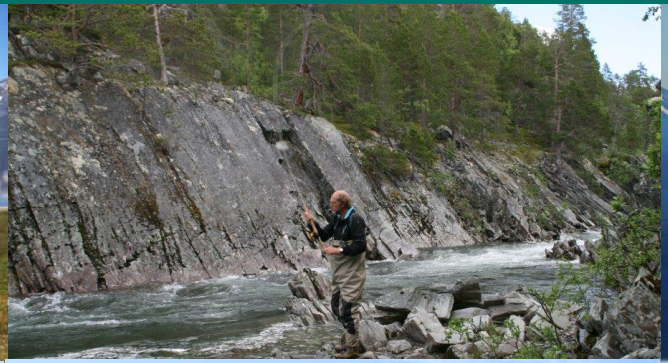
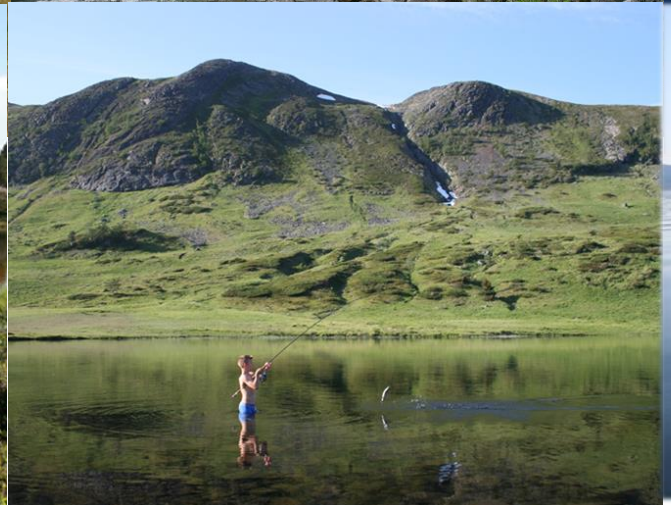
Practical mitigation measures in Norwegian water bodies to reduce pressure

– good practice examples from several sectors

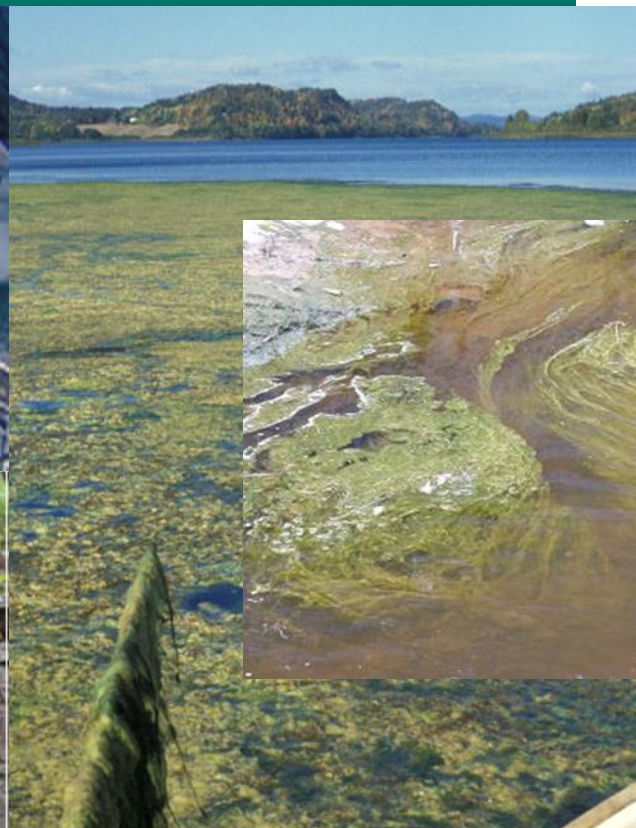
Helga Gunnarsdóttir and Steinar Sandøy Norwegian Environment Agency

The bright side of the moon ☺

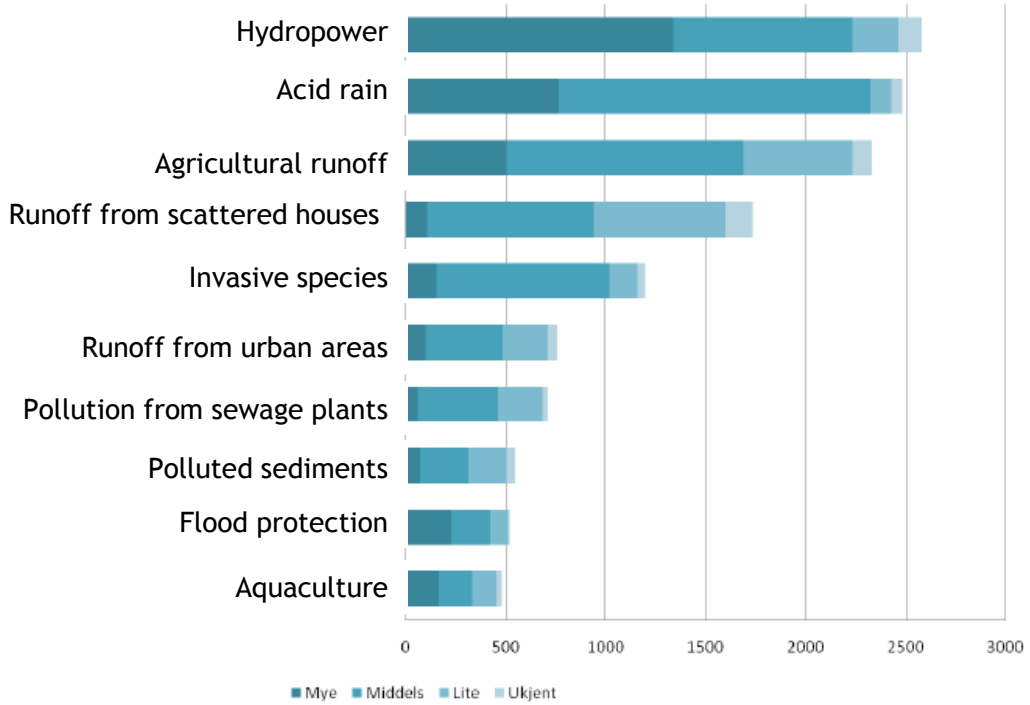




The black side of the moon ☹



Pressures on water bodies in Norway

The 10 most important pressures on watercourses in Norway



Effect: High - Medium - Low - Unknown

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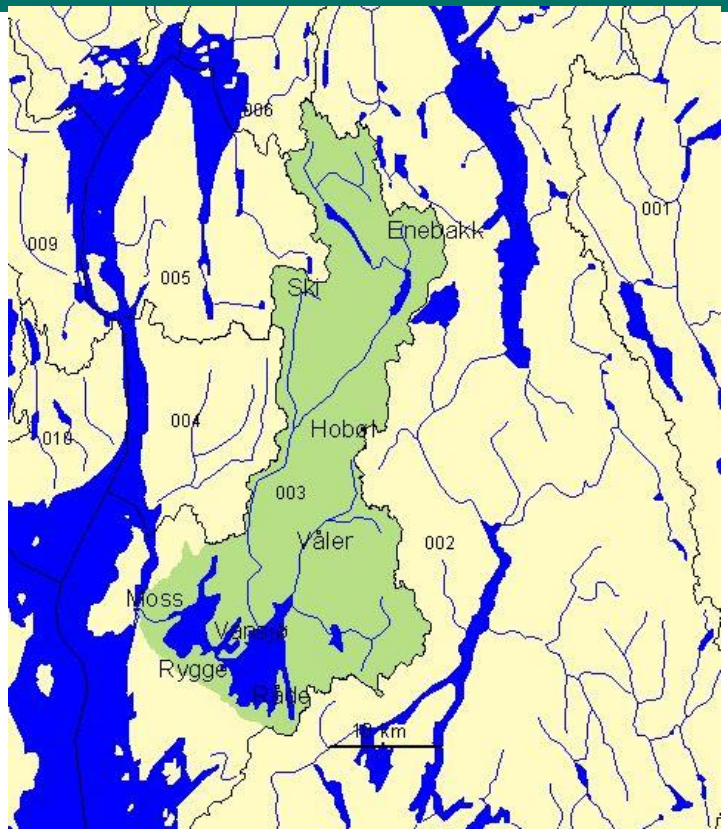
Morsa watershed – characteristics and challenges



- ***Watershed area:***
  - 9 municipalities, 2 counties,
  - 40 000 inhabitants,
  - 690 km2
  - The lake, serving 65 000 people with drinking water and recreation
  - Recreational area for the enlarged catchment
- ***Land use:***
  - 80% forest,
  - 16% agriculture
- ***Main problems:***
  - Too heavy loads of P
  - Highly eutrophic
  - Toxic phytoplankton blooms
- ***1999: The Morsa river basin organisation was established***

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Morsa river basin management strategies

- *Management based on knowledge –> public understanding and consensus*
- *Objective and neutral analysis – Environmental institutes 2001*
  - Status, objectives, measures and costs
- *Plans in every municipality 2002*
  - For wastewater in towns and in rural areas (according to local regulations)
- *Environmental program for the agriculture 2002*
  - Partly regional and partly municipal
- *River Basin Management plan for Morsa - adopted by local authorities 2003*
  - Based on the analysis and plans for municipalities and agriculture
- *Increased focus on the Western part of the lake from 2005*
  - Case environmental contracts

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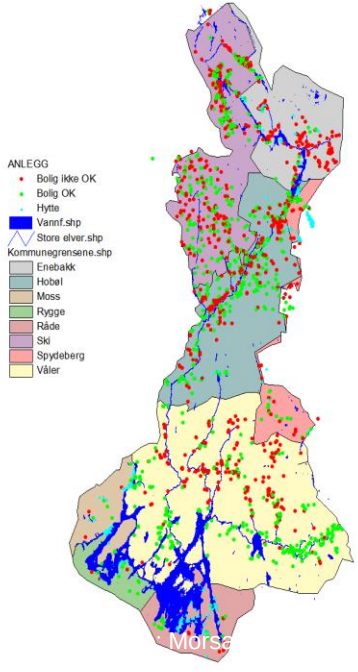
Primary measures in agriculture

- Reduced tilling in autumn
- Reduced use of P-fertilizer
- Constructed wetlands/sed. ponds
- Buffer and vegetation zones
- Environmental plan/contract for each farm

Waste water treatment – scattered households some results

- In 1999:
  - 2300 household with little waste water treatment
- In 2012:
  - 2100 households had installed new waste water treatment or been connected to a pipeline
- In 1999:
  - Loads from scattered households to lake Vansjø 2.3 tons of P
- In 2012:
  - Loads from scattered households to lake Vansjø 0,5 tons of P



The lake Vansjø 2000 - 2006 and 2008 -2015

Giftige blågrønne alger farget vestre og nedre Vansjø grønn, og førte til bade-forbud fra 2001-2007. Foto: Eva Skarbøvik/Bioforsk

Lykkelige badeengler i Nesparken i Moss sommeren 2008. Faksimile fra www.moss-avis.no

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Some cases to facilitate migration -roads

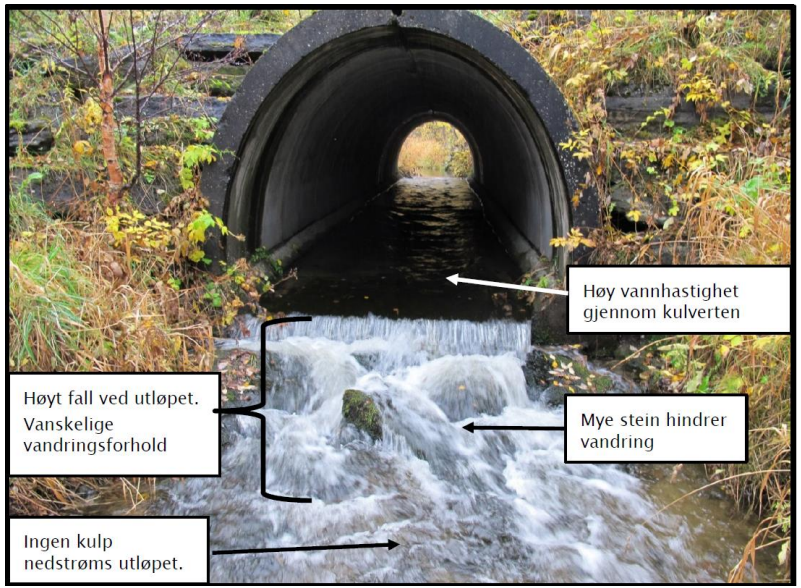

Photo: NPRA

- Small waterfalls at the outlet of the culvert
- High water velocity inside
- Lack of a pool downstream
- Stones etc. that prevent migration

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Case 1 New threshold and pool Nykvåg river in Lofoten

Photo/case: Knut Aune Hoseth NVE/NPRA

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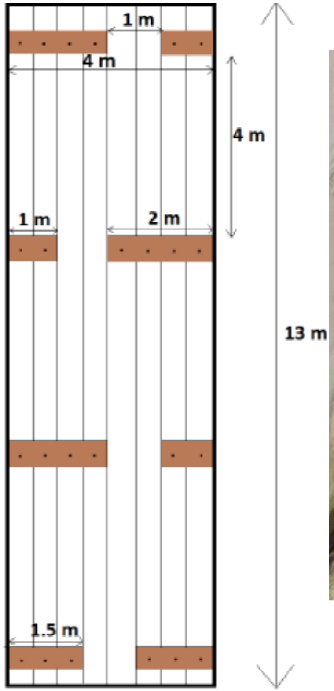
Case 2 Aspen trunks
Storelva in Steigen Nordland



Photo/Case: NPRA

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Case 3 Four fish tubs and 10 thresholds Sæveli creek in Aust-Agder

Photo: NPRA

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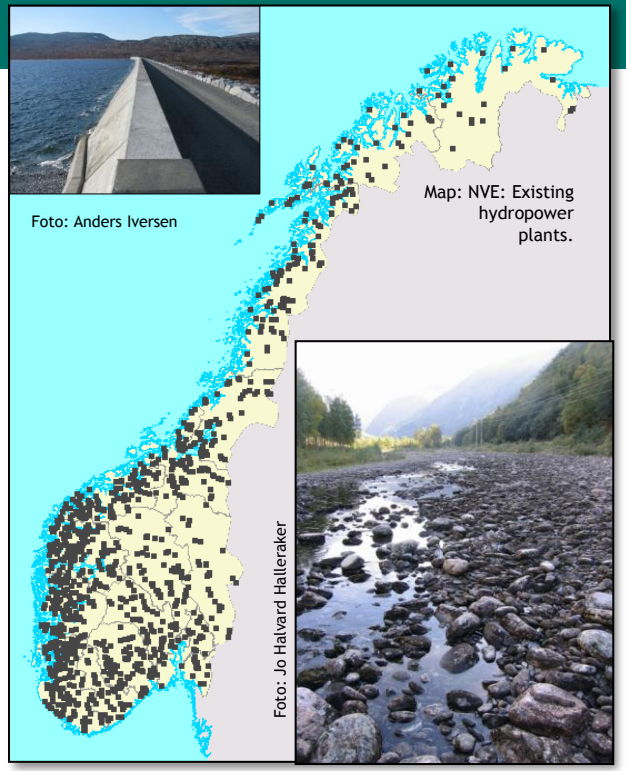
Pressures: hydropower



Impacts on:

- 15 of the 20 highest waterfalls
- 70 % of the no. of river basins
- 17 % of river stretch
- 30 % of lake area

Ecologic effect:

- Reduced (or no) flow, variation in water level
- Habitats for fish and insects, plants, birds
- Landscape, recreation, tourism

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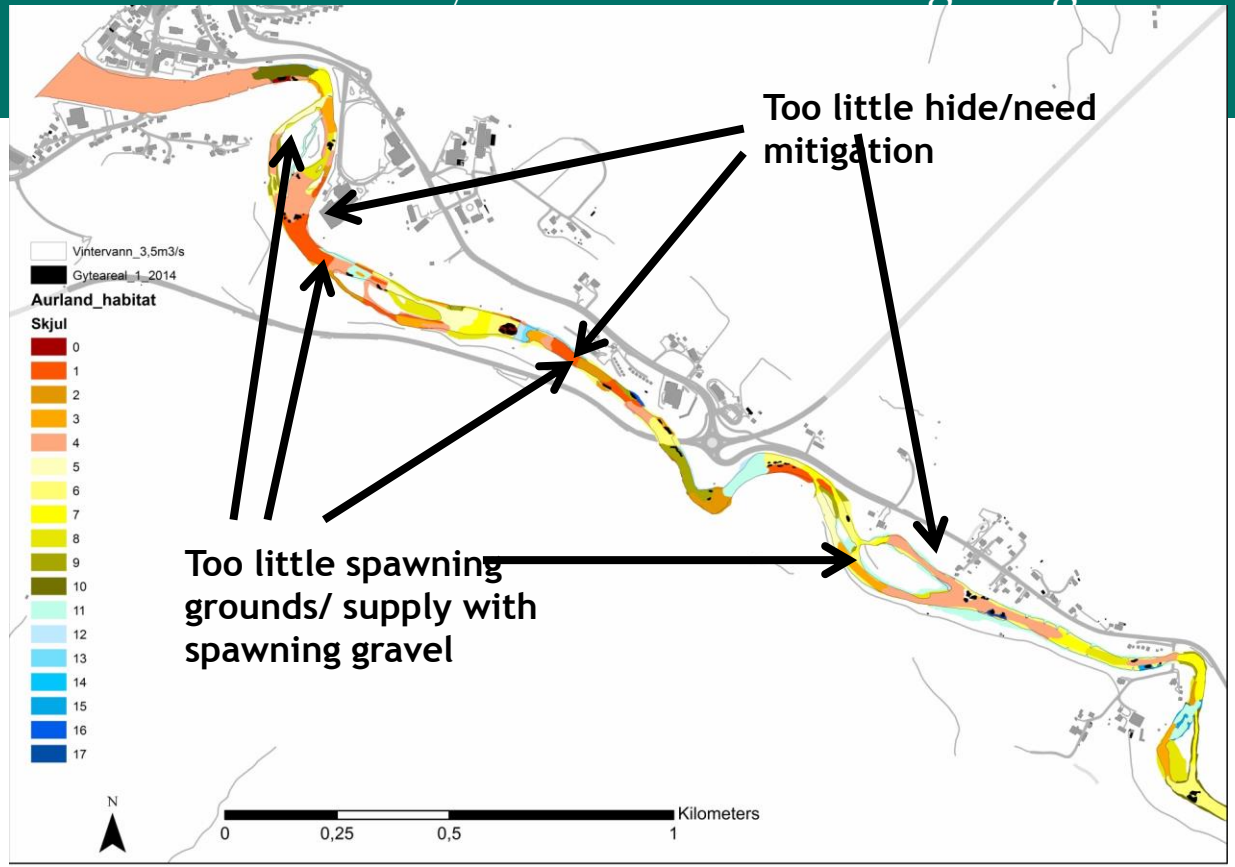
Case River Aurlandselva - Identify bottlenecks and doing mitigation measures



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HYMO alteration in Aurlandselva (Hydropower)

Tiltak - Harving 20.000 m² siden 2009

Figur 1 Harving av pakket og fast bunnsubstrat (armeringslag) ndf. E 16 bro 2011.

Figur 2 Harvingen sett under vann. Gravemaskinen mistet tenner i skuffen grunnet det harde armeringslaget.

Figur 3 Pakket og fast bunnsubstrat med få hulrom. Steinene kunne ikke snus med håndmakt (armeringslag).

Figur 4 Samme substratet etter [illegible] masse nye hulrom tilgjengelig for fisk.

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Mitigation in River Aurlandselva: 500 m^3 of new spawning gravel

Before

After

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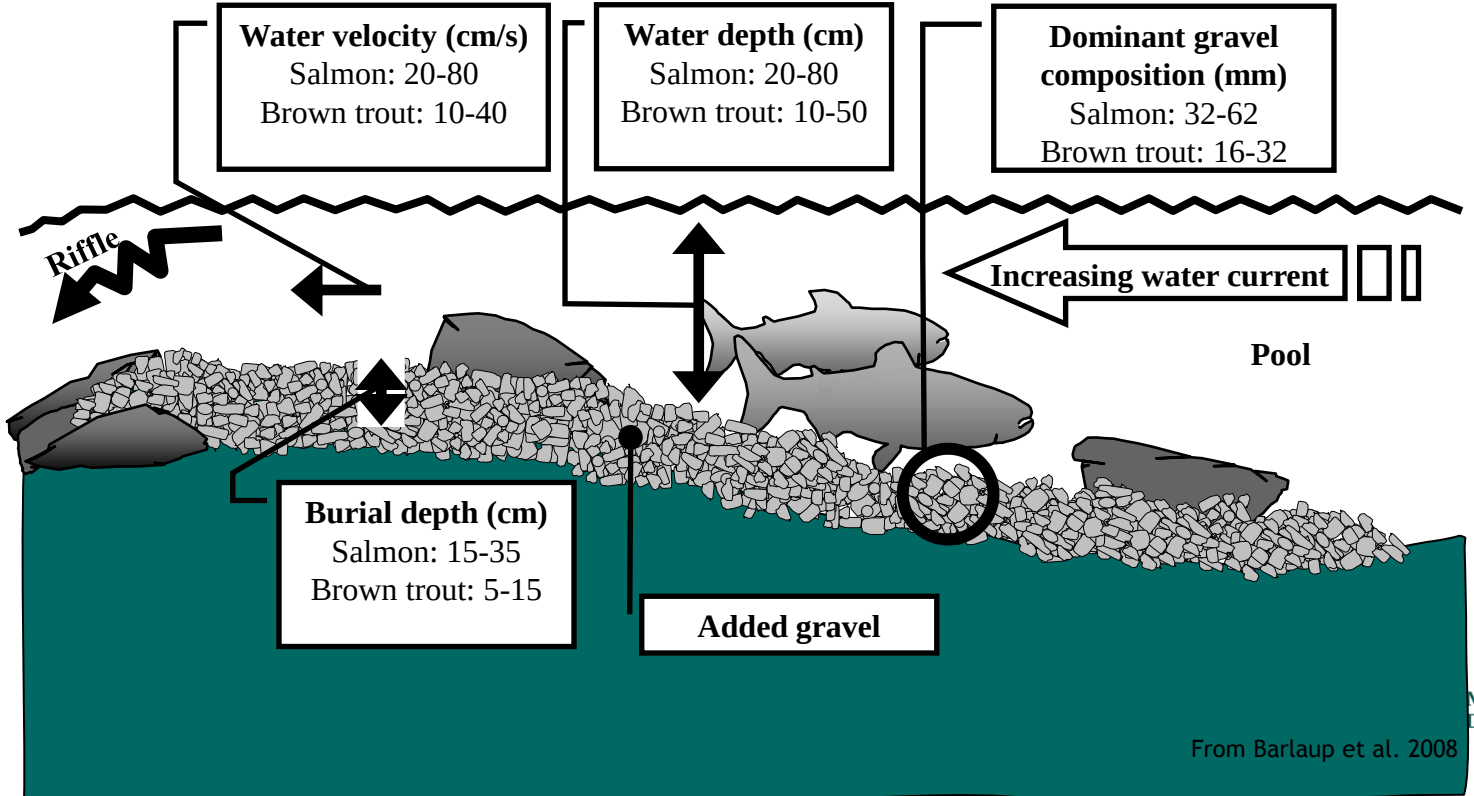
To optimize mitigation measures by adding new spawning gravel you need at least knowledge about biology and hydrology



From Barlaup et al. 2008

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If fish stocking is still needed to achieve the objectives: we try to use fish eggs

-In some rivers we use offspring of native strain kept in gene bank for endangered wild Atlantic salmon stocks

- When the objective is to get good status for fish and a good fishery without stocking:
  - We often need a combination of environmental flow and habitat measures.
  - In rivers with “environmental flow” habitat mitigation measures alone might be sufficient.

- If not, we have to continue fish stocking,
  - until the impact of the regulation (flow and habitat) is reduced to a level that result in a fish population big enough to have a fishery

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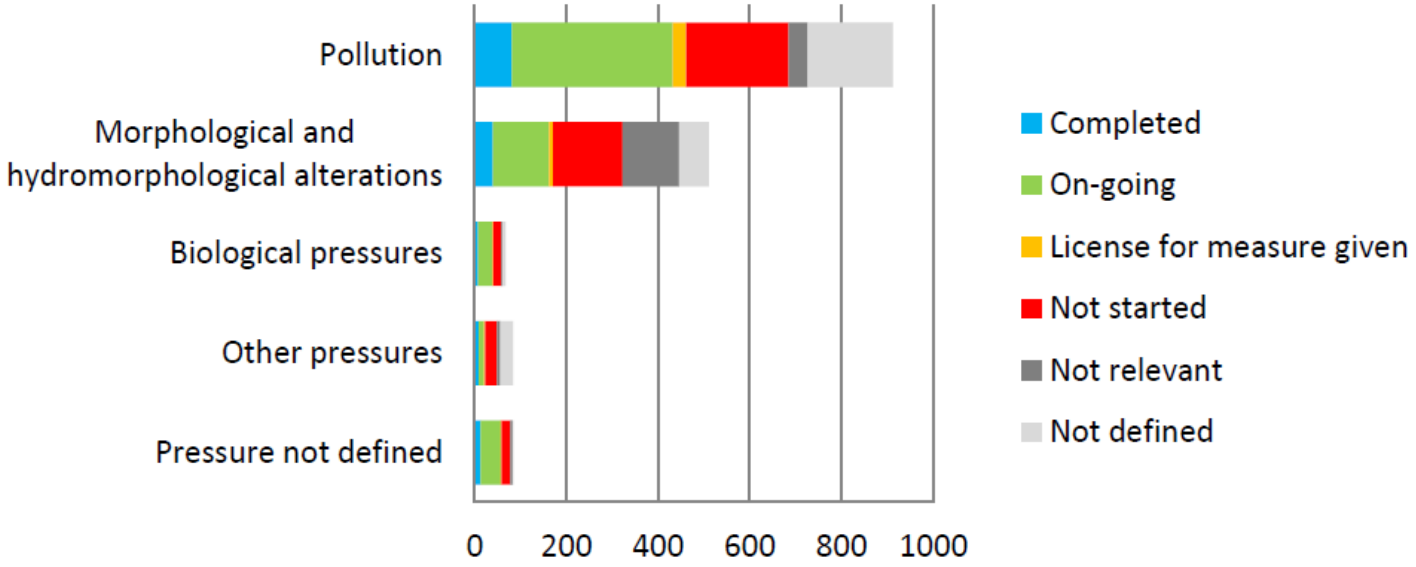
Status implementation of measures (december 2012)



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