

LAC AU DUC

at the heart of the territory's identity



AN IMPORTANT HERITAGE SITE AND TOURIST ATTRACTION

HISTORY

Lac au Duc is an artificial lake whose creation dates back to the 15th century and is located at the outlet of the Yvel River watershed, which is called Hyvet, a Costa Rican derived name. Lac au Duc is long-established in the history of the Pays de Ploërmel and is today an emblem at regional, national and even international level (people come to fish in the Lac au Duc de pays from as far as Australia!).

In addition to being used to produce drinking water (for over 10,000 people), Lac au Duc is a tourist attraction of prime importance, whether for swimming, nautical activities (Lac au Duc is one of 6 water bodies in France with a permanent water ski club), or fishing.

This tourist attraction is of paramount importance for the Pays de Ploërmel and its surroundings, representing dozens of direct and indirect jobs.



A MAINLY AGRICULTURAL WATERSHED

The water supply area of Lac au Duc (it's watershed) represents an area of 37,465 hectares.

3 DEPARTMENTS AND 22 MUNICIPALITIES

- Morbihan (mainly)
- the Côtes-d'Armor
- and Ille-et-Vilaine

AGRICULTURE

is the largest provider of employment in the watershed, accounting for 19% of the 5,200 companies in the sector.

POPULATION

the density in the watershed is less than half of the average for Brittany, reflecting the highly agricultural nature of the Lac au Duc watershed.



STRUCTURE AND EVOLUTION OF AGRICULTURE IN THE LAC AU DUC WATERSHED

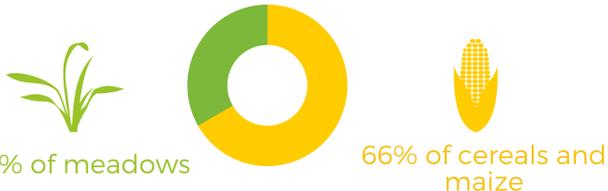
In 2018, on the Lac au Duc watershed, we counted:



448 farms

= 78 hectares of Average Useful Agricultural Area per farm

DISTRIBUTION OF CROPS AND PRODUCTION



Dairy production dominates in the north and south, with pigs and poultry - mostly in the west and centre of the watershed.

CURRENT TRENDS

- A rapid decrease in the number of farmers and increase in average farm size;
- A drop in milk production and increase in crops;
- A decrease in nitrogen and phosphorus (P) pressures;
- A P balance on average close to equilibrium;
- The adoption of cultural practices favourable to soil conservation and the protection of water quality (implementation of grass buffer strips, extension of no-tillage, vegetation cover, etc.).



ECOLOGICAL STATUS

of the Lac au Duc

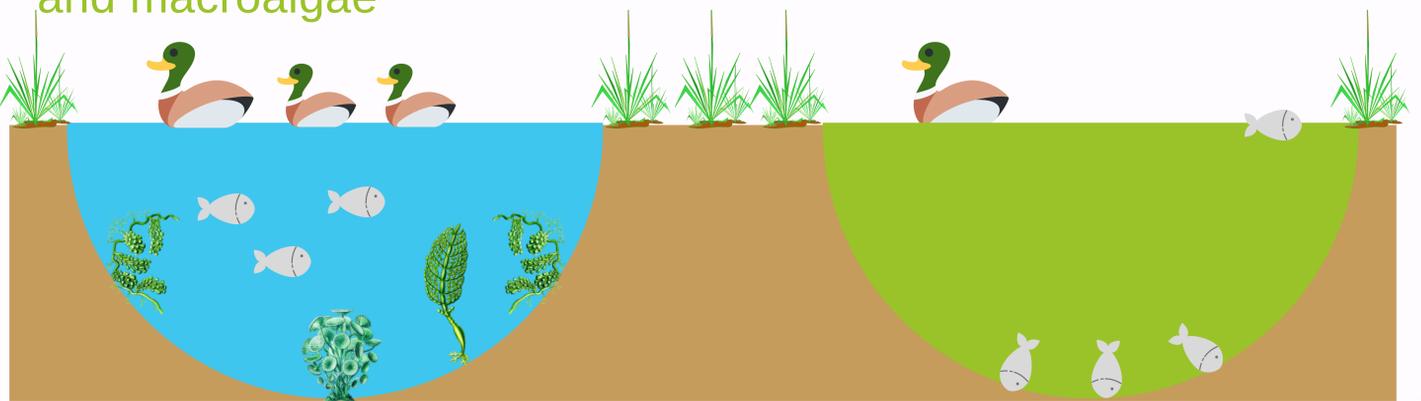
In recent decades, cyanobacteria have been growing in Lac au Duc resulting in a degradation of its ecological state and leading to reductions in use.

These massive growths are the markers of an imbalance of aquatic ecosystems: the waters have become too rich in nutrients (phosphorus in this case).

This phenomenon is called **eutrophication**. Some cyanobacterial species are potentially toxic and can have adverse health effects.

50 YEARS AGO...

Dominance of micro and macroalgae



NOWADAYS

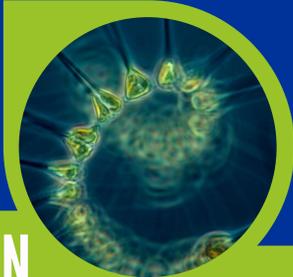
Dominance of cyanobacteria

For 50 years, there has been an increase in nutrients (P in freshwater), a decrease in light and oxygen at the bottom and a loss of biodiversity.

Cyanobacteria are present throughout the globe, and adapt easily to their environment, including extreme conditions of polar ice.



PHYTOPLANKTON



Phytoplankton produce half of the oxygen on the earth (the other half is produced by trees). It produces oxygen by capturing solar energy, CO₂ and nutrients (nitrogen, phosphorus) through photosynthesis.

Phytoplankton are all plant organisms living in suspension in water.

CYANOBACTERIA



Cyanobacteria, also called "blue-green algae", are a type of phytoplankton (but they are bacteria and not algae, unlike the rest of phytoplankton).

Appearing 3.8 billion years ago, they allowed the production of oxygen and life on earth. They are the origin of algae and plants lines

DID YOU KNOW?

CYANOBACTERIA ARE AN INTEGRAL PART OF AQUATIC ECOSYSTEMS.....

...but in recent years, regular and massive cyanobacterial growth in Lac au Duc has severely disrupted local activities: specific bans on summer bathing, consumption of fish products, hunting of waterfowl, increased costs of drinking water treatment and curative measures, and impacts on the aesthetics of the site.

The CPES project allows the Grand Bassin de l'Oust, supported by Ploërmel Community and the Pays de Ploërmel, to conduct studies to better identify the mechanisms are involved in the appearance of cyanobacteria blooms



HEALING ACTIONS

Lac au Duc, short-term solutions

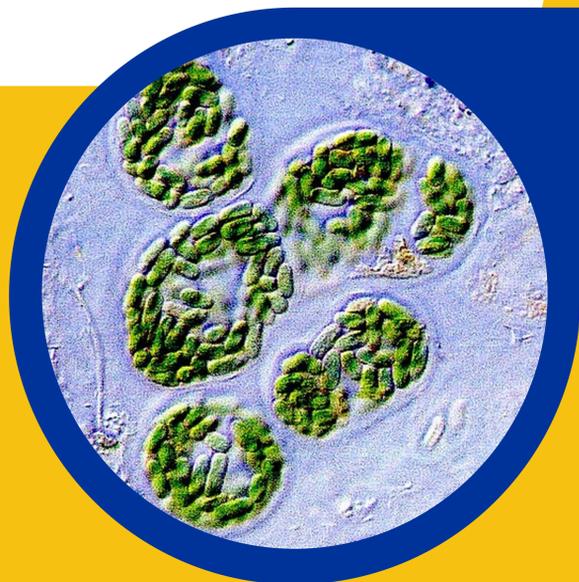
LAC AU DUC PILOT SITE

The curative actions are emergency, short-term solutions that support the longer-term solutions (see Payment for Environmental Services banner) when the local economy is at immediate risk.

Depending on the characteristics of a lake (depth, surface area, plants and cyanobacteria present, etc.), and the local context (types of recreational activities, budget, etc.), various curative actions may be considered.

However, curative actions only bring about short-term improvements in cyanobacteria blooms.

The improvement of Lake's water quality will be done through a long-term work on the watershed and by prioritising certain uses over others to find a balance with the natural heritage of the territory: carp fishing, swimming, visual aspect, tourism, leisure, etc.



CURATIVE ACTIONS CARRIED OUT WITHIN THE FRAMEWORK OF THE INTERREG PROJECT

BATHING PERIMETER

Ploërmel Community has created a bathing perimeter consisting of a 5000m² waterproof enclosure delineated by floating tubes.

TREATMENT

The Mixed Union of the Grand Bassin de l'Oust and the University of Rennes 1 have experimented with releasing hydrogen peroxide (H₂O₂) in the bathing area to slow the development of these micro-algae.

The impact on phytoplankton but also on zooplankton was evaluated.



2018



2019

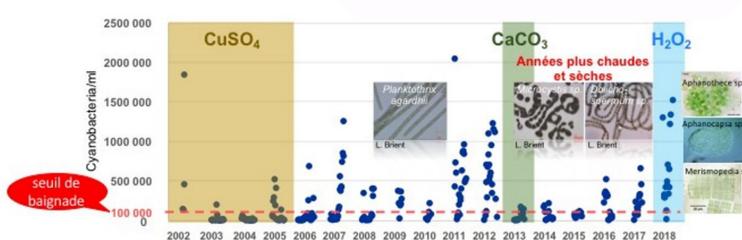
TREATMENT

The proliferation dynamics of cyanobacteria vary from year to year depending on many factors, for which modelling is still a major scientific difficulty.

In 2019, an application of H₂O₂ was made by Arcadis and funded by Ploërmel Community and the Interreg CPES project.



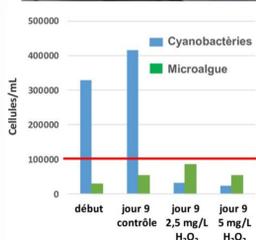
Les cyanobactéries dans le Lac au Duc



Different actions have been tested, but without reduction of nutrients, cyanobacteria can remain recurrent.

Counting source of cyanobacteria: Luc Brient until 2007 and ARS since 2008

Expérience en laboratoire



Treatment with 2.5 mg / L H₂O₂ is effective for at least 9 days in the laboratory to reduce the cyanobacterial community below the threshold of cxdc100 000 cells / mL required for swimming.

application in-situ : 4 H₂O₂ traitements



There is a significant decrease in cyanobacterial concentrations but the threshold is not reached in a sustainable manner.

PAYMENT FOR ENVIRONMENTAL SERVICES

An economic tool to improve the water quality of the Lac au Duc.

The idea is that farmers do not just produce food. Following their practices, they also contribute to maintaining or improving the quality of the air, water, natural ecosystems (wetlands, ponds, etc.), this maintenance or improvement being seen as Environmental Services (SE).

EVENING AWARENESS
JUNE 7, 2019 AT PLOËRMEL



INTEREST

- Local implementation in the form of contracts;
- Adaptable to the characteristics of territories and agricultural production systems;
- Incentive amounts going beyond the simple compensation of extra costs for the farmer.

DIFFICULTIES

Where to find the financial means? Between 4 and 12 million Euros are needed per year according to estimates. Lake users? Traders benefiting from the economic benefits of tourism? Consumers of drinking water produced from the Lake? Patrons?

For a very rural and sparsely populated area, such as the Lac au Duc watershed, the question of financing PES is a challenge!

OBJECTIVES OF THE PROJECT

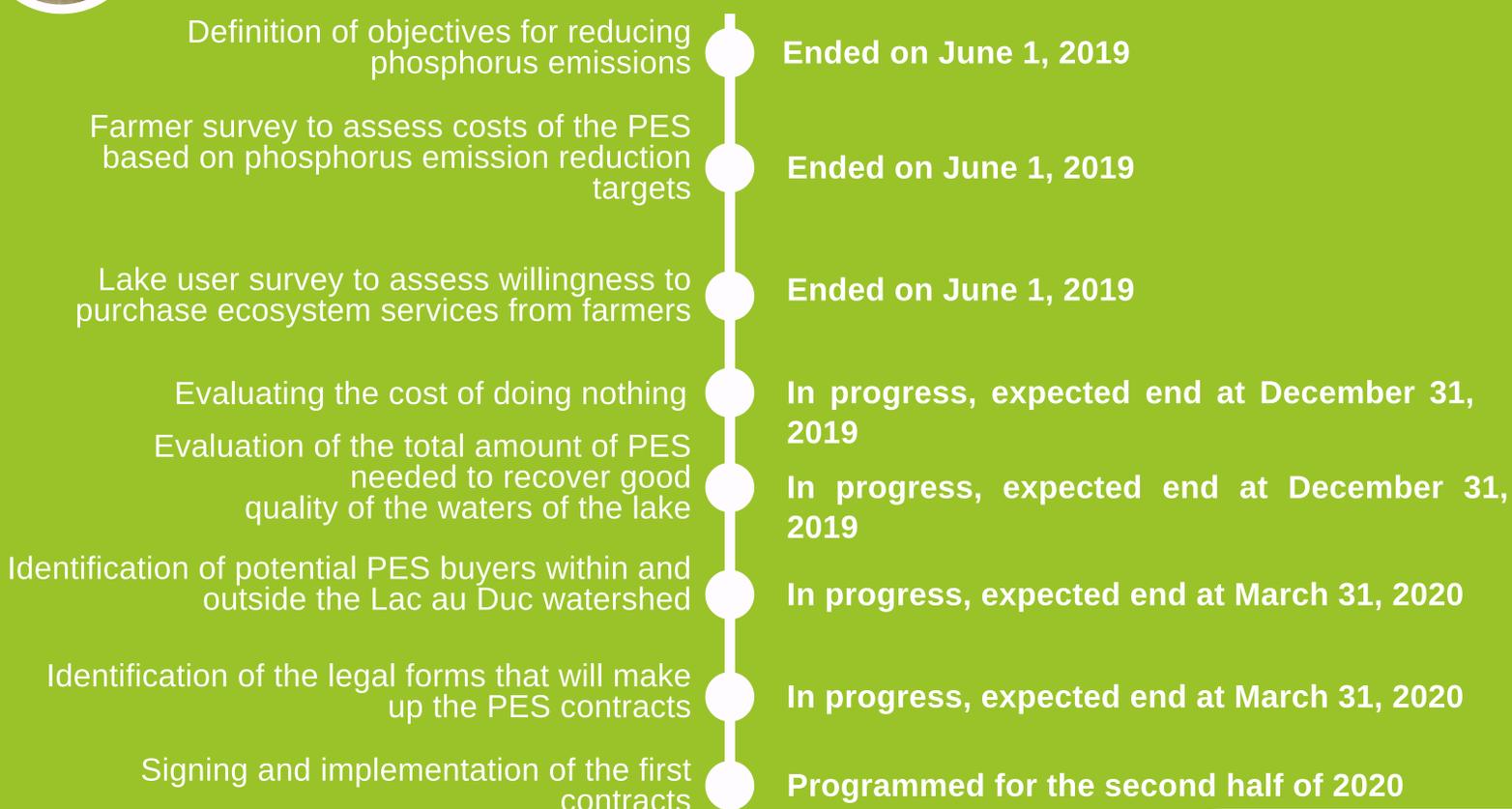
INTERREG « CHANNEL PAYMENT FOR ECOSYSTEM SERVICES »

The Channel Payment for Ecosystem Services (CPES) INTERREG project is a French-English research project that aims to determine the conditions for implementing PES-type mechanisms as tools for improving water quality in 6 catchments. There are 3 pilots in France and 3 in England, one of which is the Lac au Duc watershed. In each catchment, it is necessary to:

- Quantify the necessary financial means;
- Identify the buyers of Environmental Services;
- Determine the legal forms that make up the contracts binding buyers and sellers (farmers);
- Implement payments effectively and verify their environmental effectiveness.



STEPS FOR DEVELOPMENT ON THE LAC AU DUC



PREVENTIVE ACTIONS

on the watershed: what are they?

THE 5 PRE-STEP A REDUCTION OF PHOSPHORUS FLOWS ENTERING LAC AU DUC

WHAT IS INVOLVED IN AN ANALYSIS OF PREVENTIVE ACTIONS NEEDED IN THE WATERSHED?

Several steps are necessary:

- Determine the share of agricultural and domestic sources. Which sources should we act on first?
- Determine if some areas of the catchment emit more phosphorus than other. Where to locate the actions?
- Compare current phosphorus inputs to Lac au Duc with inputs that are compatible with the good ecological status of the lake. Set reduction goals.
- For agricultural sources, quantify current emissions based on soil types and practices and identify the changes in practices required to achieve reduction objectives.
- Communicate information to farmers and economists to assess the financial amounts required to achieve the reduction targets.



It's a question of going back to the causes of the proliferations of cyanobacteria in the Lake so that one knows where the phosphorus is coming from its watershed.

To launch preventive actions is thus to "treat the evil at its root" by reducing these emissions. These actions are distinguished from curative actions whose object is to minimize the development of cyanobacteria by acting directly on the water.

WHAT VISION DOES THE INTERREG PROJECT "CHANNEL PAYMENTS FOR ECOSYSTEM SERVICES" HAVE FOR PREVENTIVE ACTIONS IN THE CATCHMENT?

5 MAJOR RESULTS OBTAINED

1. 90% of the phosphorus entering Lac au Duc comes from agricultural soils. Preventive efforts must therefore focus on agriculture.
2. There is no real zonation of agricultural sources of phosphorus in the watershed. These seem relatively evenly distributed.
3. To achieve good ecological status in the Lac au Duc a 5-fold reduction in phosphorus input is required. This represents a significant but achievable goal.
4. The systematic establishment of a permanent plant cover on the soil and anti-erosion hedges at the edge of fields are two ways to achieve this goal
5. These practices are expensive and farmers need to be helped financially to put them in place. This is the goal of Payments for Environmental Services.



EUROPEAN PROJECT TEAM