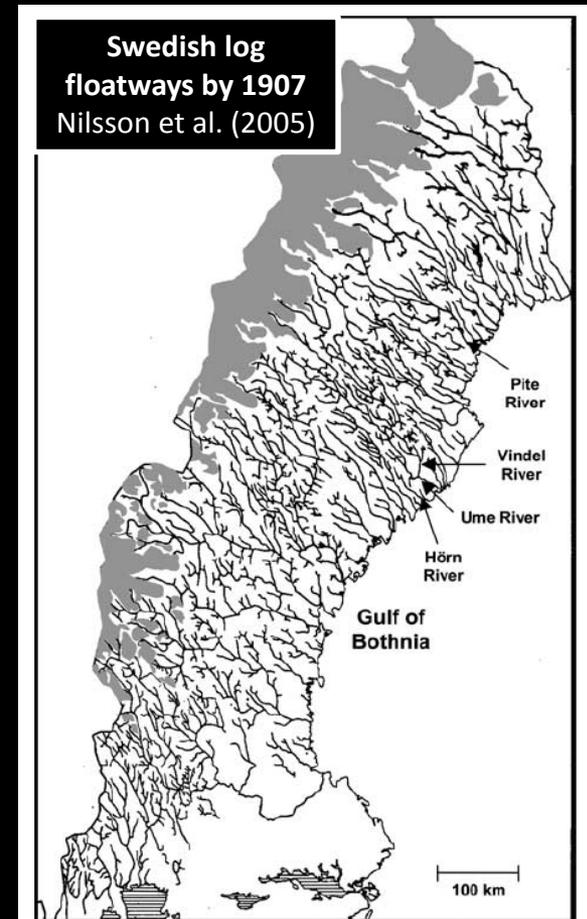


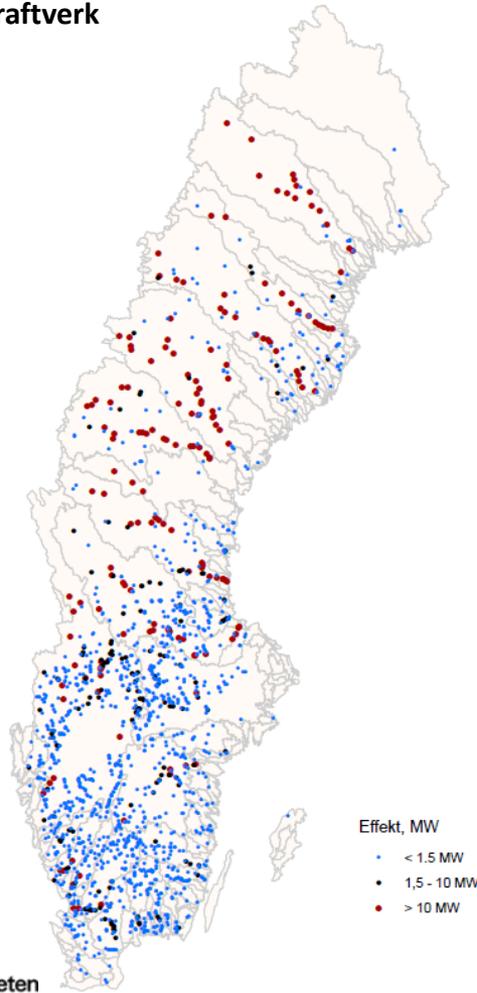
Figure 1. Map showing the network of log floatways used in northern and central Sweden (in northern Europe) by 1907 (river stretches not used for floating are not depicted). The *hatched areas* denote alpine regions without conifer log production (adopted from Andersson 1907). *Arrows* indicate the location of rivers mentioned in the text.



Photo from Daniel Holmqvist
Ume/Vindelälvens Fiskeråd

Swedish rivers - why remove dams?

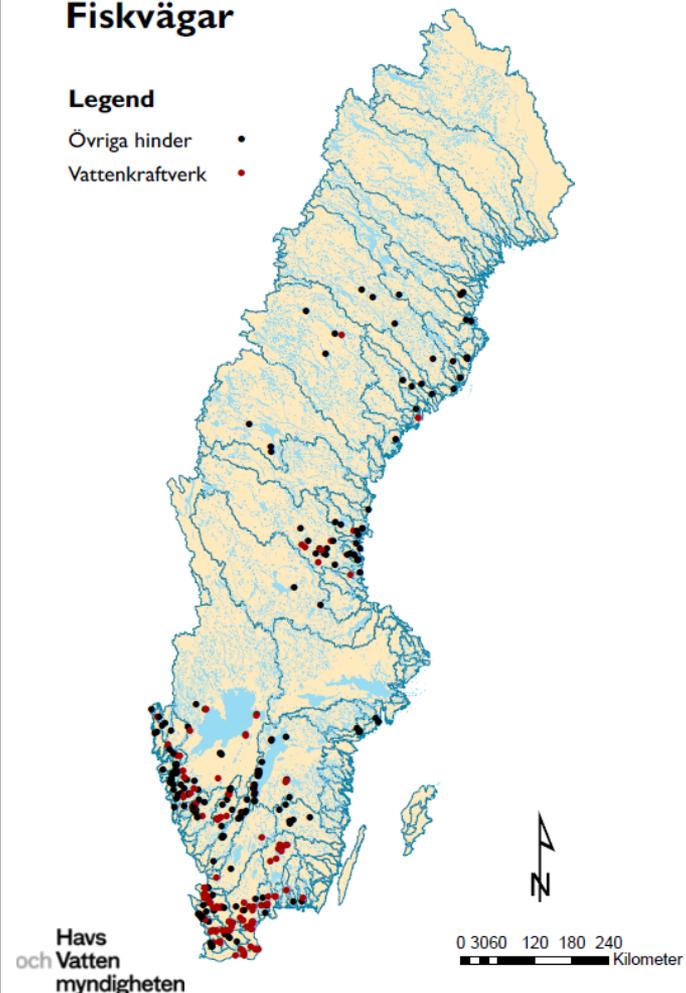
Vattenkraftverk



Fiskvägar

Legend

- Övriga hinder •
- Vattenkraftverk •



Rehabilitation measures so far...

Upstream passage



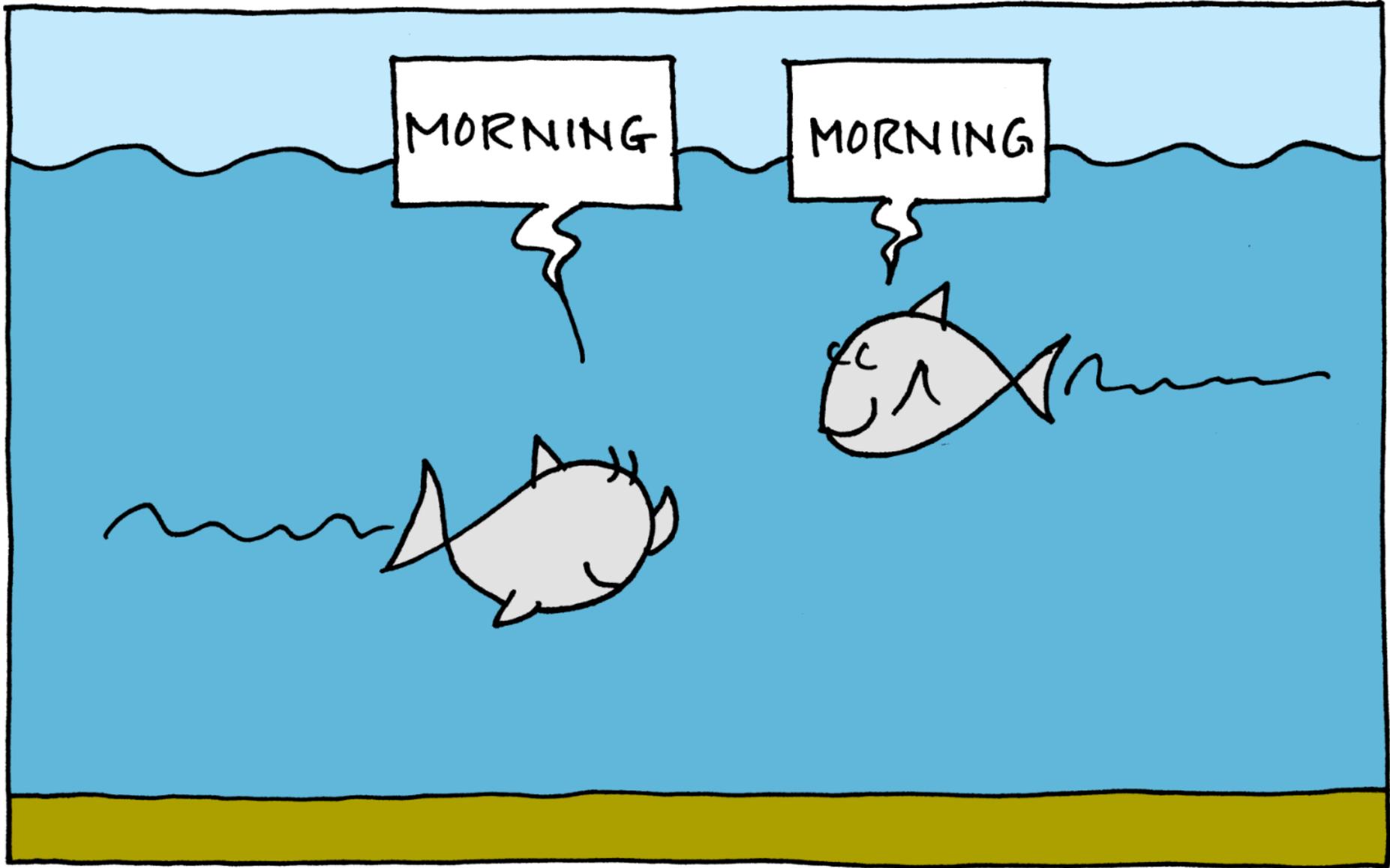
Habitat



Downstream passage



THE IDEAL SOLUTION, NO OBSTACLES



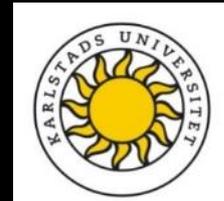
Why all these dam removals?

1. Water Framework Directive + public awareness
2. Swedish Environmental objectives:
 1. Flourishing lakes and streams
 2. Flourishing Coastal Areas and Archipelagos
3. Errors in dataset? Lissie?
4. It is also a matter of definition... Dams vs. barriers?



River Ecology & Management Research Group (REcMa)

- Extensive research on migrating fish
- National contact for DRE
- Supporting Lissie de Groot
- Will evaluate dam removals
 - BACI applied to 4 cases
 - Funding: projects, KK-foundation, REcMa) (KAU)
 - Aspects covered: fish migration, fish communities, benthic fauna, mussels, sediment transport, riparian zones and plant communities, carbon balance, decomposition etc...



Anders
Nilsson



Daniel
Nyqvist



Martin
Österling



Olle
Calles

Who is removing them?



SWEDISH DRE CASE 1

Johan Tielman

(Uniper)

→ River Mörrumsån



SWEDISH DRE CASE 2-3

Johan Andreasson

(Hudiksvall municipality)

→ River Nianån

→ River Gnarpsån

**POWER
COMPANY**

**REGIONAL
AUTHORITY**

**LOCAL
AUTHORITY**





Removal of Marieberg hydroelectric plant, River Mörrumsån

Fishmarket Luleå 20160823-20160825



SWEDISH DRE CASE 1

Johan Tielman

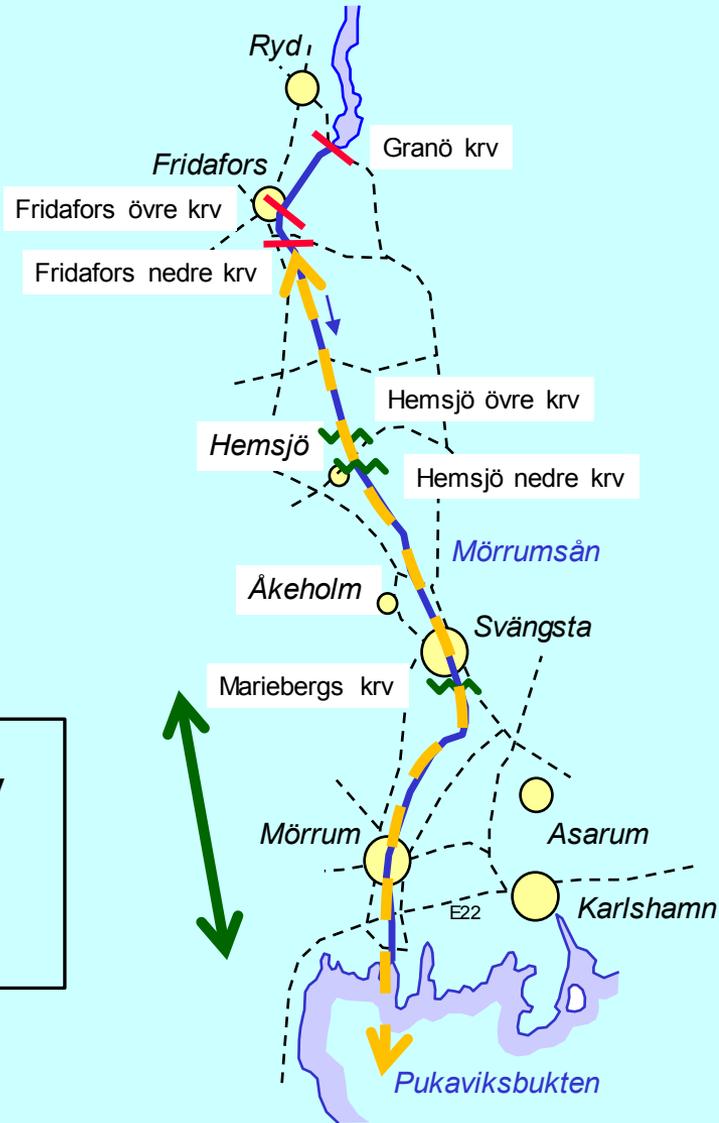
(Uniper)

→ *River Mörrumsån*



River Mörrumsån Today

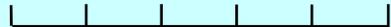
Overview river Mörrum
Plan A, skala 1 : 200.000



— Obstacle without fishway

~ Obstacle with fishway

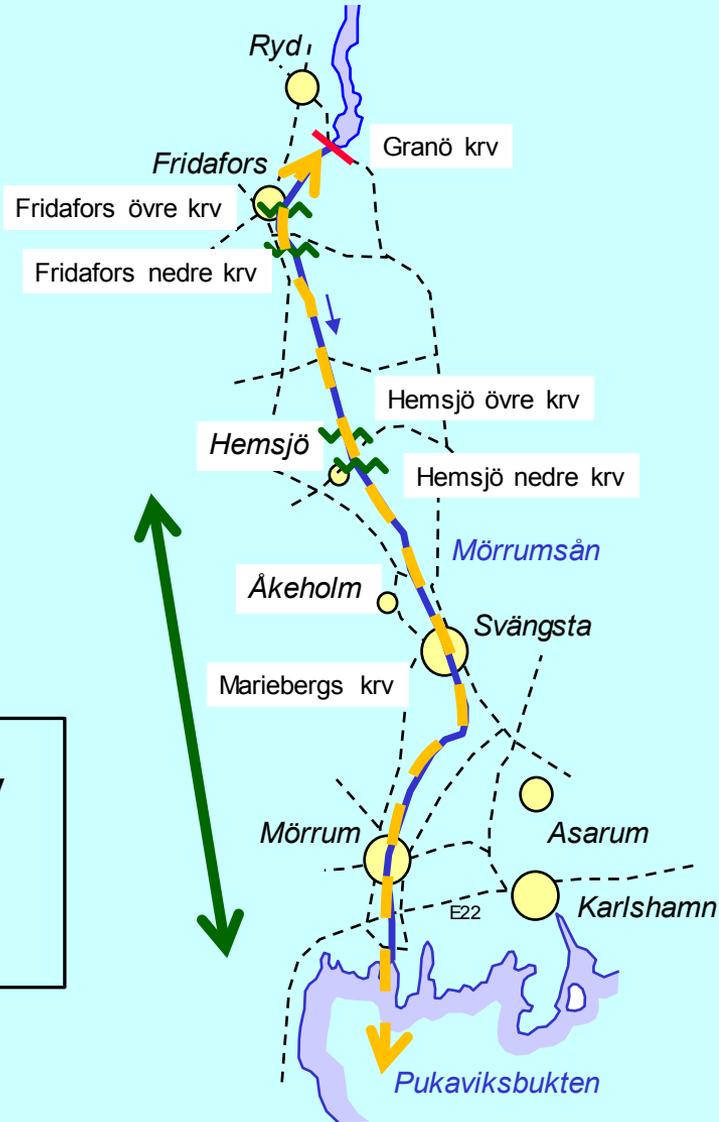
0 10 km



Fiskevårdsteknik AB
Lund 2003-06-16

River Mörrumsån Tomorrow

Overview river Mörrum
Plan A, skala 1 : 200.000



— Obstacle without fishway

~ Obstacle with fishway

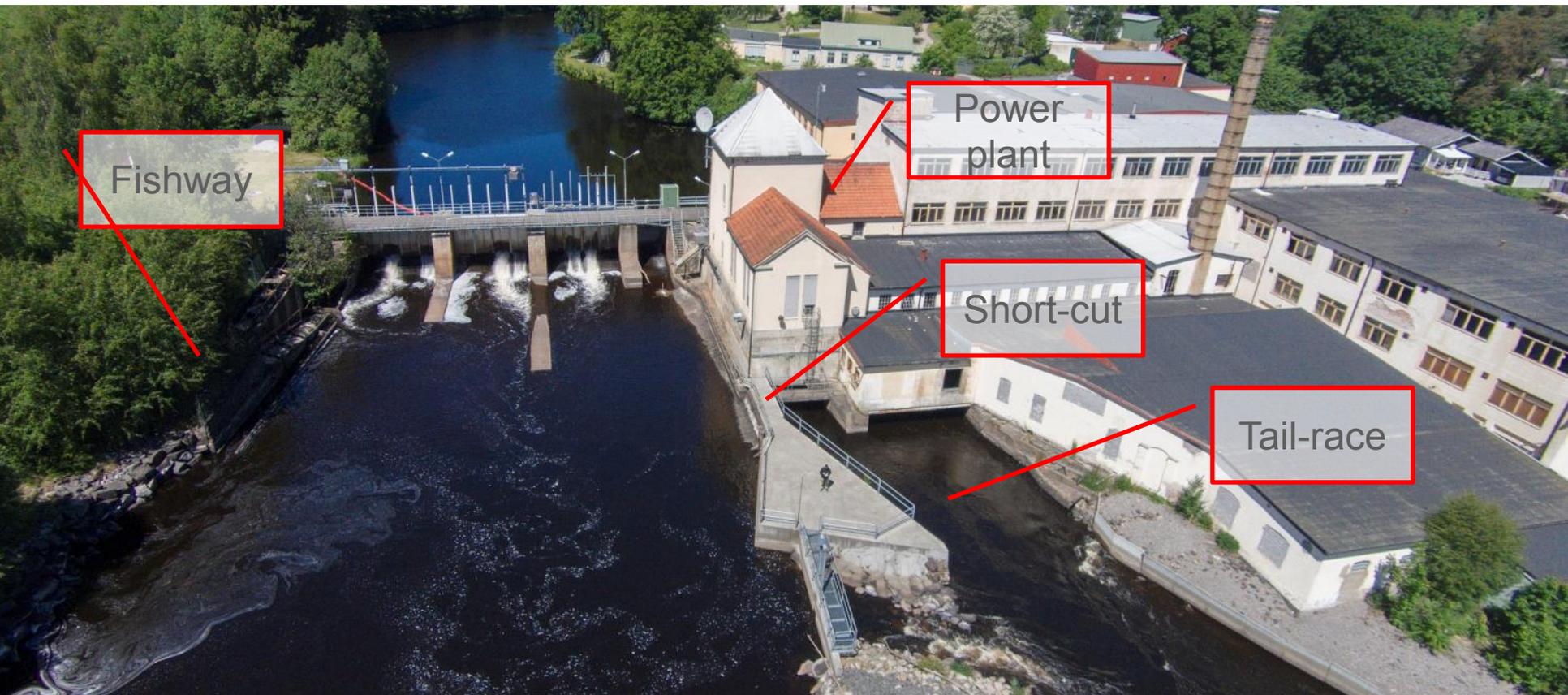
0 10 km



Fiskevårdsteknik AB
Lund 2003-06-16

Project partners

- ✓ The power company – Uniper
- ✓ County board of Blekinge
- ✓ National agency - SwAM
- ✓ Forestry company – Sveaskog
- ✓ Municipality of Karlshamn
- ✓ Universities - SLU & KAU



Why a total removal?

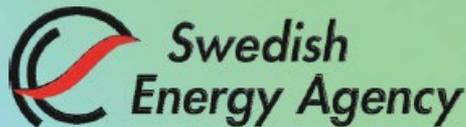
- River Mörrumsån is nationally highly prioritized!

- Limited loss of forest and land

- No

- R

Sustainable use-
National trade-off
between biodiversity
and hydropower



Niklas Egriell
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Swedish Agency
for Marine and
Water Management

Inundated stretch (≈ 1 km)



Inundated stretch (≈ 1 km)

Before



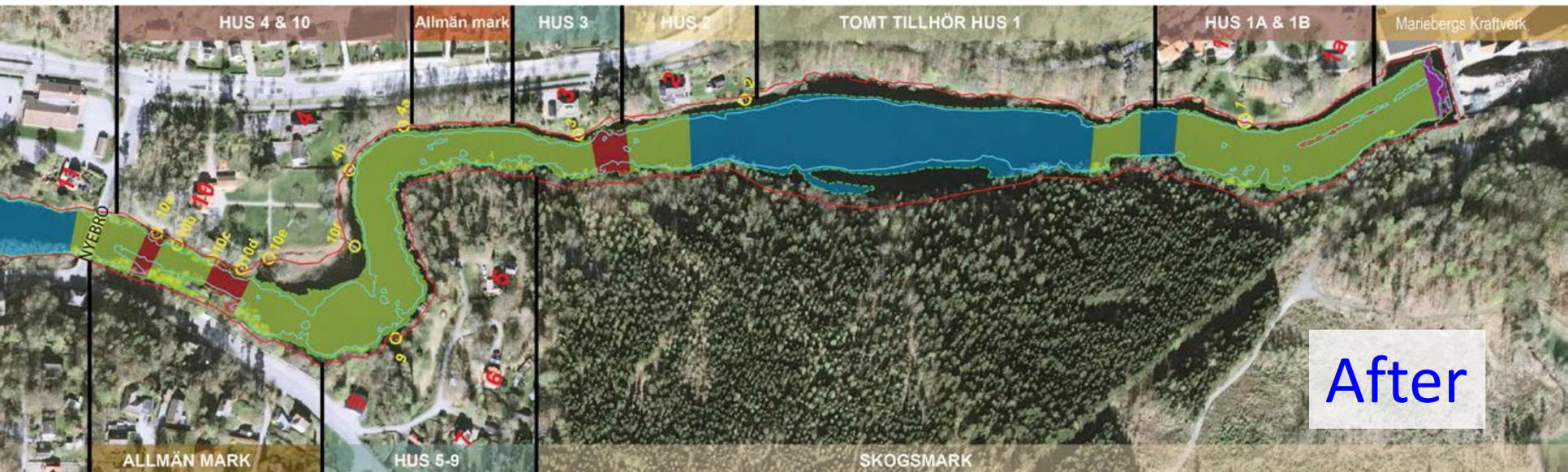
After



Expected results

- Restored heterogeneous and lotic habitat
- Increased spawning- and reproduction-areas for salmonids
 - Restored connectivity for all species
 - Loss of renewable energy

STRÖMNINGSKARAKTÄR
VID MEDELVATTENFÖRING, MQ,
EFTER UTRIVNING AV DAMM



Time-schedule

What	When
Dialogue with neighbours, NGO's and authorities	2015 - 2016
Assessment – Environmental, technical & risk	Spring 2016
Environmental court – Application	Fall 2016
Environmental court – Negotiations	Winter 2017
Environmental court – Permit	Summer 2017
Dam removal	Summer 2018



SWEDISH DRE CASE 2-3

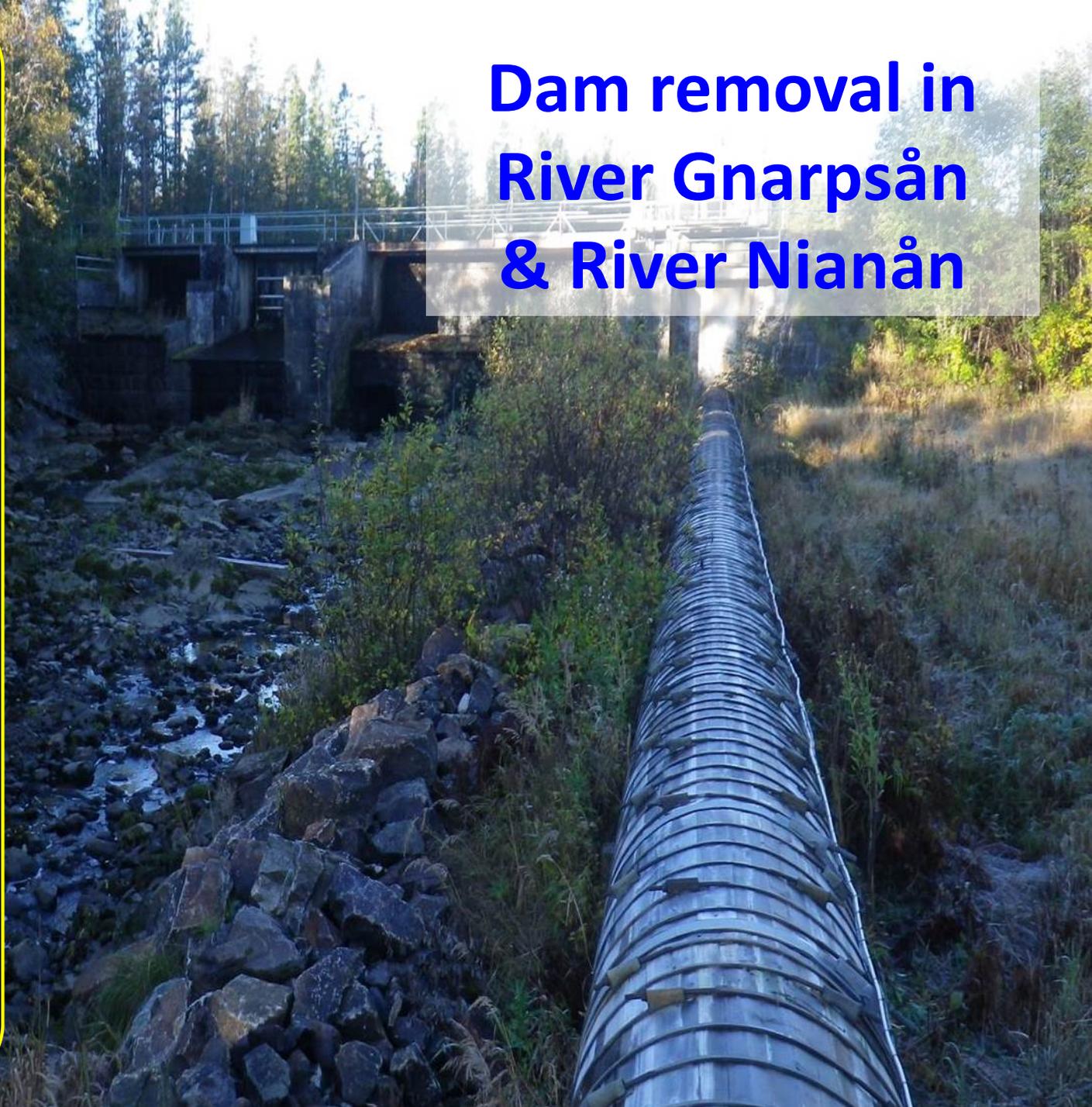
Johan Andreasson
(Hudiksvall municipality)

→ *River Nianån*

→ *River Gnarpsån*



Dam removal in River Gnarpsån & River Nianån



River Gnarpsån

Catchment: 229 km²

MQ: 2,84 m³/s

Length: 120 km (w. tribs)

Lotic habitat: 25 Ha

Lakes: 28 (total area: 7,3 km²)

Dams: 4 (2 HEPs + 2 barrages)

→ **All to be removed in 2018!**

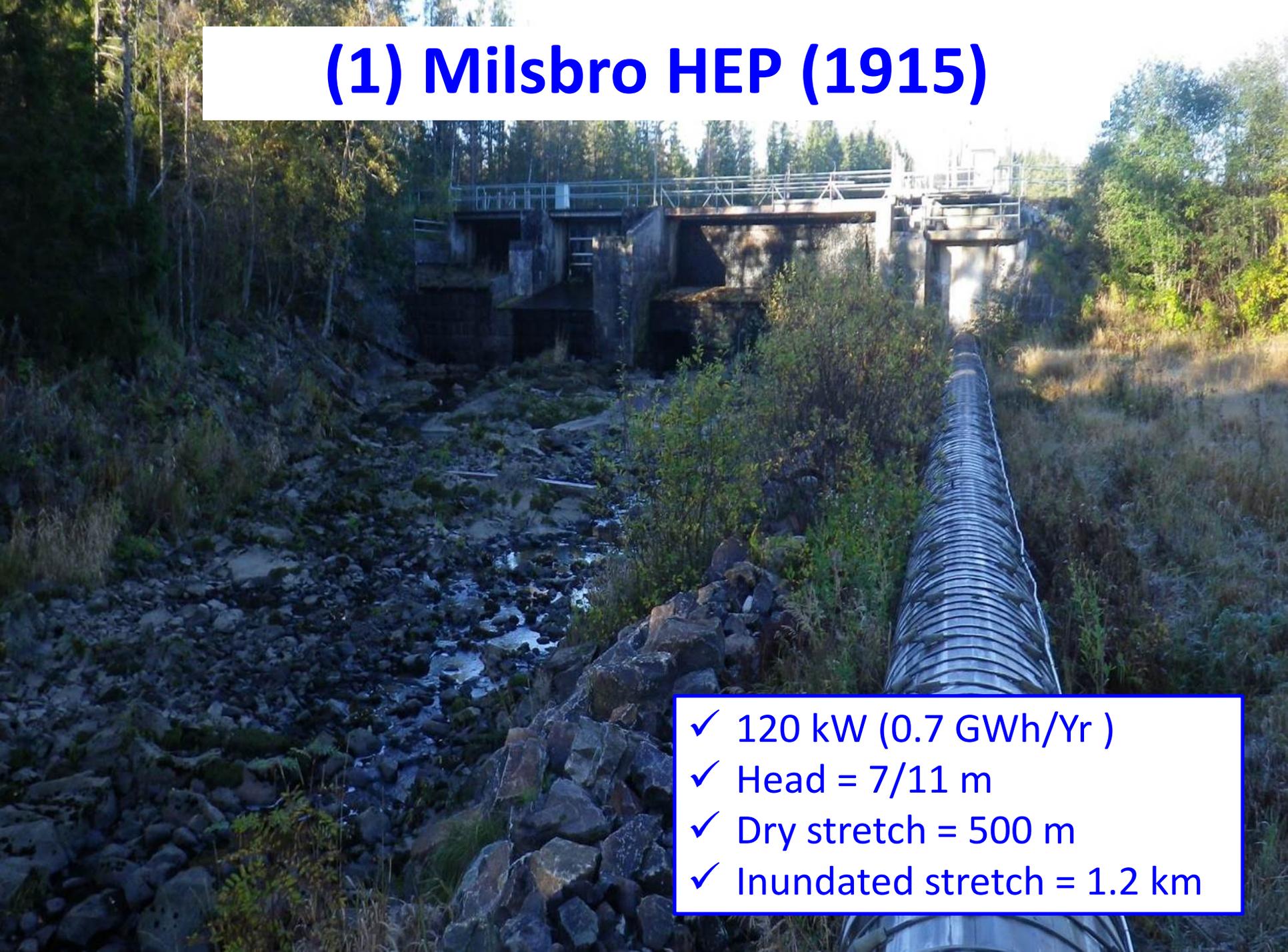
Target species:

- ✓ Brown trout (*Salmo trutta*)
- ✓ Lamprey (*Lampetra fluviatilis*)
- ✓ Freshwater pearl mussel (*Margaritifera margaritifera*)
- ✓ Crayfish (*Astacus astacus*)
- ✓ European eel (*Anguilla anguilla*)
- ✓ Grayling (*Thymallus thymallus*)

HEPs 1-2

Barrage 1

(1) Milsbro HEP (1915)

- 
- ✓ 120 kW (0.7 GWh/Yr)
 - ✓ Head = 7/11 m
 - ✓ Dry stretch = 500 m
 - ✓ Inundated stretch = 1.2 km



(2) Gällsta HEP (1940)



- ✓ 105 kW (0,6 GWh/Yr)
- ✓ Head = 5/8 m
- ✓ Dry stretch = 400 m
- ✓ Inundated stretch = 2.0 km





Why dam removal?

Hudiksvall municipality incentives:

- ✓ Increased biodiversity
- ✓ Swedish Environmental objectives:
 - ✓ Flourishing lakes and streams
 - ✓ A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
- ✓ Local growth and jobs
- ✓ Improved quality of life

Funding

21 milj. SEK (2.1 MEuro) to remove 6 dams funded by:

- Hudiksvall Municipality
- Nordanstig Municipality
- Swedish Environmental Protection Agency
- Swedish Agency for Marine and Water Management
- The Environmental Fund (Green electricity)
- Swedish Anglers Association (Ge fan i våra vatten)
- European Maritime and Fisheries Fund (EMFF)



Hudiksvalls
kommun



Nordanstigs
kommun



Bra Miljöval



EUROPEISKA UNIONEN
Europeiska
havs- och fiskerifonden



NATUR
VÅRDS
VERKET

Havs
och Vatten
myndigheten



Sportfiskarna

Sveriges Sportfiske- och Fiskevårdsförbund



Örebro county removals

1. Why?

1. The major impact on rivers – 600 dams!
2. Swe. E-objectives: Flourishing lakes and streams

2. How?

1. Tight team + supportive managers & legal expert
2. Systematic approach – Catchment by catchment

3. Funding?

1. National funding for feasibility studies
2. Green electricity and other national funds for removals

Don't you dare touch our rivers!



Sportfiskarna

Sveriges Sportfiske- och Fiskevårdsförbund



- The Soundtrack of Our Lives
- Millencolin
- Moneybrother
- Backyard Babies
- Weeping Willows
- The Hellcopters
- Voice of a Generation
- Randy
- Bitter Twins
- Bombshell Rocks
- The Hives
- The Accidents

Muchas gracias!
¿Preguntas?





**CAMPUS OR
DISTANCE STUDIES**

MASTER PROGRAM IN BIOLOGY 120 ECTS

ECOLOGY AND CONSERVATION BIOLOGY

The programme focuses on Ecology and Conservation and is led by researchers in the Biology department at Karlstad University. It is a programme for students who want to deepen their knowledge and competence in ecology and conservation, and who want to understand and contribute to sustainable resource management.

Karlstad University is located on the banks of Scandinavia's longest river, on the shores of the EU's largest lake. The research group River Ecology and Management Resource group (nrv.se) have field studies located throughout Sweden, with international cooperation throughout Europe and North America. We also house the largest indoor stream aquarium facility in Sweden, where research on stream ecology is conducted year round.

Admission by 15 april!

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KAU.SE/EN/EDUCATION

YOUR STUDY PROGRAMME

The programme of study begins with the new resilience-based course on Ecosystem Stewardship, that provides an overview of ecosystem services and their management. We follow with a course on applied Ecological Resource Management and finish with an Advanced Methods in Freshwater Ecology course. Students have space for elective courses to sharpen their own focus. Finally the Masters project is an advanced research project within our extensive research network in Sweden and abroad. Close cooperation with faculty, researchers, and graduate students with a strong commitment prepares you for further research or for employment in Sweden and abroad.

PROFESSIONAL CONTACT

The programme is led by senior researchers in the River Resources and Conservation Group in conjunction with real-time research projects (see www.kau.se/en/biology and www.nrrv.se).

Because the programme focuses on applied research projects, you gain experience working with government, private, and non-profit agencies.

You can also choose for yourself the extent to which your studies are linked to the labor market through the elective courses you choose.

Study year	Autumn semester		Spring semester	
	1	Ecosystems in a changing world	Ecological Resource Management	Free studies
2	Free studies	Free studies	Master Thesis	

For more information see:

www.kau.se/en/education/programmes/NABIM-EKNA

CONTACT

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Student councillor: Carina Skantz carina.skantz@kau.se

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