



**Ponderful**  
PONDS FOR CLIMATE

**SWITZERLAND** 

**PONDSCAPE : RHÔNE GENEVOIS**



Pond Ecosystems for Resilient Future Landscapes in a Changing Climate

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# WHAT IS A PONDSCAPE ?

## DEFINITION

A pondscape is a network of ponds with spatial proximity (“connectedness”) and the surrounding landscape matrix.

The boundaries of a pondscape may be determined by physical or ecological settings (a valley, a catchment, a set of ponds in a nature reserve) or even determined by societal or political criteria (urban ponds, provincial or national boundaries).

## PRESSURE/THREATS ON PONDS AND PONDSCAPES

50-90% of pond losses in European countries over the past century. Furthermore, ponds are largely neglected in water- and nature-related national and EU policies and strategies, including the EU-WFD.

## WHY IS IT IMPORTANT TO PROMOTE THEM ?



### BIODIVERSITY ENHANCEMENT

Largely neglected and generally undervalued, ponds are remarkably important for biodiversity conservation. Pondscapes represent biodiversity hotspots.



### DISASTER RISK REDUCTION

Ponds and pondscapes play a fundamental role in mitigating flooding and also constitute a water reserve to fight fires.



### HUMAN HEALTH

Ponds and pondscapes provide a wide range of co-benefits for human societies such as support for human health and quality of life, spaces for physical activities, or social interaction, but also aesthetic experiences and educational and recreational activities.



### CLIMATE CHANGE MITIGATION AND ADAPTATION

Given their abundance and their high productivity, ponds influence markedly the carbon cycle by acting as both carbon sinks and sources.



### WATER MANAGEMENT

Pondscapes provide a water reserve that is particularly important in the context of water scarcity. It is particularly useful for watering animals and for irrigation.

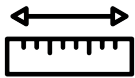
# CONTEXT



**Name of the pondscape :** Rhône Genevois  
**Name of neighboring large town (in a 30 km radius):**  
Geneva (600'000 habitants)  
**Bioclimatic zone :** Continental

## Dominant land use :

pondscape - woodland and agriculture  
surrounding environment - intensive agriculture and urbanization



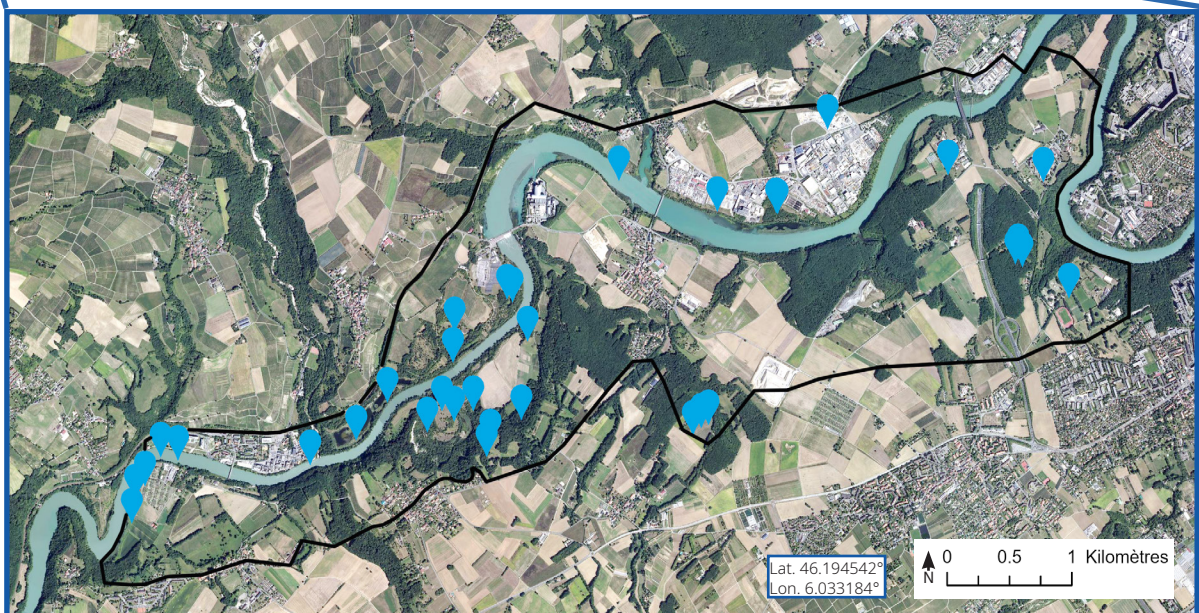
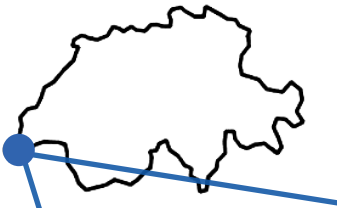
**Pondscape area :** 15 km<sup>2</sup>  
**Pond : number:** 46  
**density:** 3.1/km<sup>2</sup>  
**surface areas :** 15 to 36'000 m<sup>2</sup>  
**depths :** 0.4 to 4 m  
**ages :** 5 to 50 years

**Land owner :** Canton of Geneva

**Land manager :** Canton of Geneva

**Public access :** 91 % of the area is accessible (outside natural reserves)

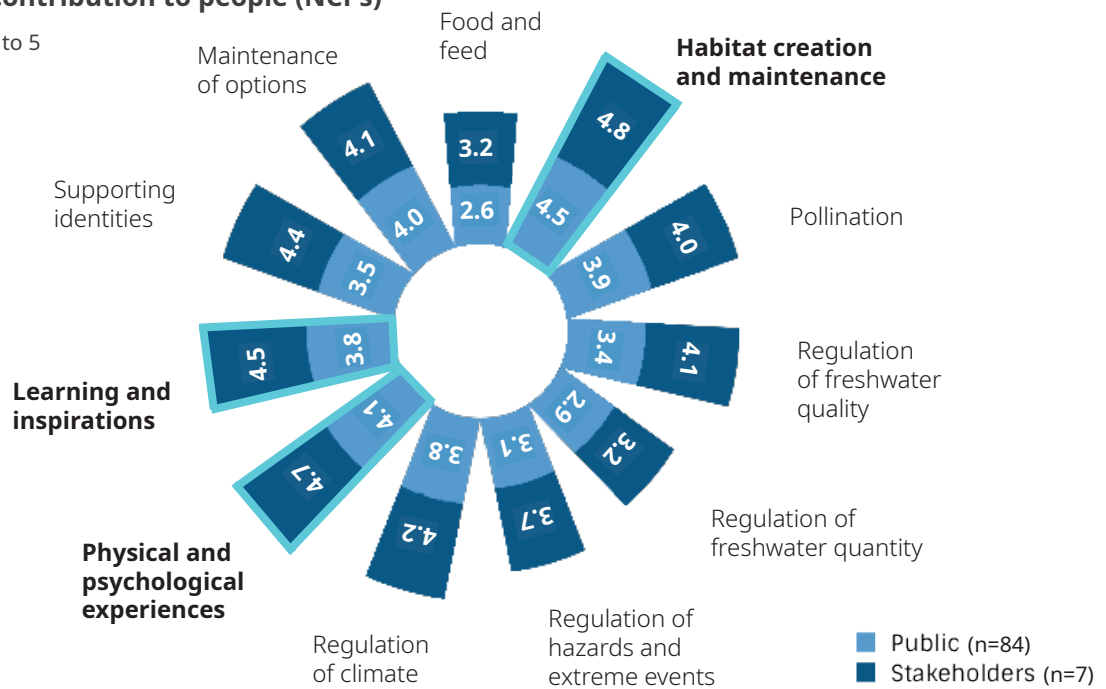
**Public amenities :** footpaths, bird hides, picnic areas,  
swimming beach, fish ponds.



# LOCAL COMMUNITY EXPECTATIONS

## The 11 Nature-contribution to people (NCPs)

Scale : scores from 1 to 5



The expectations rely mainly on (i) the provision of habitats for biodiversity and (ii) the direct use of these natural areas by people (physical and psychological experiences, supporting identities, learning).

# LOCAL POLICIES

This pondscape is of international importance for waterfowl (part of Ramsar site Nr 506) and most ponds are also considered of national importance for amphibians. The ponds benefit from strong statutory protection.

**67% of the 1500 hectares (ha) of the pondscape is protected (9% with restricted access in natural reserves).** (Federal Act on the Protection of Nature, law for the protection of the Rhone and its shores). This represents 1000 ha.

**67%**

**One waterfowl and migratory bird reserve of international importance :**  
672 ha of the pondscape included in the Ramsar site Nr 506.

**672ha**

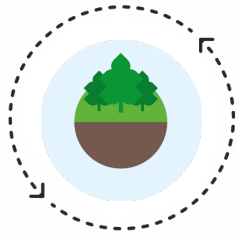
**4 amphibian spawning sites of national importance :**  
595 ha, included partly in the Ramsar site Nr 506.

**595ha**

Their management is financially supported by subsidies from the government (65%), and it is conducted by the regional authorities (Canton) and implemented by private consultancies. This management includes protection, conservation and regeneration of existing ponds, as well as the creation of new ponds and the maintenance of their good quality through management actions.

Moreover, funding from the hydropower company of Geneva ("SIG") supports the creation of new ponds. This policy framework allows on one side effective and successful protection and promotion of pond biodiversity, and on another side the enjoyment by the population of the nature, fauna and flora. The good collaboration and synergy between the Canton, the NGOs and private consultancies is also a key factor in the fruitful and effective implementation of the NBS.

# MAIN CHALLENGES AND OBJECTIVES



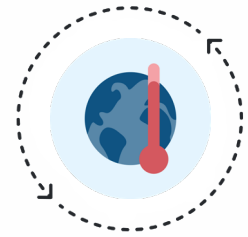
## BIODIVERSITY ENHANCEMENT

Especially waterfowls, amphibians, dragonflies and aquatic plants.



## HUMAN HEALTH

A place to hike and relax, to educate people about nature and also to fish. A region with a strong and attractive historical, geographic and natural identity (Rhône River and alluvial waterbodies, vineyards, historical villages, natural reserves).



## CLIMATE CHANGE ADAPTATION

Refreshing area to walk, relax or swim during hot days and heat waves.



# NATURE BASED SOLUTIONS (NBS)

New pond creation and their management are here the Nature-based Solutions (Nbs) put in practice to address the three identified societal challenges

## NEW POND CREATION

1972-1984

Creation of 3 large ponds (>30'000 m<sup>2</sup>)

1990-2005

Creation of 5 large ponds (>5000 m<sup>2</sup>) and several small ponds

2007-2018

Creation of 6 large ponds and 4 medium sized and several temporary ones.

## PONDS AND PONDSCAPE MANAGEMENT

- Protection status
- Pond creation
- Restauration of landed ponds
- Planting aquatic emergent vegetation in newly created or restored ponds
- Planting shrubs and sowing grasslands seeds in the vicinity of ponds
- Creation of forest and shrubs clearings
- Threatened species reintroduction
- Monitoring of selected threatened species
- Measures to enhance connectivity for amphibian populations
- Water level management
- Removal of introduced non-native fish
- Removal of alien plant species



- Creation and maintenance of trails, nature observation points and information boards.
- Creation of 2 fishponds and of a swimming pond.
- Creation of recreation areas with tables and grill.

# NATURE CONTRIBUTIONS TO PEOPLE AND MEASURED INDICATORS



## AQUATIC BIODIVERSITY

### SPECIES RICHNESS

Aquatic plants : **94**  
 Water birds : **25**  
 Dragonflies : **47**  
 Families of invertebrates : **17**

### AMOUNT OF

Conservation priority species : **42**  
 Species on Habitat Directive Annexes : **8\***  
 Introduced threatened species : **1**  
 Invasive alien species : **1**

### CONTRIBUTION TO REGIONAL RICHNESS



0%

75% 76% 83% 85% **100%**

### FLAGSHIP SPECIES :



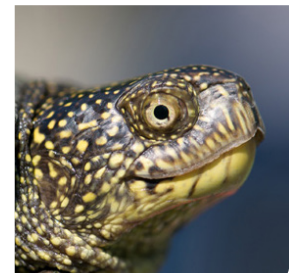
*Leucorrhinia albifrons\**



*Epidalea calamita\**



*Castor fiber\**



*Emys orbicularis\**



## CARBON BALANCE

# 18t

The Carbon budget (emissions-sequestration balance) is directed towards emissions (18 tonnes of CO<sub>2</sub>e/ pondscape/year). Future management focused on Carbon could potentially reduce these emissions (see the PONDERFUL Handbook).



## REGIONAL MICROCLIMATE

Difference between outside and inside the pondscape. in PET (physiological equivalent temperature), during hot summer days, linked mainly to the presence of trees.

# -6°

# NATURE CONTRIBUTIONS TO PEOPLE AND MEASURED INDICATORS



## PHYSICAL AND PSYCHOLOGICAL EXPERIENCE

Number of people visiting the pondscape (leisure, tourism, fishing, nature watching etc.) (number/year)

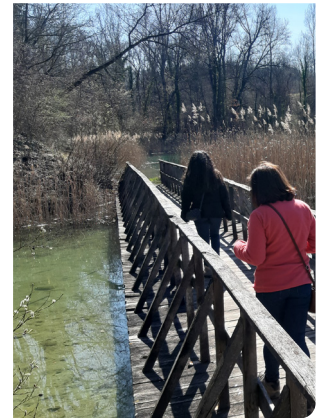
**100'000**

**91%**

Area inside the pondscape accessible to the public

### Most popular activities :

hiking (29%), wildlife observation (27%), relaxing (14%) and picnicking (9%)



## LEARNING AND INSPIRATION

**8**

Number of groups of students school/university visiting the pondscape.

Number of studies for acquisition of knowledge (nb/year). Broad estimation. Studies from NGOs, HEPIA\_UniGe students and nature consultancies.

**6**



## WATER QUANTITY

**66'250m<sup>3</sup>**

Volume of water stored during a severe flood event (m<sup>3</sup>)

Total water volume (m<sup>3</sup>)

**132'500m<sup>3</sup>**



## WATER QUALITY

Nutrients : **GOOD**



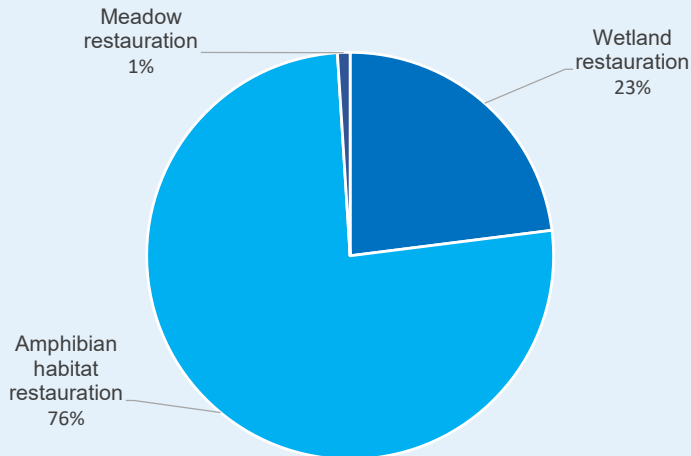
Wide range of pollution levels between ponds, some are pristine and others are polluted by pesticides (from agricultural drainage areas).

# COSTS AND BENEFITS ANALYSIS

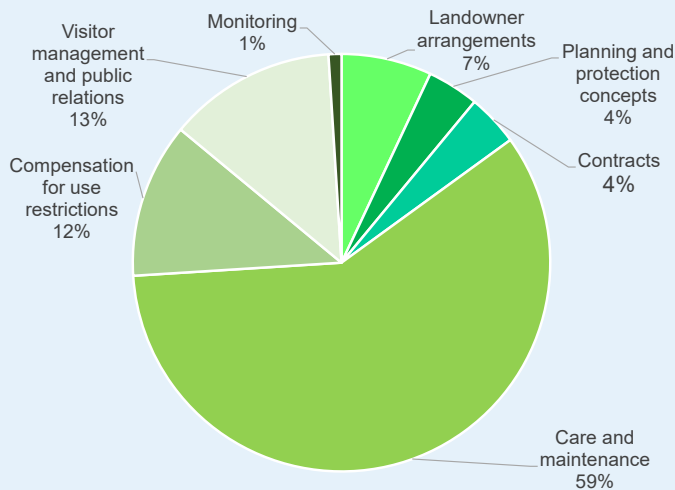
## OVERALL COSTS ASSESSMENT



## SHARE OF COSTS FOR NBS ACTION



Relative cost of NbS creation measures



Relative cost of ongoing NbS management measures

## BENEFITS ASSESSMENT



## SUITABLE FINANCE INSTRUMENTS TO REDUCE THE GAP

### ✓ 1. Income instruments

-Sale of materials: gravel extracted or wood cut when creating and maintaining ponds

### ✓ 2. Voluntary contributions /donations

-Philanthropic contributions  
-Crowdfunding  
-Fond vitale environnement (Services Industriels Genevois)

### ✓ 3. Subsidies

-Federal subsidies for the management of objects of national importance.

# REMAINING THREATS

1. Increasing pressure from tourism (disturbance, trampling, noise, rubbish, damage to infrastructure).
2. Changes in hydrology and water temperature linked to climate change, including the timing and quantity of rainfall. Some permanent ponds will turn into temporary ponds. Smaller ponds are likely to disappear. This will impact biodiversity.
3. Pollution from agriculture and industrial activities.



# SUCCESS STORY AND TRANSFERABILITY



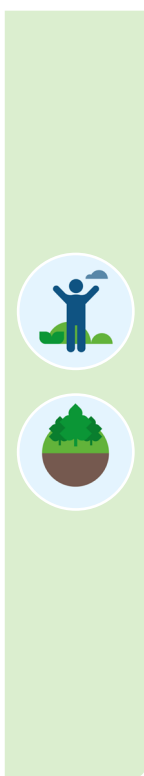
## CREATION OF MULTIFUNCTIONALITY ... AT THE PONDSCAPE SCALE !

The spatial delimitation of different types of pond uses promotes simultaneously the protection of pond biodiversity and the delivering of numerous NCPs. For example, several ponds are strictly protected (no access) and the flow of visitors is regulated and limited to pathways and bird hides. Two fishponds and one swimming pond together with recreation areas (with tables, grill and car park) were created outside the natural reserves to meet the public's needs. Thus, on pond also intends to purify the water of a campsite nearby. Arranging an heterogeneous set of multiple ponds instead on focusing on creating individual multifunctional ponds can be a successful way to deal with the interactions between different society demands and the protection of ponds biodiversity.

## A SPECTACULAR DEVELOPMENT OF THE BIODIVERSITY

This pondscape is hosting an exceptional biodiversity, characterized by a very large number of species (invertebrates, amphibians, reptiles, birds, mammals) including numerous threatened species, making it one of the richest natural site in Switzerland.

This former alluvial area has benefited from effective management over the last twenty years, with creation and restoration of numerous ponds which are currently being monitored. The pond density is presently high (with also a high biological connectivity), and they are particularly diversified, with a large range of sizes (from 10 m<sup>2</sup> to 3 ha) and depths (20 cm to 5 m), most with highly vegetated shorelines and buffer areas. Their design is optimized for biodiversity and has benefited from the expertise of local NGOs and private consultancies. This strategy of creating diversified ponds with a good water quality enabled the return of many species that had disappeared while others increased markedly their densities. Emblematic species (e.g. beaver, herons, pond turtle, natterjack toad, white-faced darter) help to raise public awareness, and the public also benefits from facilities specifically dedicated to nature education.



## SELLING EXTRACTED GRAVEL TO REDUCE CREATION COSTS

The digging of permanent ponds with a large surface area can be a relatively expensive NBS initially. But approximately 80% of the cost of creating 4 large ponds on the banks of the Rhône was covered by the sale of the gravel extracted.

Gravel is the main building material all around the world. Selling the gravel extracted when building new ponds is a solution to cover a large part of the costs and can be replicated everywhere.



HANDBOOK :



APPENDIX :



## PHOTOS CREDITS

*Leucorrhinia albifrons*, p.5 © G. Bailleux  
*Epidalea calamita*, p.5 © A. Meyers  
*Castor fiber* p.5 © C. Angst  
*Emys orbicularis* p. 5 © S. Ursenbacher  
Teppes de Verbois p. 8 © J.-C. Brutsch

## AUTHORS

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2024

<sup>1</sup>Coûts calculés d'après d'après Martin, M., Jöhl, R. et al. (2017) Biotopes d'importance nationale – Coûts des inventaires de biotopes. Rapport d'experts à l'attention de la Confédération, établi sur mandat de l'Office fédéral de l'environnement (OFEV). 2ème édition, 2017.