

Lowering the weir of the Houël mill on the Leff River

The operation

Category	Restoration
Type of operation	Partial or total weir/dam removal
Type of environment	Lowland rivers
Issues at stake (water, biodiversity, climate)	River continuity, good status of habitats

Start of operation	September 2010
End of operation	September 2010
Length of river affected by the works	700 m

River in the restored sector

Name	Leff River
Distance to source	55 km
Mean bankfull width	14,5 m before the works 13 m after the works
Mean gradient	2,35‰
Mean discharge	0.4 cubic metre per second

Aims of the project owner

- Restore river continuity for fish.
- Restore the rearing habitats for juvenile Atlantic salmon and reproduction zones for shad and sea lampreys.
- Highlight the built heritage.
- Encourage recreational activities.

The location

Country	France
River basin	Loire - Bretagne
Region(s)	Bretagne
Département(s)	Côtes-d'Armor
Commune(s)	Plourivo, Quemper-Guézennec



Regulatory context Lists 1 and 2 L. 214-17

European directive references

Water-body ref.:	FRGR0043
Natura 2000 site ref.:	FR5300010
ROE (obstacle) code	12350

The weir of the Houël mill, in 2010 prior to the works.



Hubert Catroux, FDAAPPMA 22



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The impounded reach of the Houël weir before the works (2010) and after (2011).

Environment and pressures

The Leff River is a tributary to the Trieux River. It is a small coastal river approximately 60 kilometres long, with a catchment area of 365 square kilometres. The river is a category-1 river for fish and is mentioned in Lists 1 and 2 of Article L. 214-17 of the Environmental code. Several diadromous migratory species are present in the river, notably salmon, shad, sea lampreys and eels. A number of other, emblematic species, such as otters and white-clawed crayfish, are also present. The area is part of the priority action zone (ZAP) for eels and is also part of the Trégor-Goëlo Natura 2000 site.

The existence of numerous transverse structures and leats has modified the river hydromorphology and habitat quality. The impounded reach in the lower section of the river was estimated at over 80%. The numerous constructions were built during the period of expansion for the milling activity. In light of the above, the lower section of the river was listed as "at risk of not attaining good status by 2015", as per the criteria contained in the European water framework directive (WFD).

That is why the Côtes-d'Armor FDAAPPMA (Departmental federation of certified associations for fishing and protection of aquatic environments) decided to lower the weir of the Houël mill from a height of 1.3 metres to 0.3 m. The mill was constructed between 1789 and 1832 to produce flour. The Houël mill ceased operations in 1925 and was purchased by the Côtes-d'Armor FDAAPPMA in 1954.

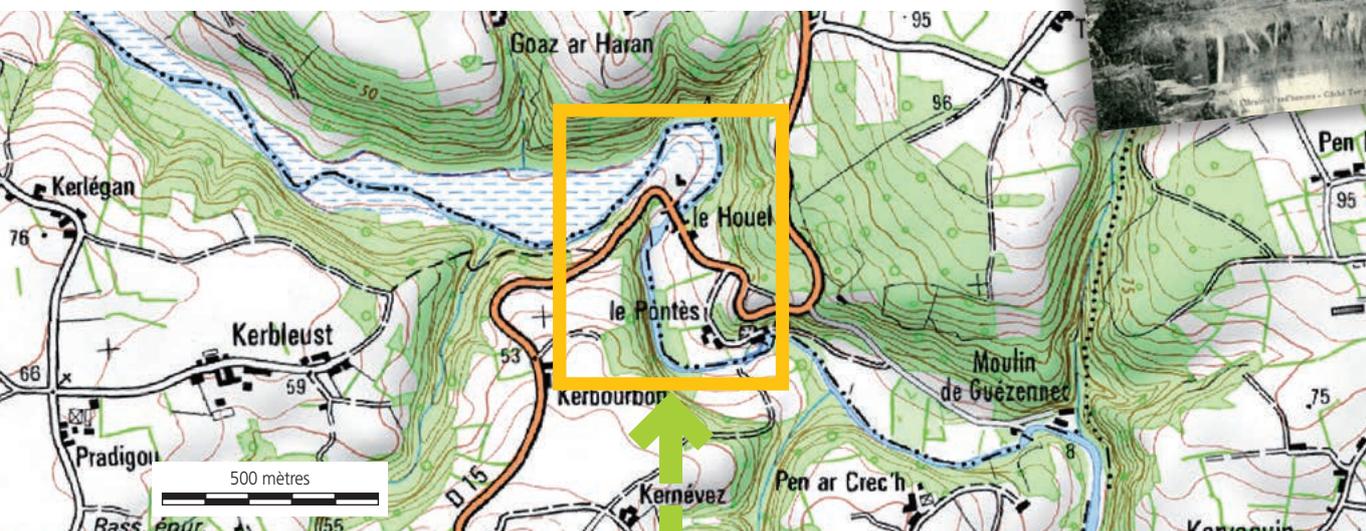
The weir is the first transversal structure upstream of the estuary and can be overcome by fish only during very high tides. Unfortunately, river continuity is again broken by another hydraulic structure 700 metres upstream.

The weir of the Houël mill was not maintained and had fallen into disrepair. It impacted habitat diversity and the flow of water in the impounded reach. It also disturbed sediment transport.

A gate in the weir was used by poachers to block the passage of fish and to gather them in a single spot in order to catch them more easily.



The Houël mill around the year 1910.



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■ **Opportunities to act**

In order to comply with the objectives of the Grenelle environmental agreements, a work group, led by the Côtes-d'Armor Departmental territorial and maritime directorate listed 50 structures in the department requiring work by 2012, including the weir of the Houël mill. The Côtes-d'Armor FDAAPP-MA was in favour of the project in order to have an example of a restoration project for river continuity in the department. The procedure was launched in 2008 with a feasibility study. The actual works were carried out in 2010 and included not only restoration of river continuity, but also efforts to promote the landscape and the ruins of the old mill, a part of the historical heritage of the town.

Long consultations over two years were required to ensure compliance with all applicable regulations in the area (territorial contract for the aquatic environments of the Leff, the document listing objectives for the Trégor-Goëlo Natura 2000 site, the Grenelle environmental agreements, the eel management plan, etc.) and to take into account the desiderata of all stakeholders, including kayakers, anglers and local residents intent on protecting their old mill.

■ **Works and developments**

The project consisted of lowering the weir by over one metre over half of its total length. The rocks resulting from the removal of a part of the weir were spread over the banks to prevent erosion or laid in the river bed to increase the diversity of flows and create rapids for the kayakers. The old buildings were enhanced by clearing the area around the ruins and trimming a number of trees.

■ **Regulatory approach**

- No applications concerning the general interest or public utility had to be filed for the project.
- The declarations were made in accordance with the Water law.

■ **Post-restoration management**

Management included upkeep of the site in terms of landscaping and promoting the historical heritage (cutting vegetation).

■ **Monitoring**

Pre-works monitoring was carried out in 2009 on the hydromorphological characteristics upstream of the weir (flow patterns, substrate sizes, morphology of the river bed and banks).

These measurements were not pursued following the works, however biological monitoring was set up in 2011 by the Côtes-d'Armor FDAAPPMA in the former impounded reach. Monitoring consisted of electrofishing for salmon and of visual inspections of

the spawning habitats and redds for the two other species. This monitoring programme was set up for a period of five years and carried out annually from 2011 to 2015.

■ **Outcome of the project and outlook**

The continuity of the Leff River has been restored over a 700-metre section up to the next hydraulic structure. Flows are now more rapid and the fine sediment deposited in the impounded reach was carried off to reveal a more coarse substrate made up of rocks and gravel. The diversity of habitats, flow patterns and new substrates revealed upstream of the former weir is favourable for diadromous migratory species that have found along the 700-metre section new spots suitable for their reproduction (well oxygenated gravel) and to the growth of juveniles (riffles). In 2011, approximately 30 spawning grounds for sea lampreys were observed upstream of the former weir. Prior to the lowering of the weir, the water was too deep and hindered the reproduction of the species. Juvenile salmon use the new riffles created in the former impounded reach during their growth phases. On the other hand, no shad have been observed upstream of the former weir, possibly because the species has not yet colonised the new environment.

Strong points of the project:

- improvements in the ecological functioning of the site;
- more attractive landscape and recreational possibilities.

More than three years of efforts, from the initial study phase to the end of the works, were required to achieve this result.

Weak points of the project:

- no standardised monitoring was set up;
- the post-work communication on the changes in the environment is insufficient.

The wide-ranging discussions held at the start of the project served to reconcile the different expectations and to allay the concerns of users. The solid technical feasibility study and the realistic impact assessment facilitated the acceptance of the project by all stakeholders and local residents.

In terms of recreational activities, the site is more frequently visited by anglers since the restoration project. It has become a good fishing spot with larger numbers of salmon caught than in the previous years. The kayakers are happy with the changes made because it is now easier to travel over the weir and the white-water areas are fun to shoot. The improvements to the historical heritage were also one of the strong points of the project. The formerly abandoned mill building was spotlighted with signs installed on the existing trail to explain the history of the site

Costs

In euros ex VAT

Studies	3 680 €
Purchase of land	Not applicable
Works and developments	5 280 €
Monitoring studies	Not applicable
Promotion (DVD, sign, press)	6 340 €
Total cost of project	15 300 €

Financial partners and funding:

Loire-Bretagne Water agency 30%, Bretagne Regional council 30%, Côtes-d'Armor Departmental council 20%, French national fishing federation 12%, Côtes-d'Armor FDAAPPMA 8%.

Technical partners:

Goëlo-Argoat environmental board (the manager of the territorial contract for the aquatic environments of the Leff), National agency for water and aquatic environments (Onema), DDTM, Paimpol certified association for fishing and protection of aquatic environments, Paimpol-Goëlo intermunicipal board.

Promotion of the project



A video was produced by the Côtes-d'Armor FDAAPPMA to present the project and provide information on how to address river continuity. DVDs were distributed to the local residents, the technical partners and other stakeholders interested in the project feedback.



The purpose of the project and the work done are explained on a sign set up near the mill to raise awareness.



The "Ecological continuity" working group for the Argoat-Trégor-Goëlo SBMP decided in 2012 to assist mill owners for projects on river continuity. To encourage the owners to undertake projects, a feasibility study is offered to explain the different technical solutions. Visits are organised for mill owners to present the restoration project for river continuity at the Houël mill and to demonstrate the results of a successful project.



- *Abaissement de la crête du déversoir du moulin du Houël sur la rivière du Leff - Déclaration de travaux et notice d'incidences.* FDAAPPMA 22. Septembre 2010, 70 p.
- *Continuité écologique : l'abaissement du déversoir du moulin du Houël sur la rivière du Leff - Fiche retour d'expériences.* FDAAPPMA 22. Décembre 2012, 6 p.
- The film may be viewed at:
<https://www.youtube.com/watch?v=bWGI-PxUQ1k>
- An information sheet is available at:
http://www.trameverteetbleue.fr/sites/default/files/fiche_experience_fdp22_0.pdf.

Project owner



Côtes d'Armor Departmental federation of certified associations for fishing and the protection of aquatic environments

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