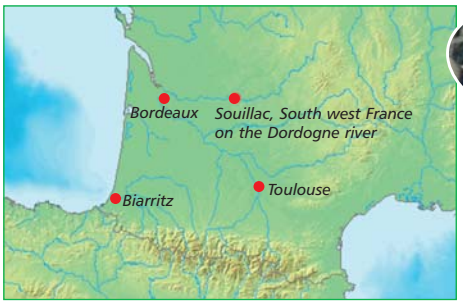
Design and production of river structures

## Biodiversity restoration in rivers

# Fish hides,fish passages

*Presented by Damien MAURY and Léopold NOTO, students in the penultimate year of the baccalaureate in Civil Engineering at Souillac Technical High School*

***Souillac Technical High School is located in South-West France. Students are training in civil engineering. A project such as "river structures" is combining production (in the Civil Engineering workshop) and installation (on site training). The technical aspect goes hand in hand with sensitivity to environmental protection. To this end we are cooperating with organisations and institutions which can inform and guide us on matters of river equilibrium.***

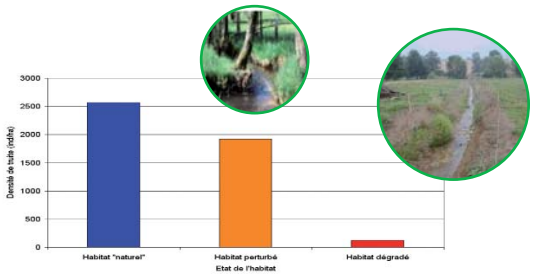



*The Céou river*

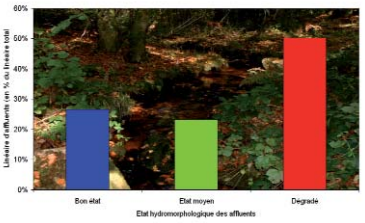
## The problem: alteration of rivers could lead to biological depletion

The rivers serve multiple purposes, including water supply, power, evacuation of waste and food provision via fishing. This close relationship between rivers and humans led them to make profound changes to these ecosystems, modifying them according to their needs and to protect themselves from flooding. These modifications led to a loss of biological diversity. Major efforts have been made to decontaminate wastewater and attempt to restore some species of fish that had disappeared from our rivers, such as the Atlantic salmon in the river Dordogne whose passage was blocked by the construction of dams.

**Fish density (nb fish/hectare) Before and after reprofiling of the river bed in order to improve hydraulic efficiency and prevent flooding**



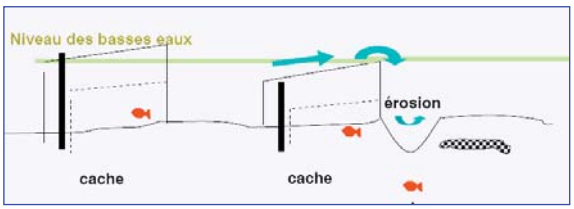

**Present state of 600 km of rivers in a middle mountain catching basin. (Hydromorphologic characteristics: Bottom and banks of the river, number of fish hides)**
**More than 50% of the length is in a bad state (red bar)**



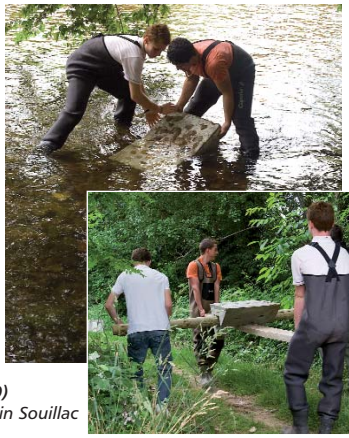

## Solution 1: Fish hides

### Design, production and on-site installation

**The aim of this project is to reconstruct resting habitats for fish, mainly trout which are the majority species in these rivers. These habitats consist of a fixed structure functioning as a hide. The hides are covered with a pebbled decoration in order to blend into their future environnement.**




*The current speeds up as it flows past the hides, which aids the oxygenation of the water, and causes the formation of a small trench downstream.*



***Three sites were equipped with a total of 36 artificial hides***

The Céou, Borrèze and Bave are rivers which mainly have trout along with sculpins, loach, minnows and chub. Hides restore good living conditions, they provide the fish with rest areas and bases for hunting.

***Number of fish hides installed (2007-2009)***
*12 River Céou at Laborie - 12 River Borrèze in Souillac*
*12 River Bave at La Vaute*

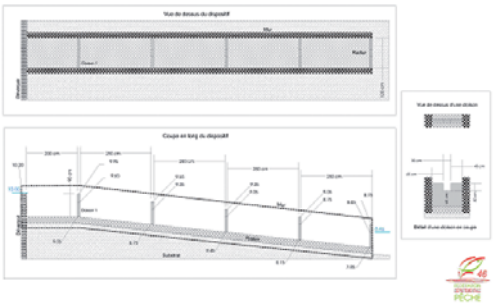
**French selection for the Stockholm Junior Water Prize 2009: Souillac Technical High School**

# Solution 2: Fish passages

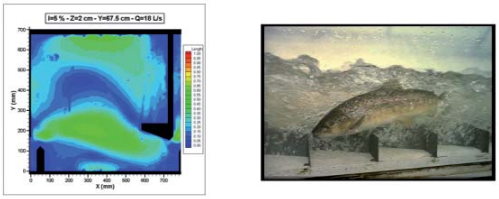
## Research, design, on site construction

**The purpose of this project is to build a structure allowing fish to pass at the location of a dam. This project complements the fish-hide structures installed on the same river. The fish passage consists of a concrete structure attached to a base and fixed into the dam. The objective being to restore the free movement of fish.**

The first technological choice was for a macro-rugosity passage with concrete blocks intended to reduce the energy of the current and to raise the water line. Unfortunately due to the steep slope of the site, we had to opt for another technique: a sequence of pools separated by bulkheads fitted with saddles.



*Experimental "Pool-type fish passage". Treshold "Laborie" on the Céou river. Document from the Lot Fishing Federation.*



*Gradient of speed in various areas of the fish passage*

*Our group had to overcome heavy constraints on a river-bed based construction site*

## Monitoring and Follow up

The actions undertaken have followed a scientific logic, associated with technical skills in Civil Engineering, resulting in practical constructions which can be an example to other areas and a reference in issues of fish management. To confirm the effect of the installations on the number of fish, monitoring has been undertaken by the Lot Fishing Federation. This is done through electric fishing before and after installation of the hides to observe the degree of colonisation of these habitats.
The initial inventory was carried out in 2007.
In 2009, a first verification is to be carried out as soon as flow conditions allow.

*Electric fishing in the Céou river to establish the initial inventory before installing the hides*

## Sharing our knowledge

One of the most gratifying aspect of our project was without doubt the opportunity to pass on our newly-acquired knowledge to younger pupils in primary and middle schools along with taking part in Nature Days which, backed by our technical experience, saw us as embassadors to the general public for this great cause.

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