# River basin connectivity restoration in Finland



Jukka Jormola Finnish Environment Institute SYKE

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#### Contents

- Conflicting interest: hydropower fish
  - Post-war policy: Energy need loss of salmon rivers
  - Now: Regulatory energy value of minimum flows
- Policy change: From stockings to natural reproduction
- Research on fish passes, downstream migration and environmental flows
- Problems in permit renewals
- Are fish passes enough? compensation of habitats

#### **Degradation of the ecological state of rivers** Example: River Oulujoki, Finland in the 1920's

- Upmost free rapids
- Route for tar transportation
- Famous for salmon fishing







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# Utilization of River Oulujoki for hydro power after 1930's



- The total elevation 120 m was dammed by 7 power plants
- Salmon was lost
- Compensation only by stocking to the sea
- One fish pass in the lowest powerplant Merikoski in Oulu city



# The only fish pass at River Oulujoki

- A fish pass at Merikoski powerplant was opened 2003
- Promblem: lack of spawning sites because of dams
- What have the salmon to do in the totally dammed river?



Photo: Panu Orell





Fish pass window

# National fish pass strategy 2012

- Reviving endangered and weakened migrative fish stocks
- Changing policy from stockings to natural reproduction
- Priority river basins were named
- Rivers with
  - vanished salmon stocks
  - endangered lake salmon stock
  - endangered sea trout stocks
- The most "hopeless" rivers like Oulujoki were left out



#### **Implementation of the fish pass strategy** by the governmental programme 2017-2018

- Fish passes by state money (not as permit requirement)
- Restoration of some reproduction areas



## **Opinions of the programme**

- Good: 8 new fish passes
- Bad: all of them are technical
- Mainly migration of salmon is considered
- Compentation habitats and other species is **not** promoted in fish pass projects
- Downstream migration and mortality in powerplants not yet solved, there is some pilot research



# **Restoration of ancient estuary side channels of R. Oulujoki in Oulu City 2018**



 New habitats and increased flow year round for the reproduction of sea trout



# **Example of a new side channel as habitat** Imatra urban brook 2015, R. Vuoksi

Constructed channel with 300/ 150 litres/sec Touristic landscape values

![](_page_9_Picture_3.jpeg)

![](_page_9_Picture_4.jpeg)

![](_page_9_Picture_5.jpeg)

![](_page_9_Picture_6.jpeg)

![](_page_9_Picture_7.jpeg)

![](_page_9_Picture_8.jpeg)

#### **Fish monitoring 2016-2017** KAS ely-centre, SYKE

- High densities of brown trout
- Also small natural fish species
- High survival rate, 75 % of first - second summer juveniles
- Enough nourishment
- Production of trout smolts

![](_page_10_Picture_7.jpeg)

5 times greater/area than in natural rivers

![](_page_10_Picture_9.jpeg)

| Site    | 2016<br>0+ | 2017<br>1+ | 2017<br>0+ |
|---------|------------|------------|------------|
| 1       | 63         | 13         | 64         |
| 2       | 76         | 42         | 3          |
| 3       | 17         | 62         | 0          |
| 4       | 41         | 19         | 131        |
| 5       | 3          | 17         | 17         |
| Average | 40         | 30.6       | 43         |

# **Examples in Europe**

- Biggest constructed reproduction channel: Rheinfelden, Rhine
- 1 km, 10 35 m<sup>3</sup>/s
- 34 000 fish, 33 species 2012

![](_page_11_Picture_5.jpeg)

![](_page_11_Figure_6.jpeg)

 Long bypass channels, Danube 10 km, 10 m<sup>3</sup>/s

#### **Examples from Canada** Production of juveniles in compensative channels

- No-net-loss of habitats is required in the legislation, impacts are evaluated
- We have a lot to learn

![](_page_12_Picture_4.jpeg)

![](_page_12_Picture_5.jpeg)

# **Dam removals**

#### Sågarsfors, Siuntionjoki 2006

- Dam of a small hydro power plant was demolished
- Voluntary buying and stopping the use of the power plant

Mikko Koivurinta

![](_page_13_Picture_6.jpeg)

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# **Ongoing projects**

- Cities have decisions to remove dams, to revive their rivers for migrative fish and recreation, SYKE is participating in two
- Tikkurilankoski dam, Vantaa city, removal 2018-2019

![](_page_14_Picture_4.jpeg)

# Municipal power companies have made decisions to stop small power plants

- Tourujoki power plant, Jyväskylä city, removal 2019-2020
- A new rapid with 13 m elevation will be constructed
- Visions of trout, recreation and tourism won the idea of reneweble energy

![](_page_15_Picture_5.jpeg)

Ramboll

#### Lahnasenkoski dam, River Hiitolanjoki

- Vantaa Energy made the decision 2017 to sell the powerplant- no value for PR anymore
- The dam will be partly demolished 2019-2020
- Helps the revival of lake salmon, migrating from Ladoga Lake, Russia

![](_page_16_Picture_5.jpeg)

#### Conclusions

- Finland has a principally good strategy for reviving continuity and fish stocks – still only the aspect of migration (connectivity)
- Modernicing old hydropower permits is a big problem
- Awereness for the need of reviving lost fish stocks has risen lately
- Municipalities recognice ecosystem services of free rivers
- Results of the first compensative habitats are promising not yet applied widely
- Implementation of WFD is **not** taken seriously
  - Requirements for Heavily modified water bodies
  - Legislation for compensation still on volyntary basis
  - Environmental flows

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• No net loss of diversity