

Destroying “water reservoirs” on 25,000 km of European rivers ? against the Water Directive Framework - The French counter-example

Review of Article 7 of the draft EU regulations on “Nature restoration”



A mill causeway



A beaver dam

Introduction:

For millions of years, rivers across France and Europe have been ‘dammed’ by tens of thousands of “small river dams”. Built in the past by beavers, these dams were progressively replaced from the early Middle Ages onwards, by watermill dams of similar modest height, ensuring an admirable historical and ecological continuity.

These small dams raise water levels and slow down water runoff across the majority of our European river systems. They conserve billions of m3 of fresh water during summer droughts, mitigate floods and play a key role in storing rainwater in alluvial and deep aquifers.

France used to be a pioneer in the policy to destroy small river mill dams. According to figures published by the OFB (the French Office for Biodiversity) : 7,800 structures have been “partially destroyed” and 4,300 have been “totally destroyed” over the last 10 years. Approximately 10,000 of these are mill causeways (See: <https://professionnels.ofb.fr/fr/node/367>). While these databases may not be perfect, they do indicate the extent of the destruction of water reservoirs in France in recent years. For more details and the list of dams etc. subject to destruction since 2012 see: <https://www.moulinsdefrance.org/liste-ouvrages-detruits-depuis-2012/>

The consequences of this policy of destruction are in proportion to the presumptions and the doctrine on which the policy is based: **destroying human-made structures to “restore nature” reflects a serious lack of understanding and a disregard for the ancient and recent history of our rivers and the key role these reservoirs play in the conservation of both our water resources and the aquatic environments of our rivers that they host.**



FFAM: French Federation of Associations for the Protection of Mills

This short document includes some of the **illustrations** (Appendix 1), **press articles** (Appendix 2), **data and citations** from scientific studies (Appendix 3) that were included in documents sent to the French Minister of Ecological Transition (and Territorial Cohesion) on 8 September 2022, on behalf of the Federations for the protection of mills and ponds, local resident associations and those working to protect heritage and natural environments. The details of these 3 Appendices can be found on our Federation's (FFAM) website: <https://www.moulinsdefrance.org/nos-actions/secheresse-ecologie-energie/>

A full 36-minute film was also made by our Federation in the run-up to the vote on "*Climate - Resilience to the Effects of Climate change*" law passed in France on 22 August 2021. **This law effectively banned the destruction of water mills, with the aim of preserving water resources and the environments they protect. The film can be accessed on Youtube under: "Stopping the Destruction of Watermills".** The last 10 minutes of the film are focused exclusively on speeches by members of the French Parliament (the National Assembly and the Senate), prior to the vote.

To quote Christian Lévêque, the renowned hydrobiologist and aquatic environment specialist, in an article in Le Figaro newspaper on 3 September 2020 :

"The current view of some environmentalists who think that everything that has been modified by the hand of man must be destroyed leads to errors and aberrations."

Contents:

- 1- From Beaver Dams to Mill Dams: The Remarkable Historical and Ecological Continuity of our Rivers p.3
- 2- The Destruction of Small Dams have strong Negative Impact on Water Storage, Alluvial Water Table, Wetlands and Dries up Riverbed during Drought p.5
 - a. The Case of the Seine and Ource Rivers (study by Pierre Potherat, geologist; and an opinion paper by Dr. Jacques Mudry, Doctor in Hydrogeology; and other scientific studies)
 - b. The Cases of the Thouet, Oudon, Dhuy and Other Rivers (press review and illustrations on the role of small river mill dams in water conservation during dry spells)
- 3- The Destruction of Small Dams Exacerbates the Concentration of Nitrates and Derivatives Responsible for Eutrophication and Green Algae Tides p.11
- 4- Small Dams Provide Advantages for Migratory Fish p.12
- 5- Conclusion: The Destruction of small dams on 25,000 kms of European rivers is contrary to the main issues set by the 2000 WFD (water resources, water quality, wildlife) p.15
- 6- Bibliography p.17

FFAM: French Federation of Associations for the Protection of Mills

Non-profit safeguarding association n° W751045847 governed by the law of 1901

Head office: Moulin de la Chaussée, Place Jean Jaurès- 94410 Saint-Maurice - SIRET 321 895 898 00039 - APE 913E

✉ : ffam@moulinsdefrance.org - 🌐 : www.moulinsdefrance.org

1- From Beaver Dams to Mill Dams: The Remarkable Historical and Ecological Continuity of our Rivers

The policy of destroying mill and pond causeways in France has been attractively named “*restoring ecological continuity*” or “*renaturing rivers*”. This new concept is based on the simplistic assumption that small mill dams of modest height, present in very large numbers on our rivers since the Middle Ages, have supposedly “*distorted*” the natural flow of rivers, which are intuitively perceived as “*free flowing*”.

Far from having “denatured” our rivers, as the illustrations below show, small dams offer a remarkable historical continuity with what they were in their wild state, when beavers lived in great numbers in Europe’s valleys.



Mill causeways

Beaver dams

The presence of thousands of ‘small dams’ of modest height (1 to 2 metres for the most part), whether mill or beaver dams, lies at the heart of the ecology and the water cycle in our valleys. **They are perfectly adapted to the distinct seasonality of our climate, where heavy winter rainfall produces floods, followed by a shortage of rain during the summer that leads to droughts.** In this context, small dams enable the water to slow down the speed of floodwater and reduce the water’s energy during heavy rainfall. **Significantly, they also maintain important water reserves in our rivers during summer droughts.**

Two North American scientific studies, cited in Appendix 3 of the Federations' communication of 8 September 2022 (p.6 of this document) have compared the effects of small human dams with those of beavers and conclude that the effects are broadly similar (*Hart et al. study 2002* / *Ecke et al. study 2017*).

Some beaver dams can reach more than 4 metres in height. In Switzerland, where it was reintroduced in the 1950s, some dams can be as high as 3 metres. Recently in Canada, satellite images uncovered the largest beaver dam ever found, 580 metres long.

Beaver dams have positive effects on all issues related to water management: on water retention, groundwater recharge, flood control, development of biodiversity (fish including salmon, insects, birds, amphibians, flora) and water decontamination (nitrates and their by-products), in the same as mills (see below).



Extract from Wikipedia (FR) (translated):

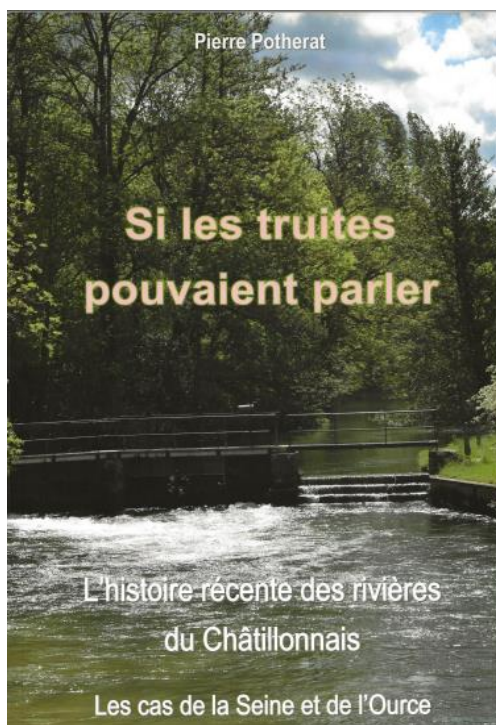
Beaver dams, traces of which have been found in [fossils](#), have been altering the natural environment for millions of years, and are among the key processes in alluvial and forest ecosystems that exist in the northern hemisphere. Beavers increase the number, proportion and size of [wetlands](#), as well as areas of open water and riverbanks. They also create areas of sedimentation and carbon sinks. They increase the proportion of wetlands and areas of open water in forest and alluvial landscapes. They increase the complexity in the morphology of small streams, the composition and distribution of fauna in streams and of alluvial vegetation, as well as the biogeochemical cycles of nutrients. **They improve groundwater recharge and water quality. They limit the frequency, severity and duration of [forest fires](#) and [floods](#); and their dams filter sediments (which could otherwise clog [spawning grounds](#) further downstream). In summer, thanks to the accumulation of water in winter (due to improved conservation), the beaver ponds support [low water levels](#). The dams are thus able to encourage and sustain a variety of species (e.g. fish, including salmonids, amphibians, mammals, water birds, invertebrates, and aquatic and marshland plants), which enrich the overall ecosystem. This makes the beaver a [facilitator](#) and "[keystone](#)" species.**

2- The Destruction of Small Dams have strong Negative Impact on Water Storage, Alluvial Water Table, Wetlands and Dries up Riverbed during Drought

a. The Case of the Seine and Ource Rivers (relationship between surface and groundwater)

<https://www.moulinsdefrance.org/wp-content/uploads/2022/10/etude-effets-de-la-destruction-des-ouvrages-sur-les-eaux-souterraines-M.-Potherat-geologue.pdf>

In July 2021, Pierre Potherat, geologist, published a book entitled “*Si les truites pouvaient parler*” (If Only Trout Could Speak, self-published, 150 pages) and documents the consequences of the destruction of small mill dams on the upper reaches of the Seine and the Ource rivers (Côte d'Or, Burgundy). In addition to a significant decrease in trout populations, he observed that:



“Since the beginning of the 21st century, when the policy of ‘ecological continuity’ was first applied, the planned removal of small dams has led to water reservoirs and catchments being drained upstream. The erosive force of the current has further accelerated the drop in water levels; in the summer, in the upper reaches of the rivers, the alluvial water table has ended up completely empty because over time, the water table is being recharged less and less. Periods of summer drying up of the riverbed have become more and more frequent and last longer. The deep groundwater table, which used to be replenished by the alluvial water table, is also struggling to maintain its water levels, to the detriment of springs on hillsides and slopes (...) After seeing the numbers of fish in our rivers drop inexorably, do we now need to resign ourselves to seeing the water disappear as well? No, not if we work hard to restore the alluvial water table by raising water levels (...) If some of the dams that have been removed can be restored, this has to be done urgently.”

Extract from opinion by Prof. Jacques Mudry, Doctor in Hydrogeology, published in *Bourgogne Franche-Comté Nature* scientific revue n°34 2021 <https://www.bourgogne-franche-comte-nature.fr>

“It is vital that the authorities assess the consequences of its mismanagement and go back, step by step, to a situation that is less catastrophic than the one we have now. In fact, applied in successive stages, the principles of recalibration of watercourses, done in the name of reclaiming agricultural areas, removing weirs and causeways in the name of restoring ecological continuity and applying a policy of minimum flow have had the cumulative effect of lowering the water line and fostering erosion. These measures have prevented the water table from being replenished and fish from reproducing, as well as increasing floods, as the water is sent downstream more quickly, and causing complete drying up of the riverbed over the summer.”

These experts, specialists in the close link between the surface water and groundwater, argue in favour of **“rebuilding those causeways that have been destroyed”**, in order to raise water levels, replenish the alluvial water table and restore the aquatic environments that have been wiped out. Other studies, specific to mills, also confirm these findings (same effect than the beaver dams on water storage):

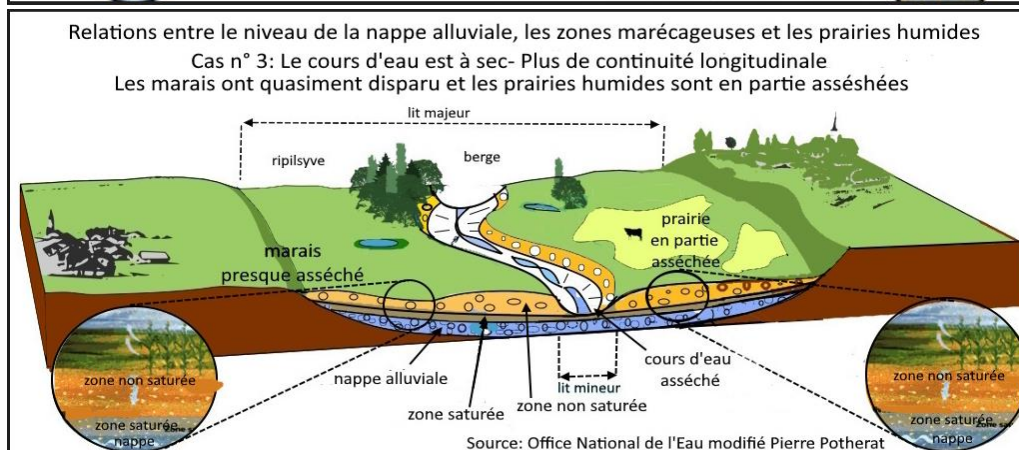
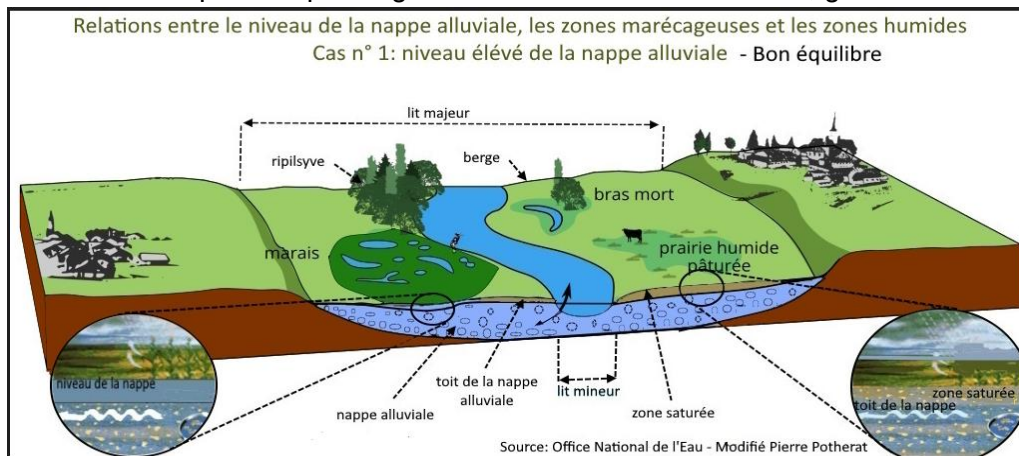
Podgórski and Szatten (2020) / “Changes in the Dynamics and Nature of Sedimentation in Mill Ponds as an Indicator of Environmental Changes in a Selected Lake Catchment (Chełmińskie Lake District, Poland)”
<https://www.mdpi.com/2073-4441/12/1/268>

“Decommissioning water mills [has] induced a number of serious changes in water resources. The most important of them include: the loss of water retention capacity in the Struga Rychnowska catchment, and decreased ground water level[s] in [the] immediate vicinity of former water reservoirs.”

Depoilly and Dufour (2015) / “The Impact of Small Dam Removal on the Riparian Vegetation of the rivers in North-West France” <https://www.cairn.info/revue-noroi-2015-4-page-51.htm>

“Retrospective measurement of tree rings in riparian zones over a period of thirty years has largely revealed a significant decrease in tree-line growth, following the removal of these structures. This decline is interpreted as a response of the riparian forest to changes in the position of the water table locally, following the removal of these structures.”

Below are two plans explaining the link between surface water, groundwater and wetlands



b. Press Review: River dries up after small mill dams are destroyed on the Thouet, Oudon, Dhuy rivers and on many others

In the summer of 2022, a number of articles in the press reported on the anger of local residents and fishermen who watched their rivers completely dried up, following the destruction of mill 'causeways'. Many more articles can be found in Appendix 2 of the Statement sent by our Federations to the Minister for Ecological Transition (and Territorial Cohesion) on 8 September 2022 at:

<https://www.moulinsdefrance.org/wp-content/uploads/2022/09/annexe-2-Revue-de-presse.pdf>

1- In Ouest-France by Marie-Hélène Moron, 18 August 2022

Full article:

<https://www.ouest-france.fr/environnement/maine-et-loire-bassin-de-l-oudon-bien-vivre-en-anjou-denonce-un-desastre-ecology-a91cd4ec-1d44-11ed-aad4-af04b598b667>



The image is a screenshot of a news article from Ouest-France. On the left, there is a logo for 'ouest france' with a red square icon. Below it, a small box contains the text: 'Le Courrier de l'Ouest', 'Marie-Hélène MORON', and 'Publié le 18/08/2022'. To the right of the logo, the headline in red reads: 'L'association Bien vivre en Anjou dénonce « un désastre écologique » dans le bassin de l'Oudon'. Below the headline, a paragraph in black text states: 'Les rivières du bassin de l'Oudon, dans le nord-ouest du Maine-et-Loire, ne coulent plus. Les poissons meurent. L'association Bien vivre en Anjou dénonce « un désastre écologique pas seulement dû à la sécheresse » mais aussi aux travaux réalisés « au nom de la continuité écologique ».'

Headline: *The local association Bien Vivre en Anjou, (Living in Anjou) condemns the “ecological disaster” in the Oudon River Basin.* *The rivers flowing into the Oudon basin in the north-west of Maine-et-Loire (central France) have dried up. The fish are dying. The local association Bien Vivre en Anjou has declared that this is “an ecological disaster, due not only due to the drought”, but also to the work done “for the sake of ‘ecological continuity’.”*

Comment by the president of the local environmental association Bien vivre en Anjou:

“They decided, supposedly for the sake of ‘ecological continuity’, to get rid of the watermill dams and remove the sluice gates, whose job is to hold back some of the water so it doesn’t run out to sea and go to waste. Are they even aware that once the water’s gone, we can’t get it back? They say that once these ‘obstacles’ are gone, the fish will be able to swim upstream more easily and spawn [...] but how can a fish swim upstream if it’s dry?”

2- In Le Parisien by Elodie Cerqueira, 1 August 2022

Full article:

<https://www.ouest-france.fr/environnement/maine-et-loire-bassin-de-l-oudon-bien-vivre-en-anjou-denonce-un-desastre-ecology-a91cd4ec-1d44-11ed-aad4-af04b598b667>



Headline: *"Drought: When a tributary of the Loiret, returned to the wild, slowly dries up."*

Comment from a local resident:

"I've always lived in Sandillon and I've taken over my grandparents' farm," explains Vincent Bouin, a 37-year old farmer. "I used to go swimming in the river and canoe on it. People used to catch lots of fish in it, but since they took away the dams, everything's dead!"

3- In Ouest-France/Courrier de l'Ouest, (author's name not given), 15 August 2022

Full article:

https://saumur.maville.com/actu/actudet_-le-coudray-macouard.-le-thouet-etat-catastrophique-9-5368867_actu.Html



Avec la sécheresse, de nombreux cours d'eau s'assèchent en France. Mais pour Ludovic Panneau, les aménagements décidés en 2012 sont responsables de l'assèchement du Thouet.

Headline: *Le Coudray-Macouard. "Le Thouet: A Crisis Situation!"*

With the drought, rivers and watercourses across France are drying up. For Ludovic Panneau, it's the works on the rivers, decided back in 2012, that is responsible for the Thouet drying up.

Comment from the president of AAPPMA, the local Association for the Protection of Water Wildlife:

"You only have to compare the Thouet on the Deux-Sèvres side, where the dams hasn't been touched, and the section of the river on the Maine-et-Loire side, where the dams have been taken away. In the first scenario, the water levels are near to normal, and things are doing well in terms of wildlife. There's even 3 to 5 metres of water in some places. In the second scenario, the water has almost completely dried up"

4- In Le Courrier de l'Ouest, (author's name not given), 23 August 2022

Full article:

<https://saumur.maville.com/actu/actudet -le-coudray-macouard.-une-odeur-de-poisson-pourri- -5377430 actu.Htm>



Headline: *The Coudray-Macouard – stinks of rotten fish!*

The local AAPPMA president reported massive numbers of fish dying in the Thouet river:

“Where water levels are at their lowest, i.e. where dams have been dismantled, the number of fish is dramatically low. It's like a death sentence for the fish. Where the dams have been kept [...] the numbers are fine.”

5- In Le Progrès, by Michel Kohler, 6 August 2022

Full article: <https://www.leprogres.fr/societe/2022/08/05/le-niveau-d-eau-du-rhins-assez-inquietant>



Headline: *Le Rhins: water levels run worryingly low.*

Le Rhins (near Roanne, Loire (42)) is hit by the effects of the drought, adding to problems caused by the destruction last year of the weir at Tampon Mill, near the Rhins bridge.

Comments from local residents:

Robert: “There could have been other solutions rather than destroying the weir, like a fish ladder or a bypass.”

Philippe: “Destroying the weir has had a big effect, particularly upstream, because when there's a drought, that's where the dyke (the weir) helps keep the water at regular level.”

6- In Le Courrier de Mayenne, by Justine Montauban, August 2022

Full article: <https://www.editouest.fr/editions/5414>



Headline: *Rivers left high and dry: are getting rid of dams making the situation worse?*

Comment from the president of the local residents' associations:

“These reservoirs helped keep water levels at a minimum and they would ‘regulate’ water levels after heavy rain. With water levels going down, there're no more fish, the banks are cracking, there're landslides [...] We can see the difference with the River Erve, the Colmont, the Emée and the Treulon, which have kept their dams.”

Some photographs that illustrate the role of mill “dams” in retaining water during dry spells (summer 2022):

Sections of the River Vire in Normandy (Manche, Calvados), summer 2022 :



The Vire at Condé-sur-Vire upstream from one of the few mill causeways that has been kept



The Vire, a few kilometres from Pont-Farcy, after the destruction of a causeway (the old river bed and the new one, clearly visible)

Bichat Watermill on the River Suran (Ain), when the waterflow was interrupted, August 2022 :



Upstream from the causeway, water conserved for hundreds of metres



Downstream of the causeway: a dried-up river bed

Mill causeway on the River Evre (Maine et Loire) at the end of July 2022:



Upstream from the causeway, water conserved for hundreds of metres



Downstream from the causeway: water reduced to a very small stream

3- Small river dams help remove pollution from water (denitrification/self-purification)

Scientific studies are unanimous in confirming that water, slowed down by beaver or mill dams, plays a role in denitrification/self-purification (natural purification). For more studies on this subject, please refer to Appendix 3 in the statements made by the Federations, pp. 6-8:

<https://www.moulinsdefrance.org/wp-content/uploads/2022/09/annexe-3-donnees-historiques-et-etudes-au-sujet-des-effets-des-petits-barrages-en-riviere.pdf>)

A selection of excerpts from authoritative studies:

Pinay et al. (2017) CNRS IFREMER IRSTEA

<https://www.cnrs.fr/fr/restitution-de-lexpertise-scientifique-collective-sur-leutrophisation>

“Generally speaking, anything that slows down the waterflow in the river and promotes exchanges between the watercourse and the sediments, whether it be the presence of weirs (small dams), wetlands, meanders, secondary channels or logjams, also encourages the purification of nitrogen through denitrification.”

Billen et al. (2011) CNRS PIREN SEINE, Seine Normandy Water Agency <https://piren-seine.fr/en>

“The aim is to restore or increase the retention capacity of wetlands along rivers or stagnant areas such as ponds and reservoirs. As we have seen (Figure 21), these systems can eliminate a significant part of diffuse nitrate pollution. The removal of nitrates by the artificial pond in Brie (Seine-et-Marne), which collects water drained off a 35 hectare farm, is exemplary.”

Powers et al. (2015)

“Control of nitrogen and phosphorus transport by reservoirs in agricultural landscapes”

<https://link.springer.com/article/10.1007/s10533-015-0106-3>

“We want to stress the fact that we are not advocating that large dams should be built, as a way of improving water quality. But small dams and reservoirs, on the other hand, often exist in areas where natural landscapes have already been lost to agriculture; these can be managed and adapted to retain nutrients and ensure other ‘services’ to ecosystems.”

Touchart, L., P. Bartout, F. Donati and Q. Choffel, University of Orléans (April 2022).

“Biophysical Characterisation of Environments Located Upstream from River Weirs: the Weir Ecotone”

<https://journals.openedition.org/vertigo/35155>

“...As an example, the capacity of weirs to act as a buffer and retain pollutants can also be taken into consideration. This factor could, in our opinion, be crucial in some European countries, where river systems have a dense network of weirs and need to come within the regulations of the Water Framework Directive (WFD-2000/60/EC), which emphasises the need to reduce pollutants to reach acceptable ecological levels in water bodies. Indeed, once appropriate management strategies are put in place, weirs can become valuable allies in the fight against these substances and help meet legislative requirements.”

4- Small Dams benefit to Migratory Fish

a- Beaver dams benefit to migratory fish

As studies in the US and Canada on beaver dams show, by conserving large volumes of water in rivers during the dry season and dry spells, small dams provide a refuge for fish fry among these species, where they can protect themselves and develop.

Extracts from Wikipedia (FR) (trans.): https://fr.wikipedia.org/wiki/Barrage_de_castors

“Dams and their pools logically benefit more slow-moving, warmer water species but (counter-intuitively) they also benefit salmonids and riparian species.”

Extract from Wikipedia (EN): https://en.wikipedia.org/wiki/Beaver_dam

“There are several reasons why beaver dams increase salmon migration. They form deep enough reservoirs for young salmon to hide from predatory birds (...).”

b- Migratory fish are perfectly adapted to crossing small dams and weirs



Salmon



Eels



Shad

With their ability to jump, swim and crawl, migratory fish are perfectly adapted to crossing small dams, as they have had to do so for millions of years (in the form of beaver dams):

- Salmon can jump from between 2 to 3.5 metres, depending on the species
- Adult trout can jump to at least 1.8 metres and can pass under sluices (gates on small mill dams)
- Eels can cross weirs by crawling on the facies or by bypassing structures through wetland meadows

c- Examples of Effects on Migratory Fish Populations after Mill Dams Destruction in France

In France the destruction of small scale dams has been presented as part of a solution to increase the very low population of migratory fishes. After 10 000 “total” or “partial” destructions over the last 12 years, the population stay at very low level, and even decrease on some of the rivers where massive destructions have been done in particular in Normandy because of the drying up those destructions have caused...

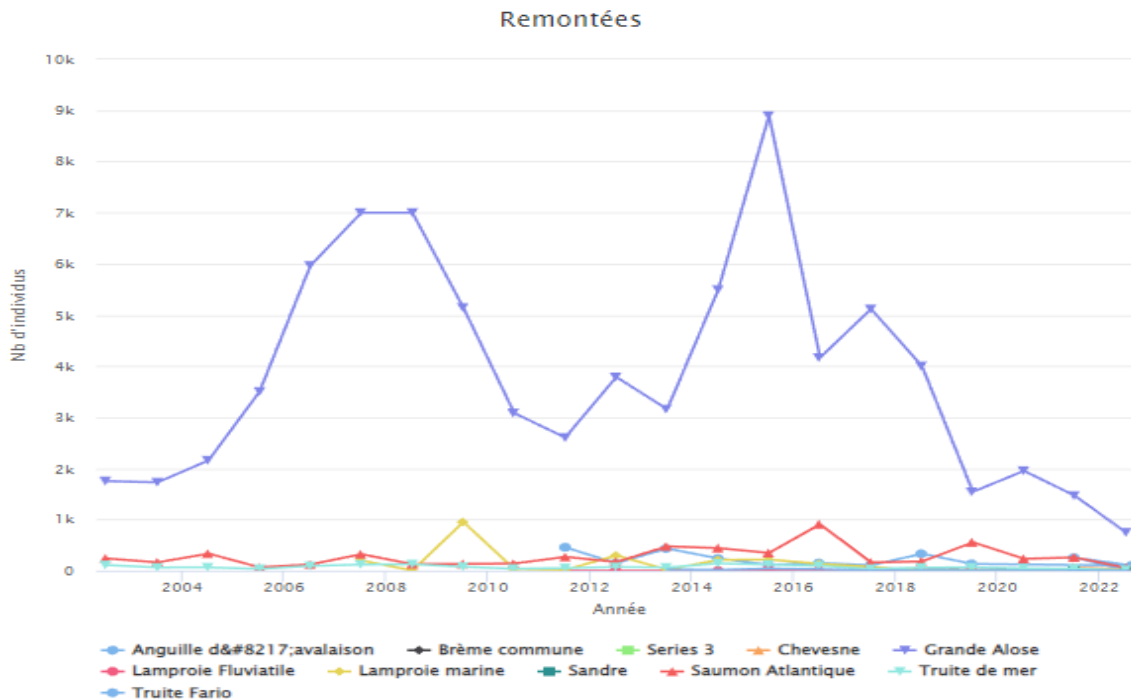


FFAM: French Federation of Associations for the Protection of Mills

The Case of the River “la Vire” (Manche, Normandy, France)

Source: Claye-de-Vire Counting Station, Fishing Federation, La Manche (Normandy).

<https://www.peche-manche.com/station-de-comptage/>



On the river Vire, between 2015 and 2022, **7 of the 9 principal small mill dams**, located downstream, were destroyed along with other causeways on its tributaries. **During this same period, shad numbers fell from 9,000 to under 1,000...**

Of the 7 mills destroyed, 6 were producing small hydroelectricity. Some of these had been bought by the Manche Fishing Federation, thanks to a 100% subsidy granted by the Seine-Normandie Water Agency. These 6 mills alone used to produce enough electricity to supply the equivalent of the annual consumption of 3,000 people.

In the summer of 2022, a few weeks after destroying the seventh small dam, the authorities were forced to take urgent measures to rebuild a temporary dam to raise water levels and supply the population with urgently needed water...

See: https://actu.fr/normandie/saint-lo_50502/secheresse-critique-dans-la-manche-un-barrage-pour-garantir-l-eau-au-robinet_52976982.html

FFAM: French Federation of Associations for the Protection of Mills

Non-profit safeguarding association n° W751045847 governed by the law of 1901

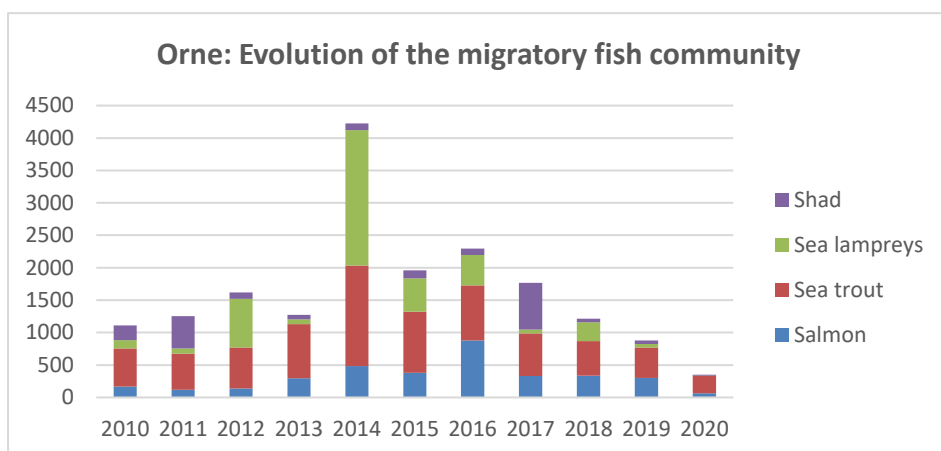
Head office: Moulin de la Chaussée, Place Jean Jaurès- 94410 Saint-Maurice - SIRET 321 895 898 00039 - APE 913E

✉ : ffam@moulinsdefrance.org - 🌐 : www.moulinsdefrance.org

The Case of the River “Orne” (Calvados, Normandy, France)

Source: May-sur-Orne Counting Station Calvados Departmental Fishing Federation

<https://www.federation-peche14.fr/may.html>



The results, although less catastrophic than on the River la Vire, are hardly better on the River Orne. Here, the destruction began in 2012, first with the causeways of two mills, the Enfernay and Maisons-Rouges, with destruction speeding up from 2015 and 2016 onwards. The result has been a drop in numbers to their lowest point in 2020, levelling off in 2021 at around 750 migratory fish across all species (i.e. lower than in 2019).

d- Fish Stocks in 18th century France: Treatise on Fishing by the French Academician Henri-Louis Duhamel du Monceau (1770)

<https://gallica.bnf.fr/ark:/12148/btv1b8626558w.image>

In 1770, when Duhamel du Monceau was commissioned by Louis XVI to carry out his study on fishin, nearly 80,000 water mills were listed on the Cassini Map, probably 30 to 40% more than today. This treatise presents a region-by-region account of all the types of fishing and the varieties of fish caught. It describes the abundance of all species of fish, including migratory fish.

e- The Disappearance of Salmon from the Seine, an authoritative work by Louis Roule

<https://gallica.bnf.fr/ark:/12148/bpt6k6365417s> (complete)

<https://www.hydrauxois.org/2015/09/reflexions-sur-les-saumons-de-la-cure.html> (summary)

In 1920, Louis Roule, the first geographer and naturalist to have studied the disappearance of salmon from the Seine River basin, concluded that this was **not** the result of old small dams. As he records in his study:

*“In the past and until the second half of the 19th century, salmon regularly swam up the river [Seine], crossing Paris to go on further upstream. Their main spawning area was located in the Morvan massif; it belonged to the Cure basin, a tributary of the Yonne. At present, there is no regular rise in the water level and the spawning grounds are often deserted, as in the case of the Meuse. **This is due to the construction of dams between the estuary and the spawning area, as well as to water pollution from the Paris conurbation.**”*



The old dams posed no hazardous to them. As they were not very high and were built on an incline, they could counter the rise [of salmon] during periods of low water, but not when the rivers were in flood or had average water levels; when this was the case, the dams were covered with enough water to allow the fish to pass through, while the current over the incline was not strong enough to curtail the salmon's momentum. This is not the case with today's dams, which are higher and more vertical (...) These have completely stopped the ascent of rivers by the fish for reproductive purposes, except occasionally when rivers experience exceptional flooding, when average-sized dams are submerged below the water level.” (Roule, 1920)

f- The recent collapse of eel and shad populations in France is not due to small mill dams

On eels:

The eel used to be classified as a pest until 1984, because the high number of eels was considered excessive. The recent sharp decline in their numbers has nothing to do with mill dams. On the contrary, eels appreciate the slow-moving and abundant water generally found upstream from the causeways. Water pollution and a nematode known as “anguillocola crassus” from Asia are probably to blame for this.

https://fr.wikipedia.org/wiki/Anguille_d%27Europe

https://www.lemonde.fr/sciences/article/2014/12/15/anguille-un-ancien-nuisible-sous-protection_4540911_1650684.html

On shad:

There has been a significant decline in the number of shad in French rivers since the 1990s. In just 30 years on the River Garonne, for example, numbers have dropped from around 1,000,000 individuals to just a few thousand. Mills have nothing to do with this (Sources: Migado, counting stations www.migado.fr)

<https://www.20minutes.fr/planete/2295903-20180625-gironde-autrefois-abondante-aloise-disparait-garonne>

5- Conclusion: the draft Article 7 of the “Restoring Nature” regulations is contrary to all the issues set out in the European Water Framework Directive of 2000

Applying a model of a “free-flowing” rivers on rivers in the northern hemisphere, as some NGOs do, is a serious error, which has dramatic consequences, as we are now seeing in France.

The fragmentation of European rivers by tens of thousands of **small dams of modest height**, whether beaver dams or mill dams, is perfectly natural and adapted to the seasonal climate of our European water courses.

These small dams have been part of the natural landscape, for millions of years for some, and centuries for others. They have always benefited by a rich stock of fish which, since the 19th century onwards, has slowly been depleted, by the construction of much higher dams and the effects of industrial, agricultural and household pollution that has accumulated since the second half of the 20th century.



FFAM: French Federation of Associations for the Protection of Mills

The French case, with its thousands of small mills dams destroyed over the last 10 years, clearly stands as a **counter example**, as testified in the number of articles in the press, confirming the partial or total disappearance of water during the summer droughts, after these traditional reservoirs were destroyed. Where mills dams have been conserved, the waters have stayed, along with the wildlife that goes with them. Without water, no life...

A year and a half ago, the French Parliament and Senate **sanctioned this policy of destruction**, after the dramatic results were recorded on water resources and the environments they host.

For every square kilometre of an alluvial plain, more than 250,000 m³ of fresh water can be stored per metre. By raising water levels and slowing down the flow of water, tens of thousands of small reservoirs thus provide the best means of water storage we have at our disposal on our continent.

By tabling the destruction of these “water reservoirs” - pejoratively described here as “barriers” - on 25,000 kms of European rivers, Article 7 of the draft European regulations on “Restoring Nature” runs counter to the main directives and recommendations of the European Water Framework Directive of 2000, which specifies the importance of preserving our water resources, improving water quality and conserving our natural environments.

Its implementation would only lead, as in France, to the gradual drying up of 25,000 km of European valleys, through the gradual emptying of the alluvial aquifers, which will lead to even greater water shortages on our continent and a disaster for aquatic environment as we experienced in France.

Significantly, this exceptional heritage also has the **considerable potential** to produce hydroelectricity on a small-scale and support traditional activities that are being revived in France (e.g. milling, oil production). Eau’rigine, who produced a study commissioned by the Federation, estimates that 36,000 water mills can be renovated, rebuilt and put into action in France, thereby producing an annual supply equivalent to the electricity consumption of 1.3 million people (approx. 3 TWh).

<https://www.moulinsdefrance.org/wp-content/uploads/2022/09/Premiere-evaluation-du-potentiel-de-production-delectricite-des-moulins-a-eau-en-France-en-2022-FFAM.pdf>

Our ancestors established and maintained this exceptional heritage over centuries, a heritage unique in the world and present in every country on our continent. They were faced with the same challenges in the past, as we do today: **preserving water, slowing down waterflows, fishing and producing energy.**



FFAM: French Federation of Associations for the Protection of Mills

Non-profit safeguarding association n° W751045847 governed by the law of 1901

Head office: Moulin de la Chaussée, Place Jean Jaurès- 94410 Saint-Maurice - SIRET 321 895 898 00039 - APE 913E

✉ : ffam@moulinsdefrance.org - 🌐 : www.moulinsdefrance.org



6- Bibliography

On beaver dams

Comprehensive Wikipedia articles on Beaver Dams (in French and English) that cite dozens of scientific studies

https://fr.wikipedia.org/wiki/Barrage_de_castors

https://en.wikipedia.org/wiki/Beaver_dam

Puttock et al. (2017). "Eurasian beaver activity increases water storage, attenuates flow and mitigates diffuse pollution from intensively-managed grasslands »

<https://www.sciencedirect.com/science/article/pii/S0048969716323099>

On the broadly Similar Effects of Small-scale Human and Beaver Dams

Ecke et al. (2017). Study comparing human- and beaver-made dams

<https://iopscience.iop.org/article/10.1088/1748-9326/aa8979>

Lautz et al. (2019). Study on human-made dam construction that imitates beaver dams

<https://onlinelibrary.wiley.com/doi/abs/10.1002/hyp.13333>

Hart et al. (2002). "Removal: Challenges and Opportunities for Ecological Research and River Restoration: We develop a risk assessment framework for understanding how potential responses to dam removal vary with dam and watershed characteristics, which can lead to more effective use of this restoration method"

<https://academic.oup.com/bioscience/article/52/8/669/254910>

Consequences of the destruction of small milldams

Potherat, P. (2021) *Si les truites pouvaient parler* (If Only Trout Could Speak) <https://www.moulinsdefrance.org/wp-content/uploads/2022/10/etude-effets-de-la-destruction-des-ouvrages-sur-les-eaux-souterraines-M.-Potherat-geologue.pdf>

Author's summary with 3 scientific opinions from Mudry, J. (2021) doctor in hydrogeology published in *Bourgogne Franche-Comté Nature* scientific revue n°34 2021 <https://www.bourgogne-franche-comte-nature.fr> M. Frochot H. emeritus former professor of ecology at the Burgundy University, M. Frochot J. former INRA researcher

Podgórski and Szatten (2020) "Changes in the Dynamics and Nature of Sedimentation in Mill Ponds as an Indicator of Environmental Changes in a Selected Lake Catchment (Chełmińskie Lake District, Poland)"

<https://www.mdpi.com/2073-4441/12/1/268>

Depoilly and Dufour study (2015): "The Impact of Small Dam Removal on the Riparian Vegetation of the rivers in North-West France."

<https://www.cairn.info/revue-noroi-2015-4-page-51.htm>

Mériaux et al. (1997) quote by Bravard J.P. and Lévêque C. in "the management of French rivers - scientists take a look at a controversy"

<https://www.editions-harmattan.fr/livre->

[la gestion ecologique des rivieres francaises regards de scientifiques sur une controverse jean paul bravard christian leveque-9782343197487-65711.html](https://www.editions-harmattan.fr/livre-la-gestion-ecologique-des-rivieres-francaises-regards-de-scientifiques-sur-une-controverse-jean-paul-bravard-christian-leveque-9782343197487-65711.html)



Small-scale dams created by mills or beaver decontaminate water (denitrification)

The Canadian Department of Agriculture (Agriculture and Agri-Food Canada):

https://publications.gc.ca/collections/collection_2013/aac-aafc/A12-1-7-2012-eng.pdf

M. Billen et al. (2011) CNRS PIREN SEINE “Cascade nitrogen”

<https://www.piren-seine.fr/fr/fascicules/la-cascade-de-l%E2%80%99azote-dans-le-bassin-de-la-seine>

Pinay et al. (2017) CNRS IFREMER IRSTEA “Europhication”

<http://www.cnrs.fr/fr/restitution-de-lexpertise-scientifique-collective-sur-leutrophisation>

Passy Paul (2012) “Doctoral Thesis on Nutrient Cascades”

https://www.researchgate.net/publication/262673758_Passe_present_et_devenir_de_la_cascade_de_nutriments_dans_les_bassins_de_la_Seine_de_la_Somme_et_de_l'Escaut (“The Past, Present and Future of the Nutrient Cascade in the Seine, Somme and Scheldt River Basins.”)

Powers et al. (2015) “Control of nitrogen and phosphorus transport by reservoirs in agricultural landscapes”

<https://link.springer.com/article/10.1007/s10533-015-0106-3> <https://doi.org/10.1007/s10533-015-0106-3>

Touchart, Laurent. Pascal Bartout, Francesco Donati and Quentin Choffel, University of Orléans (April 2022):

“Biophysical Characterisation of Environments Located Upstream from River Weirs: the Weir Ecotone”

<https://journals.openedition.org/vertigo/35155>

Additional Studies:

Grantz et al. (2014): on the dynamics of nitrogen and phosphorus accumulation in reservoirs that are already eutrophic;

Gasparini et al. (2014): on the positive outcome on nutrient (nitrogen) retention in the reservoirs of the Great Plains;

Némery et al. (2014/2015): on carbon, nitrogen and phosphorus retention by a tropical dam in an urbanised area.

Tiessen et al. (2011): demonstrates the effectiveness of small dams in storing nitrogen and phosphorus in Canada;

The Passage of Migratory Fish over Dams

Chanseau et al. (1999)

<https://www.kmae-journal.org/articles/kmae/abs/1999/02/kmae199935335406/kmae199935335406.html>

Ovidio et al. (2007)

https://www.researchgate.net/publication/227692683_Field_protocol_for_assessing_small_obstacles_to_the_migration_of_brown_trout_Salmo_trutta_and_European_grayling_Thymallus_thymallus:_A_contribution_to_the_management_of_free_movement_in_rivers

Historical Studies on the population of migratory fish

Duhamel du Monceau, Henri-Louis (1770) “The General Population of France in the 18th century: Treatise on Fishing”

<https://gallica.bnf.fr/ark:/12148/btv1b8626558w.image> (in French only)

Roule, Louis (1920). “The disappearance of the salmon from the Seine bassin”

<https://gallica.bnf.fr/ark:/12148/bpt6k6365417s>



FFAM: French Federation of Associations for the Protection of Mills



FFAM: French Federation of Associations for the Protection of Mills

Non-profit safeguarding association n° W751045847 governed by the law of 1901

Head office: Moulin de la Chaussée, Place Jean Jaurès- 94410 Saint-Maurice - SIRET 321 895 898 00039 - APE 913E

✉ : ffam@moulinsdefrance.org - 🌐 : www.moulinsdefrance.org



Mill dams

Beaver dams

FFAM: French Federation of Associations for the Protection of Mills

Non-profit safeguarding association n° W751045847 governed by the law of 1901

Head office: Moulin de la Chaussée, Place Jean Jaurès- 94410 Saint-Maurice - SIRET 321 895 898 00039 - APE 913E

✉ : ffam@moulinsdefrance.org - 🌐 : www.moulinsdefrance.org