



Ponderful
PONDS FOR CLIMATE

SWITZERLAND 

PONDSCAPE : BOIS DE JUSSY



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. They're also an ideal place for people seeking freshness during summer heatwaves.



WATER MANAGEMENT

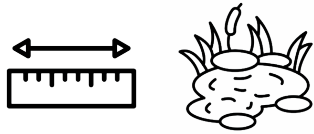
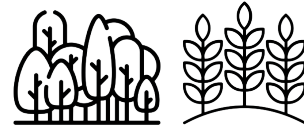
Pondscapes provide a water reserve that is particularly important in the context of water scarcity. It is particularly useful for watering animals and for irrigation.

CONTEXT



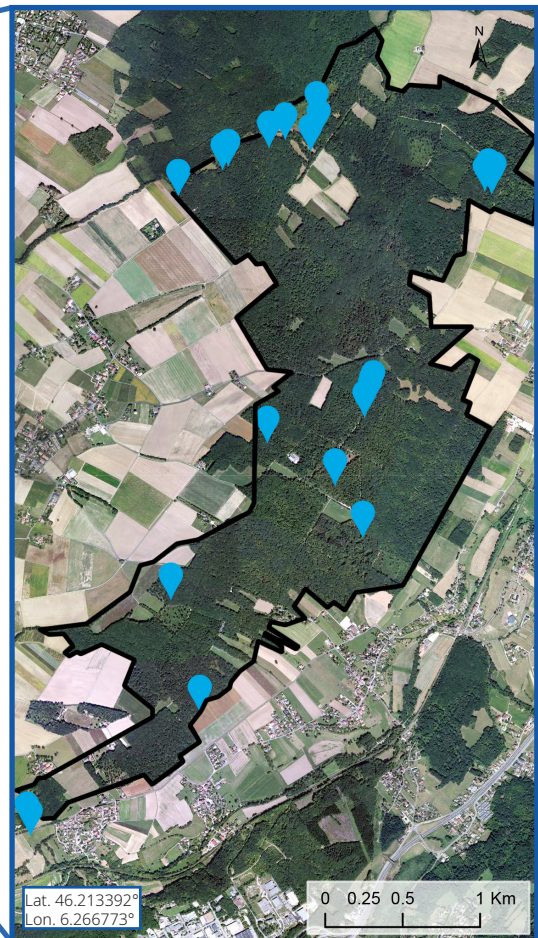
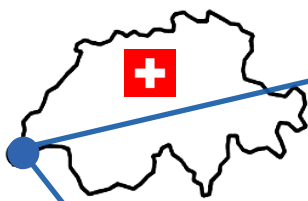
Name of the pondscape : Bois de Jussy
Name of neighboring large town (in a 30 km radius):
Geneva (600'000 habitants)
Bioclimatic zone : Continental (oceanic influence)

Dominant land use :
pondscape - woodland
surrounding environment - agriculture



Pondscape area : 6.1 km²
Pond : number: 69 (+ 300 pools of 1-2m²)
density: 12/km²
surface areas : 100 to 4000 m²
depths : 0.4 to 2 m

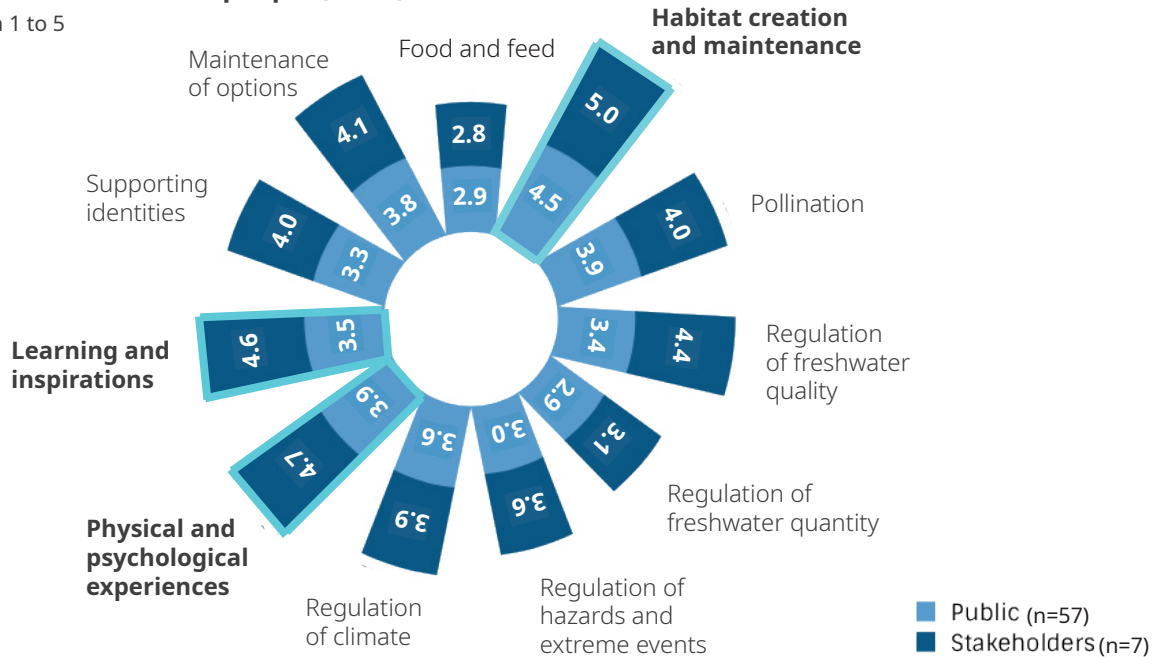
Land owner : Canton of Geneva
Land manager : Canton of Geneva
Public access : 85 % of the area is accessible
Public amenities : several footpaths and some hides



LOCAL COMMUNITY EXPECTATIONS

The 11 Nature-contribution to people (NCPs)

Scale : scores from 1 to 5



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

LOCAL POLICIES

In this pondscape, most ponds are of national importance for nature conservation, as a result they are listed on the inventories of natural sites of national importance. Therefore, they benefit from strong statutory protection and management.

60.5% of the 610 hectares of the pondscape is protected (15% with restricted access) : 368 ha is a «Biotopes of National Importance» (Federal Act on the Protection of Nature) and additionally 90.2 ha have a local protection.

60.5%

Four amphibian spawning sites of national importance (361.5 ha): Passages under roads were built. New temporary ponds were created for toads.

361.5ha

One mire of national importance (6.5 ha): in good state of conservation.

6.5ha

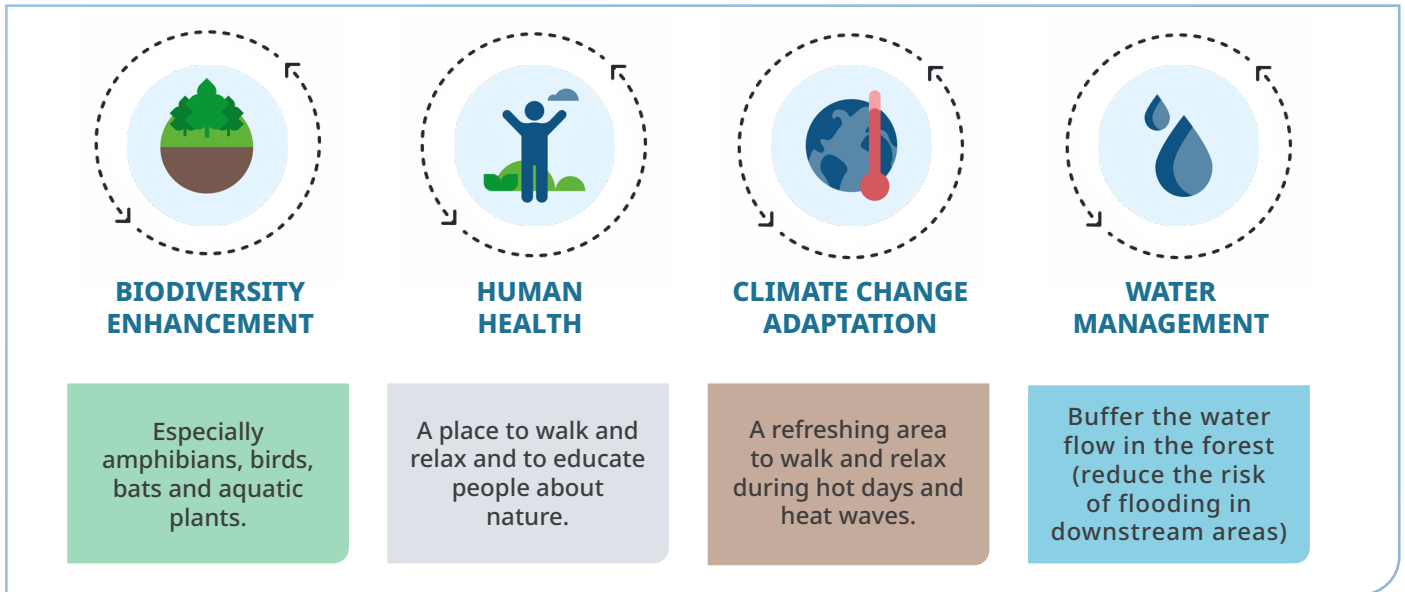
Local protected areas : at cantonal and communal levels (forest reserves) of 90.2 ha (no active action or targeted to the promotion of biodiversity).

90.2ha

The management includes conservation and regeneration of existing wetlands, as well as the creation of new ponds and the maintenance of their quality through management actions. These are mainly conducted by the regional authorities (Cantons) and implemented by private consultancies, with subsidies coming from the government (65% of management cost is linked to the national inventories of natural sites).

This policy framework allows for effective and successful protection and promotion of pond biodiversity. The good collaboration and synergy between the Canton, the NGOs and environmental consultancies is also a key factor in the fruitful and effective implementation of the NBS.

MAIN CHALLENGES AND OBJECTIVES



NATURE BASED SOLUTIONS (NBS)

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

NEW POND CREATION

1968-1970

2005-2008

2019-2022

Creation of a network of 10 large ponds (2000-5000m²), primarily aimed at draining the forest

Creation of 59 medium-sized ponds (50-300m²), aimed as habitats for biodiversity (amphibians)

Creation of 400 very small ponds (1-2m²), aimed as habitats for biodiversity (e.g. the amphibian *Bombina variegata*)

PONDS AND PONDSCAPE MANAGEMENT

- Protection status
- Ponds restoration
- Creation of forest clearings
- Removal of alien plant species
- Removal of introduced non-native fish
- Threatened species reintroduction
- Measures to provide connectivity for amphibian populations
- Removal of drainage ditches and controlling water level
- Planting aquatic emergent vegetation in newly created or restored ponds
- Planting shrubs and sowing grasslands seeds in the vicinity of ponds



- Creation and maintenance of trails and nature observation points
- Creation and maintenance of information boards



- Dredging of terrestrialised ponds
- Removal of drainage ditches



NATURE CONTRIBUTIONS TO PEOPLE AND MEASURED INDICATORS



AQUATIC BIODIVERSITY

SPECIES RICHNESS

Aquatic plants : **82**
 Water birds : **8**
 Dragonflies : **17**
 Families of invertebrates : **22**

AMOUNT OF

Conservation priority species : **33**
 Species on Habitat Directive Annexes : **5***
 Introduced threatened species : **2**
 Invasive alien species : **1**

CONTRIBUTION TO REGIONAL RICHNESS



0%

60% 75% 75%

100%

FLAGSHIP SPECIES :



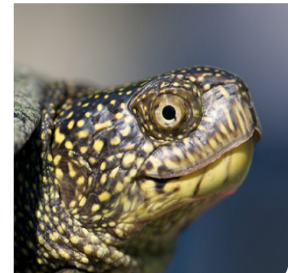
*Bombina variegata**



*Leucorrhinia pectoralis **



*Triturus cristatus**



*Emys orbicularis**



CARBON BALANCE

10t

The Carbon budget (emissions-sequestration balance) is directed towards emissions (10 tonnes of CO₂e/ 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 EXPERIENCES

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

60'000

85%

Area inside the pondscape accessible to the public

Most popular activities :

wildlife observation (69%), hiking (67%) and relaxing (35%)



LEARNING AND INSPIRATION

8

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

Number of studies for acquisition of knowledge (nb/year). Broad estimation. Studies from NGOs, HES-SO & Uni Genève students and nature consultancies.

5



WATER QUANTITY

9'300m³

Volume of water stored during a severe flood event (m³)

Total water volume (m³)

18'600m³



WATER QUALITY

Nutrients : **GOOD**



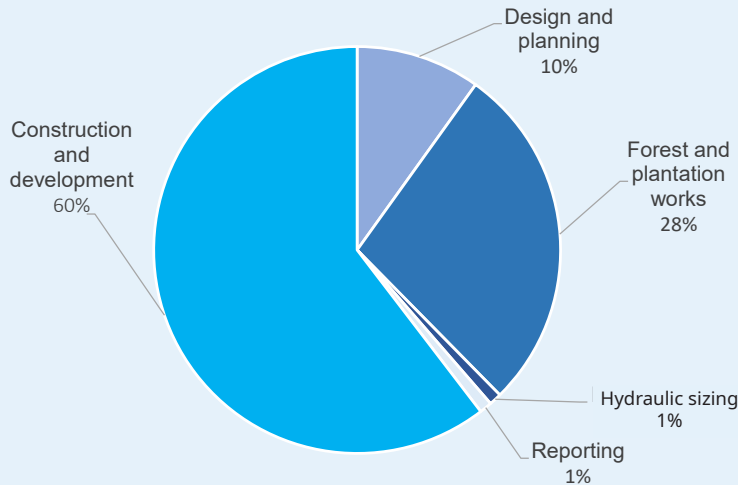
Wide range of pollution levels between ponds, some are pristine and others are polluted by pesticides coming from the agricultural drainage area.

COSTS AND BENEFITS ANALYSIS

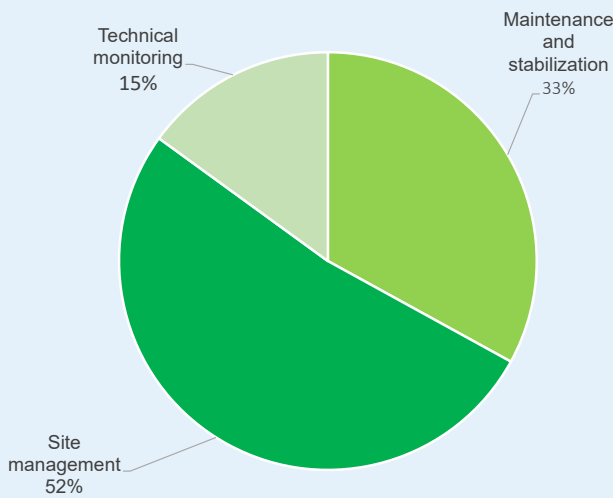
OVERALL COSTS ASSESSMENT



SHARE OF COSTS FOR NBS ACTION

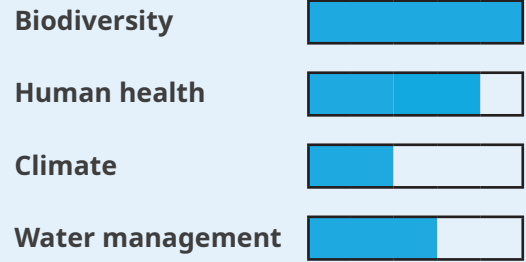


Relative cost of NbS creation measures



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

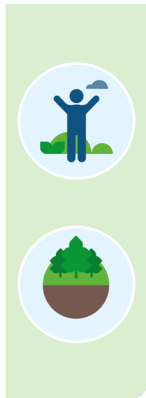
- ✔ **2. Voluntary contributions /donations**
 - Philanthropic contributions
 - Crowdfunding
 - Fond vitale environnement (Services Industriels Genevois)

- ✔ **3. Subsidies**
 - Federal subsidies for the management of objects of national importance.

REMAINING THREATS

1. The impact of people and their pets on biodiversity, including damage to pond banks from walkers and disturbance of wildlife. It also includes the introduction of exotic species (fish, turtles, amphibians and plants).
2. Changes in hydrology linked to climate change, including the timing and quantity of rainfall. Smaller ponds are likely to disappear. This will impact biodiversity.

SUCCESS STORY AND TRANSFERABILITY



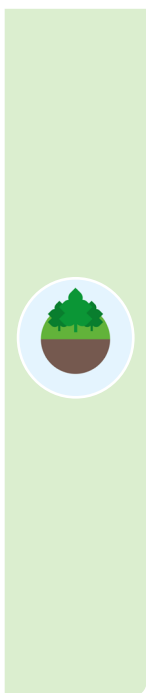
ENFORCEMENT OF PROTECTION STATUTS

Successful, the implementation of several protection statutes in the pondscape (covering 60.5% of its surface), together with a regulation of the flow of visitors (car park on the periphery, hiking trails, observatories), allowed to maintain a low anthropic pressure and enabled a full development of the biodiversity in all ponds. For example, there is restricted access to most of the ponds, minimizing trampling and disturbance by dogs. The local population and visitors expressed the added value of this pondscape to their well-being and recognized its ecological quality.

Such NBS can be easily implemented elsewhere and are relatively low-cost measures, which are essential first steps in the conservation of ponds.

HETEROGENEITY IS STRENGTH

The creation of an heterogeneous set of ponds that vary in their morphology, age or water chemistry has proved to be highly beneficial in increasing the capacity of the pondscape to host flora and fauna. The multiplication of ponds types improves the survival of species by offering them opportunities for dissemination and greater resilience to change and disturbance. Such an approach simply requires upstream consideration of the desired design of the ponds to be created or restored to maximise the heterogeneity of the pondscape.



ACTIVE MANAGEMENT OF THE PONDSCAPE

On-going management of the pondscape for 20 years, with the support of external consultancies, following a management plan. This management plan targets biodiversity. To facilitate the movement and reproduction of amphibians within the Bois de Jussy, a dense network of ponds and small pools was created inside the wood, and barriers to dispersal were identified and removed or resolved (creation of passages under the road, installation of temporary barriers to move individuals daily during the migration period). The combination of forest and ponds is highly favorable for aquatic and terrestrial biodiversity which has developed particularly well, including amphibians, dragonflies, aquatic plants, larks and small mammals, bats and birds. The presence of invasive species is monitored and action is taken to eliminate them when they represent a tangible danger (capture of exotic fish or turtles, uprooting or mowing of neophytes).

Such active management of a pondscape, with the implementation of various management measures, is a NBS requiring continuous funding. It has nevertheless proved here to be the key for the successful protection and enhancement of the biodiversity value of the site.

REINTRODUCTION OF THREATENED SPECIES

The reintroduction of a threatened species, the European pond turtle (*Emys orbicularis*), was successful and the population is now reproducing in this pondscape. This flagship species brings an added social value and enhance the attractiveness of the pondscape for nature-watching. There are other reintroduction programs at the site, e.g. for the Harvest Mouse (*Micromys minutus*).





HANDBOOK :



APPENDIX :



PHOTOS CREDITS

Bombina variegata, p.5. © E. Sansault
Leucorrhinia pectoralis, p.5. ©OPIE
Triturus cristatus, p.5. © E. Sansault
Emys orbicularis p.5 © Sylvain Ursenbacher
Emys orbicularis p.8 © Charlotte Ducotterd

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