

Report of the project

“Restoration of Lake Camécuaro National Park and prevention of its recolonization by invasive fish species”

funded by the EAUC in 2024.

Before we could start our proposed work in Lake Camécuaro National Park in 2024, the most severe flooding in the area since the park was established in the 1940s cancelled out many of our ideas. Continuous heavy rainfall caused the Duero River to overflow its banks in early August, but this did not originally cause many problems due to existing dams at the side of the Camécuaro Lake National Park. However, the flood gate, which regulates the water level of the river, was blocked by flotsam that had been washed up and two days of heavy rain led to additional surface water coming in from the hills on which the park is located (photos attached). This, combined with the already heavy flow of the springs after more than six weeks of rain, led to an unprecedented flood that not only caused the lake to overflow its banks (as usual in some years), but also flooded the spring areas. As a result, tilapia and black bass from the lake were flushed into the majority of the springs for the first time ever and caused problems there. These fish have since all been removed, but the event changed our priorities permanently as we now know that our focus must be on safeguarding the existing springs. This can be achieved on the one hand through structural measures and on the other hand by increasing the removal of exotic fish species from the lake, with the aim of removing them completely in the medium term, so that future flooding might cause no more problems with exotic fish species.

Additionally, there was a change in park management in September with new faces and new ideas. The new administration is luckily interested in a comprehensive and lasting restoration of the park, which gave us the opportunity to set the course for more massive interventions in the park as part of a workshop organized by us. The workshop was evaluated (the document is attached) and will be handed over to the National Park management on August the 1st. After the National Park management has reviewed the document, an appointment will be made to discuss the order and sequence of future activities, some of them will be proposed by us at this meeting. These will include the raising of individual walls of the springs as well as quiet zones on and in the lake, which will serve to provide rest for the fauna and flora. The areas for replanting the underwater vegetation will also be located there. In addition, the flow of visitors is to be channeled, the locations of the Education Trail fixed and further measures approved (such as not using disposable packaging and plastic bags).

Part of the management plan will also be to check the flood gates daily during periods of heavy rainfall and to intervene if there is a risk of blockage. In addition, the outlet of the Camécuaro River is to be relocated after the flood gate in future so that it does no more contribute to the problem. However, this must first be discussed with CONAGUA, which is responsible for hydraulic engineering measures in Mexico. Due to the problems caused by the flooding and the possibilities offered by the new park administration, only some of the planned steps have been implemented. Others will not be implemented at all because it got revealed that they do not make sense, others in agreement with the National Park Administration in the next few months. In addition, there are further measures that we did not have on our radar because the previous management was not open to a major revision of the National Park concept, but the current management is striving for a permanent improvement that can no longer be influenced by future administrations. We see this as a step in the right direction.

Below are the measures we planned for which we received EUAC funding. We added what was done, what could not and cannot be done, and what we realized with this funding instead. Part of the funding is still available to us and will be used to protect the native species in the springs in the next few months.

* Continue the removal of exotic fish species from the springs with fish traps, seine nets and hand nets. This work will be done by students from the University Michoacana from Morelia, is financially supported by the municipality of Tangancícuaro de Arista and doesn't request additional funding.

This was done continuously, especially after the flooding in August 2024, to remove immigrant black bass and tilapia. During our last survey in May 2025, only three guppies (*Poecilia reticulata*) and six green swordtails (*Xiphophorus hellerii*) were found in the springs, a few more swordtails could be observed visually, so these measures are clearly having an effect. In turn, it was observed that fry of native species has increased in numbers. Unfortunately, the numbers were never recorded quantitatively, which means that a corresponding paper on the effect of such measures would only be possible by comparing the numbers of native and exotic species in the fish traps, but not by recording the absolute numbers.

* Continue the removal of exotic fish species from Lake Camécuaro by a team of professional fishermen, and from the Camécuaro River by a team from the University Michoacana of Morelia with seine and hand nets and electrofishing devices. Funding needed.

When we realized after the flood that building dams and barrages made no sense (some of the springs were covered by 20 cm of water), we used the funding to increase the number of planned removals in the lake from ten to around twenty in order to reduce the pressure of exotic large fish in general on the springs in the event of another flooding of this magnitude. However, the main objective is the complete removal of the four species present (*Cyprinus carpio*, *Oreochromis aureus*, *Micropterus salmoides* and *Lepomis macrochirus*). To date, these extraction measures have led to an (estimated) 80% removal of these larger species from the lake (photos attached) with the support of the local fishermen community and by hunting predatory fish at night with harpoons. This process is not yet complete.

* Build two little dams with waterfalls to isolate two springs from the lake to stock them with native species for the planned reintroduction process of the lake. The natural conditions and local materials will be used in a clever way to keep costs low. Funding needed.

The flood in August 2024 showed us that isolating these springs (that are connected with the lake at the same level) from the lake with dams is not possible when an exceptional flood like the one from last year happens. It connected more or less all parts of the system, including part of the already isolated springs. To prevent such dramatic events, other structures are needed, such as catch basins for the water that flows down the hills after heavy rainfall, and stricter management of the flood gates. These structures and a change of the park management will be part of the restoration of the park. The money that was planned for these dams (and the barrage from the next point) has partly been used to increase the number of fish extraction from the lake and to hold the workshop in February of this year.

* Build a barrage with a shallow waterfall in the lower part of the Camécuaro River to prevent the re-immigration of exotic fish species into the lake. The natural conditions and local materials will be used in a clever way to keep costs low. Funding needed.

This was not built for the same reasons as the dams at the two springs, but fishing operations in the Río Duero as part of the survey of historical sites for Plan G were completely unsuccessful throughout the year. It seems that the (very polluted) river is now unsuitable as a habitat for fish, as some Mexican experts have already surmised, and is free of fish. However, it cannot be completely ruled out that a short-term improvement in the water quality during the rainy season could lead to an influx of robust exotic species, and we will evaluate methods that can be used instead of a barrage when drawing up the management plan.

* Parts of the reduced underwater flora shall be planted in suitable places to create spawning and retreat zones for aquatic life. The work will be carried out by a team from the

University Michoacana, is financially supported by the municipality of Tangancícuaro de Arista and doesn't need additional funding.

We have already started in the river with planted areas, which are working well, but the areas in the lake will be part of the adaptation of the management plan and with the designated underwater quiet zones.

* Continue the environmental education programs for the park visitors and construct an educational trail. The work will be carried out by a team from the University Michoacana, is financially supported by Goodeid Working Group and doesn't need additional funding.

The environmental education programme was completed and the results integrated into the workshop. The locations of the future Education Trail will be determined in consultation with the park management and the park division. An interactive programme for smartphones will also be used, which enables a kind of 'naturalistic scavenger hunt' adapted to different age groups.

How was the financial support used? For the approximately 20 (19 to be exact) fishing operations in the lake with gillnets, 250 euros were spent per operation, so 4,750 euros went into it. The planning and organization of the workshop in the town of Tangancicuaro de Arista costed EUR 2,000, which means that EUR 6,750 were spent and EUR 3,250 are still available. This is to enable the walls around the existing springs to be raised by around 40 to 50 cm so that they are no longer flooded and the immigration of fish from the lake is prevented.