

REMOVING BARRIERS ON THE RHONE MEDITERRANEAN BASIN

Highlights from the French experience

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The 22nd of October 2025

Presentation outline

- 1) Context of water management in France
- 2) History of barrier removal in France
- 3) Main objectives with barrier removal
- 4) Stakeholders engagement
- 5) Several examples / lessons learned

1) Context of water management in France

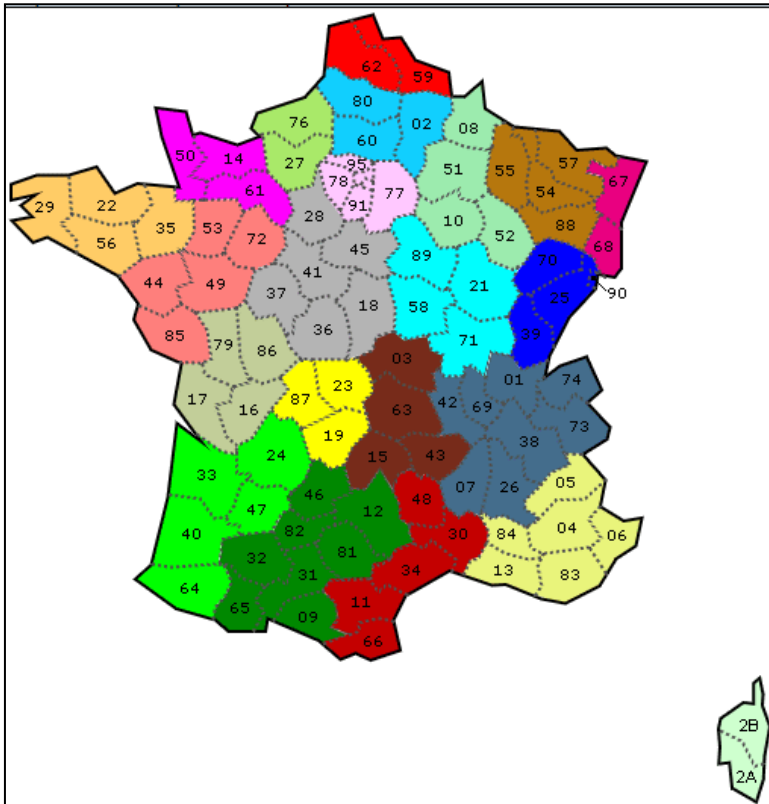
The 1964 French water law

26 regions (at the time)

101 “departements”

36700 municipalities

7 river basins with river basin Committees (so-called **parliament of water**) (40% local authorities, 40% users, 20% state)



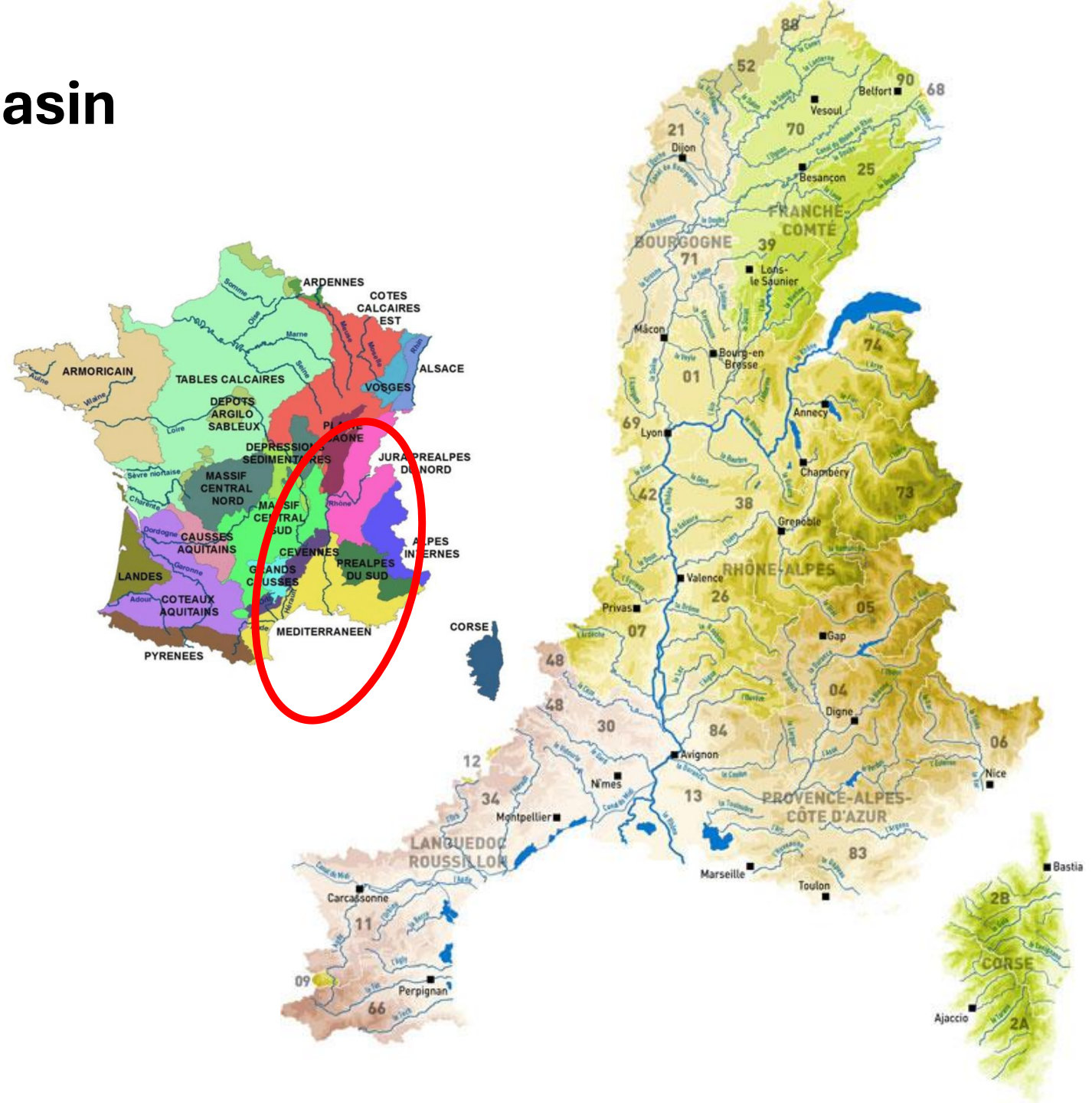
The main missions of the Water Agencies

To implement the water policy, **according to national guidance** but **designed at basin level**, by:

- **Collecting environmental taxes** - “**water pays for water**” or “**polluter pays**” principles
- Giving subsidies to **finance projects to reduce pollution, restore rivers**, etc.
- **Preparing River Basin Management Plan** according to EU Directives
- And more, providing information on water quality, monitoring aquatic ecosystems etc.

The Rhone-Mediterranean basin

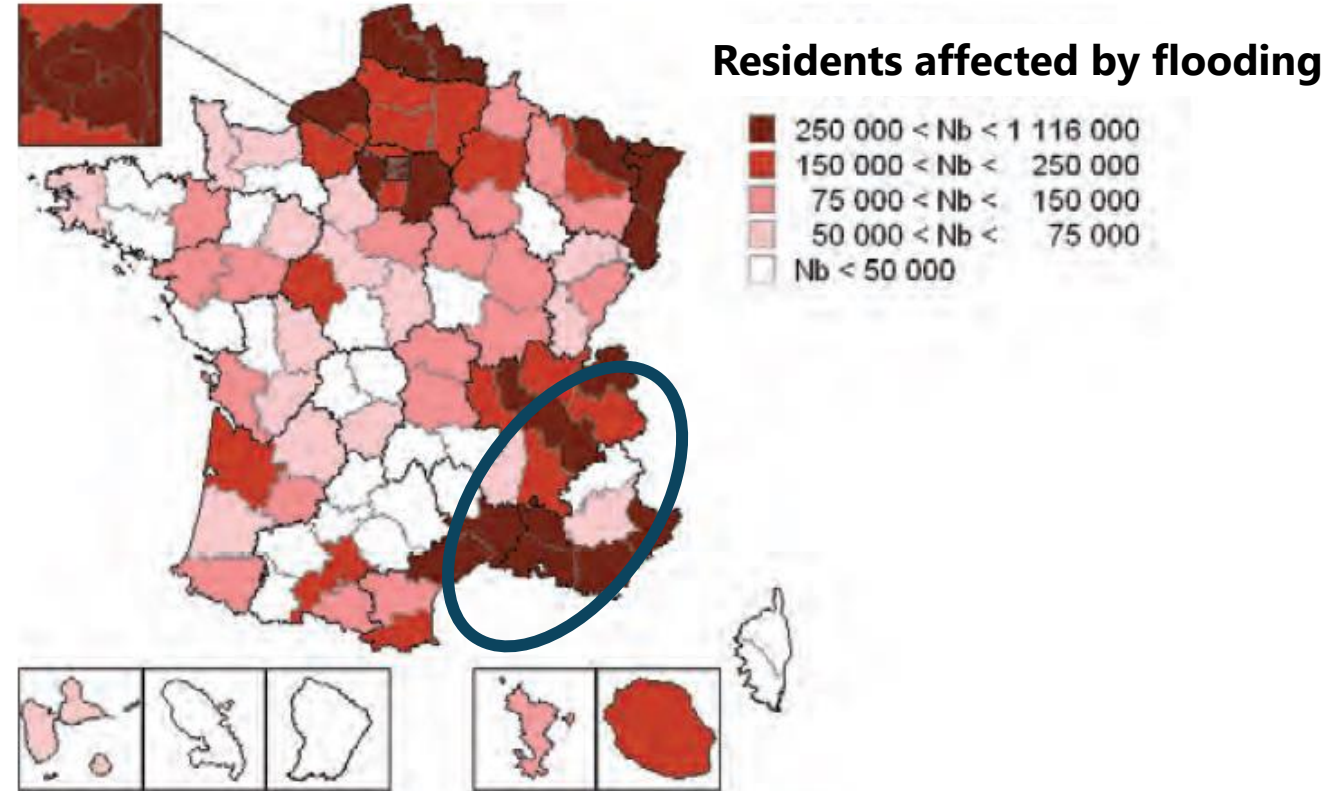
- 20 % of French area
- 5 regions, 29 departements
- 15,8 million inhabitants
- A diverse geography:
 - Mountaineous areas of different altitudes (Jura, Alps, Cevennes, Pyrenees etc.)
 - Low-lying areas (val de Saone, Dombes etc.)
 - Coastal rivers



Flood risk in France and in the Rhone Mediterranean river basin

In France:

- **One in four inhabitant** exposed to flood risk
- **9 million jobs** exposed to flood risk
- **19000 towns** at risk
- **Annual damages** due to flooding: between **650 and 800 M€**



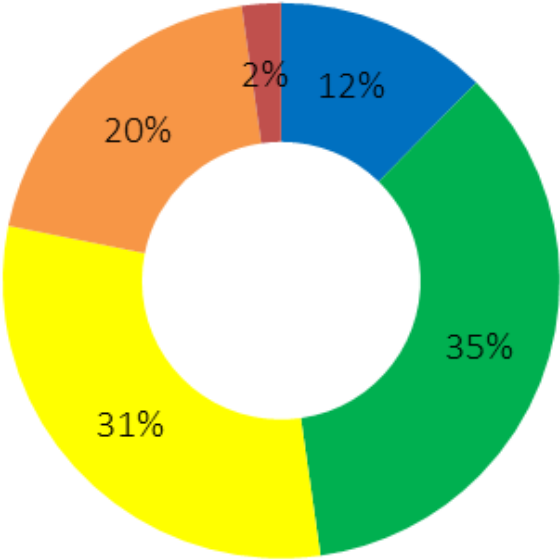
National preliminary flood risk assessment (2012)

In the Rhône Mediterranean river basin :

⇒ The river basin **the most exposed** to flood risk in France

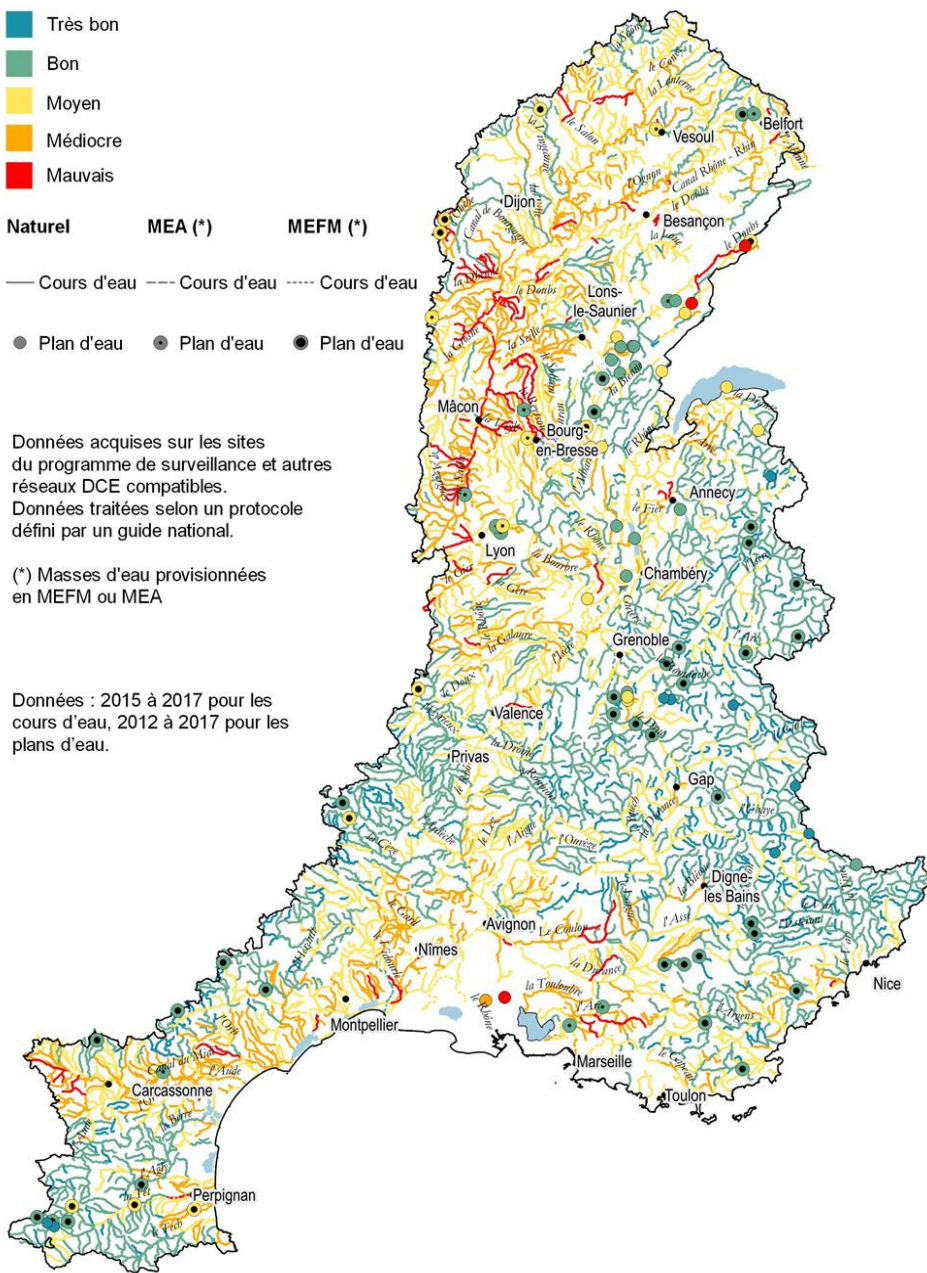


Fewer than half of river water bodies are in good ecological status



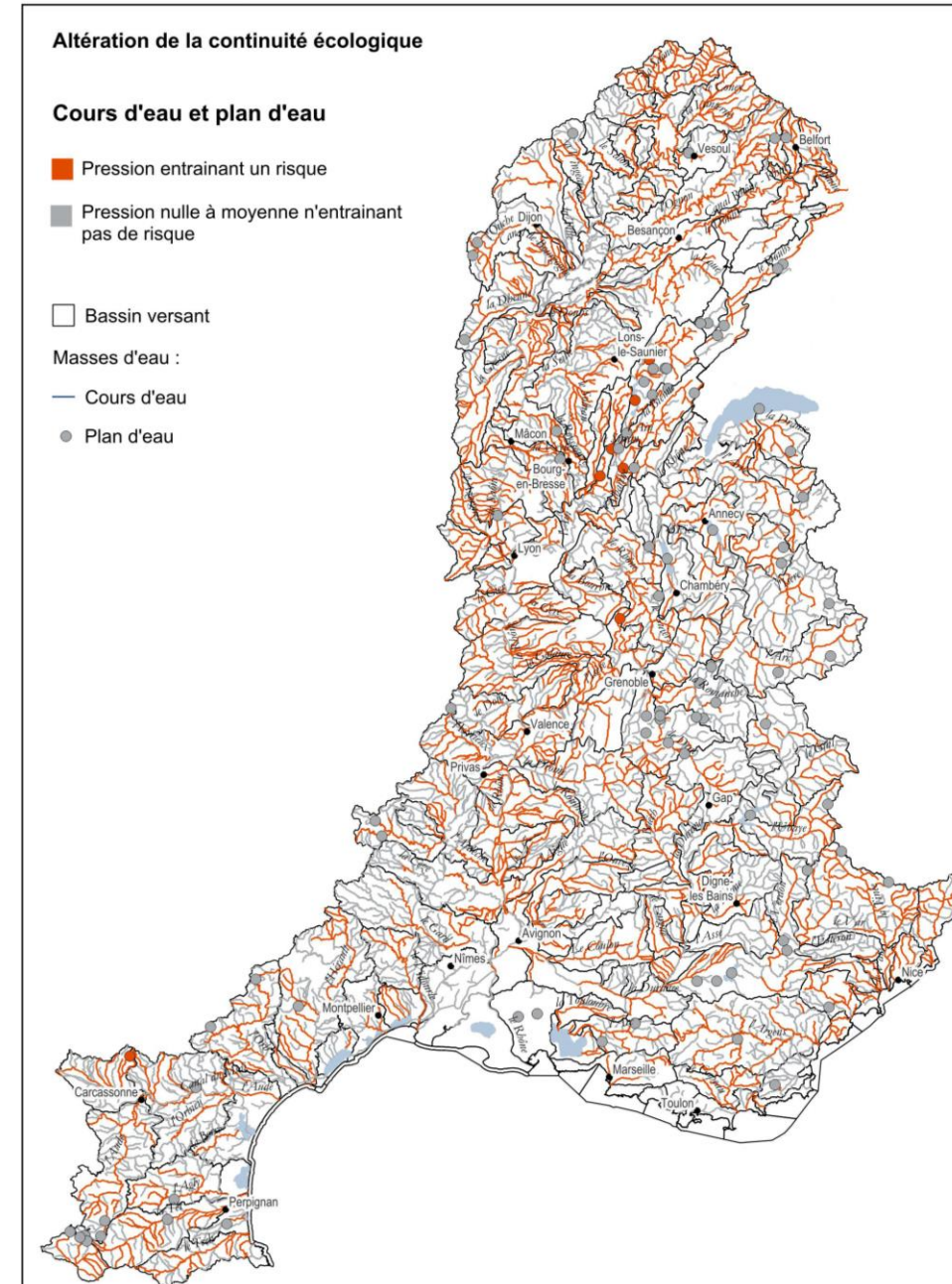
■ Très bon état ■ Bon état ■ Etat moyen ■ Etat médiocre ■ Etat mauvais

Source: agence de l'eau, tableau de bord du SDAGE , édition 2022



Good ecological status on the Rhône Mediterranean basin

- 32% of rivers have an altered **hydrological regime** (hydropower, irrigation etc.)
 - About 51% of water bodies at risk due to **morphological pressures** (channelization etc...)
- 36% have their **biological and sediment transport continuity** disrupted by weirs or dams



2) History of barrier removal in France

In France, dam removal started in the 1990s



St Etienne du Vigan, on Allier river, removed in 1998

Some large dam removals in the Rhone Mediterranean basin



Ayrette dam (26m) in Herault, on Rec Grand river – removed in 2013

But mostly small obsolete barriers (weirs) are removed (<5m)

In various contexts, like in rural areas



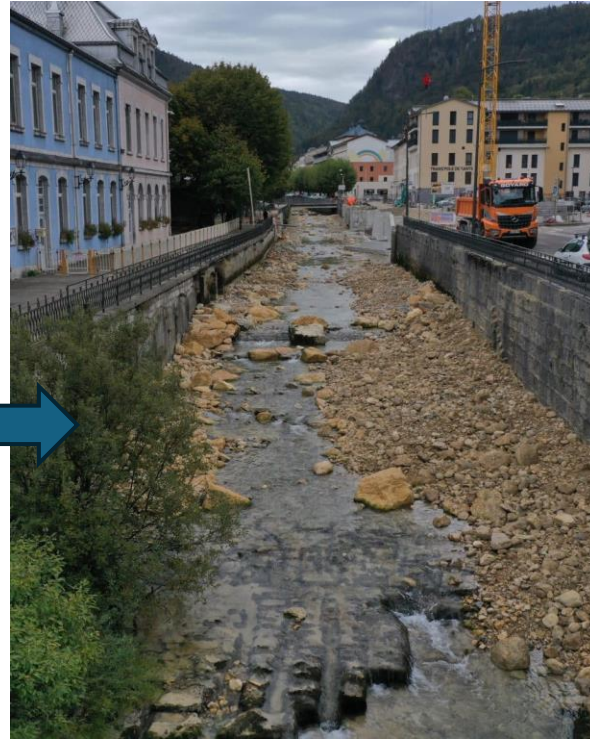
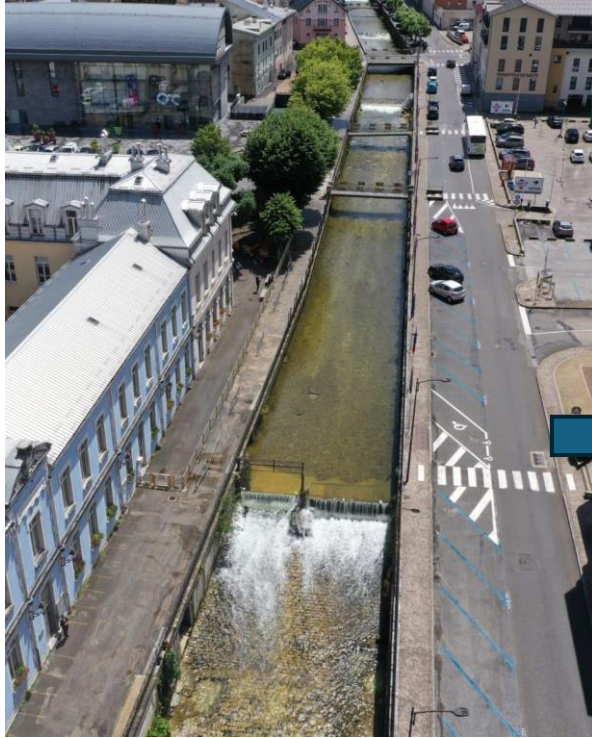
*Removal on
Serein river*



*Removal on river
Brevenne in
Beaujolais*



In urban contexts



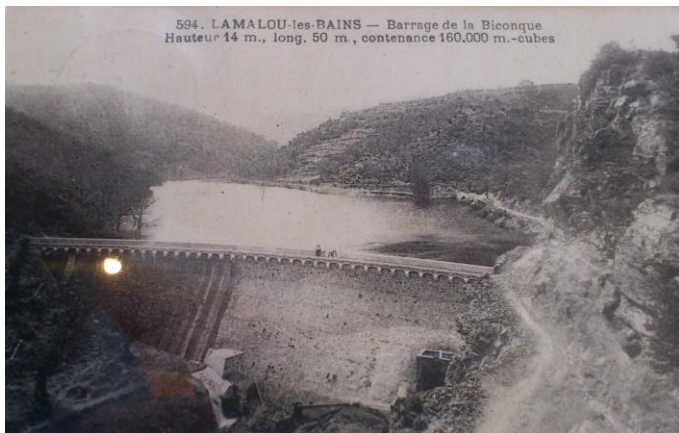
Removal of 7 barriers in Bienne river in 2025 in 2017 in Morez town center



Removal on Azergue river near Lyon



In rivers flowing into the Mediterranean sea



Removal of Biconque dam (6m high) in Lamalou on Bitoulet river in 2017, following the 2014 flood and safety concerns



Bitoulet river



Removal of Lachaux dam (1m) on Fresquel river in 2017

Fresquel river

In rivers flowing in mountainous area

Chéran river



Removal on the Chéran river :
Aumône weir in 2020 (4m high)



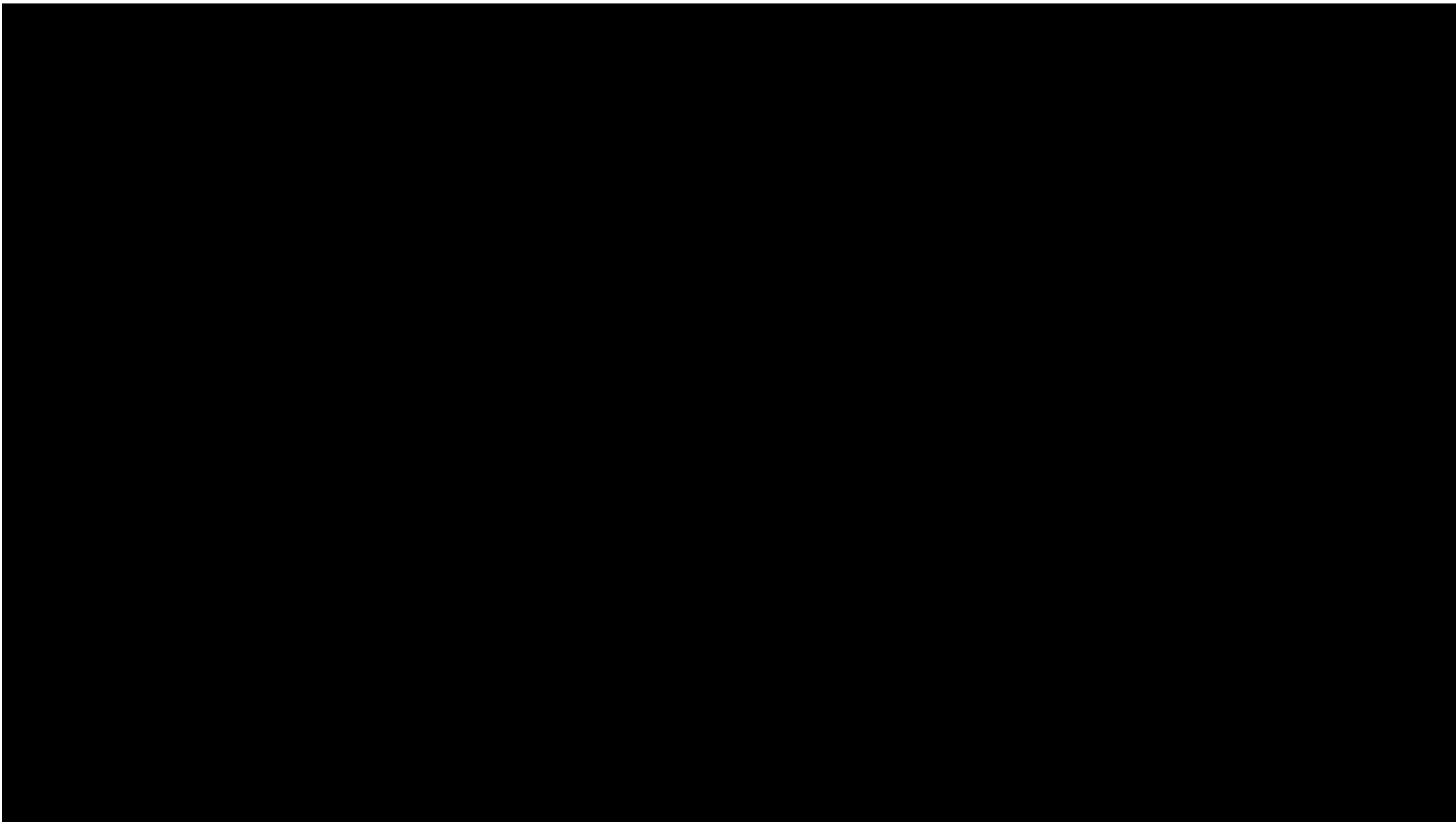
Partage



LE CHÉRAN SE LIBÈRE DE SON DERNIER SEUIL
ARTIFICIEL

Publié le 24 juillet 2020 par Service Communication

« The Chéran river becomes free from its
last artificial barrier » 2020



**We are not
removing
dams like
these ones !**

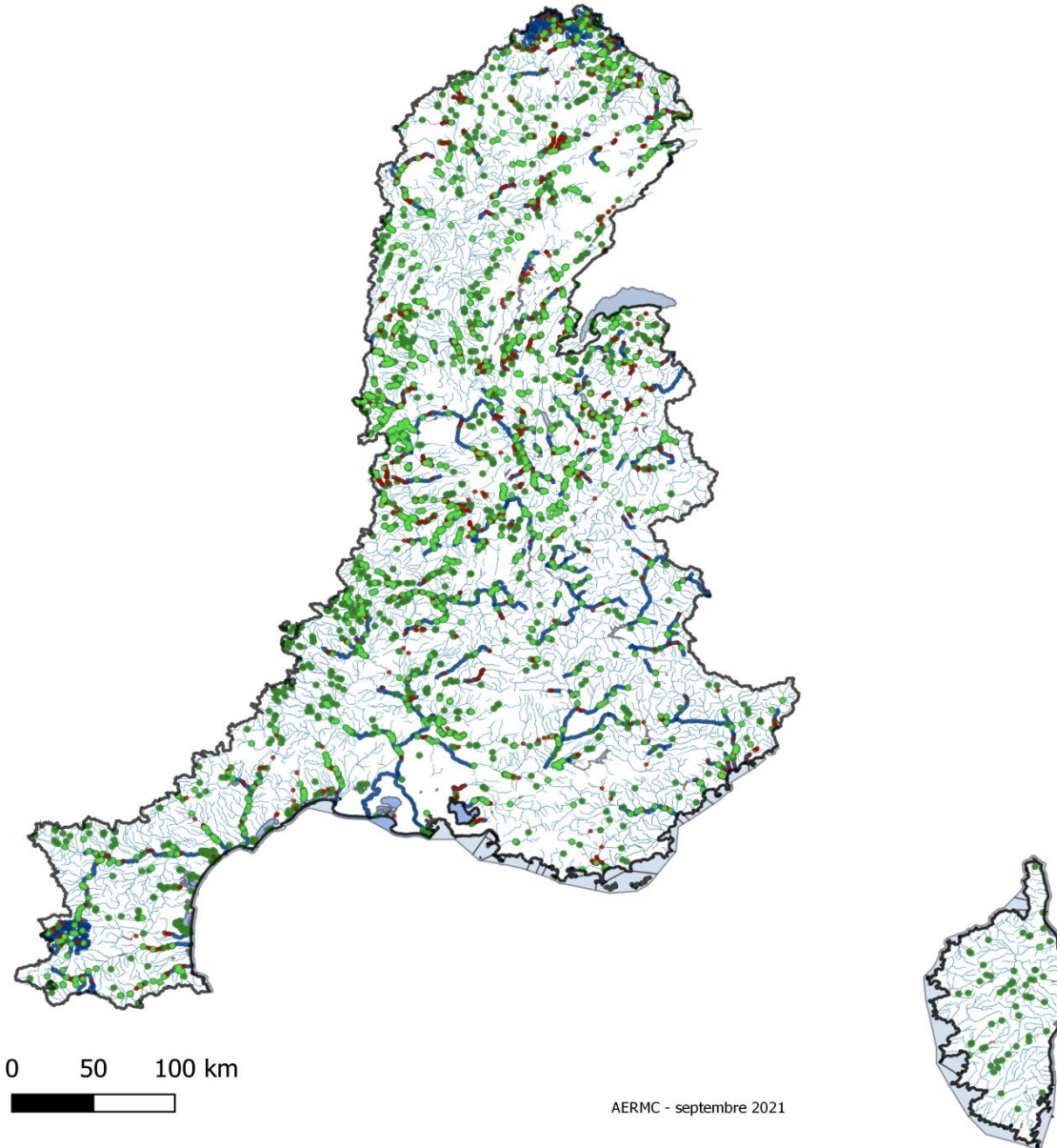


*Génissiat dam on the Rhône,
1,7 billion kWh / year (103m
high, 23km long reservoir !)*

*Serre-Ponçon dam on
Durance river 123m high,
600m wide, 352 MW,
28km² reservoir*



More than 550 barriers removed on the Rhone Mediterranean and Corsica basins and several 1000s in France



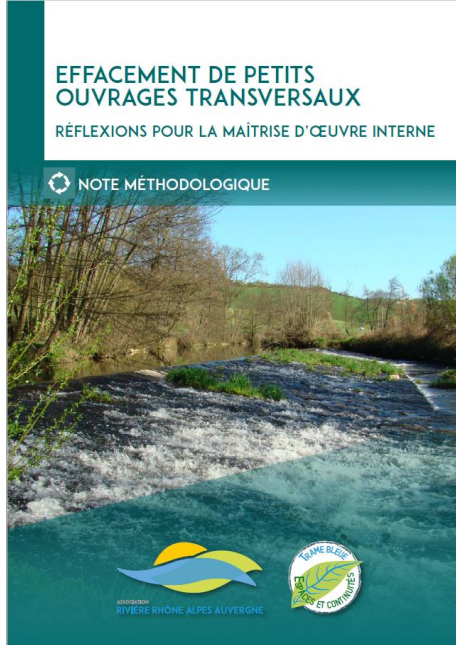
- Barriers with restoration financed by the agency

Restoration of ecological continuity financed on :

- **more than 550 removals**
- **800 fish passes / bypass rivers /ramps etc.**

More than **26000 dams/weirs** on the Rhone Mediterranean and Corsican basins

Many technical documents available in France to help with dam removal operations



Removing small barriers 2020



Helping river managers to remove weirs 2017



Writing specifications 2012



Protection aquatic environments during site work, 2018



Technical report - 2011



Technical report - 2012



Reference costs, 2014



Monitoring, 2019

How did we get there ?

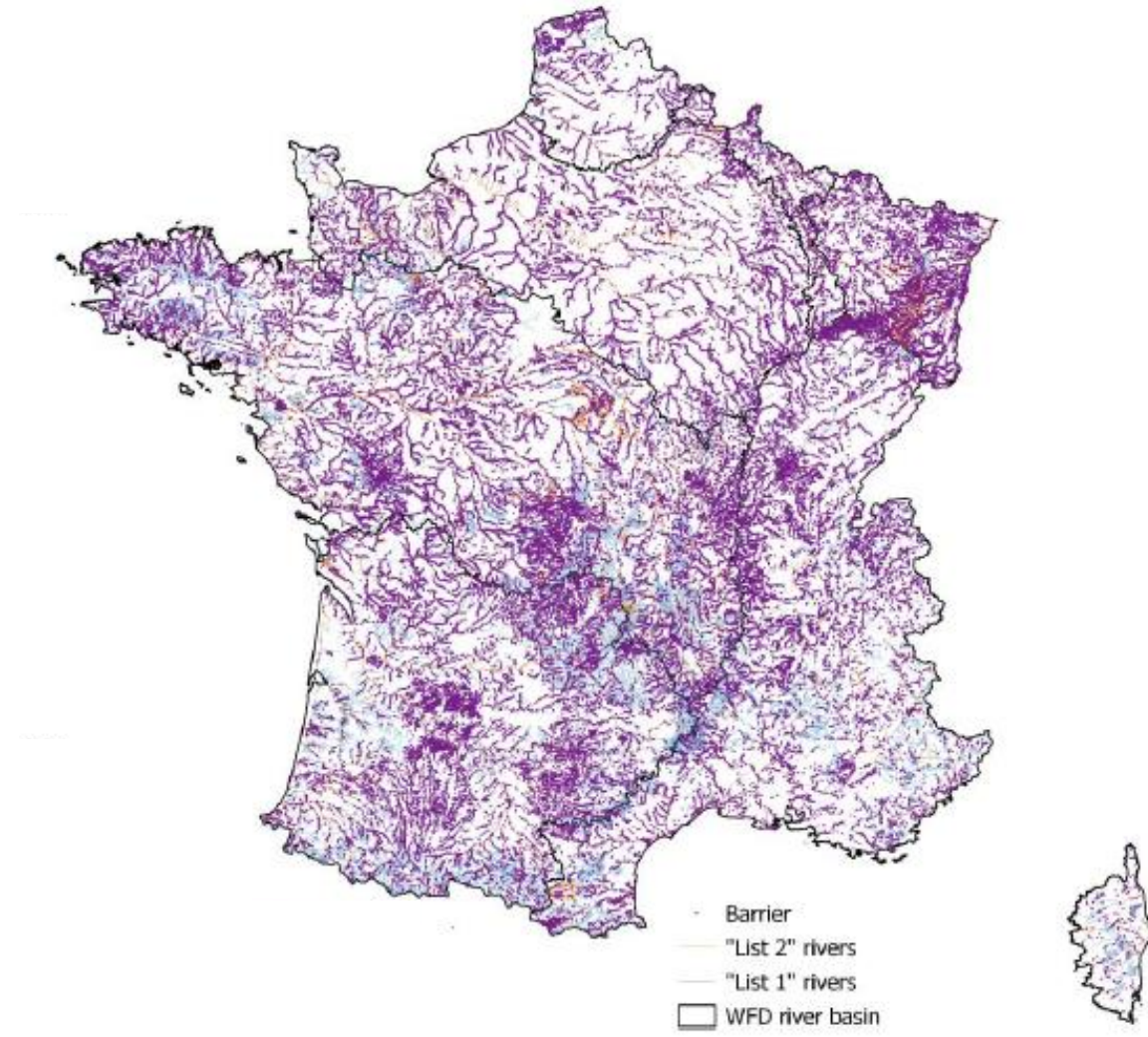
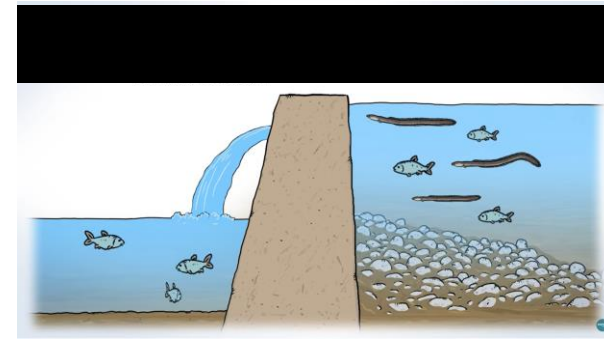
Building a national inventory of barriers

A national inventory of longitudinal and lateral barriers in river

Created in 2012, from regional databases

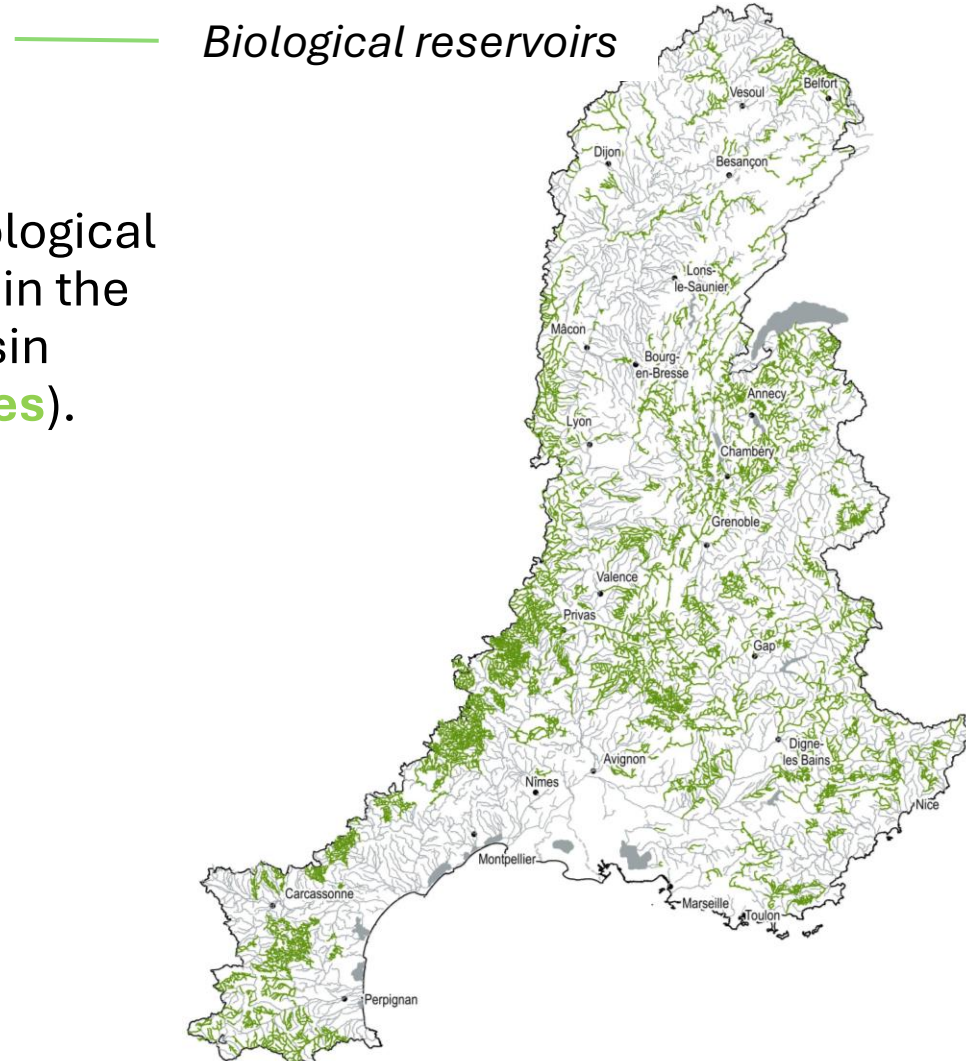
Constantly growing: **more than 105 000 barriers**

=>The majority of them without known water use / obsolete

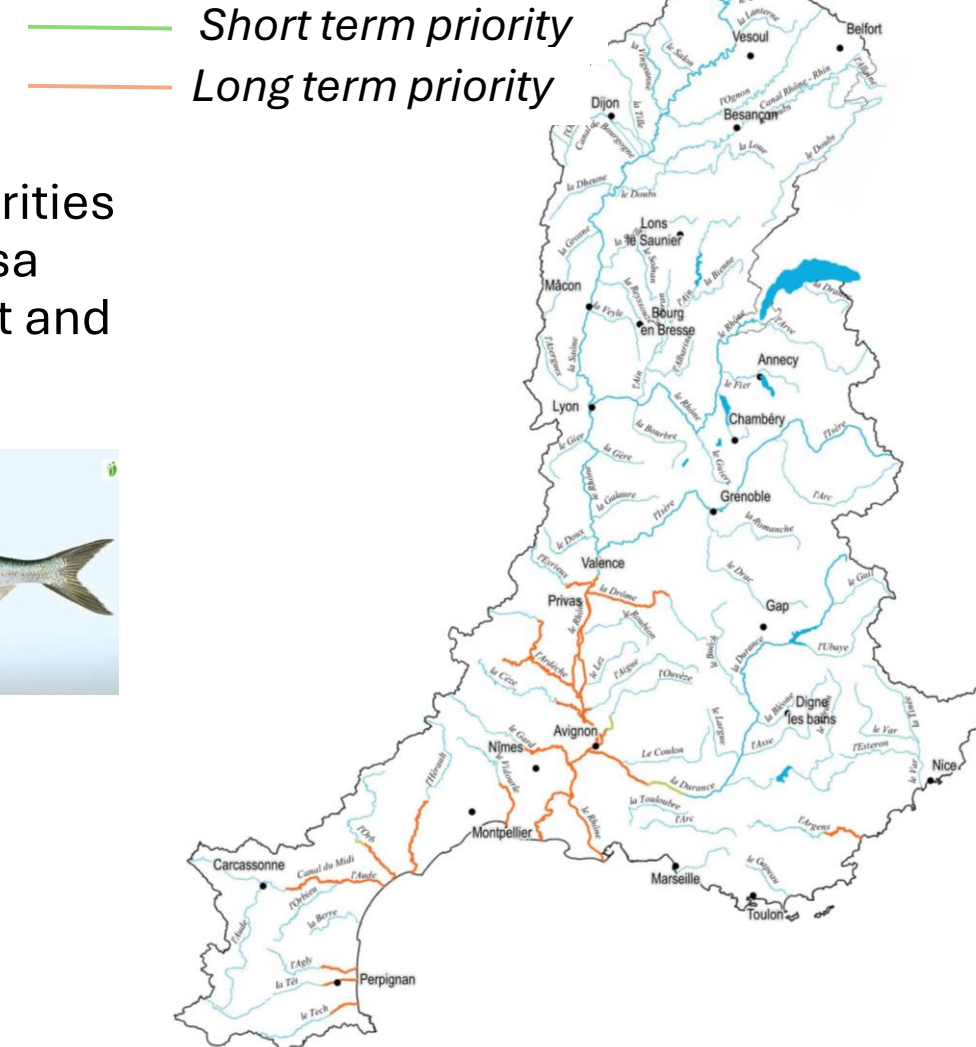


Priorities defined in the river basin

*Building a strategy at catchment scale,
with consultation*



Map of priorities
e.g. for *Alosa fallax* (short and
long term)



THE FRENCH CONTEXT – A LEGAL OBLIGATION TO RESTORE ECOLOGICAL CONTINUITY ON SOME RIVERS

PLANNING approach

A legal requirement to publish **2 lists of river reaches** (L. 214-17 article) :

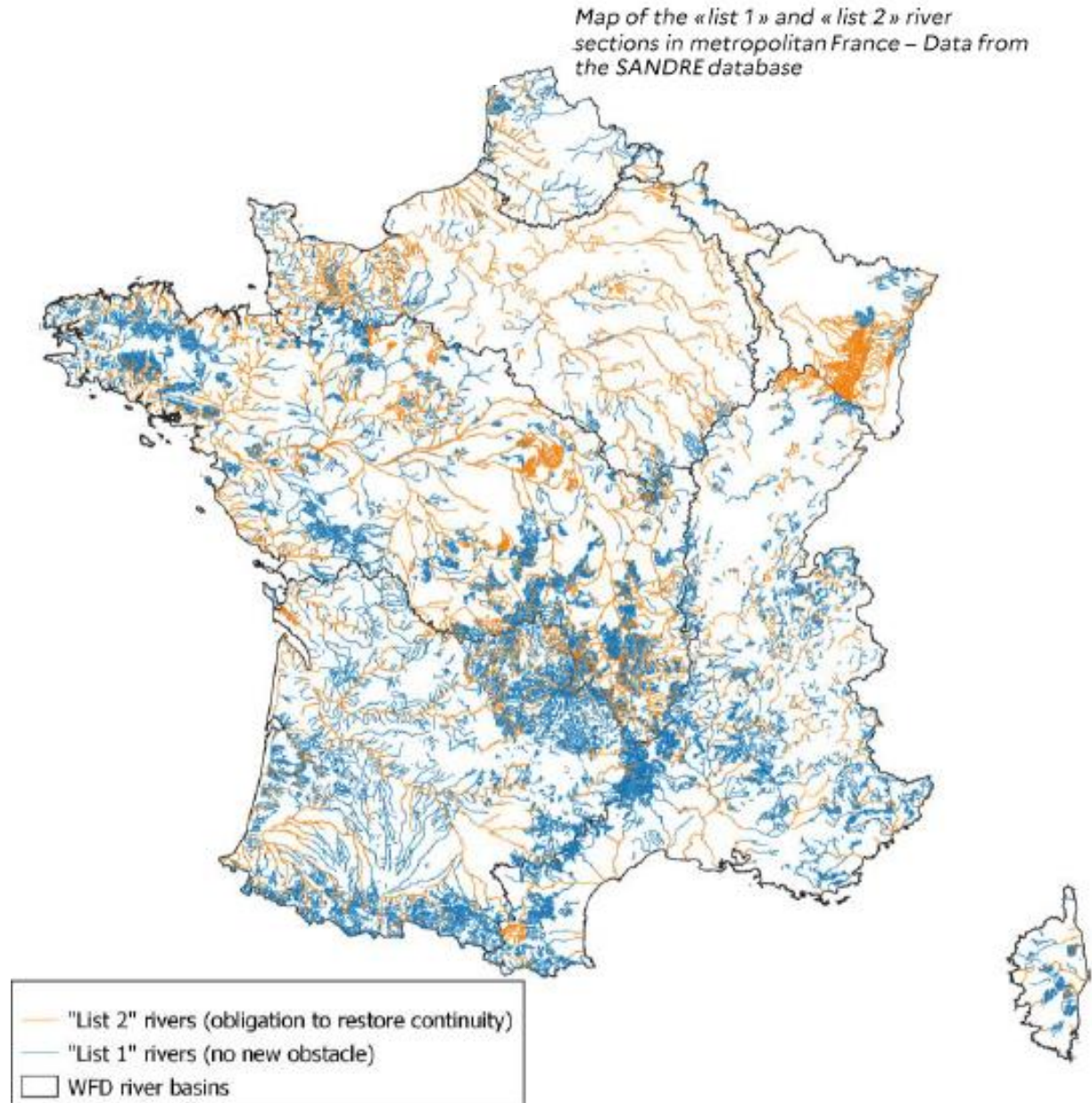
List I: rivers in very good ecological conditions and/or in biological reservoirs

Legal obligation: permits for new construction cannot be granted (**in blue**)

30% of length of French rivers

List II: river reaches for which restoring ecological continuity is required (within 5 years - originally by 2018 and then extended with new barriers added) (**in brown**)

11% of river length

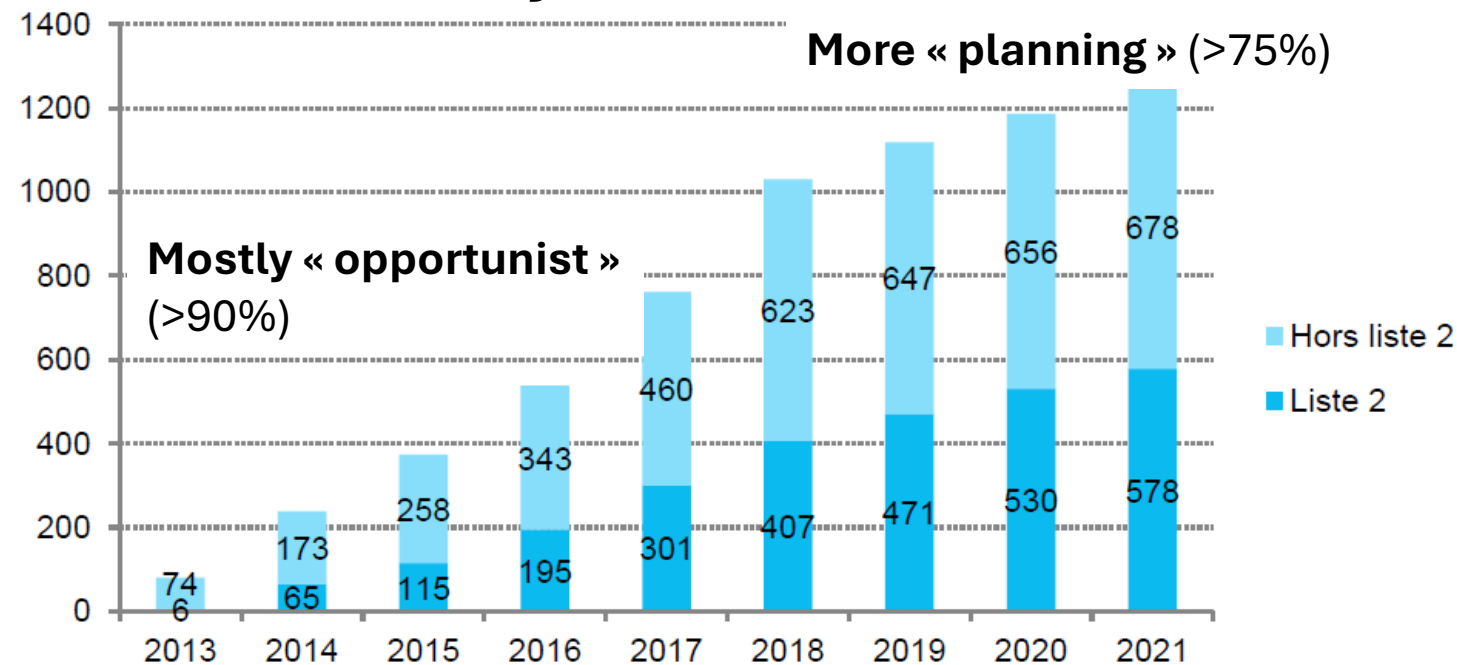


PLANNING and OPPORTUNISTIC approaches

The **planning approach** is now dominant in the Rhone basin, priorities are defined

BUT
when there are **opportunities for barrier removals** outside of official priorities we go for it, and 15 years ago we were mostly opportunistic

*Cumulated number of dams on Rhône Mediterranean basin on which **ecological continuity was restored***

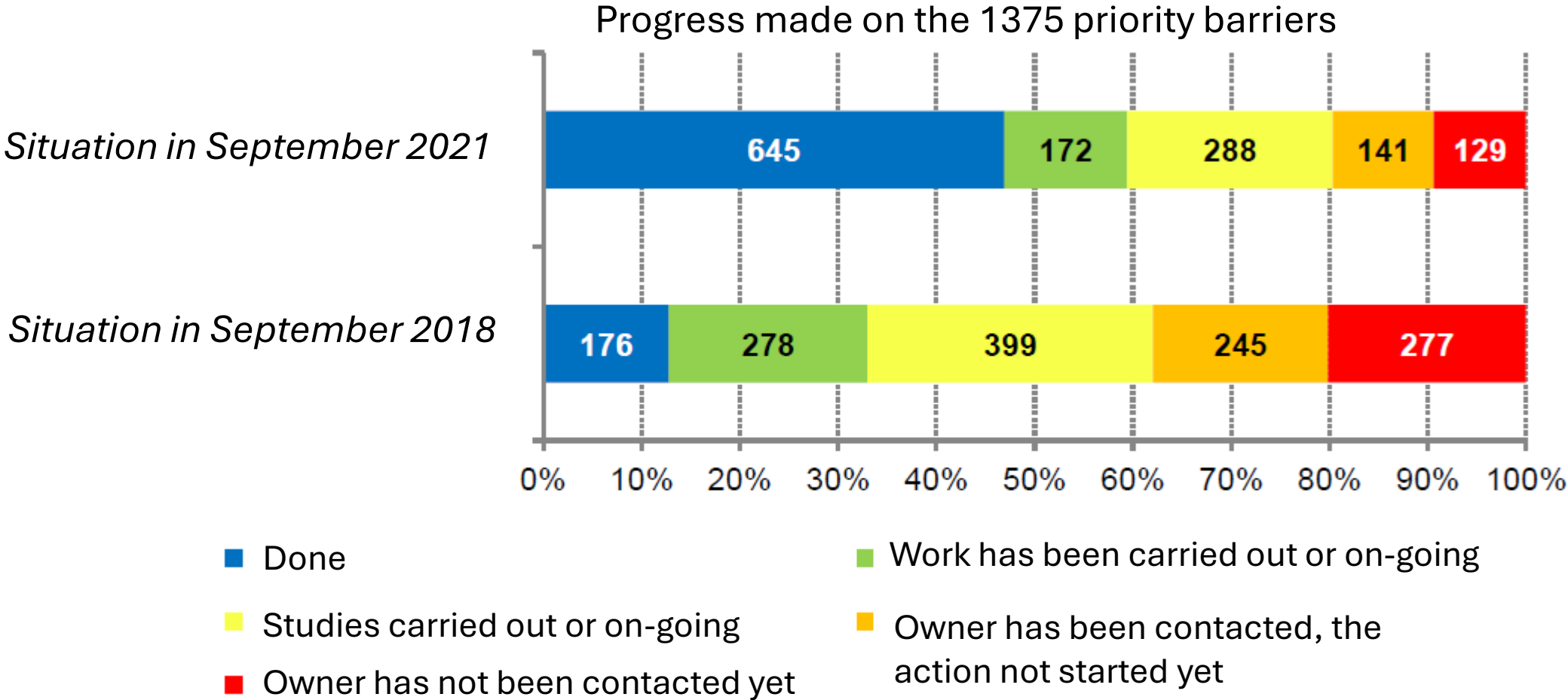


In light blue: outside official priorities (mostly opportunities)

In dark blue: within official priorities

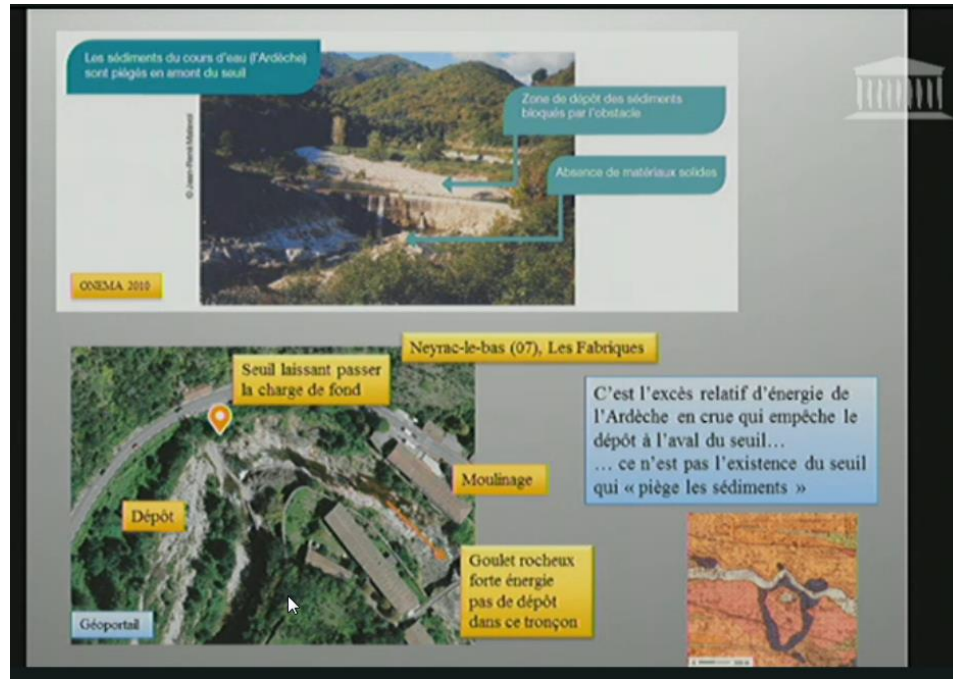
The planning approach: monitor your progress

Restoring ecological continuity and removing barriers became a key topic for state services and stakeholders



A national controversy with a new plan in 2019

- **Not enough prioritization in some river basins** (over 6000 weirs on some list II), a lack of communication, sometimes a lack of concertation etc. have locally caused some strong opposition.
- **Some lobbying** against the list I and II law
- Some debates at the National Assembly



But an old story.....



ORDONNANCE INÉDITE
DE
PHILIPPE LE BEL

SUR LA POLICE DE LA PÊCHE FLUVIALE

(17 MA 1293)

Le dépeuplement des rivières est un point dont se sont vivement préoccupés Philippe le Bel et ses fils. En 1853, M. Duplès-

“The depopulation of our rivers...”

But an old story.....



“Rivers have become fruitless, the damages affect the rich and the poor in our kingdom”

“We require that rivers are brought back to their original state”

ORDONNANCE INÉDITE

DE

PHILIPPE LE BEL

SUR LA POLICE DE LA PÊCHE FLUVIALE

Sacent tuit, pour ce que tous les fluev[e]s et cascun par soy et toutes les rivières grans et petites de nostre royaume, par la malice tant du commun des pescheurs comme des sergens et des gardes desdites rivières, ont esté par long tans et sont encorres aussi comme sans fruit, et par ce ont esté et sont empechié les poissons a croistre en leur droit estat et ne sont de nulle valeur quant il sont pris, la quele cose tourne en grant damage tant des riches comme des povrez de nostre roiaume³, Nous, considéré le pourfit des dis flueves et

Et vous mandons et commandons destroitement que vous, cascuns tant comme a lui appartendra, entendés o grant effet a accomplir diliganment cest commandement en tel maniere que les devant dis flueves et rivières soient ramenées en leur estat ancien et acoustumé par vostre diligence, et commandons a tous nos subgés, tant

3) What are the main objectives of barrier removals ?



Implementation of legislation (WFD, nature restoration plan, national, local)

Safety (a powerful argument)



Flood alleviation u/s (a powerful argument too)



Adaptation to climate change (improve water quality – temperature – more and more powerful too)



Reconnecting biological reservoirs



Sediment continuity



Fish passage

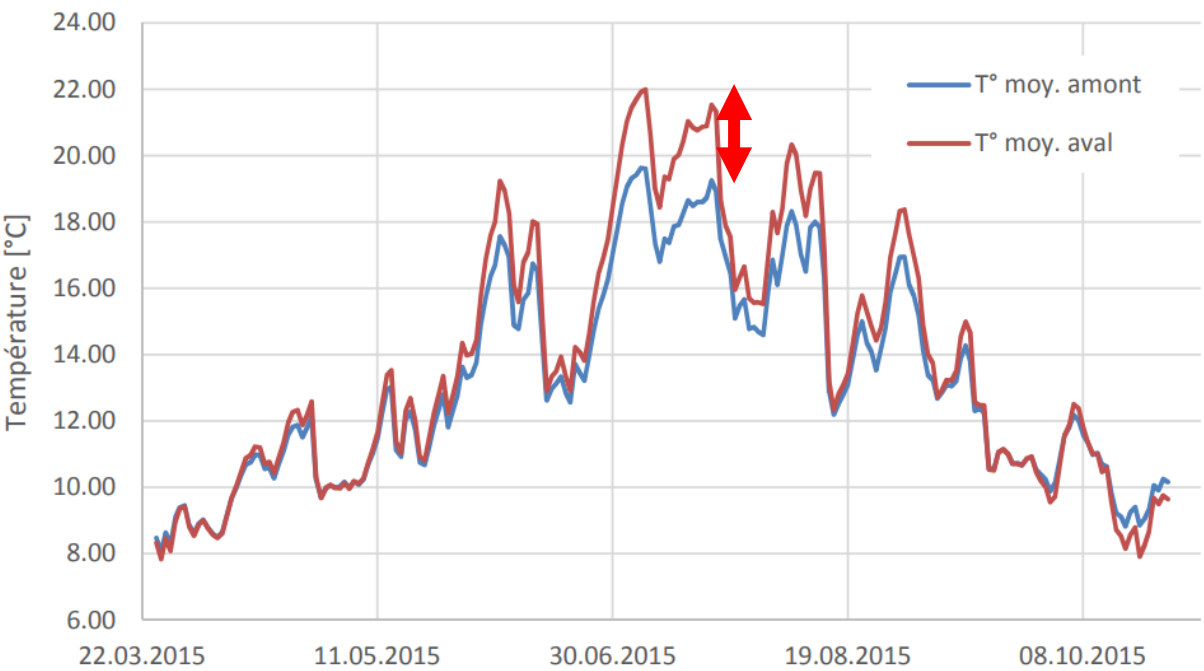
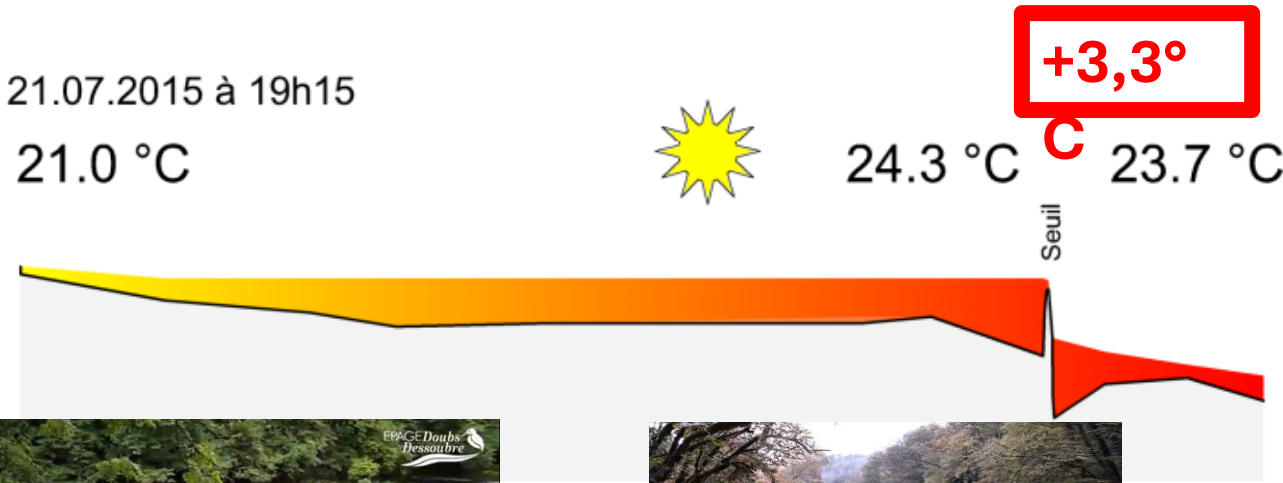
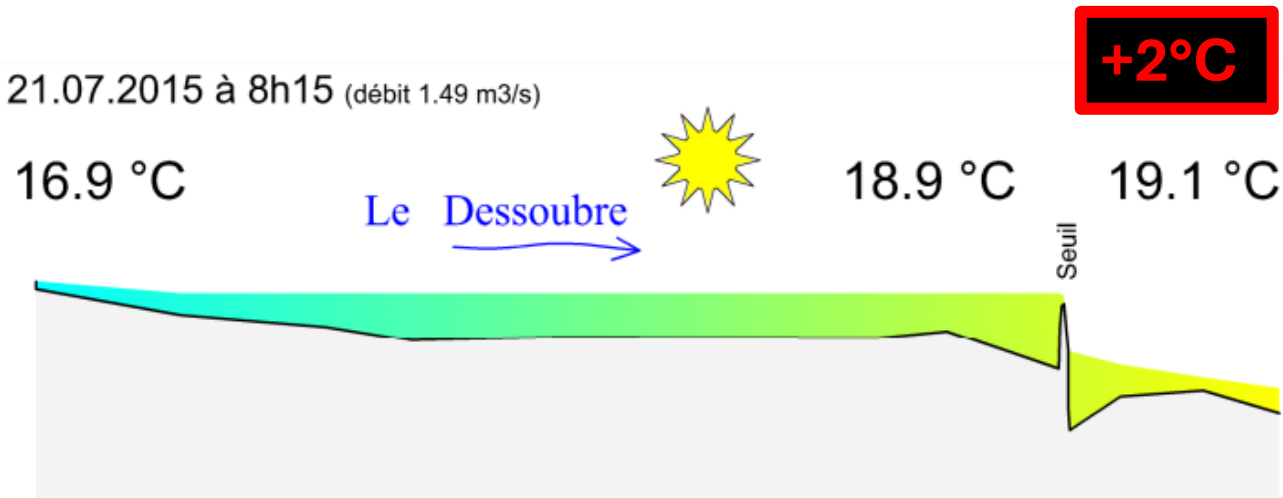


Etc.



Even in barriers officially identified for removal, one needs to give sense to a dam removal project.

Improve water quality and reduce temperature



Before removal



After removal (6 months)

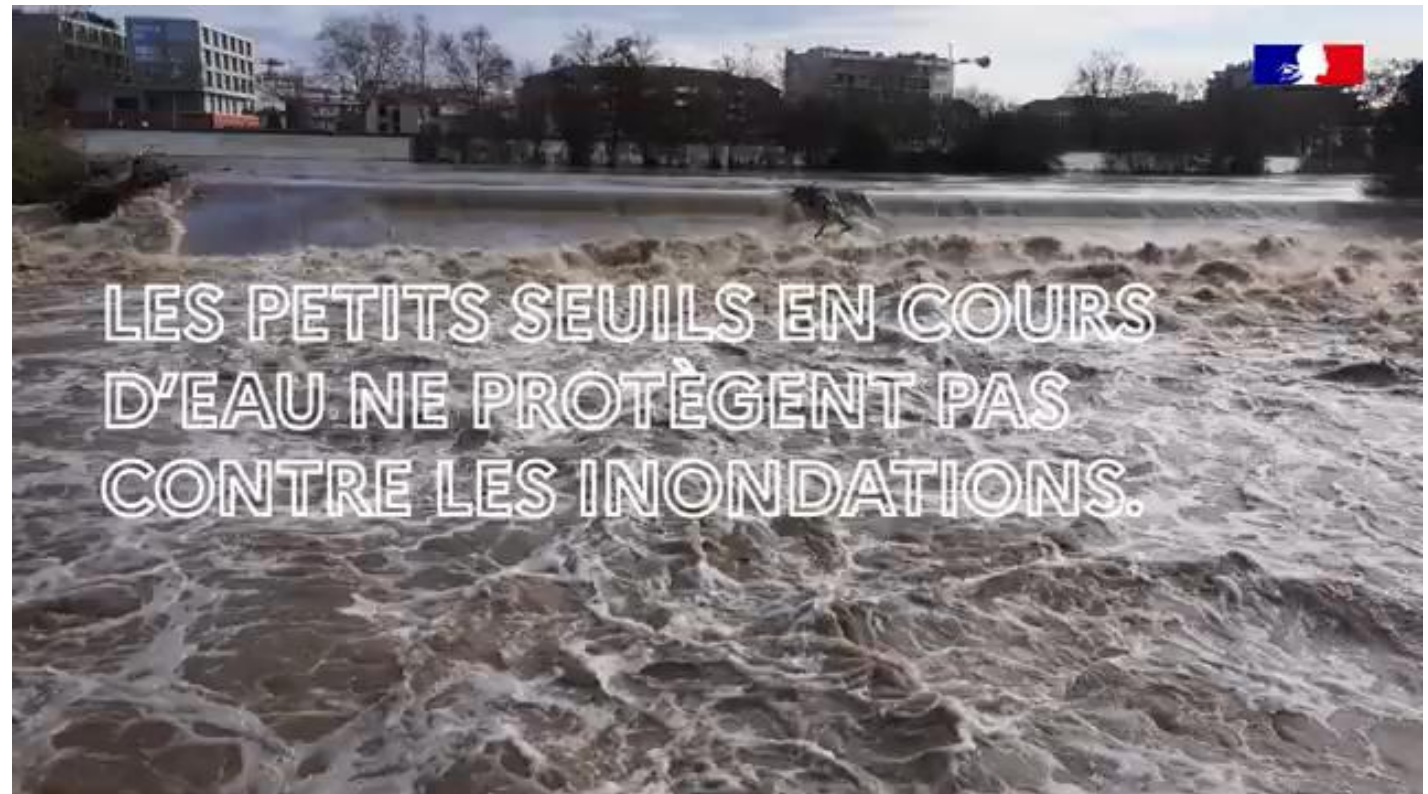


*« True / false
of restoring ecological
continuity on rivers »*

A short 8min video from the **French Ministry of ecological transition** on restoring ecological continuity (2023)

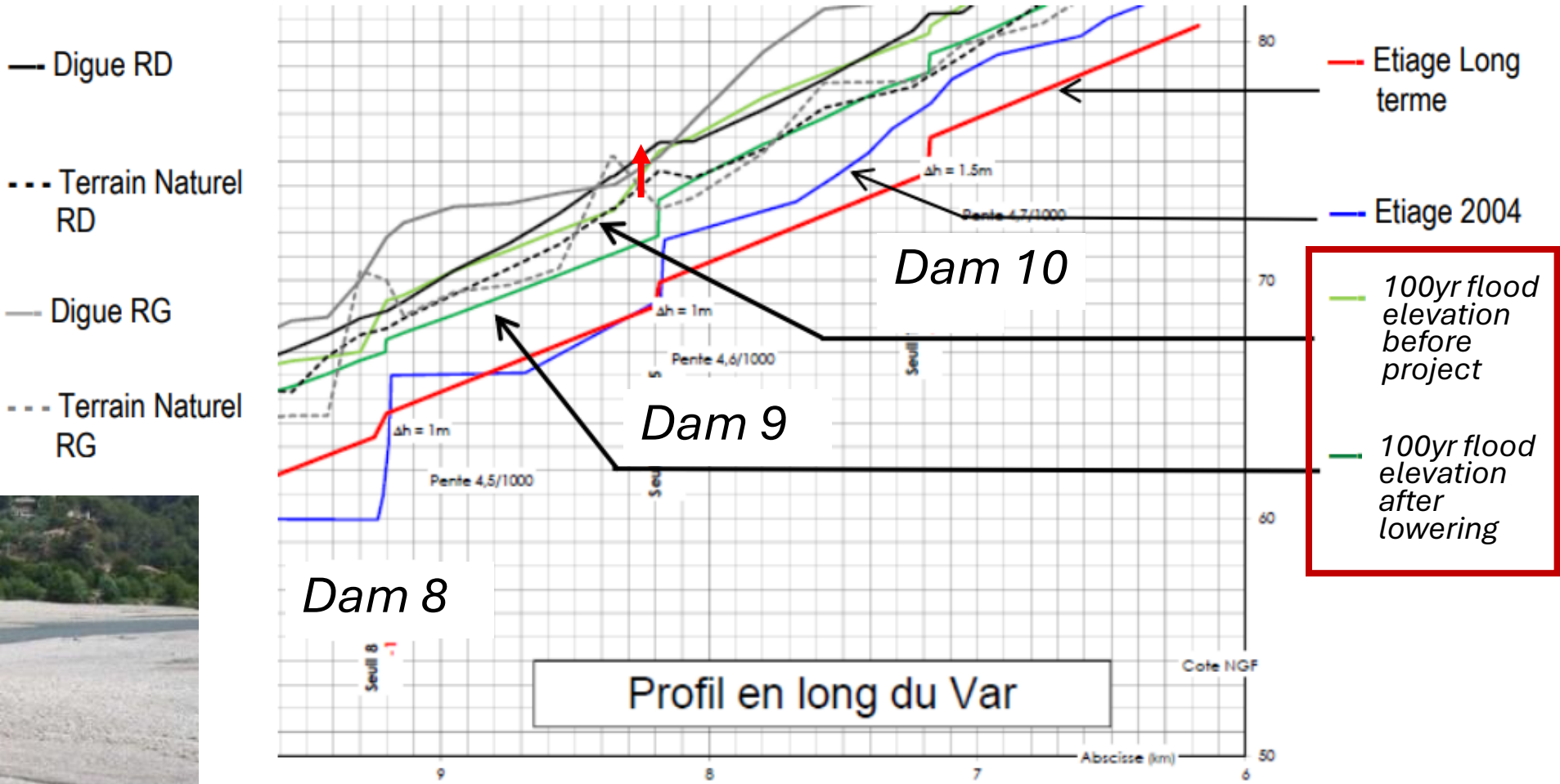
« Small barriers do not offer protection against flooding »

TRUE



In fact, they can increase the risk of flooding

Increased risk of flooding u/s of the dam



Seuil 9 : 5m de chute dont 3m engravé - avant travaux

Examples of dams on the Var (5m high)

What about stakeholders engagement ?

4) Stakeholders engagement

In France, we recommend to **engage with stakeholders right at the beginning** of the project

Listen to stakeholders - are there any expectations? Issues? Needs? Fears? **Learn from local knowledge** and develop a shared vision



Will your removal project bring “social usefulness” ? Provide new uses or strengthen existing ones (aquatic sport, new species of angling) ?

In a project, it is **key** at the **validation steps** (choice of river restoration scenario, choice of design etc.)

Stakeholders engagement



Who are the STAKEHOLDERS:

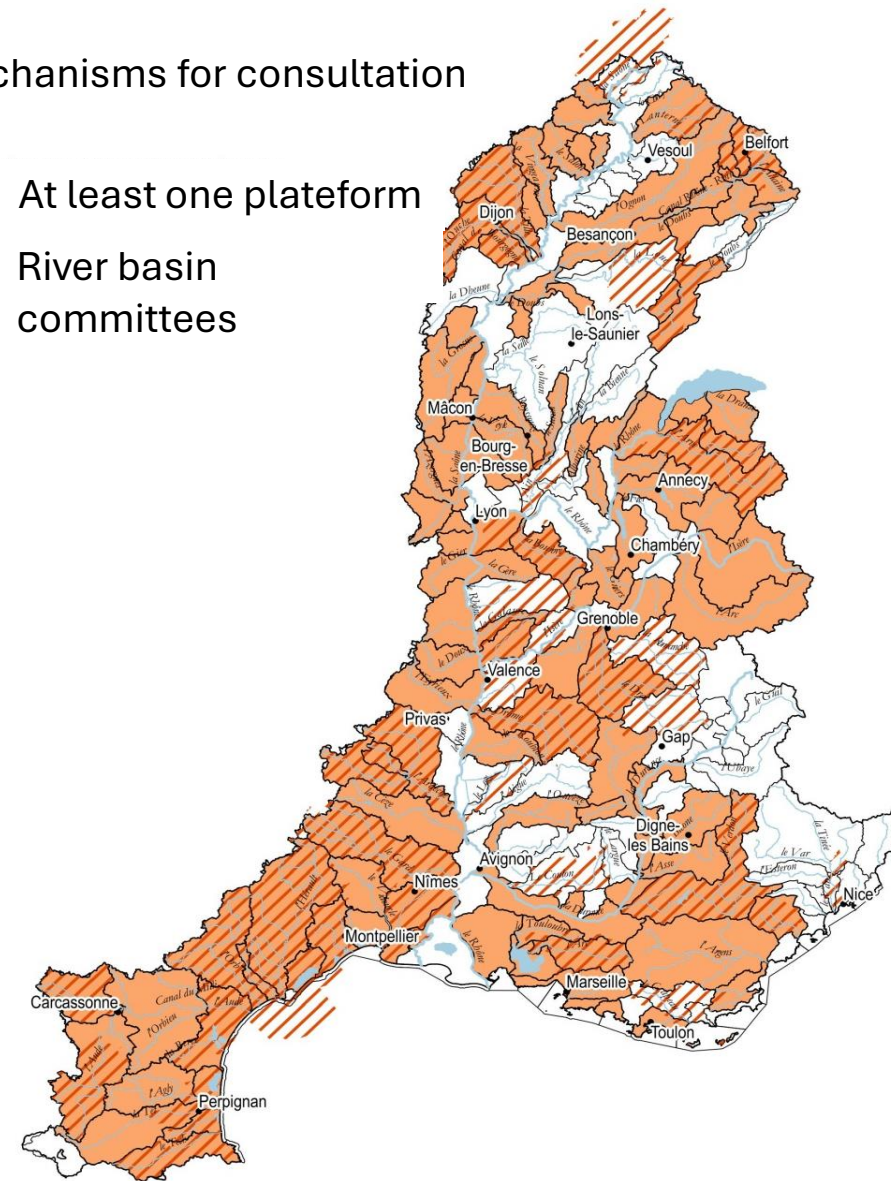
- **Project owner:** local authority / municipality or groups of municipalities, hydropower compagny, fishing federation,...
- **Financial partners :** Water agency , district (regional authority, département,...)
- **Law enforcement stakeholders :** State Administration (DDT/DREAL) , French office for biodiversity
- **Scientific and technical expertise :** French office of biodiversity, water agency, private consultant
- Residents, NGO in favor of nature restoration, anglers, sport association etc., opponents to this policy : water mills NGO, defenders of historical heritage NGO, small hydropower company (Hydrauxois)

Governance at catchment scale has improved but there are still gaps

- Most of the catchments have some platform of concertation for stakeholders representatives (**local river basin committees or commissions**)
- When those platforms have a **long history**, stakeholders can usually better understand each other. Building **trust and understanding** can take time.
- Some challenges:
 - really representatives ?
 - involving the “general public” (still experimental)

Mechanisms for consultation

- At least one platform
- ▨ River basin committees



Will the owner consider removal ?

Work with **scenarios** if dam removal does not seem to be the option chosen at first by the owner:

- Can you lower the dam ?
- Consider a ramp or a fishway ?
- Does it need to be repaired / replaced?

Score those scenarios on multiple criteria and try to have rough estimates of cost – benefits.

**Often, the dam removal scenario is
the best scenario !**

Sapeon dam removal, north of Lyon



In an **urban setting**

2m high dam, 200m influenced by the dam
u/s

Privately owned dam, part of a old mill not in
use anymore



Feasability study in 2012 (35k€)

**Design and permitting started in 2014
(90k€)**

**Public enquiry in 2016 – final permit
at the end of 2016**

Construction in 2017 (900k€)

Sapeon dam removal north of Lyon



3 scenarios:

- Removal
- Lowering (1m)
- Fishway

Scénarios	Incidences				
	Hydrauliques	Géotechniques	Ecologiques		Financière
			Morphologie	Biologie	
Arasement du seuil	Abaissement ligne d'eau -0.4m < > -0.9m sur le tronçon amont	Destabilisation potentielle du quai des frênes et du pont du cheval blanc Destabilisation du quai sapéon et des enrochements rive droite	Restauration du transit sédimentaire grossier Diversification des fascies d'écoulements sur la zone d'influence	Restauration de la continuité biologique Restauration de substrats favorables aux espèces rhéophiles	1 000 000 €HT
Arasement partiel du seuil (1m)	Abaissement ligne d'eau -0.2 < > -0.5m sur le tronçon amont	Destabilisation potentielle du quai des frênes et du pont du cheval blanc Destabilisation du quai sapéon et des enrochements rive droite	Conservation de l'impact sur le transit sédimentaire et sur la diversité des écoulements	Nécessité d'équipement par une passe à poisson Conservation des substrats fins	800 000 €HT
Passe à poisson	Aucun impact hydraulique	Nécessité de conforter le seuil et d'assurer son entretien	Conservation du plan d'eau et de l'impact sur le transit sédimentaire, la diversité des écoulements	Restauration de la continuité biologique	110 000 €HT

Best scenario: removal
(-80cm for Q20 flood event, no more maintenance costs)
BUT
high cost of 1M€ (strengthening of foundations)

The importance of visuals



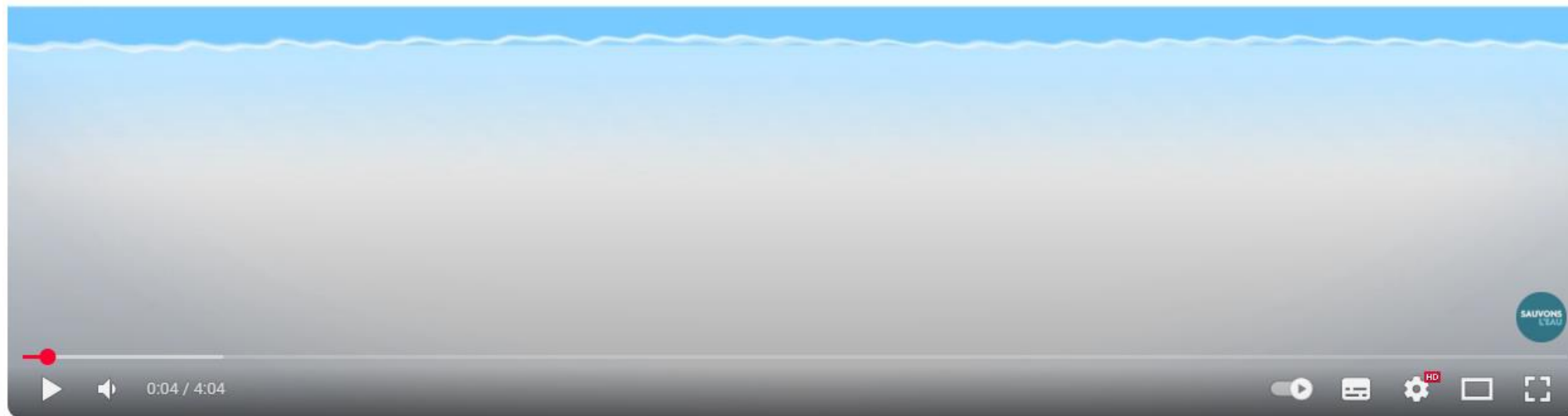
Before



Visual after

Although you also need to be careful with them!

REDONNONS LIBRE-COURS À NOS RIVIÈRES



Redonnons libre-cours à nos rivières !



Sauvons l'eau !
3,37 k abonnés

S'abonner

👍 629



➦ Partager

⬇ Télécharger

🔖 Enregistrer



5) Examples / lessons learned

Barrier removal can be very easy

Before



Removal of a 0,5m weir, which used to be a gauging station (2021)

A live removal at IS Rivers

Live removal



On the Yzeron river, South of Lyon



Before



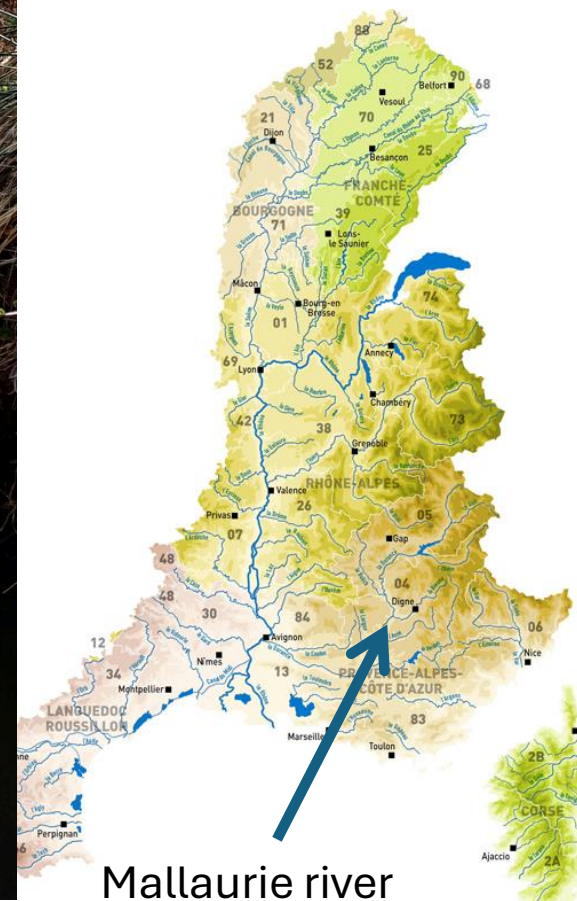
The barrier is removed



Hydraulic hammer

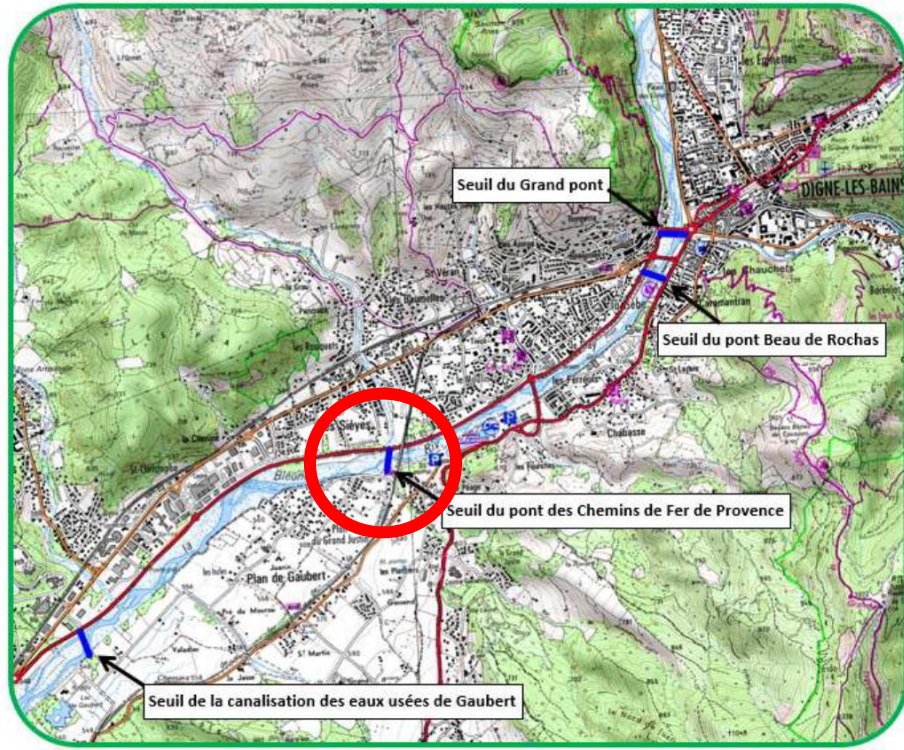


On the
Mallaurie river
in Provence
(2025)



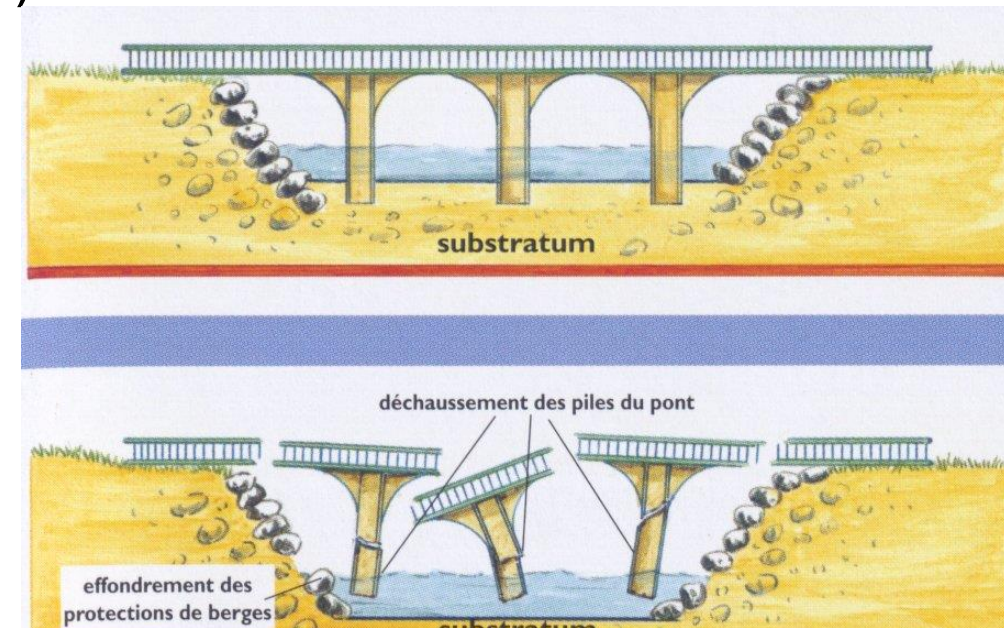
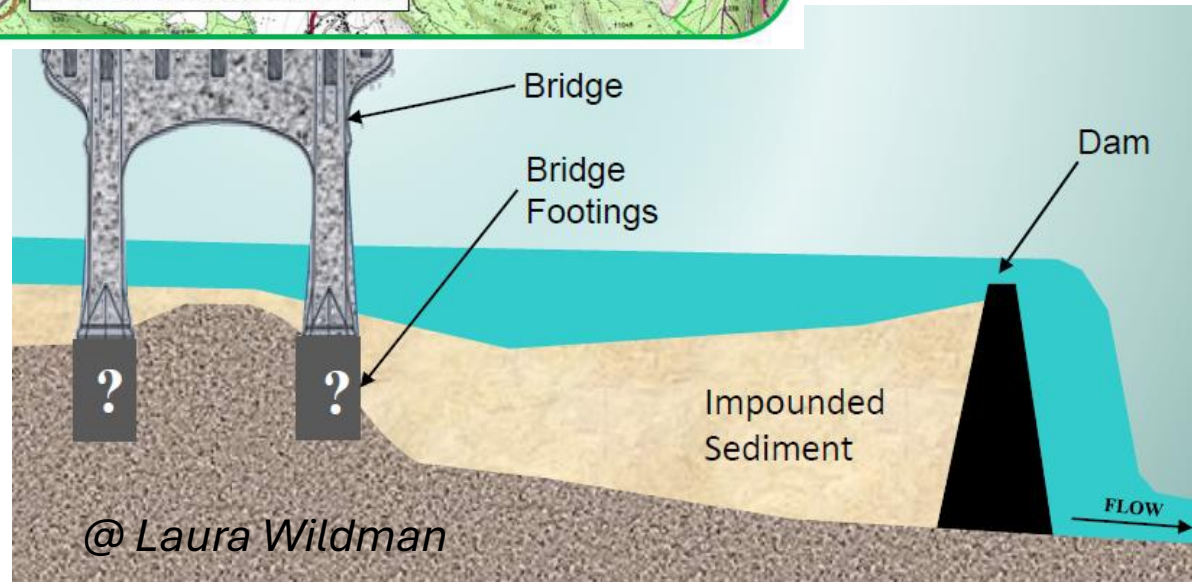
Mallaurie river

It can also be tricky for complex cases



Barrier d/s of
historic railway
bridge
(built by *Gustave Eiffel*!!)

River Bléone dam
removal, in 2022
(South East of France)



But it can be done !



But it can be done !



With the relocation of a water intake for irrigation and bank protection along a major road

We sometimes made mistakes...

Example of sediment « mis-management »



Removal of 2 obsolete dams (5m high each),
at risk of failing, to the South of Lyon



Austropotamobius pallipes

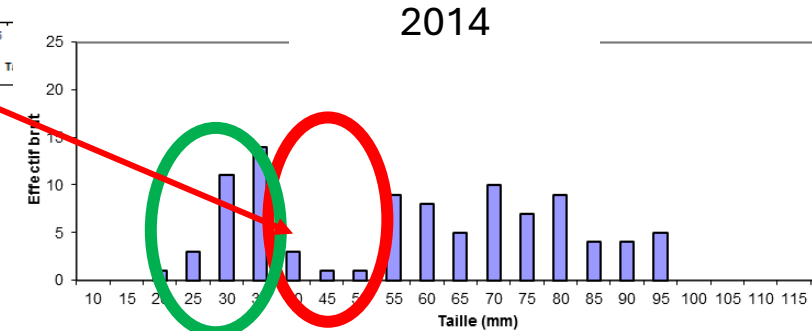
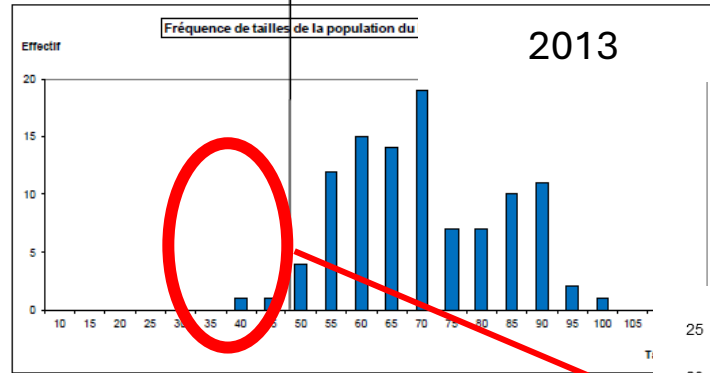
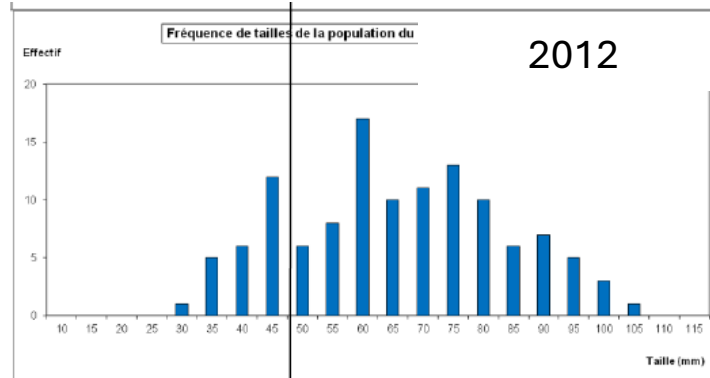
A good population of native
crayfish hampered by the
dams

Example of sediment « mis-management »

Poor estimate of the quantity fine sediment and poor management from the construction consultant



Example of sediment « mis-management »



- Deficit in native crayfish reproduction in 2013 but back to normal in 2014
- Habitat u/s colonized after removal

Example of removals at catchment scale

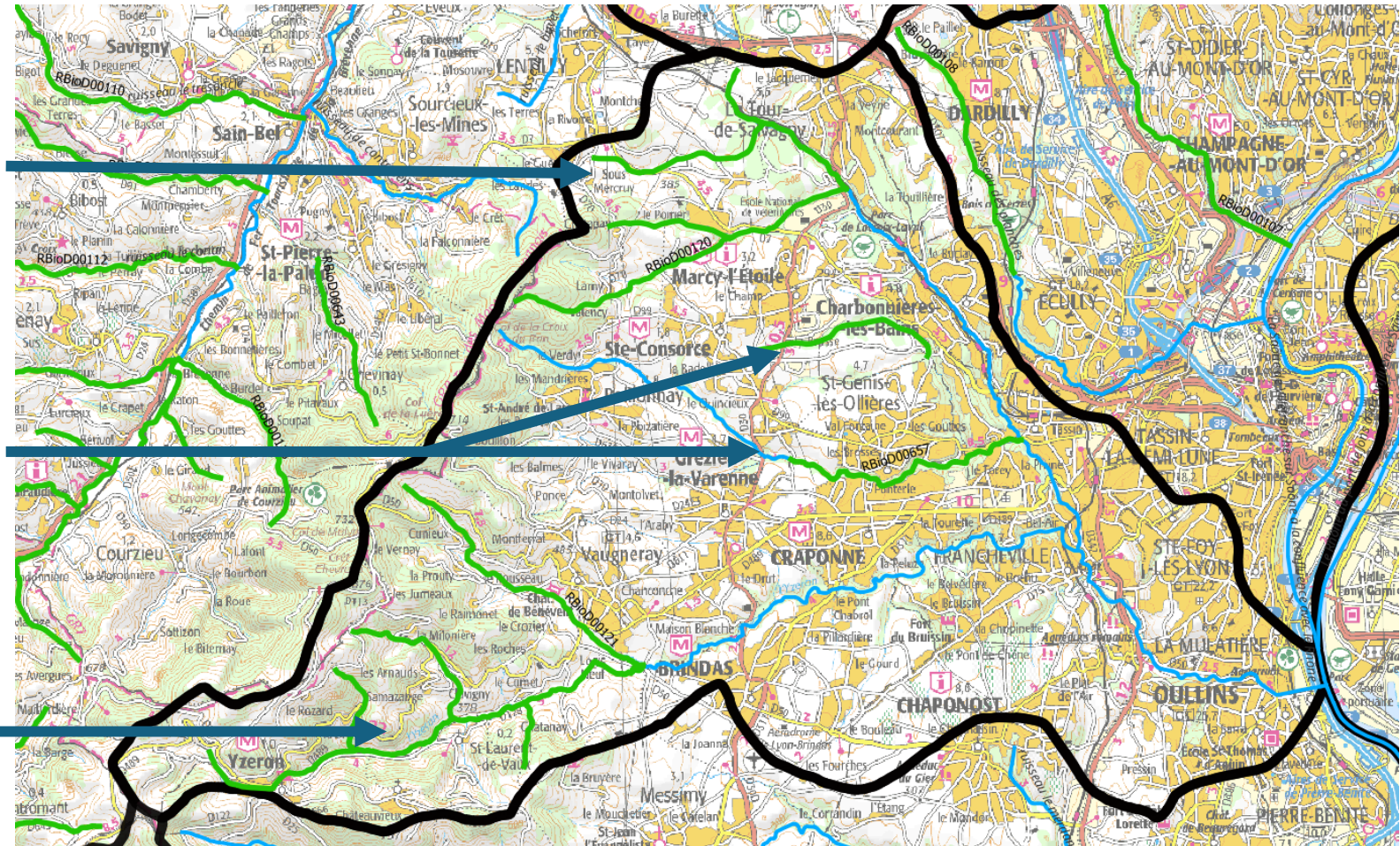
The Yzeron case study

3 biological réservoirs identified

Le ruisseau de Charbonnières, affluents compris, jusqu'à sa confluence avec le ruisseau du Poirier

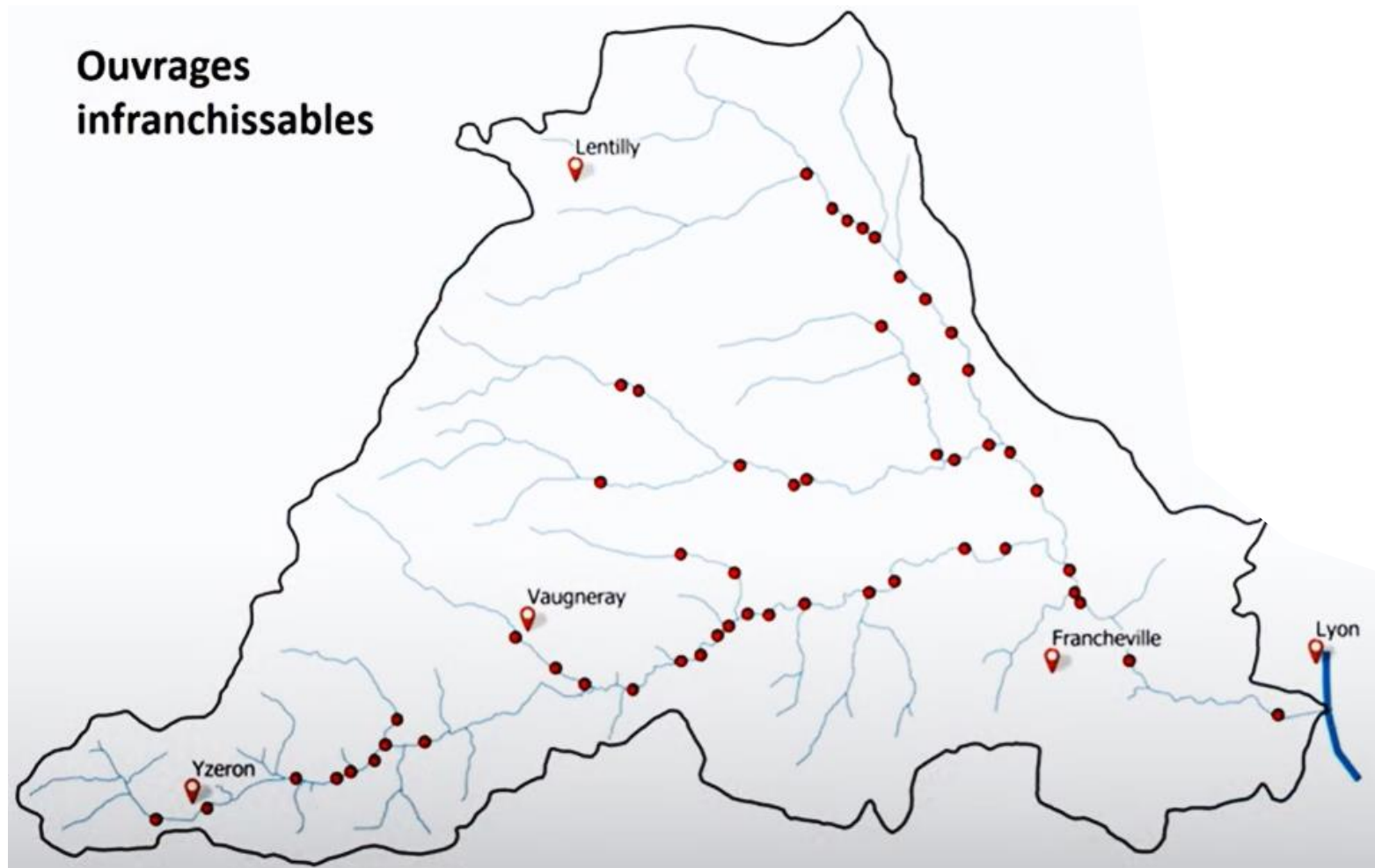
Le Ratier de sa confluence avec le Charbonnières jusqu'au lieu-dit « La Rivière », et le ruisseau du Ribes

L'Yzeron et ses affluents, de sa source à sa confluence avec le Dronau inclus

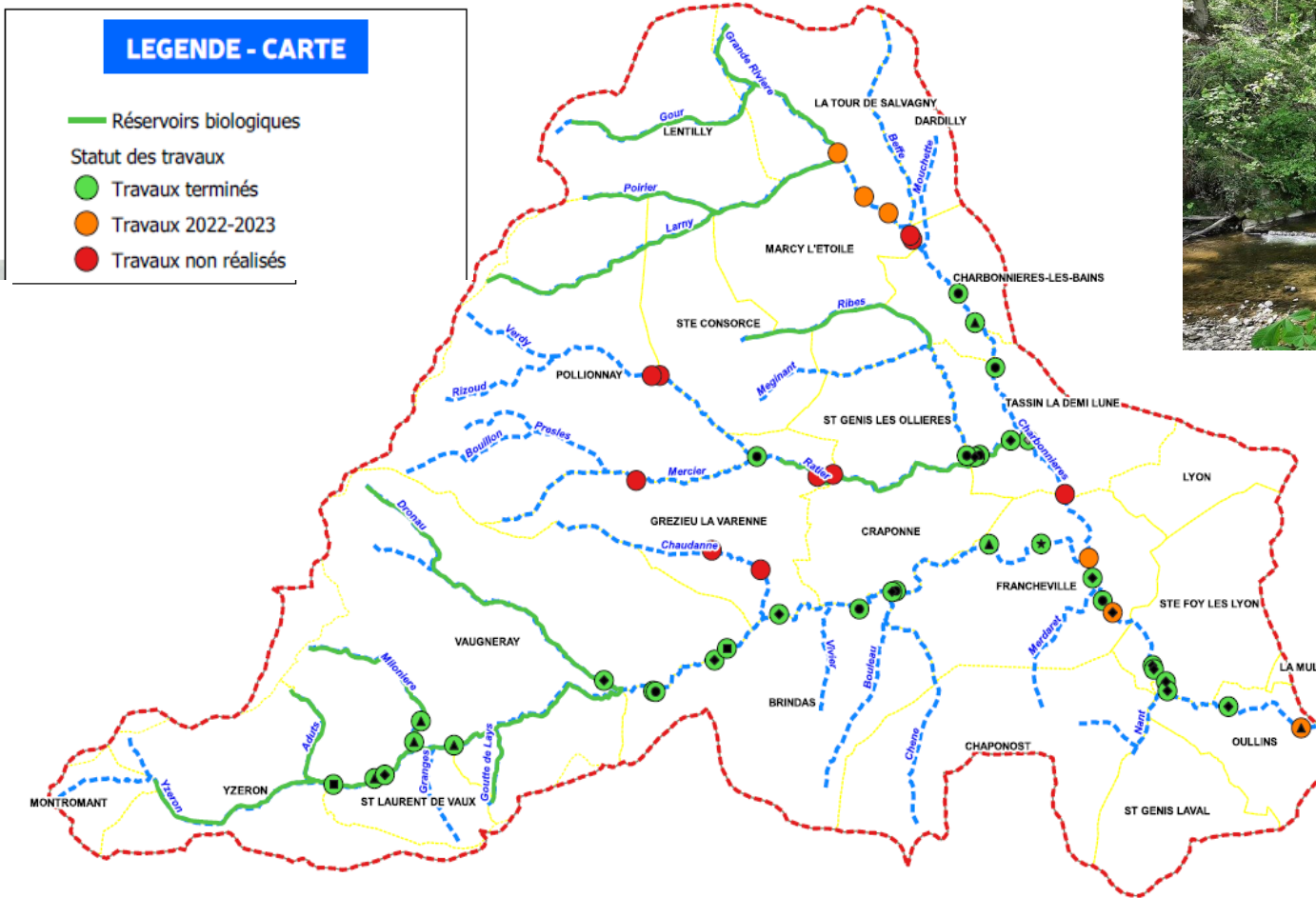


A very fragmented catchment

The 2002 river contract identified about 50 dams impassable for fish



Ambitious restoration plans

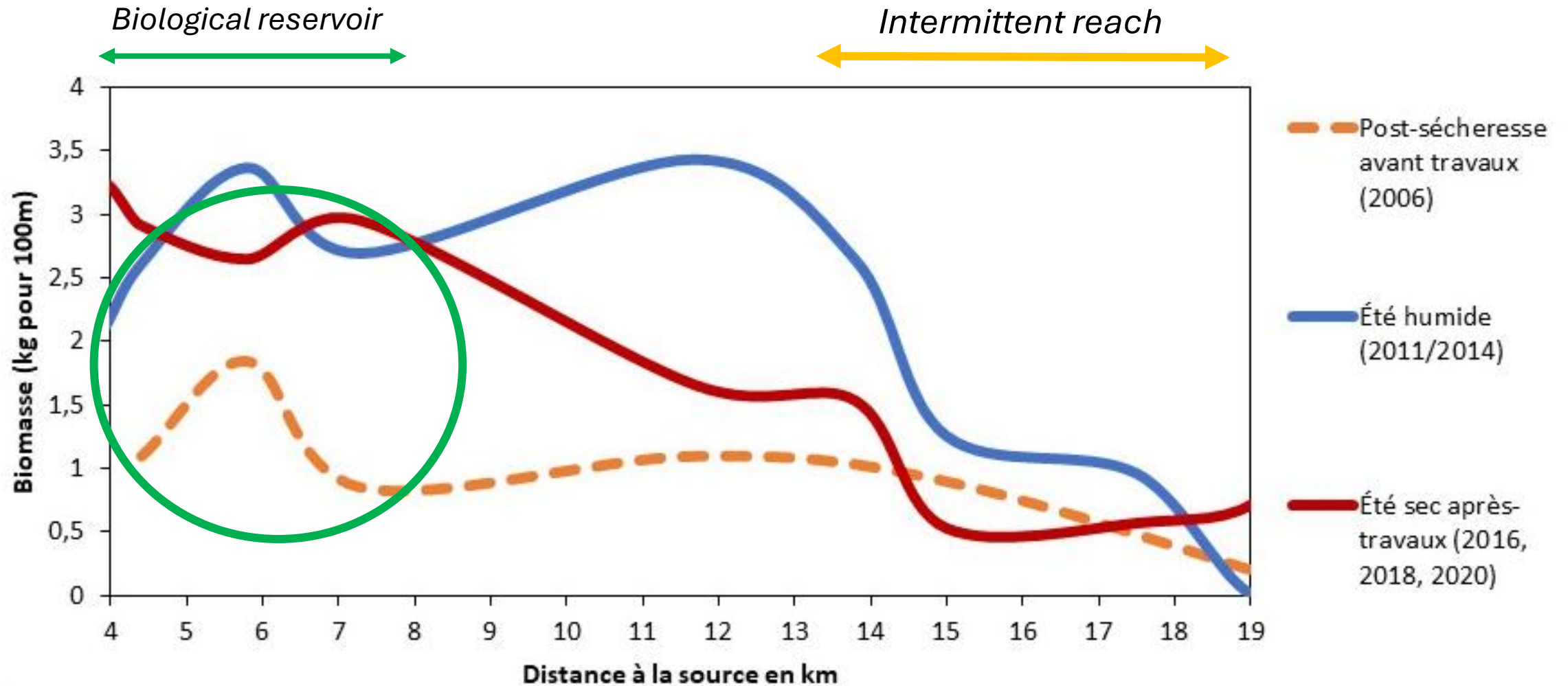


Ecological continuity restored on **35 dams** (many removals)

Improved resilience for trouts, able to reach the biological reservoir

Is it worth removing a dam when a river is intermittent?

The Yzeron case study



How much does it costs ?

Dam removal costs varied between 4,5k€ to 190k€

One exception Taffignon dam removal : 1,5M€

⇒ 6m high and 16m wide, with protected listed buildings at risks of erosion and two 1m diameter pipes of sewage water running along the crest, the construction of a syphon as an alternative.

⇒ not a full removal as a ramp had to be built to stabilize the river bed



Who pays?

Subsidies from water agency :

- **Dam removal:** 80% (100% in some case)
- **Fish passes, ramps or other solutions :** usually between 30 and 50%

Co-funding is usually provided by the districts (regions / départements), the municipalities, the dam owner, fish federations, ngo etc.



Removal of Barrage des pipes dam, in 2023, with co-financing from Water agency and Open Rivers Program

Slow down the flow, remove concrete and give more space : barrier removal should be part of integrated restoration projects



The Yzeron river in Oullins near Lyon

- One car park removed, one way removed from a dual carriageway to give space
- 3000 people protected against Q30, 85 M€ of damages saved over a 20 year period
- Greater amenity for local inhabitants



To conclude

- 1000s of dams have been removed in France and there are **1000s more to be removed**
- Removal of small barriers is generally easy, but **a good diagnosis** is still required to ensure this is the best option and key issues are properly identified and addressed.
- **Stakeholders engagement** can be very important and it can require some know-how for complex cases
- **Sharing best practice** is extremely helpful. We have some organisations dedicated to this in France which really help.
- An **integrated approach** is required, to ensure issues related to water quality, hydrology, hydromorphological processes are tackled if necessary



Thank you !

Merci !

Děkuji !

Benoît TERRIER
Rhone-Mediterranean river basin
agency