

Dam Removal Europe: Achievements and goals



Pao Fernández Garrido

World Fish Migration Foundation

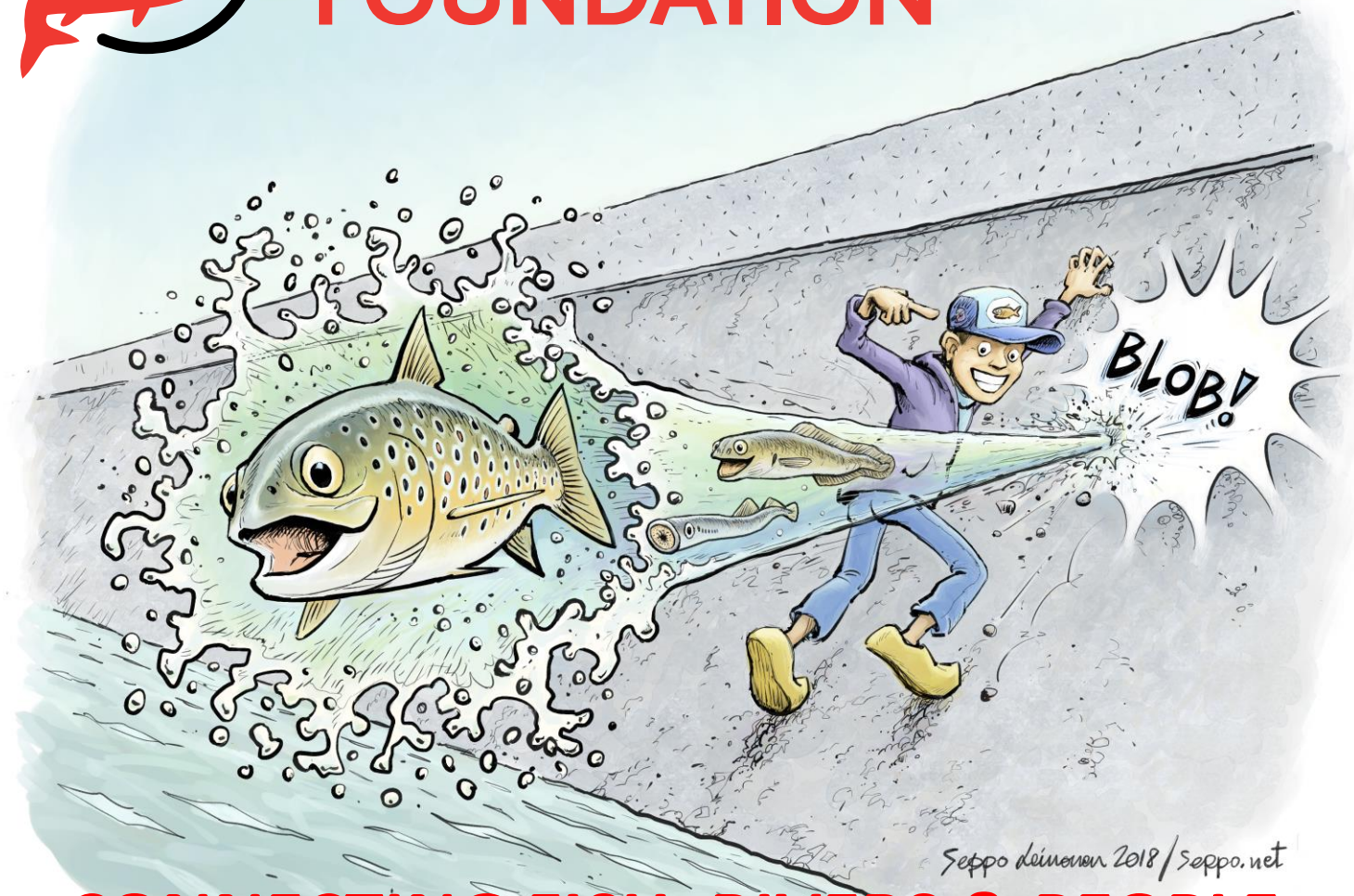
8th May 2019 – Greece AMBER National Workshop

Outline

- **Who we are**
- **European river fragmentation situation**
- **Status of dam removals in Europe**
- **Why are we removing dams?**
- **Dam Removal Europe (DRE)**
- **Good case studies**



WORLD FISH MIGRATION FOUNDATION



CONNECTING FISH, RIVERS & PEOPLE

From local to global

World Fish Migration Foundation - PROJECTS

- World Fish Migration Day (WFMD)
www.worldfishmigrationday.com

- Dam Removal Europe (DRE)
www.damremoval.eu



- Adaptive Management of Barriers in European Rivers (AMBER)
<http://amber.international>



- From Sea to Source 2.0
www.fromseatosource.com



- Swimway Posters
www.swimway.org



Fish Passage Conference 2012 – Amherst, MA, USA



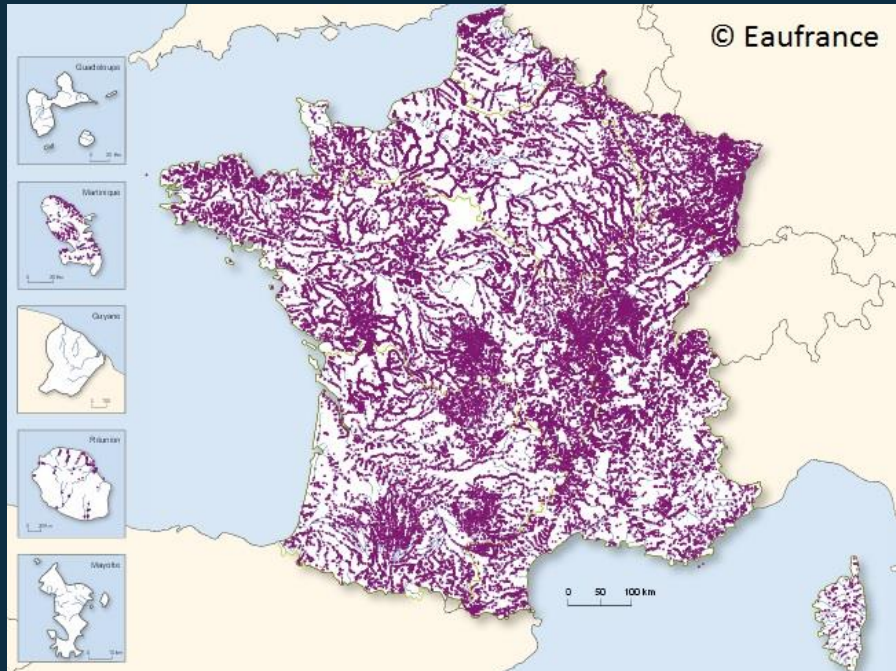
Source: <https://www.americanrivers.org/threats-solutions/restoring-damaged-rivers/dam-removal-map/>

How many dams and weirs in Europe?

- **European Environmental Agency:** There are currently about **7,000 large dams** in Europe
 - Spain approx. 1,200
 - Turkey approx. 610
 - Norway approx. 364
 - UK approx. 570
- **International Commission on Large Dams (ICOLD):** **59,071 dams** data corresponding to registered dams only

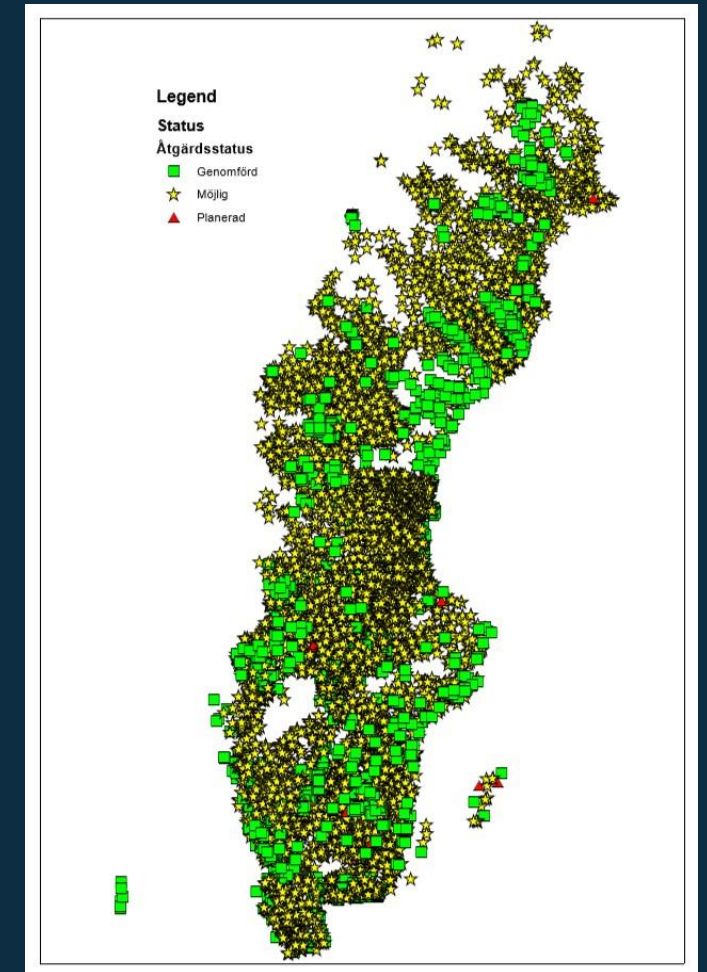


How many dams and weirs in Europe?



England & Wales: Over 95,000 man-made obstacles

England & Wales: Over 22,000 man-made obstacles



England & Wales: Over 10,000 man-made obstacles

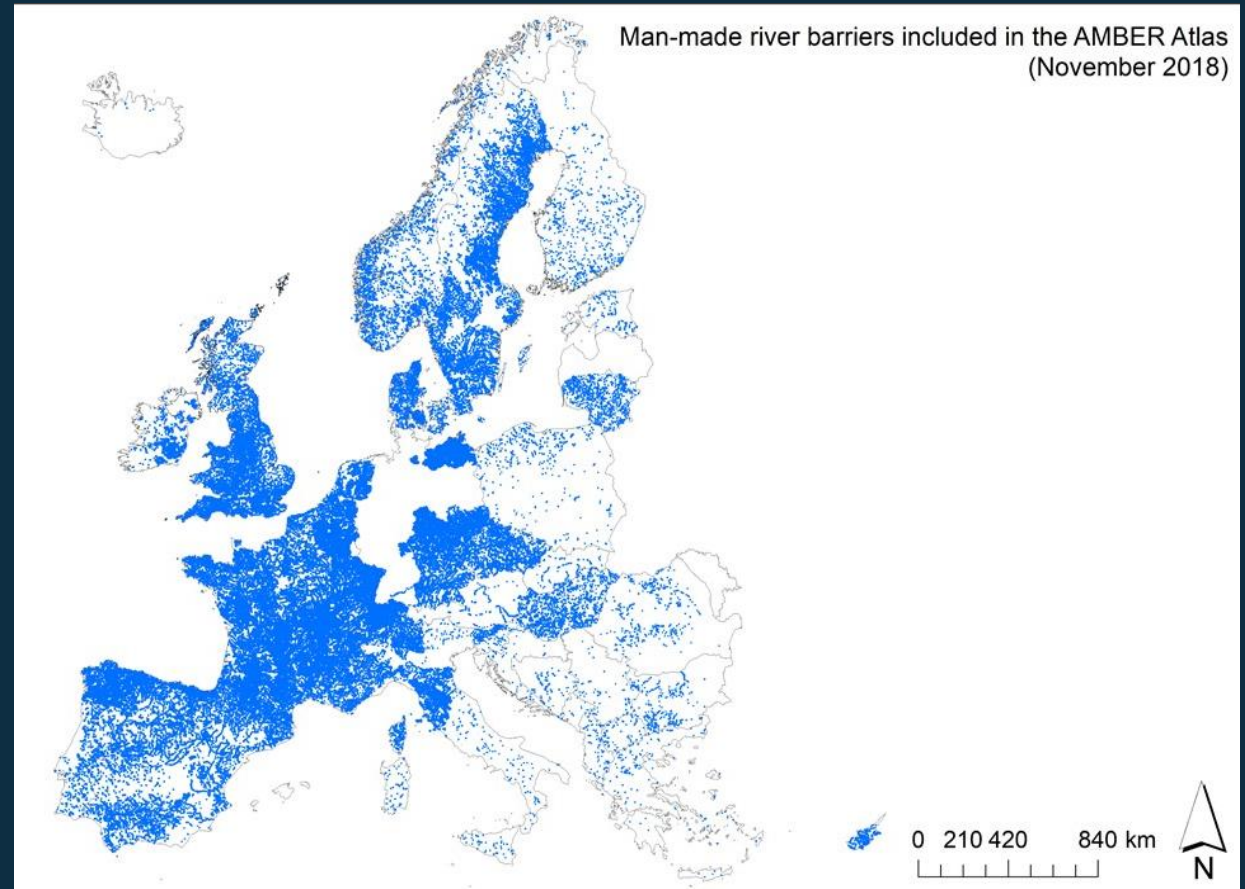


Adaptive Management of Barriers in European Rivers

A barrier almost every kilometer

First indications AMBER project (Horizon2020) after collecting river barrier inventories through all Europe and after 1,000 km of rivers surveyed:

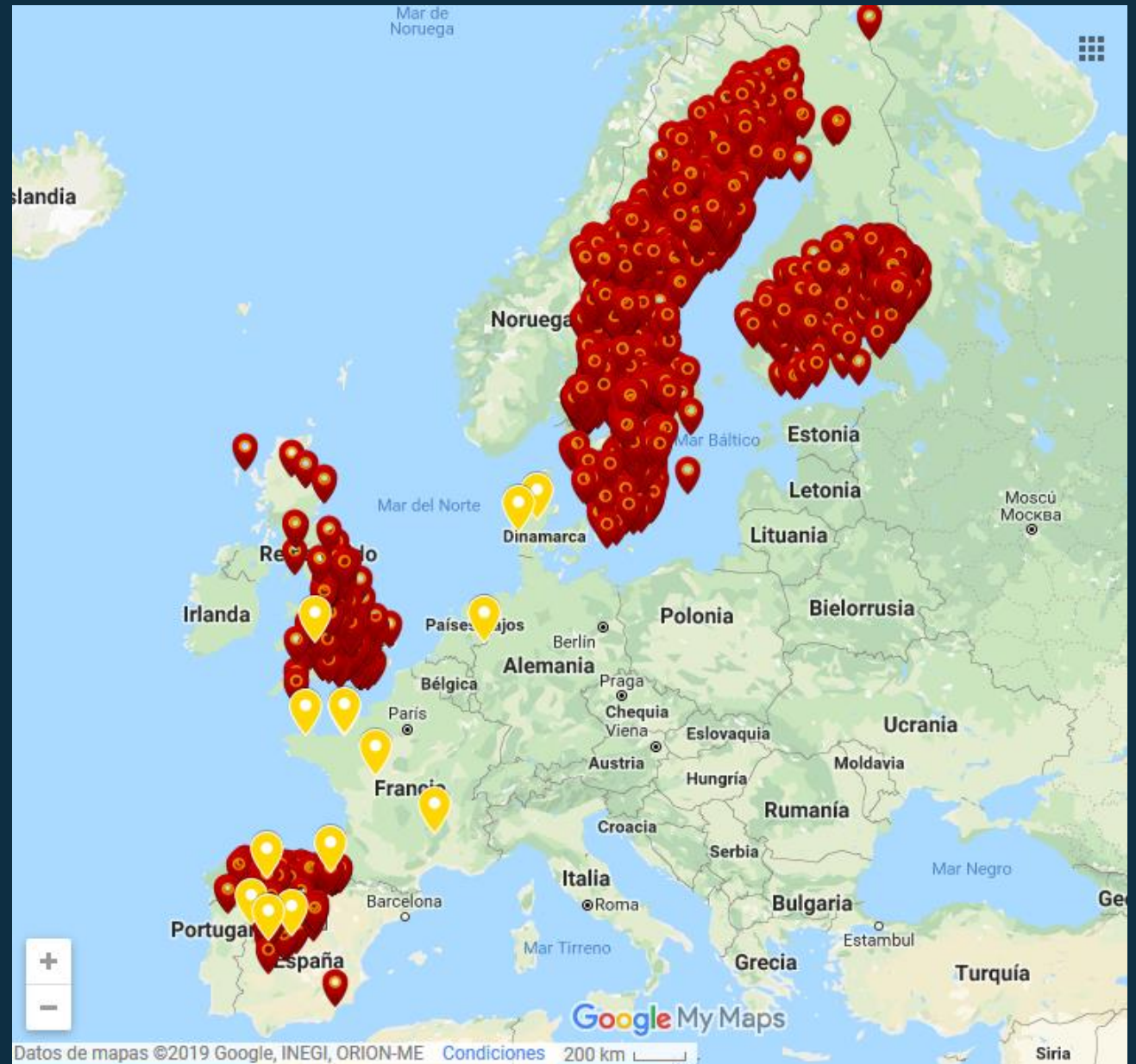
- Approx. 1,000,000 barriers
- Approx. 1 barrier every kilometer



Source: <https://amber.international/european-barrier-atlas/>

Dam removals in Europe

- **FRANCE:** 2,300
- **SWEDEN:** 1,600
- **FINLAND** 450
- **SPAIN:** 250
- **UK:** 150
- **NETHERLANDS** 50
- **ESTONIA** 10
- **BELGIUM:** tbd
- **GERMANY:** tbd
- **SWITZERLAND:** tbd
- **DENMARK:** tbd



Source: <https://www.damremoval.eu/dam-removal-map-europe/>

Why Dam Removals

- Impacts on fish's, rivers', oceans' and people's health

- **Sediments and nutrients trap behind dams,**

- * nutrients and sediment starving downstream the dam,
- * causing channel and bank erosion,
- * dismissing deltas' formations due to the lack of sediment deposition,
- * in some cases causing coastal erosion (beach shrinking or disappearing) due to sand decrement.

- **River fauna blocked and isolated:**

- * not able to migrate to be able to feed and reproduce (i.e.: anadromous and catadromous fish like salmon and eel)
- * decline and even extinction of fish populations → which affects also to other fauna (i.e.: birds and mammals, i.e. decline of eagles or otters population).

- **Alter the natural flow of rivers, reducing the downstream flow and decreasing the river's natural flood frequency:**

- * reduces channel connection with floodplains (= decreases soil fertility and aquifers recharge),
- * deteriorating water quality (less oxygen levels, no natural temperatures above and below the dam, potential algae booming during hot seasons)

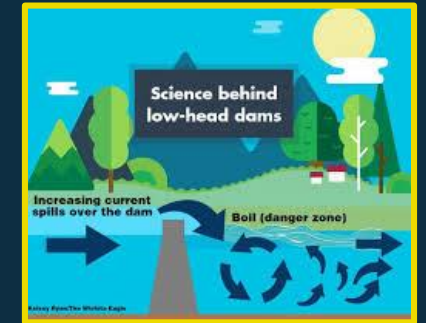


Photo: Pao Fernández Garrido.

Why Dam Removals

○ Hazards for people

- No structures in poor safety conditions in the rivers (abandoned or not well maintained)
- Avoiding structures in the rivers which causes human deaths (called in USA “drowning in machines”)



Low-head dam safety

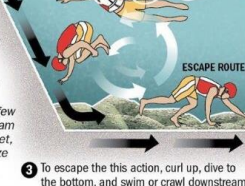
Approximately 300 dams in Pennsylvania fit the definition of a low-head dam and are regulated by the Department of Environmental Protection. While these structures must be marked with signs and buoys to warn anyone approaching to stay back, they may not always be visible from upstream to unsuspecting boaters and swimmers. Adding to the danger, these barriers can create an underwater hydraulic cycle that is nearly impossible to escape.

SURVIVING A HYDRAULIC 'BOIL'

If you are caught in a low-head dam try to stay with the boat or on-top of anything that floats, for as long as possible.

- 1 The water above the dam picks up speed as it is squeezed over the top of the structure.
- 2 Fast-moving water plunges to the bottom of the dam, forcing the water already there to the surface. Water is then forced back down to the bottom by the water falling over the dam, and the cycle repeats itself.

This recirculating hydraulic is known as a "boil." Anything caught in it will be repeatedly forced under the water and back up again. The "boil" can extend a few feet in front of the dam or more than 100 feet, depending on the size of the river and the depth of the water.



Sources: Pennsylvania State Police community awareness bulletin, Popular Mechanics

Post-Gazette

Tragedia in Trebbia a San Salvatore, 26enne muore annegato FOTO foto

E' stato recuperato intorno alle 17 il corpo del giovane annegato in Trebbia a San Salvatore di Bobbio (Piacenza). Classe '89, il giovane era arrivato da Pontecurone in provincia di Alessandria

di Editore - 28 Giugno 2015 - 0:00

Commenta Stampa Invia notizia

Più informazioni su



Tragedia in Trebbia, alla diga di San Salvatore di Bobbio (in provincia di Piacenza), dove nel pomeriggio di domenica 28 giugno un giovane di 26 anni, Dario Triglione, originario di Pontecurone, in provincia di Alessandria, è annegato nelle acque profonde del torrente. in

Why Dam Removals

- Economical

- No costs for maintenance and repairs to low benefit, useless or abandoned structures.



[...] Together, the higher ongoing costs of operating dams and an improved awareness of the economic and social benefits of removing them has shifted the balance sheet for some dams. For these dams, **removal often provides greater rewards to taxpayers, local economies, and the surrounding environment [...]** [...] This review demonstrates that **in many cases the economic, environmental, and social benefits of dam removal outweigh the costs of keeping a dam in place.** Source: Headwaters Economics, 2016.

Dam Removal Europe Ambition

**Free flowing rivers full of life
for people and nature**

**By removing dams,
starting with old and obsolete
dams**



Dam Removal Europe Objectives

Facilitating information

- Website
- Newsletters

Sharing knowledge and experiences

- International seminars
- National seminars

Putting dam removal in policy-makers agenda

Seminars and events



Seminars/ Workshops/ Conferences and Meetings

Lunch meeting: dam removal, a viable solution to regenerate european rivers

Lunch Meeting: Dam Removal, A Viable Solution to Restore



Seminars/ Workshops/ Conferences and Meetings

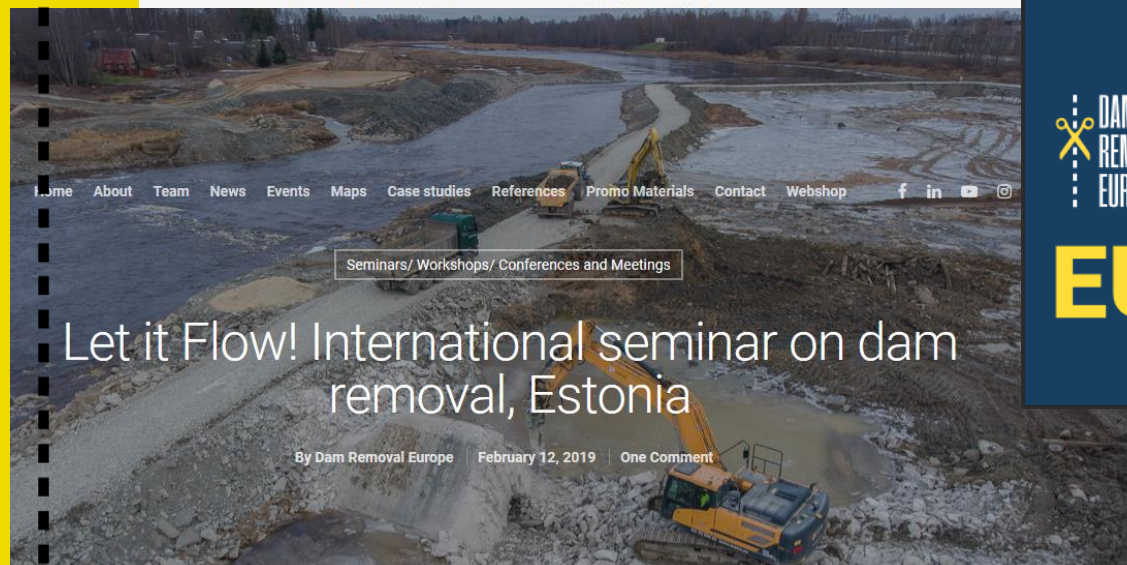
Let it Flow! International seminar on dam removal, Estonia

Let it Flow! International seminar on dam removal, Estonia Estonia,



Dam removal
WWF Netherlands their first dam removal of 2019!

On January 1
Netherlands
dam removal



DAM
REMOVAL
**A VIABLE
SOLUTION
FOR THE
FUTURE
OF OUR
EUROPEAN
RIVERS**



DRE Policy report (June 2018)

www.damremoval.eu

1. >30.000 old and obsolete dams
2. Removal is not part of European policies yet
3. Great showcase projects already in place
4. Mapping obsolete & removed barriers
5. Focus: LIFE research 'dam removal economics'?
6. Funding mechanism needed

1

There is almost one dam
per kilometre of river!

4

Removing obsolete dams can
be safer and cheaper than
maintaining them.

6

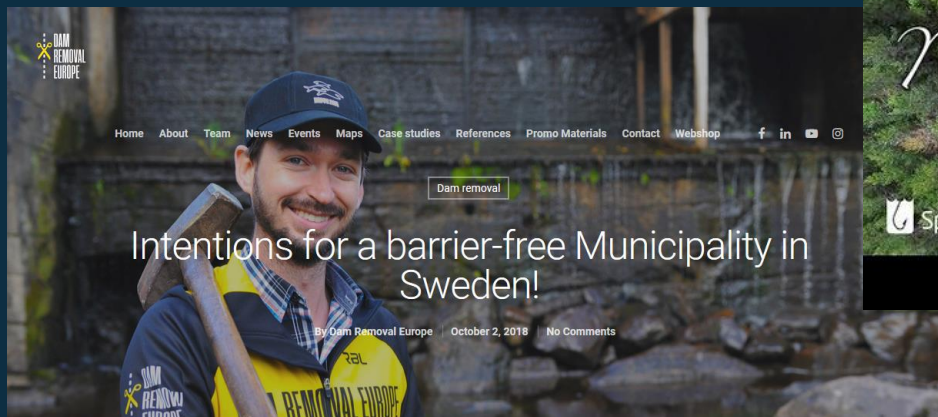
Removing obsolete dams can be
of great benefit for the identity
of local communities
and economies.



Case studies

<https://www.damremoval.eu/case-studies/>





Intentions for a barrier-free Municipality in Sweden!

By Dam Removal Europe | October 2, 2018 | No Comments

This past September 140 experts from 23 different countries met in the city of Hudiksvall, Sweden, 300 km north of Stockholm.

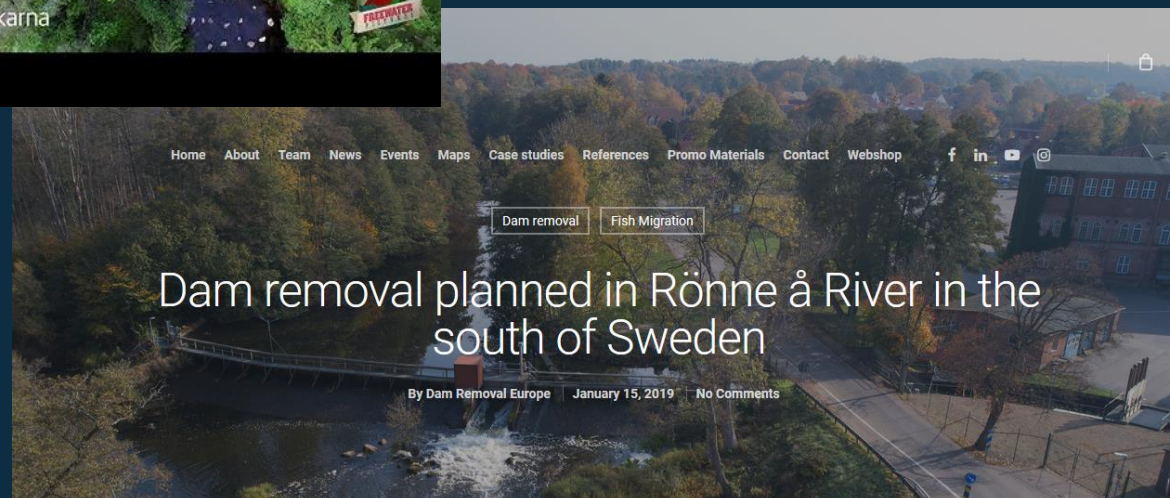
There, they participated in a conference on dam removal projects in Europe and across the globe. Over two days, participants enjoyed presentations from a wide range of viewpoints by ecologists, engineers, politicians, social activists, NGOs, and the energy sector themselves. Questions abounded and the halls of the beautiful Kulturhuset building in Hudiksvall were full of energetic conversations.



© Iwan Hoving

Of course, hearing stories and seeing photos of removed barriers (or those on their way out) is great, but what would an international conference on dam removal be without actually seeing some dams! Luckily, the municipality of Hudiksvall recently removed two barriers in the river Nianån, and a neighboring municipality, Nordanstig, has plans to remove two hydroelectric stations in the river Gnarpån as part of their mission to become Sweden's first barrier-free municipality. Both municipalities have a challenging task ahead of them as Sweden's waterways contain over 10,000 barriers, but if the drive and determination of the Dam Removal Europe 2018 conference attendees is any indication, we are well on our way.

Author: Andrew Harbicht; Post-doctoral Research Fellow at the Department of Environmental and Life Sciences/Biology; Karlstad University.



Dam removal planned in Rönne å River in the south of Sweden

By Dam Removal Europe | January 15, 2019 | No Comments

In the south of Sweden a small municipality – Klippan (pop.17 600) – has decided to acquire the three hydropower plants in Rönne å River with the purpose of removing them. This will be the most comprehensive dam removal so far in Sweden and will provide immense opportunities for wildlife and blue growth in the catchment.

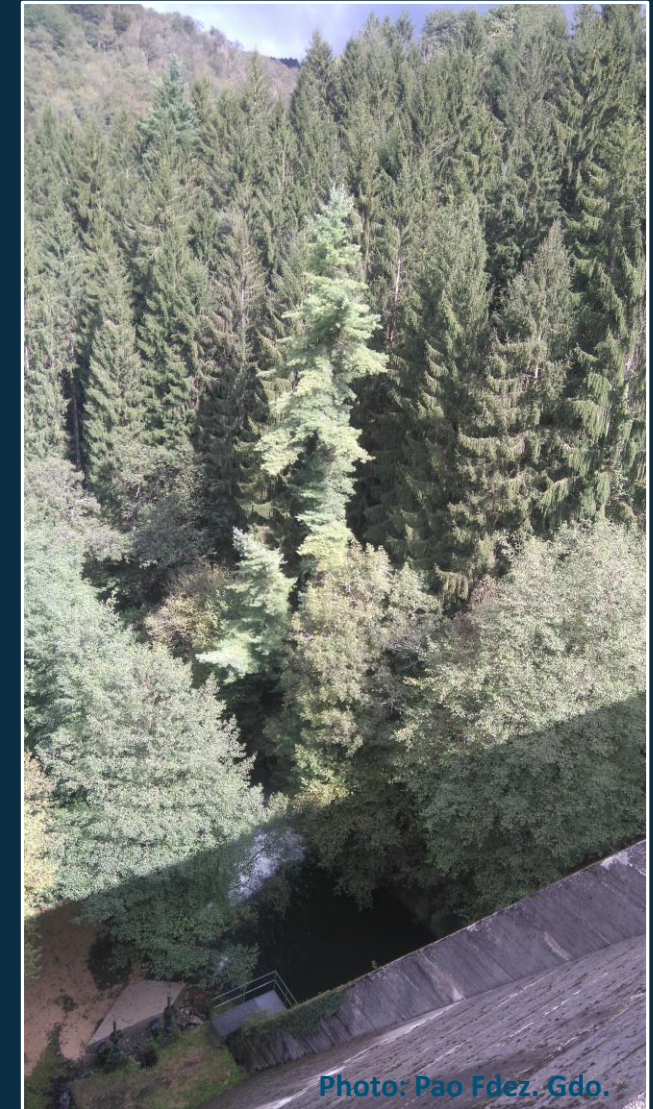
The action will result in 47 kilometers re-opened migration routes in the main river stem for the first time in 70 years, and an additional 100 km in tributaries. Removal of the dams will also restore the river's natural drop in elevation, of which half (25 m) is currently affected by the hydropower plants. Hence, spectacular rapids will be recreated.

A free flowing Rönne å River together with large-scale plans to restore the river bed will significantly improve conditions for fish species such as Atlantic salmon, brown trout, sea lamprey as well as for endangered species of freshwater mussels.

In December 2018, the municipality and the hydropower company agreed on the price tag of 2,8 million Euro. The

Enobieta Dam (Spain)

- Artikutza Natural Reserve, Navarra Province
- Height: 43m
- In progress: Reservoir being dewatered
- Expectations: Drilling a tunnel in 2020



Scotland: Water Environment Fund (WEF)

- WEF is an annual fund of around £2-3million, administrated by SEPA (Scottish Environment Protection Agency)
- Provides funding to projects which will help restore Scotland's catchments to achieve the objectives of their River Basin Management Plan
- WEF is supported by the Scottish Government, Scottish Natural Heritage and the Forestry Commission Scotland and
- WEF does not fund improvements to fish barriers which are being used to generate profit or are an economic asset
- WEF can only support improvements at redundant and historic weirs and dams, which no longer serve an economic function



Tarff Creamer Weir, Scotland, UK

- Built in 1920
- Almost 5m high
- Removed in September 2016
- Opened up 10km of river
- Monitoring after removal: salmon, sea trout, eel and lamprey are back
- Fund: Water Environment Fund (SEPA)

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Salmon return to Stewartry burn after an absence of almost a century away

The removal of a barrier in a burn at the former Tarff Creamer at Twynholm has allowed the fish to return

By **Stephen Norris**
10:10, 9 MAR 2018 | UPDATED 10:25, 9 MAR 2018

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NEWS



Vilholt Dam, Gudenå River (Jutland, Denmark)



Removal of dams in the Varde River (Esbjerg Denmark)

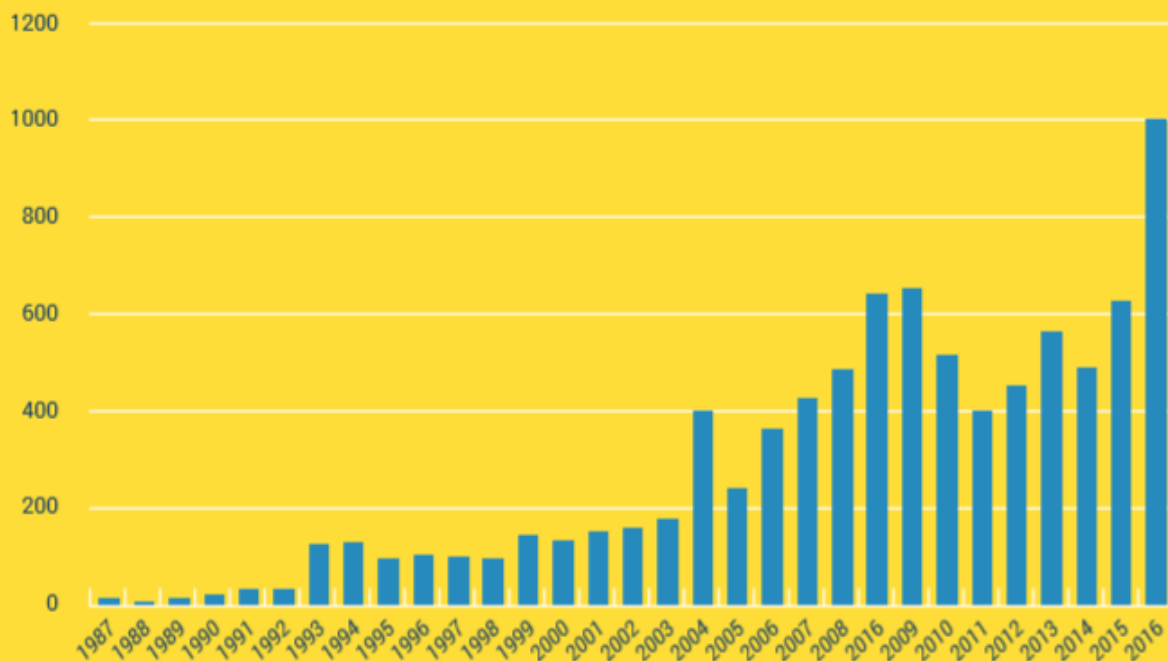


Figure 9. Presence of Atlantic salmon in the Varde river 1987 - 2016 (source: <https://varde-sportsfiskerforening.dk>)



Den lokaløkonomiske værdi af laksefiskeriet i Skjern Å

DTU Aqua-rapport nr. 287-2014

Af Jørgen Jordal-Jørgensen, Arne Kvist Rønne, Jacob Ladenburg, Kim Aare-strup, Christian Skov og Anders Koed

“Since the resurgence of Skjern Å at the beginning of 2002 and the subsequent work to improve the spawning conditions for the salmon, the salmon population has increased significantly. The increased salmon stock (which is now about 4,000 per year) has meant extensive fishing for salmon, which is grown by both local and visiting anglers. The fishing industry has a local economic value in that the pleasure boats buy equipment and food in connection with the fishing. Both Danish and foreign studies have shown that salmon fishing can have a positive local economic value¹², just as it has previously been shown that angling in general in Denmark has a significant socio-economic value¹³.”

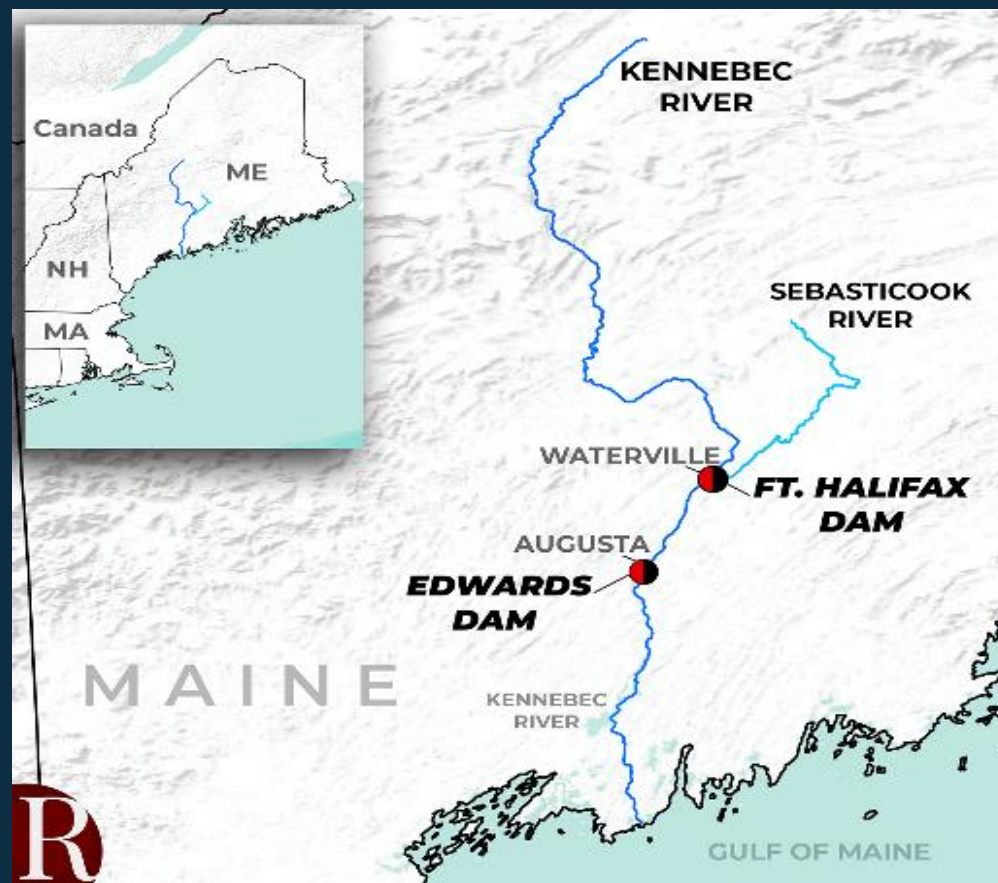
“Overall, it is thus likely that a targeted future management through improving the salmon habitats and passage conditions will cause the salmon fishing in Skjern Å to become even more attractive, and thus the local and social value of salmon fishing will be increased considerably.”

Edwards Dam 1837 (Kennebec River, Maine, USA)

- Before construction:
 - Salmon catch per season: 500
 - Sturgeon catch per season: 320,000 pounds
 - Shad industry
- After construction:
 - Salmon catch per season (1850): 5
 - Sturgeon catch per season (1880): 12,000 pounds
 - Shad industry: closed (1867)



1999 - Edwards Dam removal (Kennebec River)
2007 - Fort Halifax Dam removal (Sebasticook River)



Edwards Dam and Fort Halifax Dam removals

- **Return of alewife run in approx. 160 years**
- **After both dam removals, the number of alewives returning to spawn jumped from 78,000 in 1999 to 5.5 million last year**
- **The river herring are also a valuable source of bait for commercial lobstermen, who in recent decades have had such a deficit in securing local supplies that they've had to turn to importing bait from southeast Asia, introducing a host of new environmental problems and costs.**

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Revelator

Wild, Incisive, Fearless.

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An initiative of the Center for Biological Diversity



How Removing One Maine Dam 20 Years Ago Changed Everything

The removal of the Edwards Dam on Maine's Kennebec River helped river conservationists reimagine what's possible.

<https://therevelator.org/edwards-dam-removal/>

Edwards Dam and Fort Halifax Dam removals

- A state-approved town ordinance makes it legal for Benton to harvest the fish once 225,000 have made it over the Benton Falls Dam
- Benton Town locals, harvested 350,000 to 500,000 alewives
- The town typically nets about \$20,000 during alewife harvesting
- President of Alewife Harvesters of Maine comments the resurgence of alewives also has benefited the rest of the state's fish population, especially cod and haddock. He said fishermen are lining the banks to catch these fish, which now can be found bountifully in grocery stores and fish markets around the state.

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BUSINESS > Posted May 17, 2018 | Updated May 18, 2018 INCREASE FONT SIZE **A+**

Despite millions of alewives rushing up Sebasticook River, Benton cancels alewife festival

The annual alewife run in Benton, the largest in the state and one of the largest on the East Coast, is credited with reinvigorating the environment and the fishing industry.

BY COLIN ELLIS STAFF WRITER

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Ryan Schultz, left, steadies a crate as Ernie Wallace fills it with alewives netted below the Benton Falls dam on Wednesday. Staff photo by David Leaming

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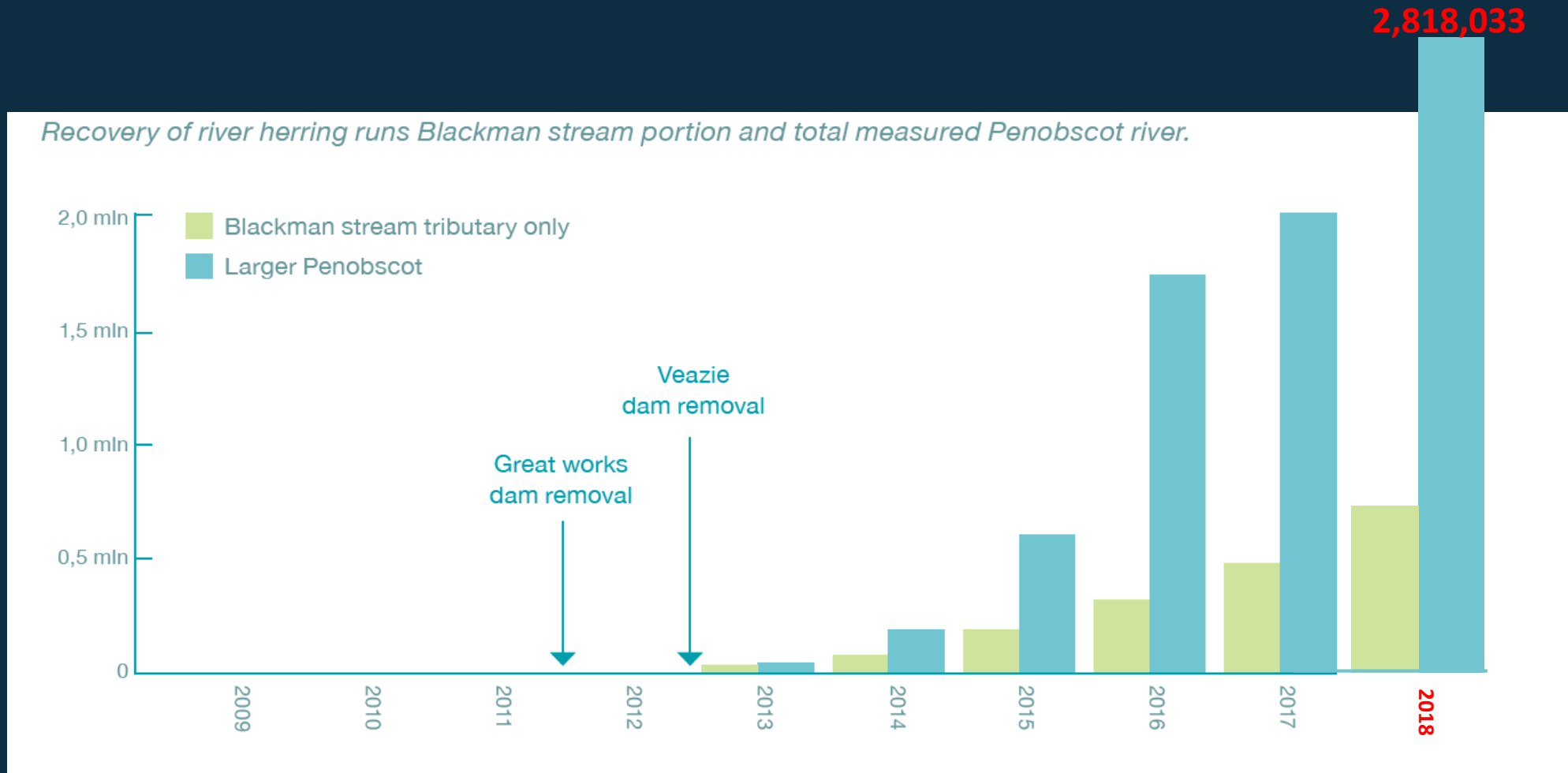
Source: <https://www.centralmaine.com/>



Veazie Dam and Great Works Dam removals (Penobscot River, Maine, USA)

Theodore Willis
(University of Southern
Maine): **“The removals
and restorations listed
[...] started to repair
not only the
diadromous fish
fisheries, but the
marine fisheries that
count on them”**

John Burrows (Director,
New England
Programs, Atlantic
Salmon Federation):
**“There were river
herring in tributaries
below Veazie Dam, but
essentially none above
it for 200 years”**

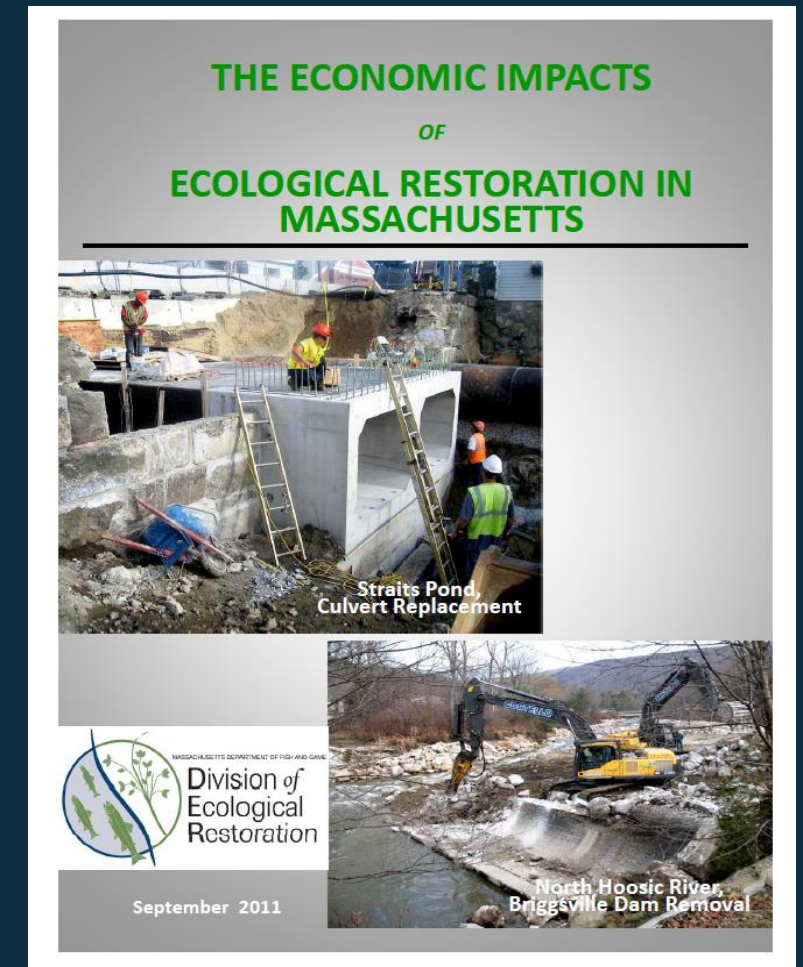


The Economic Impacts of Ecological Restoration in Massachusetts

Massachusetts Division of Ecological Restoration (DER) conducted an analysis in 2011 to estimate the regional economic impacts of spending on restoration projects across the Commonwealth.

The study found that **each \$1.0 million dollars spent on its restoration projects** (including stream barrier removals, as well as salt marsh restoration) **supported 10 to 13 jobs and \$1.5 to \$1.8 million in regional economic output** (2009 dollars): contributing to a growing **"restoration economy"** in Massachusetts.

Restoration projects generate total **economic outputs equal to or greater than other types of capital projects such as road and bridge construction** and repair, replacement of water infrastructure, etc.



Economic & Community Benefits from Stream Barrier Removal Projects in Massachusetts



The Straits Pond Tidal Restoration Project, Hull, MA

Economic Impacts of Ecological Restoration in Massachusetts Summary of Report Findings

Massachusetts Department of Fish and Game
Division of Ecological Restoration
March 2012



Deval Patrick
Governor
Richard K. Sullivan, Jr.
Secretary

Mary B. Griffin
Commissioner
Tim Purinton
Director



Site of the former Off Billington Street Dam, Plymouth, MA

Economic & Community Benefits from Stream Barrier Removal Projects in Massachusetts Report & Summary

Massachusetts Department of Fish and Game
Division of Ecological Restoration
March 2015



Charles D. Baker
Governor
Karen E. Polito
Lt. Governor

Matthew A. Beaton
Secretary

George N. Peterson, Jr.
Commissioner
Tim Purinton
Director





Dam Removal Crowdfunding Campaign WWF NL:

✓ Target reached



raised
€ 10.624

106%
reached

WERELD NATUUR
VIDEO

Removal Crosthwaite culvert, Lake District UK

✓ Target reached



raised
€ 19.843

141%
reached

WERELD NATUUR
VIDEO



raised
€ 2.095

69%
reached

WERELD NATUUR
VIDEO

Remove Sunny Bank dam, Torver Beck UK

<https://crowdfunding.wnf.nl/?locale=en>

**Σας ευχαριστώ
πολύ για την
προσοχή σας!**

**Thank you so
much for your
attention!**

Pao Fernández Garrido
pao@fishmigration.org

**ABSENT 50 YEARS, SPAWNING TOMCOD RETURN TO
A RESTORED BROOK IN MAINE AFTER DAM REMOVAL**



February 1st 2019

<https://revitalization.org/article/spawning-tomcod-return-to-restored-brook-in-maine-for-first-time-in-50-years/>

