

*Let's adapt our habits
to preserve the natural state of our rivers*

**HANDBOOK FOR
WATERMILL OWNERS**

VOCABULARY

Catchment area (Bassin versant)

An area from which surface runoff is carried away by a single drainage system

Ecological continuity (Continuité écologique)

Process allowing the circulation of living organisms and their access to areas essential for their breeding, feeding, development, protection, as well as the natural circulation of sediments, and proper functioning of biological reservoirs

Eutrophication (Eutrophisation)

Excessive richness of nutrients in a lake or other body of water, frequently due to run-off from the land, which causes a dense growth of plant life (sometimes toxic). This phenomenon causes the reduction of oxygen concentration

Fish ladder (Passe à poissons)

Mechanism that allows fish to bypass unsurmountable hydraulic infrastructures

GEMAPI

Qualification that territorial organisations have on monitoring aquatic environments and preventing floods (GEstion des Milieux Aquatiques et Prévention des Inondations). Organisations in charge are called Syndicats GEMAPI

Hydraulic flushing (Chasse hydraulique)

Rapid evacuation of sediments

Hydraulic infrastructures (Ouvrages hydrauliques)

Hydraulic elements of a watermill : sluice, tailrace, spillway gates... They allow the regulation of water level

Logjam (Embâcle)

Blockage caused by the crowding together of a number of logs or plant debris floating in a river

Low-water level (Etiage)

Flow of water in a stream during prolonged dry weather

Sediment transport (Transit sédimentaire)

Movement of solid particles (sand, gravel, boulders...) by the movement of a fluid

Wetland (Zones humides)

Area where the water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during th year.



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PRÉAMBULE

A water mill is an **infrastructure designed to use the hydraulic force of a river**. It can transform hydropower into electricity or mechanical force. Historically, it was used to crush cereales by the rotating of a grindstone. Water mills were then used for other purposes : oil mills, metalworking, papermaking...

By diverting or diverting watercourses and using mobile or stationary infrastructures, mankind has been exploiting the hydraulic energy of rivers to have **sufficient drop heights to activate the rotation of mill wheels**. Water mills used to be essential production machineries, with very specific rights and duties undertaken by owners or millers.

Nowadays most mills are residential areas, as they have ideal pleasant settings. Still, some are exploited for other purposes such as to produce electricity, grind flour or oil.

AN INFRASTRUCTURE DIRECTLY LINKED TO AQUATIC ECOSYSTEMS

All elements within the watermill can **alter the natural ecological functioning of the river**. Other hydraulic infrastructures can also have an impact on aquatic ecosystems : hydroelectric dams, drinking water dams, weirs, sluices ...



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HISTORY

9th century

First water mills in France

12th to 13th century

More and more craftsmen notice the huge help that are mills, and energy it saves them. The original use of water mills is diverted to new purposes : oil making, metal working, flour milling, tanning...

1789

Because of the French Revolution, all lordship rights are abolished except for the droit de l'eau. Mills now belong to millers, and are used to feed the constantly growing population.

18th century

Inventories of all water mills located on each département are being made. Cassini's maps identify more than 100 000 mills in France

End of 19th century

Industrial revolution : more and more mills set their weirs higher to produce more energy, and enhance their production. The use of charcoal slowly starts to replace other equipment such as water mills.

20th century

The phenomenon of industrialisation continues. The use of the hydraulic force is progressively replaced by other sources of energy (fossil energy, then nuclear). From 1925 and especially in 1936 due to law of contingentement, the development of gristmills largely substitutes water mills.

Most industries leave watercourses as motorised factories are more profitable. During the 20th century, most water mills become residential locations. Some still work in other industries such as paper making, oil making or flour grinding.

21st century

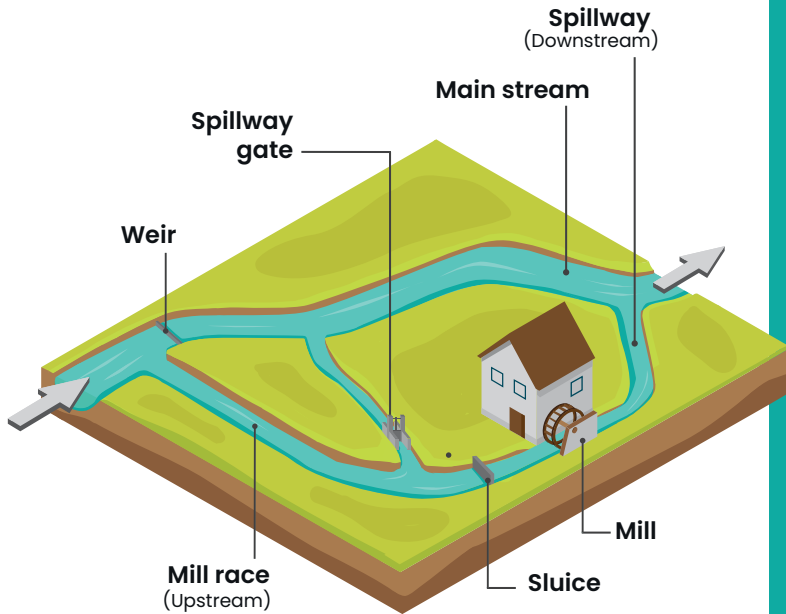
The Directive Cadre sur l'eau in 2000 introduces the notion of ecological continuity.

The 2021 law on climate change "Loi climat et lutte contre le dérèglement climatique" reinforces regulation on freshwater and aquatic environment management. The regulatory framework is constantly evolving, that's why it is important to always be aware of current applicable laws.



MECHANICS OF A WATERMILL

The watermill is actually part of many other hydraulic infrastructures that all belong to the owner of the mill.



COMPONENTS OF A MILL

Weir (seuil de répartition)

Low dam built across a river to raise the level of water upstream or regulate its flow. It also can deviate part of the stream towards a mill.

Millrace (bief)

Artificial channel carrying the current of water that drives a mill wheel

Spillway (Canal de fuite)

Channel used to control the release of water from a dam mill into the mainstream

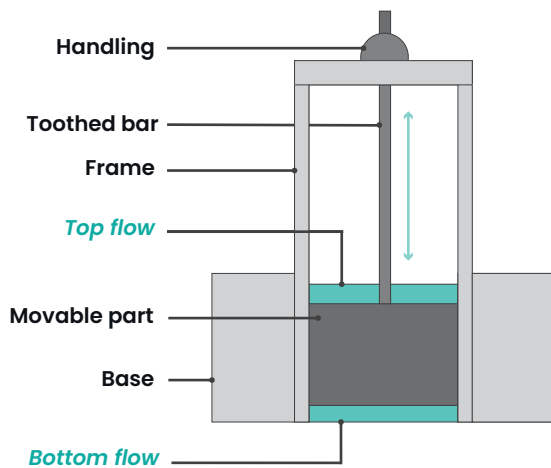
Spillway gate (Vannes de décharge)

A gate for regulating the flow from a reservoir or stream. It is located upstream from the watermill and allows the miller to regulate the water flow

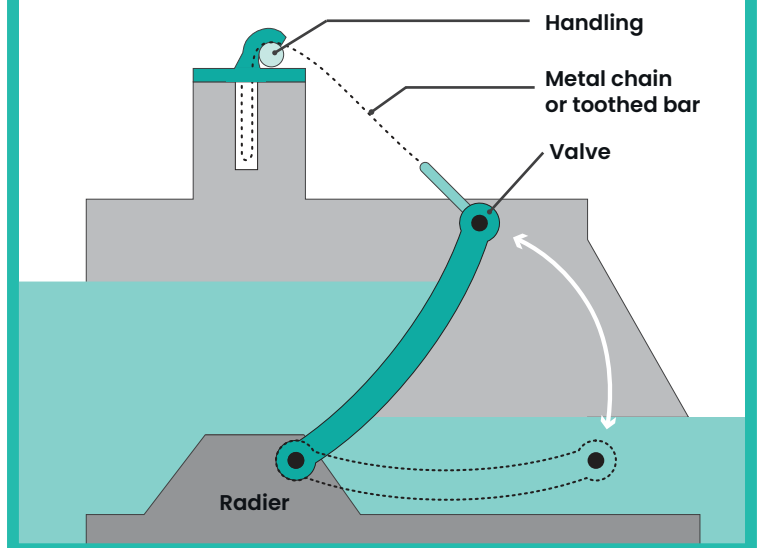
Sluice (Vanne ouvrière)

Sliding gate for controlling the flow of water

SPILLWAY GATE guillotine style



SPILLWAY GATE valve style



RIGHTS AND DUTIES

Water mills require a particular maintenance adapted to their regulatory status.



« DROIT D'EAU »

A watermill owner can use the hydraulic energy produced from the mill only with legal authorisation. The owner can deviate **the natural watercourse to exploit it with a hydraulic engine**. The droit d'eau can be obtained or authorised through two different ways.

HOW CAN I RECEIVE THE DROIT D'EAU ?

Droit d'eau fondé en titre

All hydraulic infrastructure that were constructed **before the French Révolution in 1789** are concerned. This right is perpetual, and doesn't require any renewal procedure or authorization.

The owner needs to find the construction date through an **authentic title or any other archive**, to prove its existence prior to the French Révolution (notarial deed, extract of Cassini's map, proof of business activity...).

This right can be removed in case of general public interest : flood risk, presence of ruins, threats on aquatic ecosystems, safety or health risk (article L214-4 of the environmental code). Moreover, any construction that could modify the hydraulic force **needs to be authorized by the DDT(M)** of your département. The infrastructure could then have the title of « droit d'eau fondé sur titre ».



ATTENTION

All hydroelectric infrastructures authorized before October 16th 1919, are also considered **as fondées en titre** (article L511-9 of the code de l'énergie).

Droit d'eau fondé sur titre

This right is the result of **a procedure of authorization delivered by prefectorial decree**. It concerns all watermills constructed before 1789 that would have been modified to enhance the original engine power mentioned in the original title of ownership.

RÈGLEMENT D'EAU

This water regulation declares management rules for all watermills receiving the droit d'eau fondé sur titre. It takes into account :

- The legal weir level
- The dimensions for all hydraulic infrastructures (weir, spillway gates...)
- All maintenance and management duties the owner is responsible for



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RIGHT OF OWNERSHIP

All annex infrastructures (channels, millrace...) are privately owned structures. **Except otherwise proved, they belong to the owner of the mill**, even if they are located on different properties.

When a watermill is directly located on the mainstream, the owner is responsible for all infrastructures present in the area where water flow is visually influenced by the mill.

REGARDING RESIDENTS SURROUNDING HYDRAULIC ANNEXES

They are not allowed to extract water or modify the water level. They can also be submitted to a contract specifying a right of way (**servitude de passage**) so that the owner can have access to all hydraulic annexes.



MAINTENANCE

According to regulations associated to watermill rights, all infrastructures should be maintained **in working conditions** :

- Weirs and spillways in good condition and deprived of any logjams
- All gates should be functional and easily operated
- Fish ladders, if present, should be deprived of any logjams or plant debris

Your local DDT needs to be informed of any potential maintenance work or repairs, especially if they require the lowering of water level. **Please maintain your infrastructure regularly** rather than occasionally, to avoid any severe impact on water flow or aquatic ecosystems in general.



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DID YOU KNOW ?

The establishment of a **collaborative management of spillway gates manoeuvres between property owners** located on the same watercourse is a very useful and relevant organisation to adapt each management.

> **Contact your local syndicat GEMAPI** (See map p.12)



MANAGEMENT

Every infrastructure should be managed according to water regulation (**règlement d'eau**) and other possible local regulations (Plan de Prévention des Risques Inondations, drinking water dispositions, recreational purposes, irrigation...).

The regular and progressive manoeuvre on hydraulic infrastructure reduces their impact on watercourses :

FLOOD RISK

The owner is responsible for upkeeping its gates and sluices to always maintain the legal water level. This regulation requires the presence of person in charge at all times. Contact your syndicat GEMAPI to learn more on flood management.

SEDIMENT TRANSPORT

Spillway gates should often be opened to facilitate the circulation of sediment. Historically, owners on a same watercourse would open their spillway gates at the same time on Sundays and hollidays to allow a better and more dynamic circulation.

LOW-WATER LEVELS

To protect a watercourse's biological life, owners should leave a minimal water flow upstream of their weir at all times.



BRINGING INFRASTRUCTURES UP TO REGULATION ENVIRONMENTAL CODE

WATERCOURSE CATEGORIES

Watercourses on list 1

The construction of any new infrastructure is forbidden as it could be an impact to the ecological continuity. The renewal of existing authorisations is supported by new regulations on species conservation and freshwater quality.

Watercourses on list 2

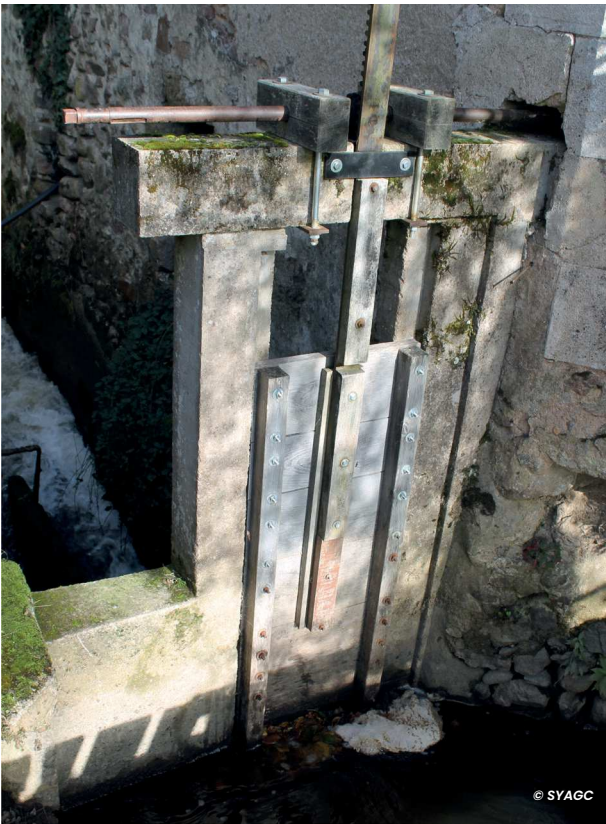
The existing infrastructures should allow sufficient sediment transport and fish circulation.

A mill should not be a barrier to the circulation of aquatic flora and fauna. It is also important that it's effect on sediment transport is limited. Two types of regulation exist on watercourse management.

(Article L-214-17 of the French Environmental Code)

IMPACT ON AQUATIC ECOSYSTEMS

Hydraulic infrastructures can be barriers to the ecological continuity, including aquatic species circulation and sediment transport.



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on 3rd January 2019

(Source : Observatoire national de la biodiversité).

1 barrier every 6 km
of watercourse
identified in France

100 100
Barriers
identified in France
99 000
Barriers identified
on French mainland

POSSIBLE IMPACTS OF HYDRAULIC WORKS ON WATERCOURSES

- **Habitat fragmentation** limits the access of fish to reproduction sites, or even genetic mixing within aquatic species ;
- Deterioration and aquatic habitat homogenisation due to the **impediment of natural sediment transport** in the watercourse ;
- Alteration of freshwater quality due to **water stagnation** upstream of hydraulic infrastructures (water warming, decrease of oxygen concentration) that can lead to the spread of algae (eutrophication) and aquatic fauna asphyxiation.
- **Modification of water flow** downstream

MAINTENANCE ON WATER FLOW BARRIERS

Only a part of all identified barriers are considered to have an impact on water flow.

If a hydraulic infrastructure has an impact on water flow, the owner is responsible for any ecological continuity restoration needed. Bringing the structure up to regulation can include the installment of fish ladders, maintenance or the construction of new structures.

These regulations support other actions aiming the regaining of freshwater quality and aquatic ecosystems conservation (reduction of contamination risk, wetland conservation, waterways renaturation...). All these measures contribute to the restoration of dynamic and healthy rivers, biodiversity richness and climate change adaptation.

DID YOU KNOW ?

The impact of watermills on aquatic species circulation has been observed for the first time during the 19th century. This phenomenon increased during the 20th century, that's why maintenance and management modifications were made on existing structures : heightening of weirs and dams, changes in spillway gates, firsts hydroelectric mills (severe impact of turbines on aquatic fauna), changes in the use of coating materials (concrete)... All these modifications have led to mills being insurmountable barriers for the aquatic fauna.

Fish populations have also been impacted on by other factors (contamination, watercourse morphology modification, removal of smaller adjacent waterways...)

MAINTENANCE ON AQUATIC ECOSYSTEMS

« GEMAPI » organisations are essential participants in the maintenance of hydraulic infrastructures, as well as to ensure the proper execution of bringing up to regulation these structures.

Ecological restoration of the «Sawmill du Camp» MOURIOUX-VIEILLEVILLE | Syndicat Mixte Contrat de Rivière Gartempe (SMCRG)

In order to restore and enhance a section of the Ardour river and its environment, a construction project was initiated at a sawmill located in the municipality of Mourious-Vieilleville. The approach aims to reintegrate the river's bed to its historical altitude, prior to the construction of the weir at the sawmill that was retaining the flow. To achieve this, the structure was replaced with

This achievement has the advantage of regulating, over several years, the input of quantities of sand and mud into the Ardour river, as well as limiting bank erosion and destabilization of trees on it. It ensures ecological continuity.

The works were completed in December 2022, with a cost of €67,600. They were financed by the Loire-Bretagne Water Agency (70%), the SMCRG (20%), and the Nouvelle-Aquitaine region (10%).



Erasure of the weir of « la Galache » BERNEUIL | Syndicat Mixte d'aménagement du Bassin de la Gartempe et affluents (SMAGBA)

The weir of this water mill obstructed the sediment flow on the Vincou river, a tributary of the Gartempe. The upstream water storage was filled up to 95% by 26,000 m³ of sediment, with a residual water volume of 1,400 m³. It had not been drained for fifteen years and was subject to conformity requirements.

The project involved temporarily diverting the course of the river by constructing a secondary canal to maintain continuity. Then, the water and sediment were drained from the threshold, allowing its removal. The downstream banks of the removed structure were restored, and the temporary diversion canal was removed to allow the river to flow again in its original bed.

The project, which cost €357,539 including taxes, was funded 80% by the «Agence de l'Eau» and 19% by the «Nouvelle-Aquitaine region». The work was completed in 2022.



I AM INTERESTED IN **BUYING A WATERMILL**, WHAT DO I NEED TO KNOW BEFORE PURCHASING IT ?

Purchasing a watermill is **not trivial** : it's not only a residential area, but also a very peculiar property. It requires a **lot of maintenance and management**. Before purchasing it, it is recommended to :

1. Check the **land ownership, and its extent to all hydraulic infrastructures** connected to the watermill
2. Be aware of le **droit d'eau et du règlement d'eau (regulation on water use)**
3. Be aware of the potential existence of a **convention de gestion et de servitude**
4. Evaluate the **general state of the mill** and all its **components (sluice, spillway gates, weirs...)**, and the need to bringing them up to regulation
5. Determine the state of the mill towards **the respect of ecological continuity**

To learn more about important information you need before purchasng a watermill :

- Contact your local **syndicat GEMAPI** (See map p.12)
- Contact your local **DDT(M)** (Information p.12)
- Ask the property **owner/seller**

WHAT TO DO WHEN **FLOODING** ?

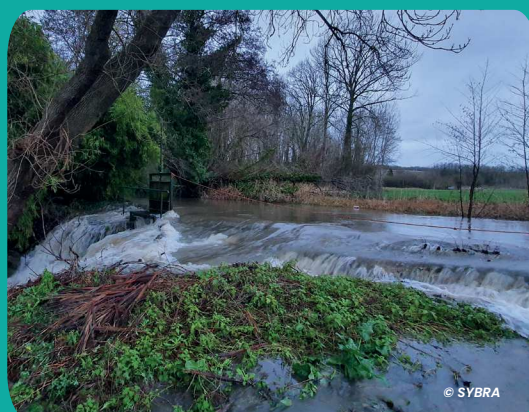
The owner is in charge of respecting the **legal range of water-level** at all times. Spillway gates need to be regularly opened, and deprived of any logjams or plant debris that could be accumulated, to ensure the natural water flow.

When flooding, it's important that the owner :

- **Is present** - in case of extended absence, please make sure the property is accessible (leave keys for all gates and easy access to all hydraulic infrastructures)
- **Anticipate the opening of spillway gates** before flooding :
- **Open slowly and progressively** all gates to allow a more natural and regulated water flow
- **Encourage the circulation of water located at the bottom of the water column** to improve sediment transport and fish circulation
- **After the flood, remove all logjams and plant debris from every hydraulic infrastructure**



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WHAT TO DO DURING A PERIOD OF **LOW-WATER LEVEL** ?

During low-water period, maintenance changes are needed :

- You need to respect the **minimal legal water level** and all regulations on gate manoeuvres imposed by **prefectorial decree** during low-water period
- **Encourage the circulation of water located at the bottom of the water column** to improve the ecological continuity and to stir freshwater (careful not to create a brutal flushing during low-water period as mater in suspension could cause the clogging of the riverbed downstream).



© Charente Eaux

CAN A MILL **SUSTAIN A WATERCOURSE** DURING LOW-WATER PERIOD ?

Volumes of water retained by a weir or a "chaussée" **are too limited to sustain** the whole watercourse during low-water period.

When doing works on a mill, it is important to **evaluate the dynamic of the whole equipment**, to make sure the connexion between the watercourse and adjacent land plots.

This connectivity allows the vegetation to **play their role of sponges**, and to **limit the negative impact of droughts** on aquatic ecosystems.



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To learn more on the best management approach in this situation :

> **Contact your local syndicat GEMAPI** (See map p.12)

MY MILL IS NOT USED ANYMORE. WHAT CAN I DO WITH IT ?

Evaluate its future with the adequate administration :

> **Contact your local DDT(M)** (See map p.12)

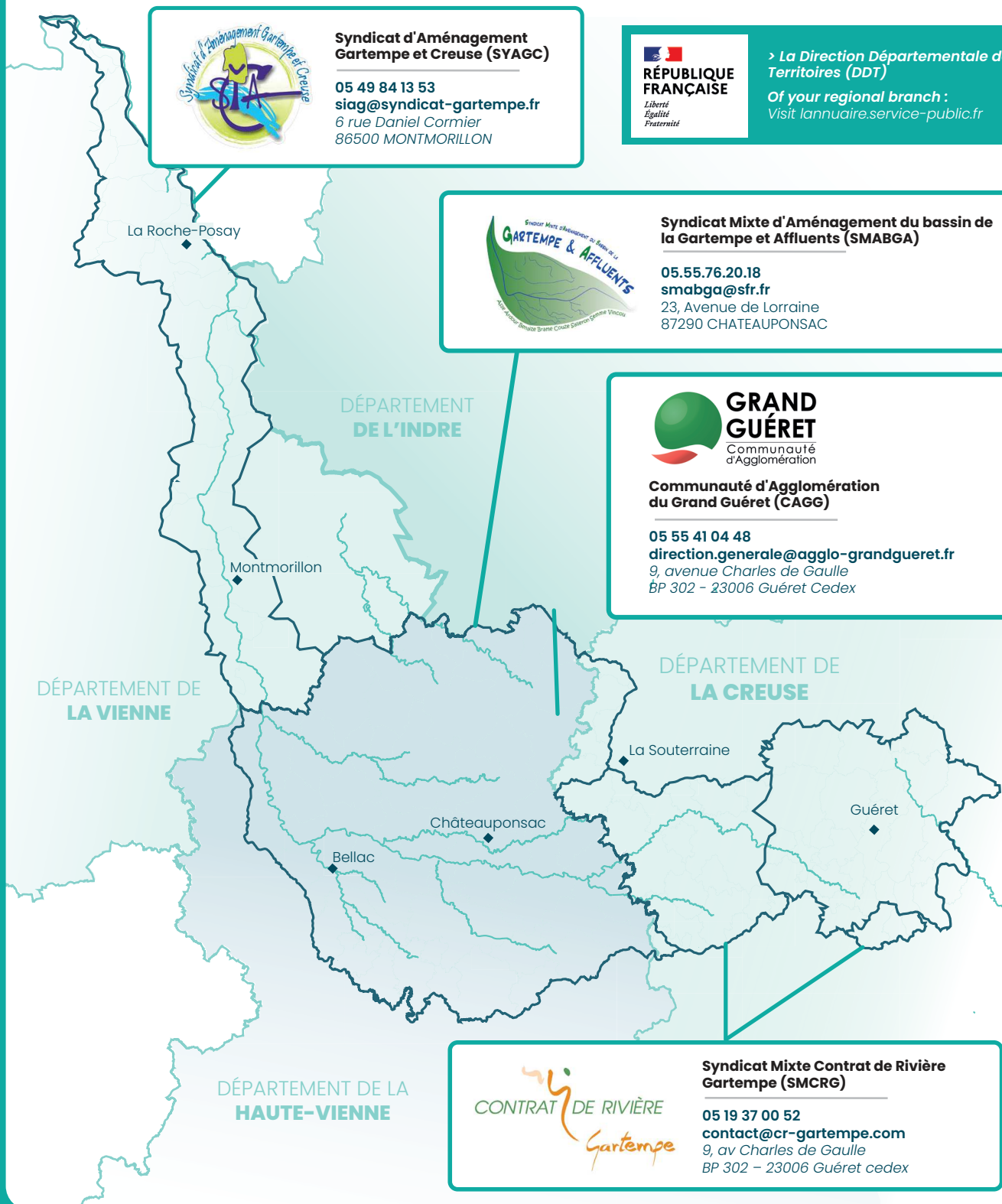
I WANT TO RESTORE MY MILL TITLED AS "FONDÉ EN TITRE" **TO PRODUCE ELECTRICITY**, HOW CAN I DO IT ?

You need to contact the local Préfet, that will give you all requirements on aquatic ecosystems protection and the sustainable management of freshwater quality.

> **Consulter la DDT(M) qui indiquera les éléments à fournir**

WHOM CAN I CONTACT ?

> Join your « GEMAPI »
« GEMAPI » organisation of your area are available to answer your questions and to assist you in certain procedures.



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