



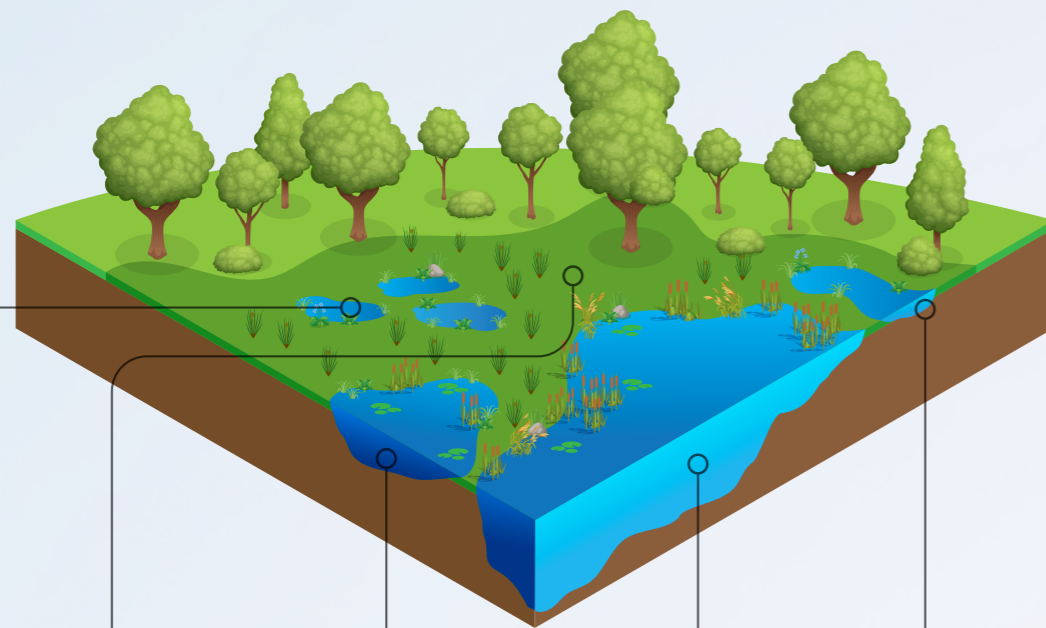
# Ponderful

## PONDS FOR CLIMATE

### What is a ponscape?

A ponscape is a group of ponds, often of different sizes, shapes and depths, spread across the landscape to form a network. A ponscape provides habitats for more species than a single waterbody of the same size - and multiple ecosystem services for people.

Ponscapes may comprise anything from a handful to hundreds of ponds. Biologically, the ponds will form a habitat network, even if they are not physically connected to each other, because freshwater plants and animals are adapted to dispersing between them, forming a landscape with ponds.



Small seasonal ponds   Wetland area   Medium deep pond   Large deep pond   Shallow pond

The ponds will also be part of the network of other freshwaters in the landscape, like streams, rivers and wetlands. Although some freshwater species depend on a specific kind of waterbody, many can live in all of these habitats.

This network is vital for freshwater biodiversity and for delivering a variety of ecosystem services. When thinking about ponds as nature-based solutions, bringing benefits both for biodiversity and human wellbeing, it is important to consider the whole ponscape. This means, for example, you could design or manage some ponds to be leisure destinations for people or for pollution interception, and therefore too disturbed or polluted for sensitive plants and animals, while zoning other ponds purely for biodiversity.



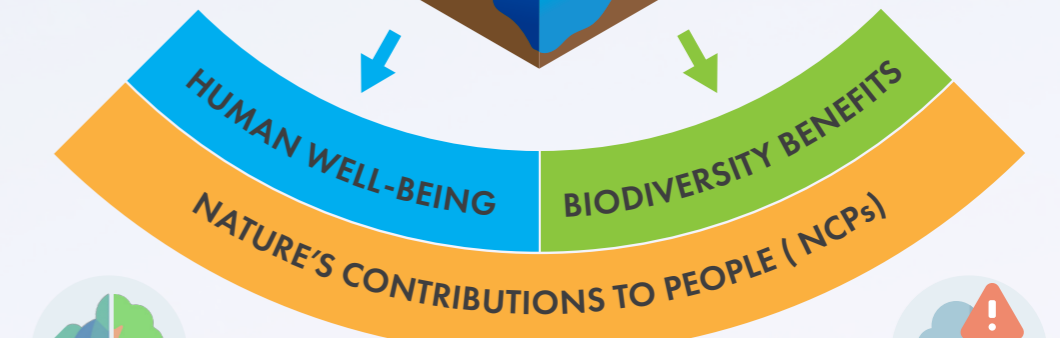
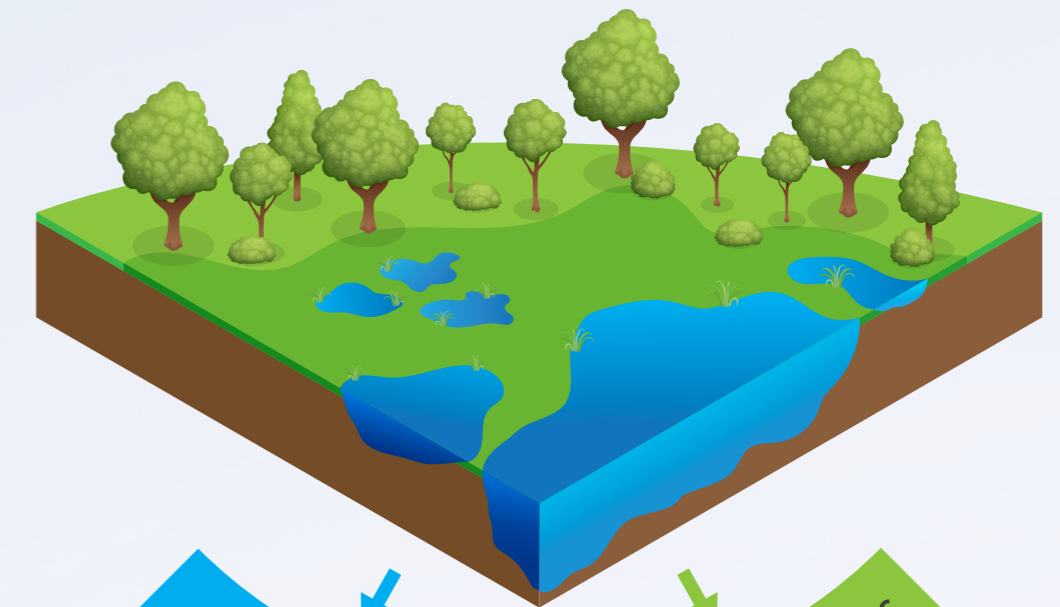
**Coleshill ponscape (UK)**  
This mosaic of ponds and wetlands was created to add new areas of clean water to the floodplain of the River Cole.



**Albera ponscape (Spain)**  
All ponds in this landscape are shallow and temporary, and many are priority habitats under the European Habitat Directive.



**Tommelen ponscape (Belgium)**  
This ponscape was created unintentionally by bombing during World War II and was designated as a nature reserve in 2006. With a management plan to support biodiversity, it is an important green space for local people.



This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No ID869296

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PONDS FOR CLIMATE

## Ponds and pondscapes as nature-based solutions for climate change adaptation and mitigation

Ponds and pondscapes are nature-based solutions for climate change adaptation and mitigation, providing many human wellbeing and biodiversity benefits.

### ADDRESSING SOCIETAL CHALLENGES

PONDERFUL discovered that ponds and pondscapes can address the seven major societal challenges identified by IUCN. These include environmental issues (e.g. climate change and biodiversity loss), food and water security, human health and people's wellbeing.



#### ENVIRONMENTAL DEGRADATION AND BIODIVERSITY LOSS

Ponds are remarkably important for biodiversity conservation, and pondscapes represent biodiversity hotspots. Despite this, ponds have been widely neglected and generally undervalued.



#### 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, as well as aesthetic experiences and educational and recreational activities.



#### CLIMATE CHANGE MITIGATION AND ADAPTATION

Given their abundance and their high productivity, ponds significantly influence 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. They are particularly useful for providing a water source for animals and for irrigation.



#### FOOD SECURITY

Ponds and pondscapes are ecosystems which can produce food directly (e.g. crustaceans, fish, amphibians, water birds). Furthermore, they are used for watering animals and also wildlife.



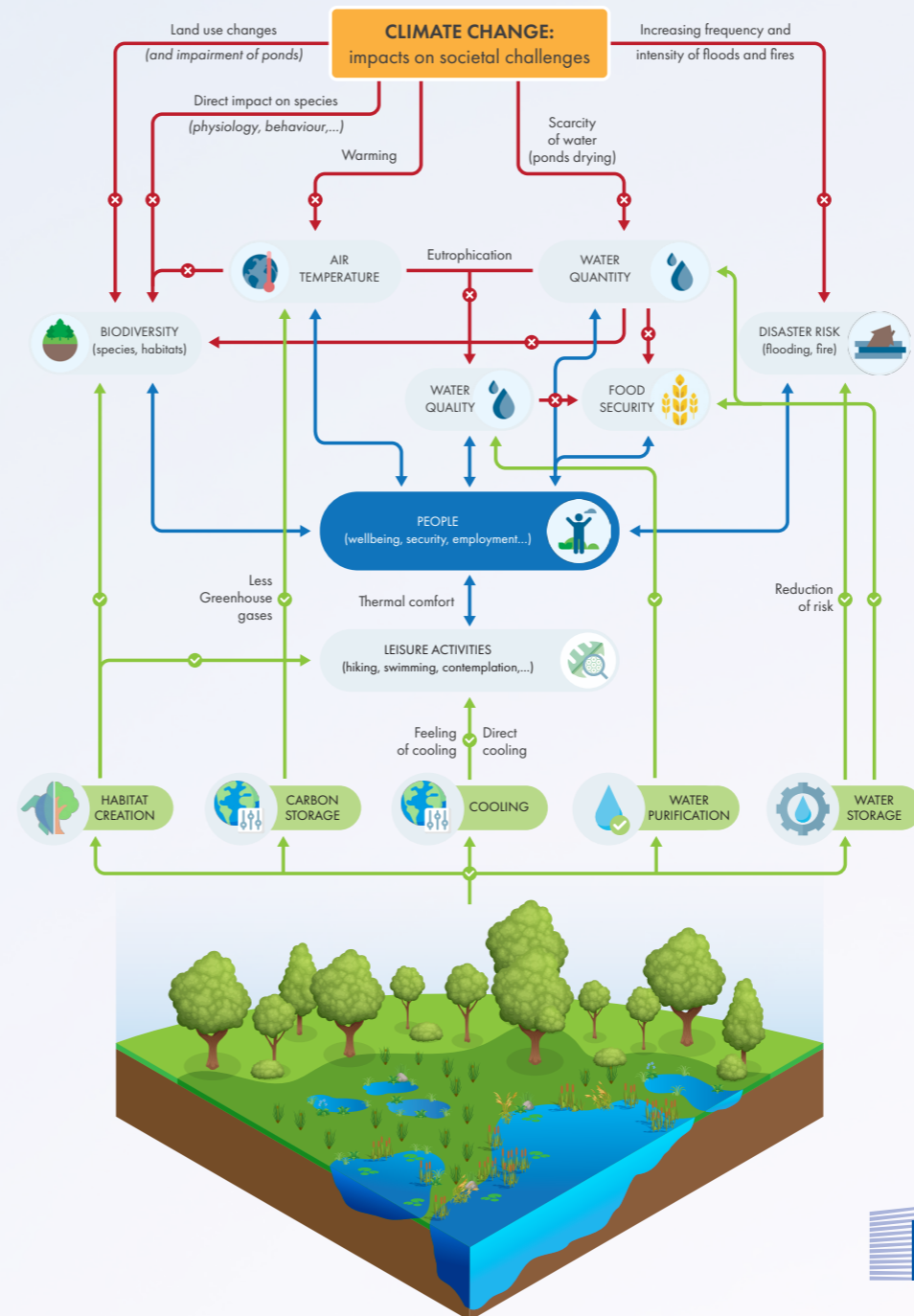
#### SOCIAL AND ECONOMIC DEVELOPMENT

Most ponds and pondscapes have a close relationship to society. Therefore, many socio-economic activities are developed, linked, for example, to leisure (hiking, water sports), nature experiences (wildlife-watching) or food production (fish, livestock).

## SERVICES CONTRIBUTING TO CLIMATE CHANGE ADAPTATION AND MITIGATION

Ponds and pondscapes can be used to address challenges from climate change:

- Managing ponds to reduce their greenhouse gas production.
- Creating ponds to provide cooling leisure activities.
- Increasing water quality and quantity by the creation of ponds.
- Flood risk can be reduced by the creation of stormwater ponds, and fires can be fought with water stored in ponds.
- Food production benefits.
- Biodiversity will gain from the creation of all types of new ponds if they are suitably designed, are protected from pollution, and offer diversified habitats.



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## Ponds and pondscape for biodiversity

Pond management, restoration and creation are nature-based solutions that have a crucial role to play in stemming freshwater biodiversity decline due to climate change.

As the most diverse part of the water environment in many landscapes, ponds make a vital contribution to maintaining the variety of freshwater life in all the locations where they are found. The conservation, sustainable management and creation of ponds is essential for maintaining and enhancing freshwater biodiversity in a changing climate.

### ADDRESSING SOCIETAL CHALLENGES

Ponds are rich and biodiverse habitats. Collectively, they support more freshwater and wetland species – and more uncommon and endangered species - than any other freshwater habitat. They also support rich assemblages of terrestrial plants and semi-aquatic animals.



Great Crested Newt (*Triturus cristatus*)  
© Pieter Jan Alles



Yellow-bellied Toad (*Bombina variegata*)  
© Benny Trapp



European Pond Terrapin (*Emys orbicularis*)  
© João Manuel Lima



Tadpole shrimp (*Triops baeticus*)  
© jmneiva

Starfruit (*Damasonium alisma*)  
© Beat Oertli

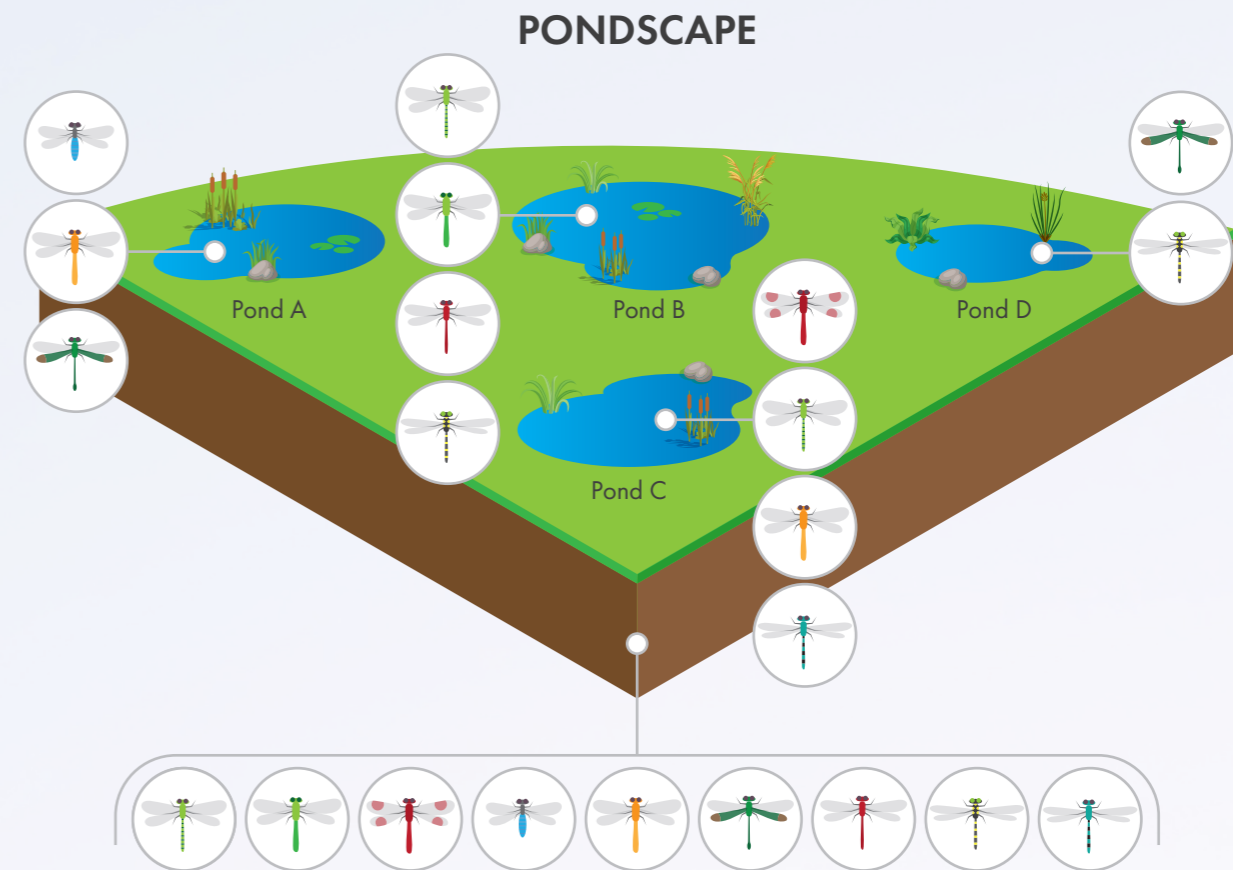


Tyrrhenian Painted Frog (*Discoglossus sardus*)  
endemic to the Tyrrhenian Sea basin\*.  
© Benny Trapp

### AN OPPORTUNITY FOR PROTECTING FRESHWATER BIODIVERSITY

Ponds provide opportunities for protecting freshwater biodiversity from human impacts, including the effects of climate change. The main practical opportunities provided by ponds are:

- The richness of ponds: Ponds provide habitats for a very wide range of freshwater species, including many that are at risk of local, regional, European or global extinction.
- Protecting high-quality habitats: Many ponds remain in good condition and require protection.
- Good ecological outcomes: There is excellent evidence of the effectiveness of ponds in enhancing freshwater biodiversity.
- Engaging with people: Ponds can be found and created in a wide range of locations. This gives many different people the opportunity to protect freshwater biodiversity.
- Small size can mean lower costs: Ponds are relatively small, meaning that the cost of protection, management and creation is lower than for bigger waters.



Example of how biodiversity is boosted in a pondscape. The four different ponds (A, B, C, D), each presenting different physical and chemical characteristics, each host two to four species of dragonfly (alpha richness). As each community is different, with slight overlap in species composition, the beta diversity (i.e. difference between ponds) is high and consequently the accumulated richness of the pondscape (gamma diversity; A+B+C+D) is markedly higher, reaching in total nine species.



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PONDS FOR CLIMATE

## Managing, restoring and creating ponds and pondscape for climate change adaptation

Measures that can be applied to ponds and pondscape to enhance their role as nature-based solutions broadly fall into three categories:

### 1. Management of ponds as nature-based solutions

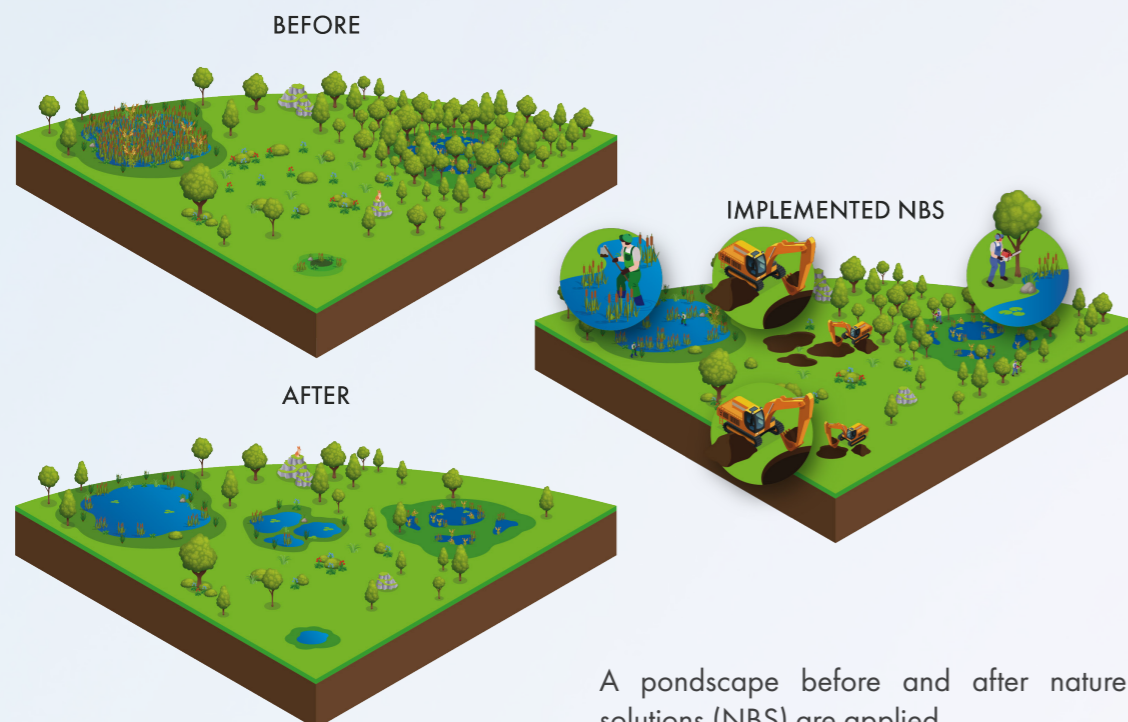
Applying practical measures to existing ponds or pondscape to maintain their function as nature-based solutions. Management at the landscape scale also includes protecting existing high-quality ponds.

### 2. Restoration and 'resurrection' of ponds as nature-based solutions

Where ponds have lost their function, or to recreate habitat for a particular species, more intense intervention may be required. Restoration can also involve the 'resurrection' of 'ghost' ponds, re-establishing old ponds which have been deliberately filled in.

### 3. Creation of ponds as nature-based solutions

Digging or building a new pond in a location where there was no pond before brings this nature-based solution into the pondscape. Creating new ponds increases the amount of clean water in the landscape or pondscape, increases freshwater habitat connectivity and reverses the effects of pond loss.



A pondscape before and after nature-based solutions (NBS) are applied.



#### FREQUENT MANAGEMENT

(e.g. annual grazing to minimise scrub growth)

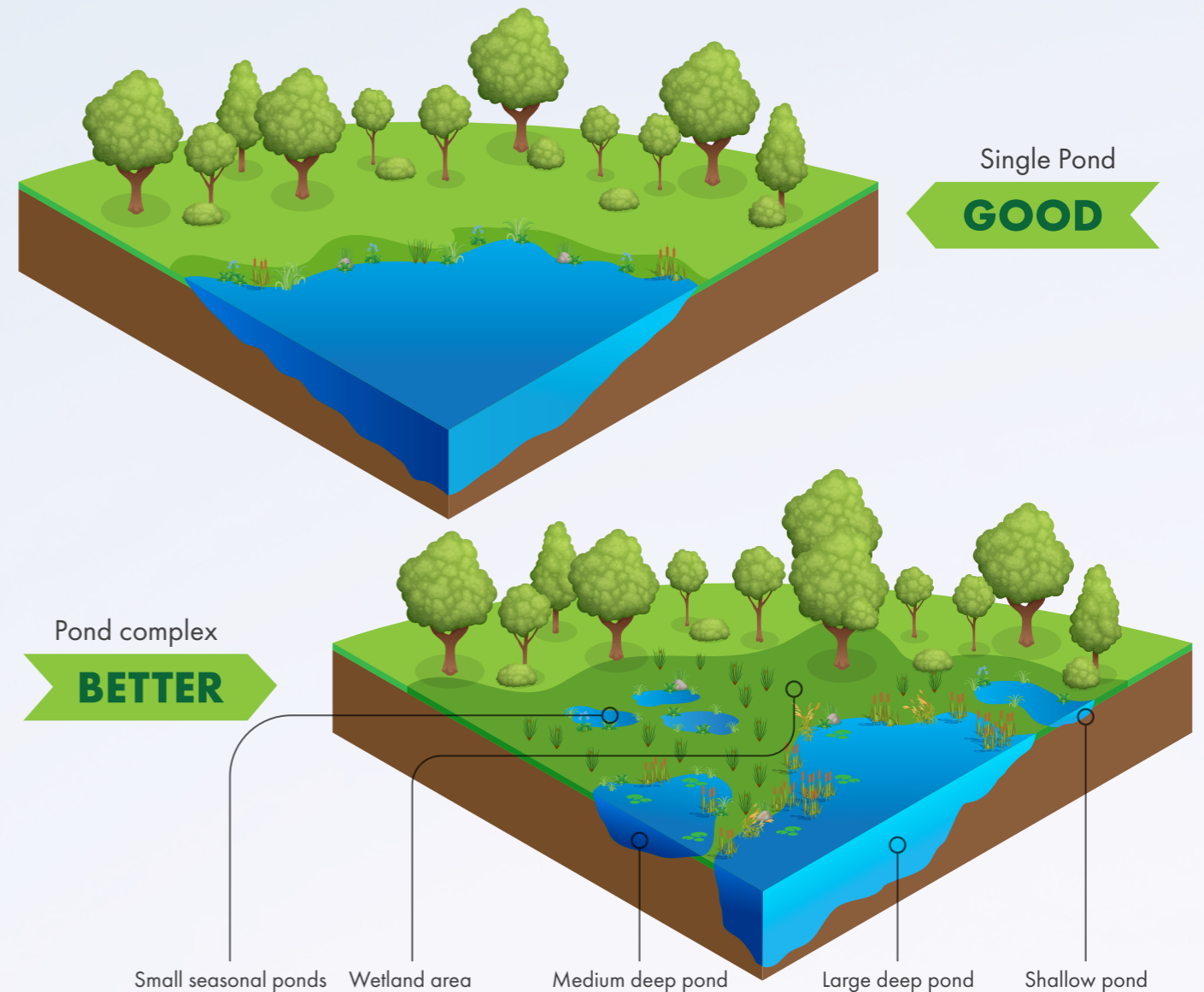
#### OCCASIONAL MANAGEMENT

(e.g. coppicing scrub on a five year rotation)

#### RESTORATION

(e.g. removing most of the scrub entirely)

The pond management-restoration continuum. The same action (e.g. scrub management) can be considered as either management or restoration, depending on the level of disturbance and frequency of intervention.



**Making single new ponds with clean water is good for freshwater biodiversity. Making a complex of ponds is better.**



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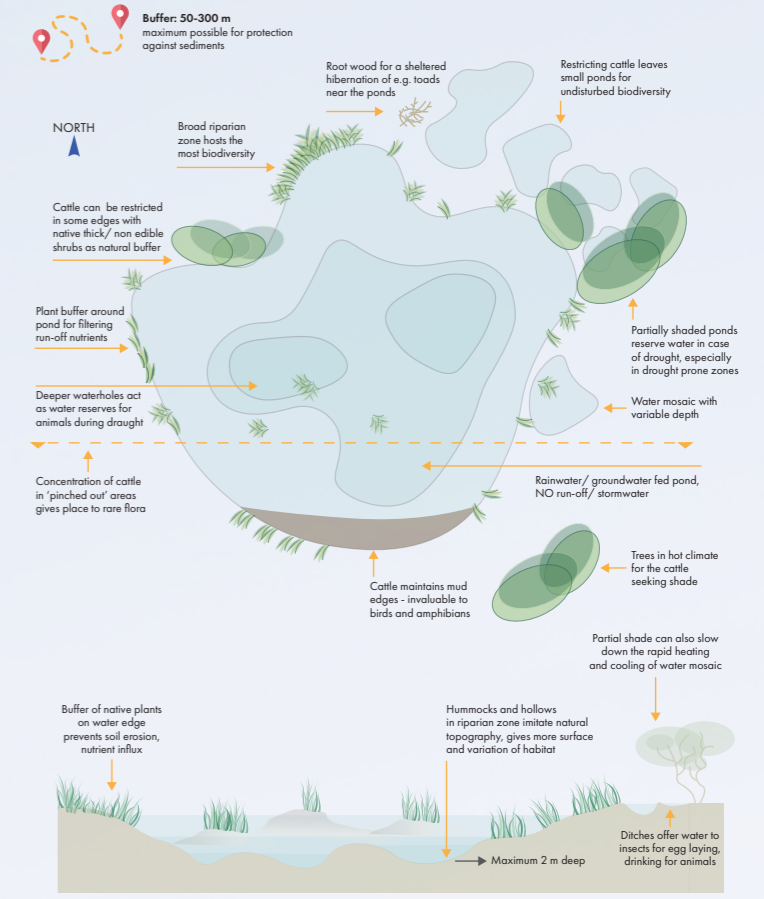
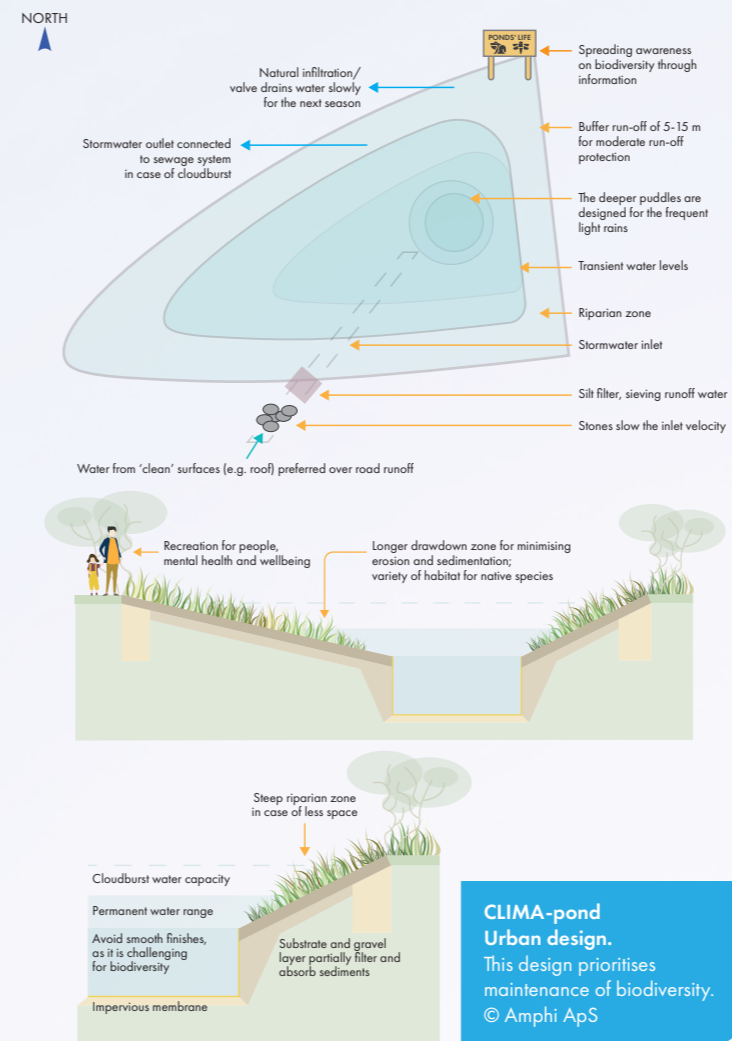
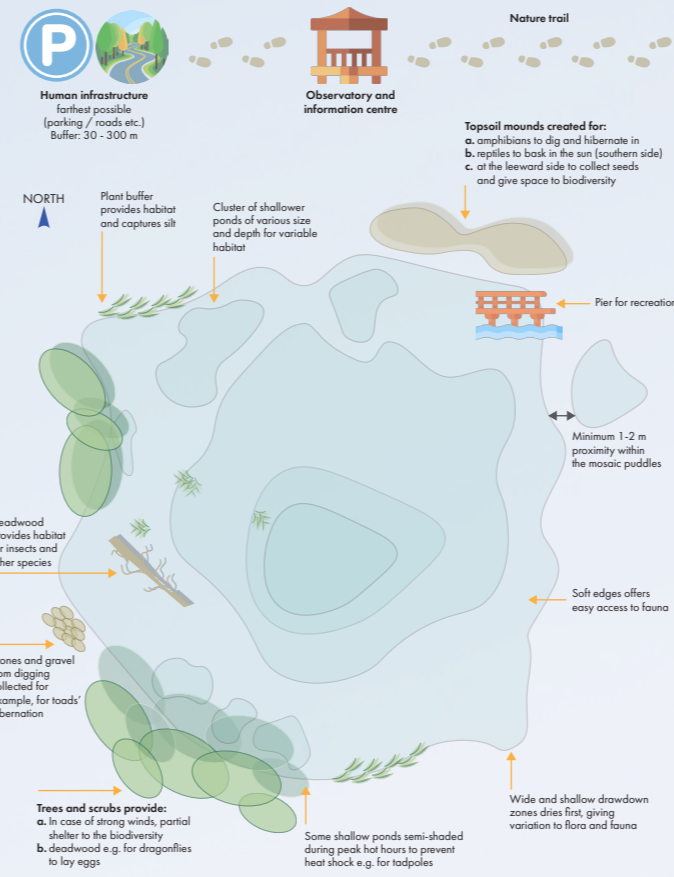
## PONDS FOR CLIMATE

### CLIMA-ponds

**PONDERFUL** has created standards for the design of climate mitigating ponds to provide standardised designs which can be rapidly and widely implemented to a set of common standards.

#### Designs have been created for:

- Ponds purely intended for biodiversity and engagement (including wellbeing and health) and related Nature's Contributions to People. Containing unpolluted water, greenhouse gas production should also be minimised
- Ponds intended for the delivery of a variety of Nature's Contributions to People in rural landscape including minimising greenhouse gas production, storing water, treating polluted sediment and runoff and providing biodiversity benefits
- Ponds intended to provide Nature's Contributions to People in urban areas where water storage, pollutant retention, health and wellbeing and biodiversity are all intended benefits. The design is also intended to minimise greenhouse gas production.



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