Implementation of the EU WFD in Finland

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Implementation of the EU WFD in Finland

- Designation of Heavily Modified Water Bodies
- Identification of HMWBs
- Ecological Classification
- Classification of HMWBs

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Introduction - defining hydromorphological status

- Hydromorphological status is evaluated with so called HyMo-criteria
- In this method water bodies are given points according to the level of anthropogenic changes in their hydrological and morphological pattern
- Water bodies can be designated as heavily modified **either according to the direct criteria** or with the **more specific evaluation** with the HyMo-criteria

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Direct criteria for designation as heavily modified water bodies

- Regulated lakes
  - Water-level draw down during winter
    - is over 3 m, or at least half of the average depth or
    - decreases the water covered area to at least half of the regular size
- Rivers
  - River has been changed by damming, cleaning, embanking or moving for at least half of its length or at least half of its natural head loss is dammed
- Dammed coastal bays
  - No natural connection to the sea exists

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Heavily Modified Water Bodies in Finland

- Until now, we have 6165 water bodies of which ecological status was possible to classify in 2600 water bodies
  - Rivers 1604, Lakes 4286 and Coastal waters 275

- There are altogether 126 heavily modified water bodies
  - Lakes 32
  - Rivers 79
  - Coastal waters 13
- There are altogether 29 artificial water bodies
  - Lakes 25
  - Rivers 4

- The number of heavily modified and artificial water bodies is 5 % of the total number of classified water bodies and 2 % of total number of all water bodies

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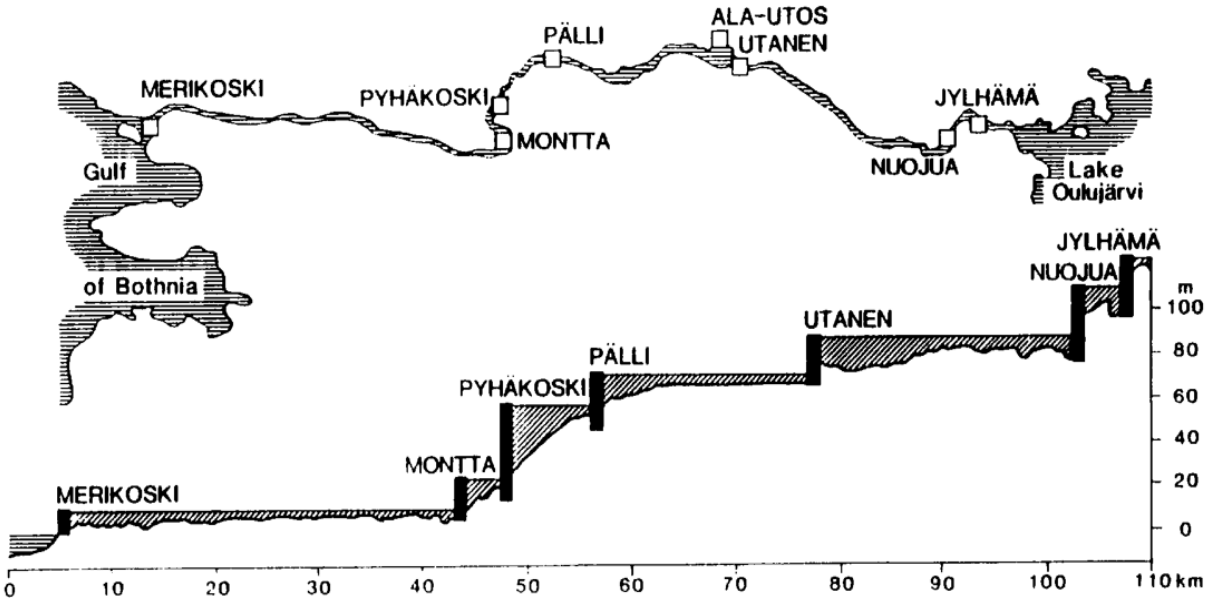
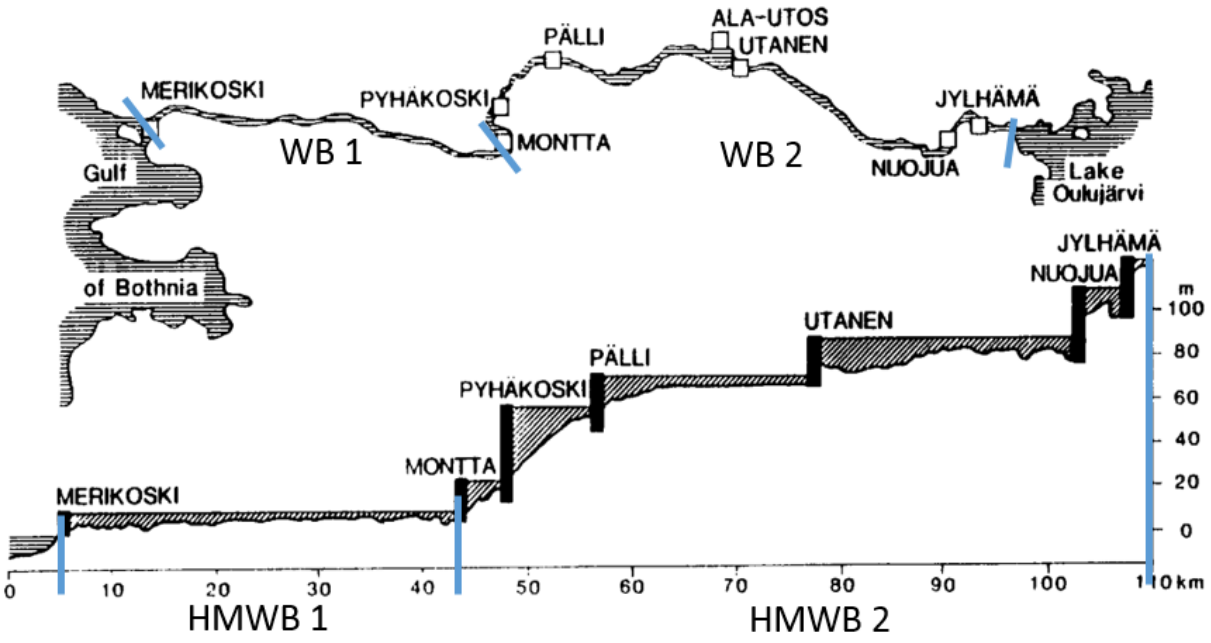
The River Oulujoki



- Length 110 km
- Mean flow 250 m^3/s
- Catchment area 22 800 km^2
- 8 hydropower plants
- Annual production 2 TWh
  - Flexible power 50-450 MW
  - Storage co-efficient 60%
    (annual flow/available storage in upstream reservoirs)
    - Flexible power available even during spring flood period

Identification of water bodies



- Bodies of Water
  - River before construction of hydropower plants
  - Type: very large humic river
    - Lowland river < 200m
  - 2 bodies of water
    - First step identification according to original situation (no HPPs)
    - Different kind of land use and slope of local catchment area
    - different kind of valley shape
    - Different mean water slope
    - Different kind of form and shape of main river bed
    - Different kind of substratum composition
  - HMWBs
    - Second step designation of HMWBs and possible revision of Waterbody identification
    - 100 % of original head has been built
      - Impact area of HPPs is the whole main stem
      - Main stem Heavily Modified
    - Most of differences of original river WBs still relevant
      - No need to revise identification
    - 2 HMWBs

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Biological quality elements

Rivers

- Fish
  Finnish Fish Index
- Benthic Invertebrates
  Three metrics: PMA (Percent Model Affinity), Type Specific Taxa and Type Specific EPT-Taxa)
- Diatoms
  Two metrics: PMA (Percent Model Affinity) and Type Specific Taxa

Lakes

- Fish
  EQR4 - index
  Benthic Invertebrates
  Benthic Quality Index
- Macrophytes
  Three metrics: PMA, Type Specific Taxa, Reference Index
- Diatoms
  Two metrics: PMA (Percent Model Affinity) and Type Specific Taxa
- Phytoplankton
  Three metrics: Biomass, Chlorophyll a, % of blue-green alga

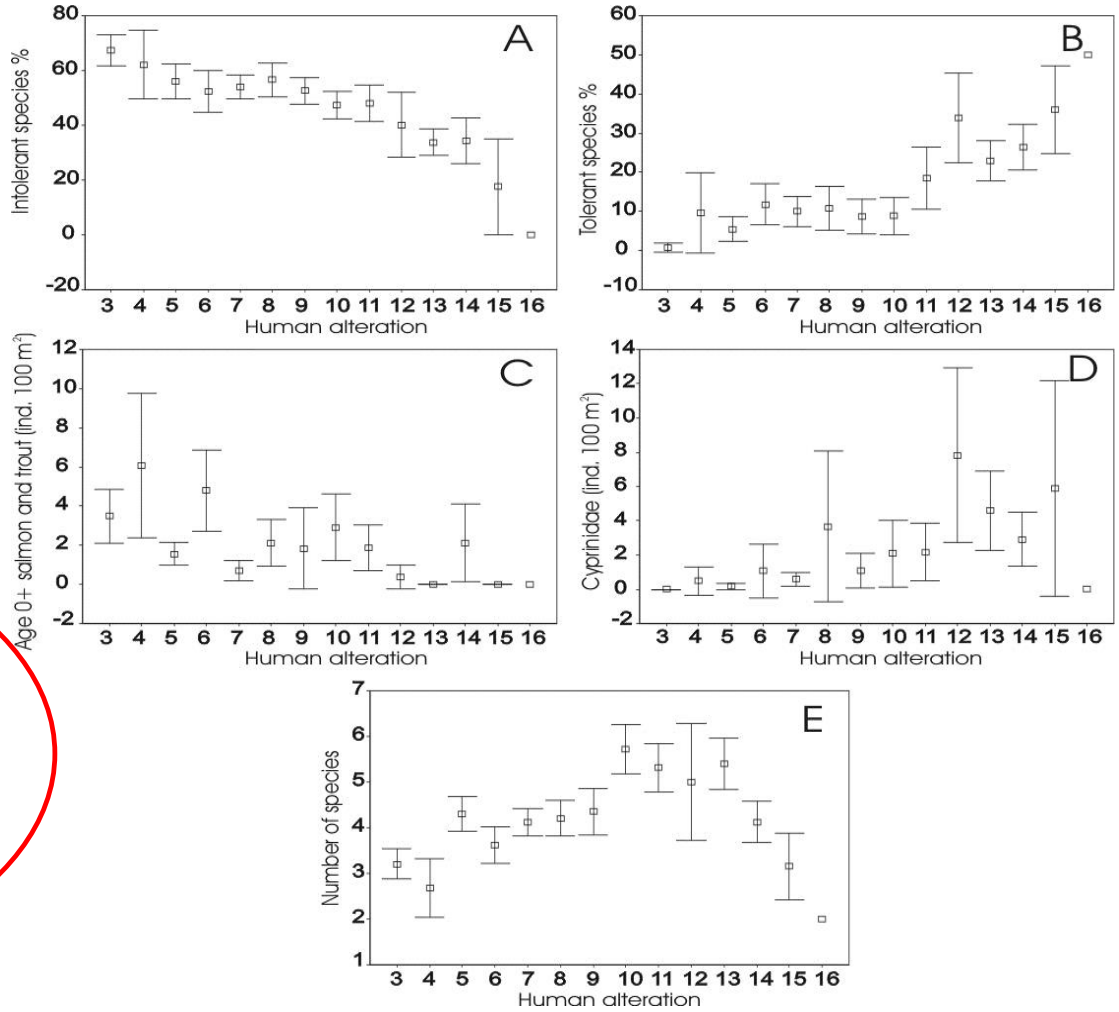
FiFI – Finnish Fish Index

-**WFD** – Composition, abundance and age structure of fish fauna must be monitored when assessing the ecological status

-Finnish Fish Index compiles five fish metrics, selected from large group of candidate metrics, which gave best response to human impact on the environment (rivers)

These five metrics are:

A Proportion of intolerant species
B Proportion of tolerant species
C Density of 0+ salmonid juveniles
D Density of "Cyprinid"-group
E Number of fish species



Vehanen, T., Sutela, T. & Korhonen, H. 2010. Environmental assessment of boreal rivers using fish data – a contribution to the Water Framework Directive. Fisheries Management and Ecology 17: 165-175.

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The approach - content

- The aim is to identify for which of the following three categories the WB belongs:
  - Water body is already in GEP
  - Unclear situation: water body may or may not be in good ecological potential
  - Water body is not yet in GEP
- The process includes the identification of potential hydro-morphological mitigation measures and the assessment how much they improve the current status
- The biological conditions are not described in EQRs. The focus is to assess the order of magnitude of the mitigation measures' impacts
- It is possible to carry out the process using experts' judgments about the order of magnitude for HyMo measures' impacts

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HYDROMORPHOLOGICAL "TEST"

TASK 1: Identify all hydro-morphological mitigation measures which improve the ecological status and do not have significant adverse effect on uses.

TASK 2: Assess the impacts of chosen mitigation measures on relevant biological quality elements, different uses of water course and costs.

TASK 3: Develop a reasonable combination(s) of mitigation measures which do not have significant adverse impacts on uses and which improve ecological status as much as possible.

TASK 4: Define the cumulative ecological overall impacts of the chosen measures, and assess which is the most appropriate group:

1. No or slight positive ecological impact
2. Moderate positive ecological impact
3. Significant positive ecological impact

Group 1	Group 2	Group 3
GEP is already achieved	Uncertain situation GEP may be not achieved	GEP is probably not achieved
No mitigation measures are required	Undertake the further assessment or wait for the results of monitoring	Undertake cost-efficient mitigation measures

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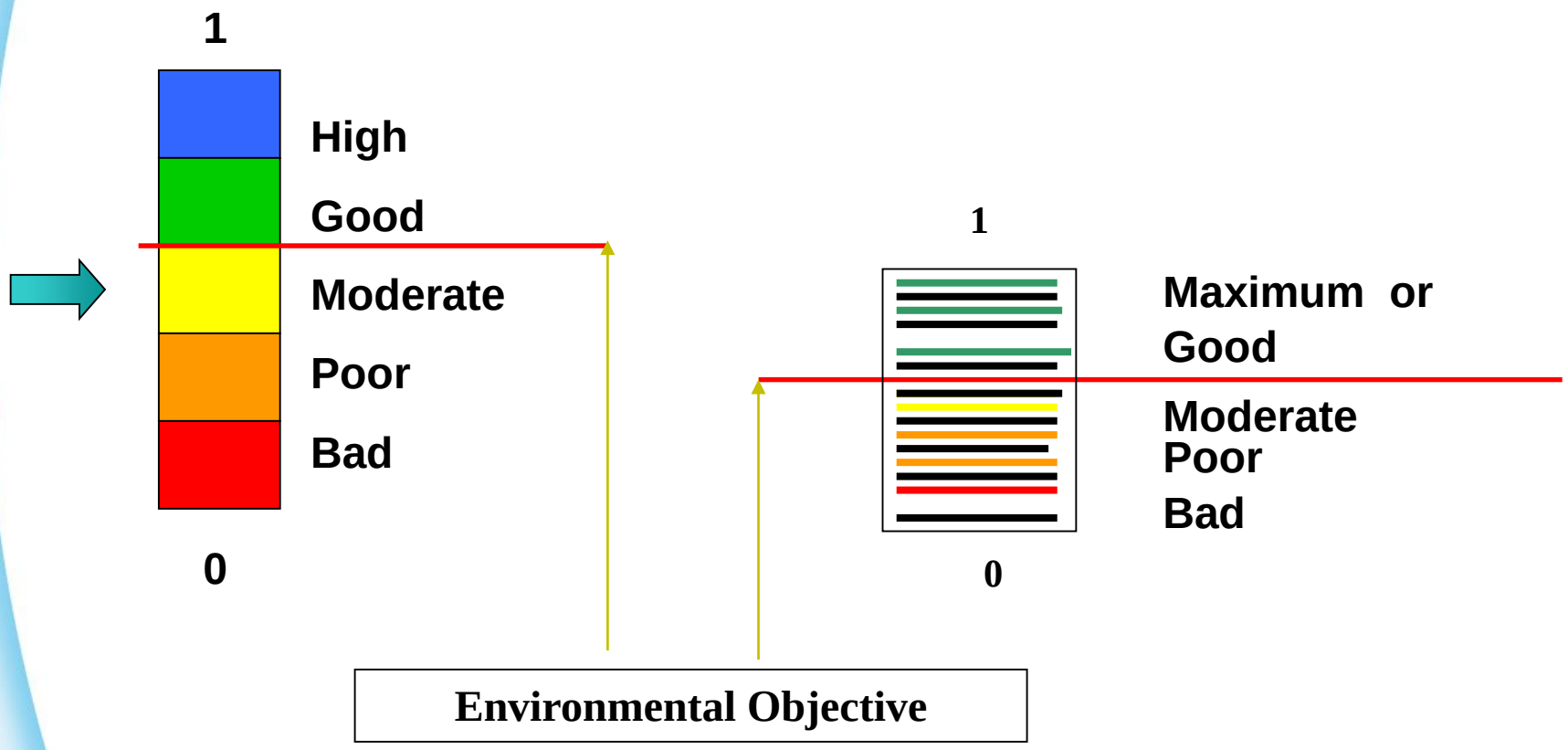
Natural Waters	Heavily Modified or Artificial Waters

Ecological Status

Ecological Potential



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Moderate Status of Fish Fauna
WFD ANNEX V

- The composition and abundance of fish species differ moderately from the type-specific communities attributable to anthropogenic impacts on physico-chemical or hydro-morphological quality elements.
- The age structure of the fish communities shows major signs of anthropogenic disturbance, to the extent that a moderate proportion of the type specific species are absent or of very low abundance.

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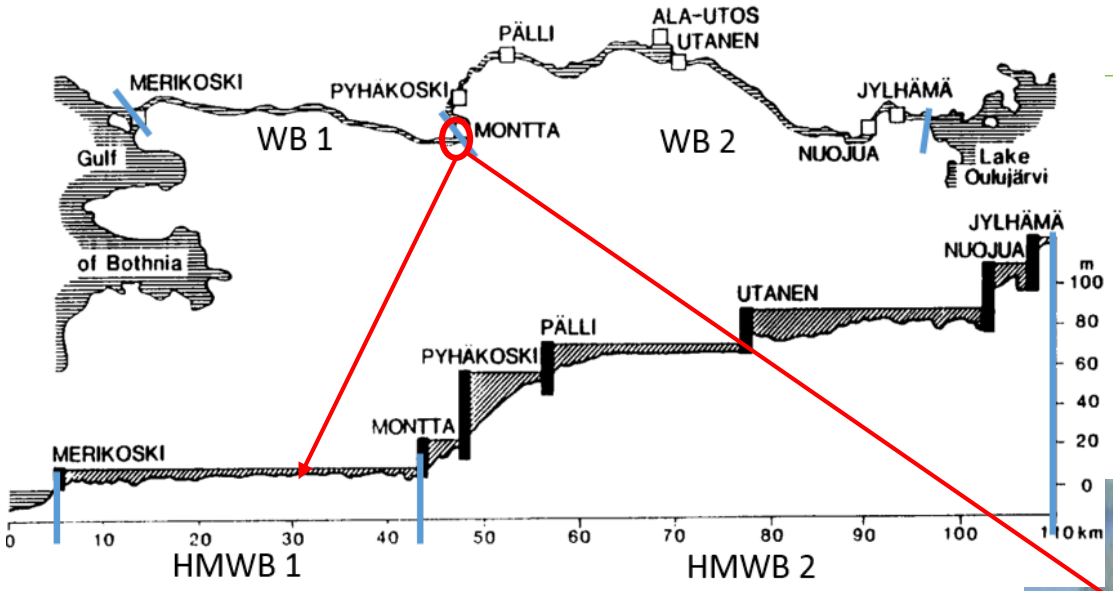
Classification Case the River Oulujoki



- Abundance of local fish is about good
- 2-3 long distance migratory species missing or of low abundance
- Only limited areas for breeding upstream, only in small tributaries
- Simplified population model calculation > no improvement expected from fish ways
- **Upstream HMWB is already in GEP**

Significant rivers for migratory fish

- The Finnish Guidance Document for HMWBs
  - The rivers, in which it is possible to restore sustainable self productive population of migratory fish species, can be nominated as significant migratory fish river
  - In significant migratory fish river the body of water cannot be classified to good status or potential, if fish migration is not arranged
- It is essential to use population models to transparently evaluate possibility to restore self-sustainable migratory fish population
- There is still lack of knowledge needed for population models
  - Mortality and losses during migration
  - Possibilities to improve downstream migration
    - Efficiency of structures
    - Technical feasibility and costs, especially in big rivers

Salmon, population model: Case Kemijoki-Ounasjoki

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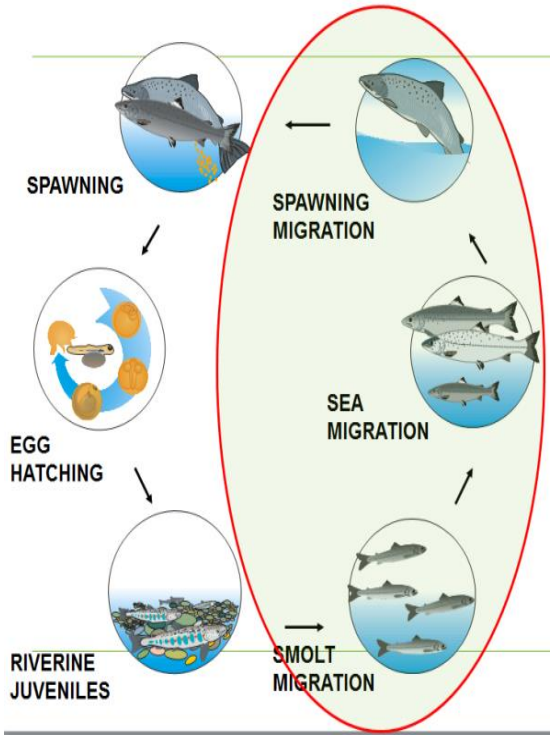
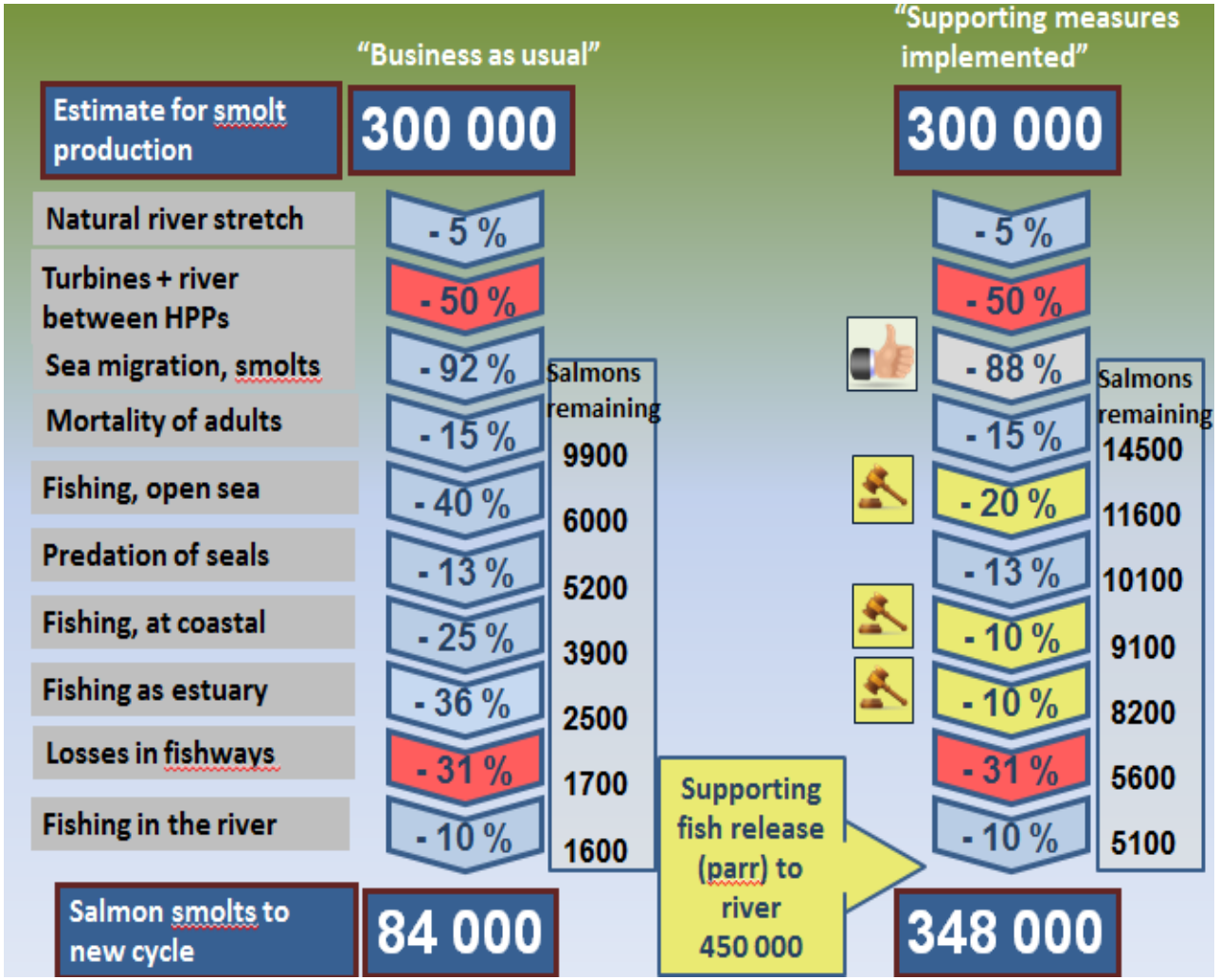
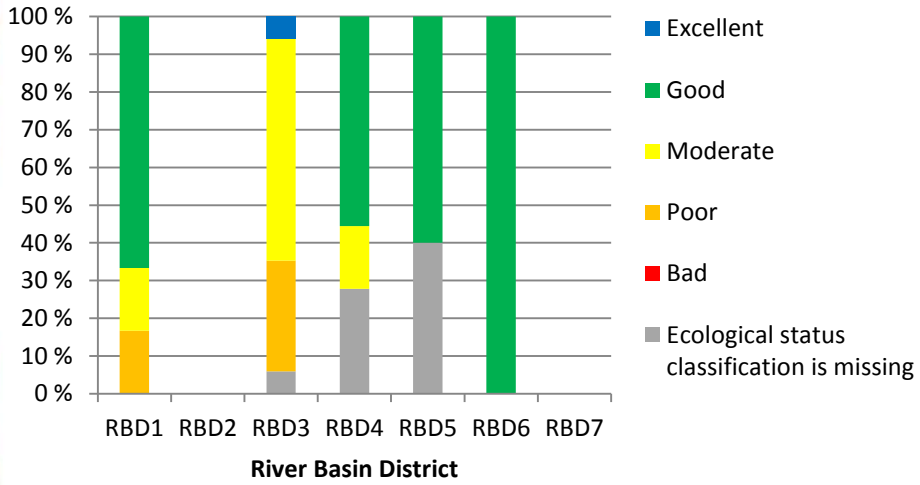


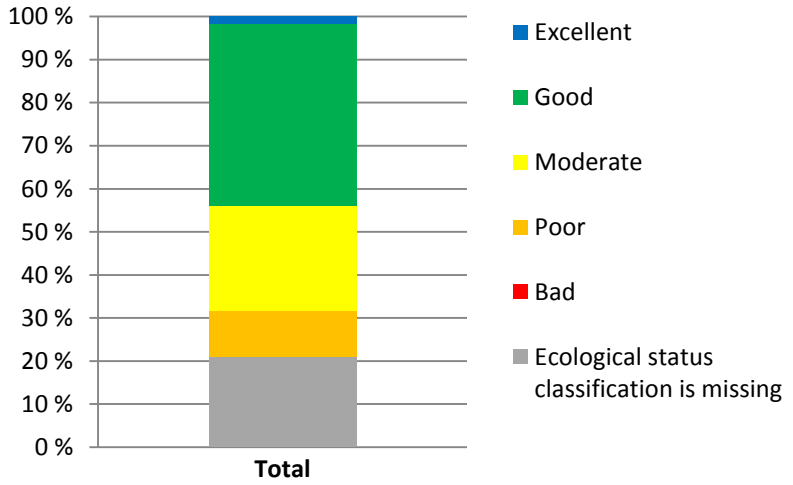


Lähde: Aki Mäki-Petäys, Luke, esitelmä, Pohjolan vaelluskala- ja kalatiesymposio 8. - 9.10.2013, Rovaniemi http://www.ymparisto.fi/fi-FI/Vesistokunnostusverkosto/Vaelluskalaforumi/Pohjolan_vaelluskala_ja_kalatiesymposio

Antton Keto, SYKE 7.7.2017

Class Status of the Heavily Modified and Artificial Rivers





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Thank you !