

LIFE INSUBRICUS

LIFE19 NAT/IT/000883

Presented by Daniele Seglie

ELEADE Società Cooperativa

Speed presentations – ARC Platform Meeting – 22nd May – Santander, Spain



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Wetland restoration and climate change

Experiences and solutions within the LIFE INSUBRICUS project (LIFE19 NAT/IT/000883)

Presented By

Daniele SEGLIE



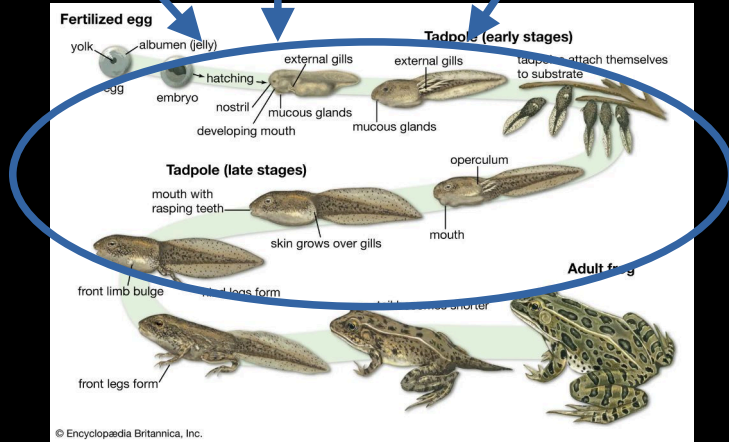
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1) The basics: How to improve the conservation status of a metapopulation? What are the main factors that influence the success of metamorphosis in wetlands?



Larval mortality rates and local extinction



In most cases, the main cause of decline and extinction in amphibian populations is **failure to achieve metamorphosis**.

In the larval stage, numerous factors can lead to a 100 percent mortality rate: the main ones include **disease**, **predation**, and death from **wetland drying up**.

Depending on the longevity of different species, if the catastrophic event is repeated for more consecutive seasons than the longevity of individuals, there is **local extinction** of isolated populations.

Hydroperiod and Climate Change



Climate change, in particular the **spatial and temporal variation of rainfall**, heavily impacts the period of wetland flooding, the hydroperiod, and can lead to larval death by desiccation, completely nullifying the success of larval metamorphosis. But not only that, hydroperiod (timing and duration) heavily influences the survival rate of larvae because it regulates the structure and dynamics of aquatic communities and the phenomena of **predation** and **competition** at breeding sites.

Generally speaking, the more the duration and timing of the hydroperiod meet the **life-history requirements** of amphibian species that could potentially breed at the site, the greater will be their metamorphosis success (Pechman et al., 1989; Paton & Crouch, 2002; Hamer et al., 2016)



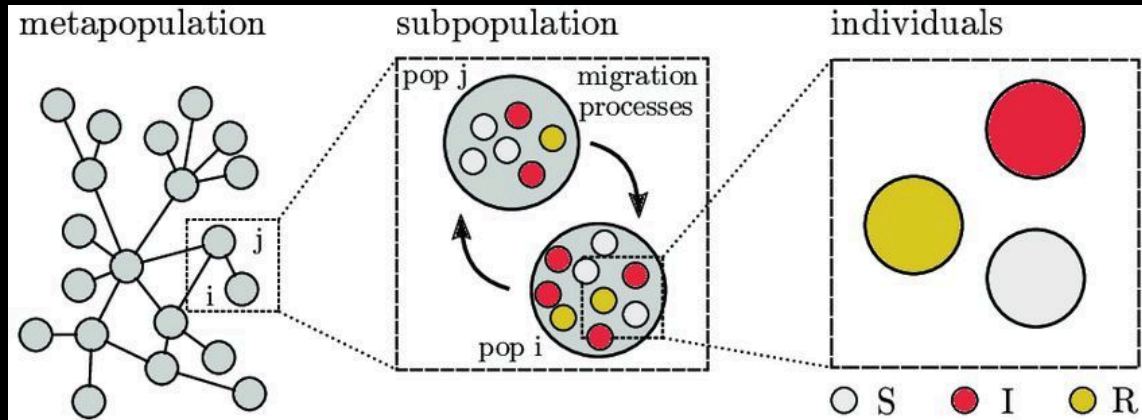
Designing Wetlands

In creating and restoring wetlands one of the main factors to consider in design is therefore the **duration and timing of flooding**.

In particular, the most important results to be obtained are:

- 1) Seasonally, obtain a hydroperiod that corresponds to the **duration of larval development**
- 2) Possibility of **control the duration and timing of the hydroperiod** the greater the guarantees of successful intervention

2) The strategy: Increase the number of sub-populations and connectivity through restoration and creation of new wetlands, and restocking actions





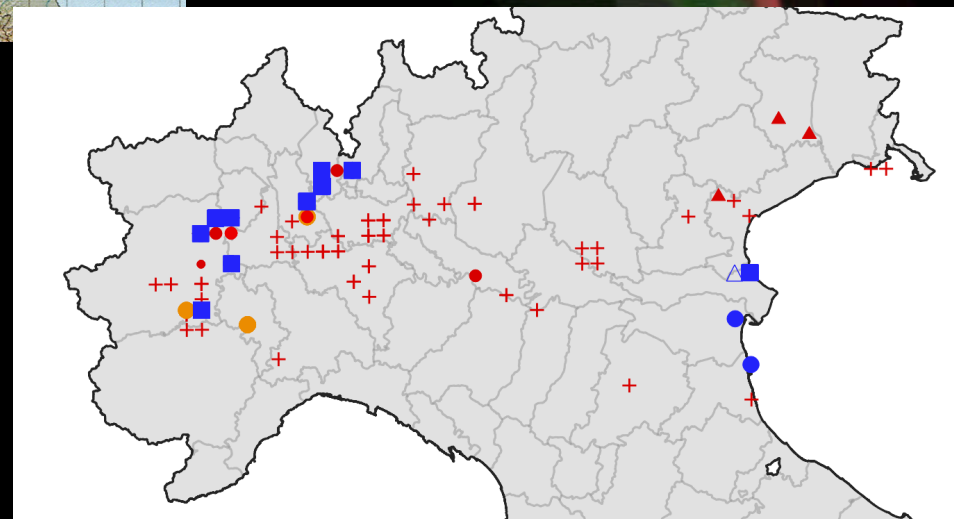
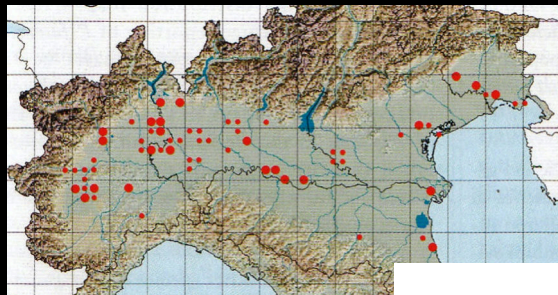
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Pelobated fuscus in Italy



Pelobated fuscus populations have undergone a **dramatic decline**. In the pictures you can see the comparison of the distribution from the first publication of the Atlas of distribution of amphibians and reptiles of Italy (2006), and from the update (in print soon)

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Ecological preferences

Terrestrial

Preference for sandy soils, but very adaptable (woods, cultivated fields, riverine areas)

Acquatic

Temporary wetlands only!



Ecological preferences

Competition

This preference for temporary wetlands is a consequence of **predation** and **competition** phenomena

In the Po Valley, 95% of the perennial wetlands are also occupied by **non-native species**



Predation





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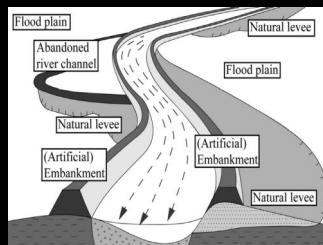


Causes of decline

1) **Disappearance of large temporary wetlands** (the larvae require considerable volumes of water given their enormous size)



2) **Alterations in the dynamics of flooding and drying** (especially in river ine systems, in which multiple causes add up: artificialisation of the watercourse and climate change)



3) **Presence of alien species**, mainly fish (more than 60% of the fish fauna of the Po is alien; but also *Procambarus clarckii*)





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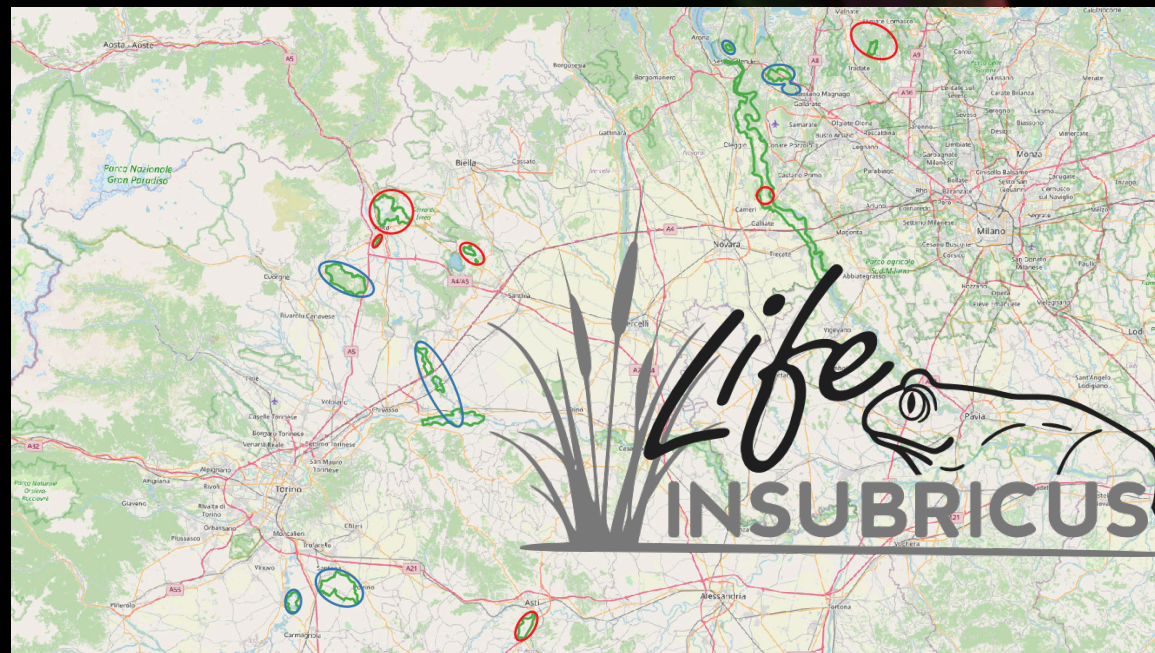


LIFE19-NAT/IT/000883 Insubricus

The Project, entitled "**Urgent actions for long-term conservation of *Pelobates fuscus insubricus* in the distribution area**", envisages interventions in favor of *Pelobates fuscus insubricus* and its habitat, aiming to significantly improve its conservation status and providing the basis for population growth also in the period following the conclusion of LIFE.

The project involve 14 Natura 2000 sites and the main actions are:

- 1) Monitoring and Study
- 2) **Wetland creation and restoration**
- 3) Restocking and Reintroduction
- 4) Communication plan





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3) Case studies: Designing wetland restoration and creation to mitigate climate change impacts, few examples.



Design

We analyzed and studied two aspects:

- 1) **Larval ecology** in sites of occurrence with abundant populations
- 2) Quantitative and semi-quantitative evaluation of **metamorphosis success** in response to hydroperiod

The hypothesis that **hydroperiod** influenced reproductive success was found to be the most realistic

Main requirements for a wetland with high suitability for *Pelobates fuscus*:

- 1) **Temporary**; flooding period of approximately 3 months;
- 2) Flooding should start in **March-April**





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Examples

Three solutions with a different degree of artificialization tested in the project

A) Artificial

- Zaboïna wetland, Cameri (Piemonte)

B) Semi-artificial

- Peverascia marsh, Arsago Seprio (Lombardia)
- Stramazzo wetland, Cameri (Piemonte)

C) Natural

- Paludina marsh, Saluggia (Piemonte)





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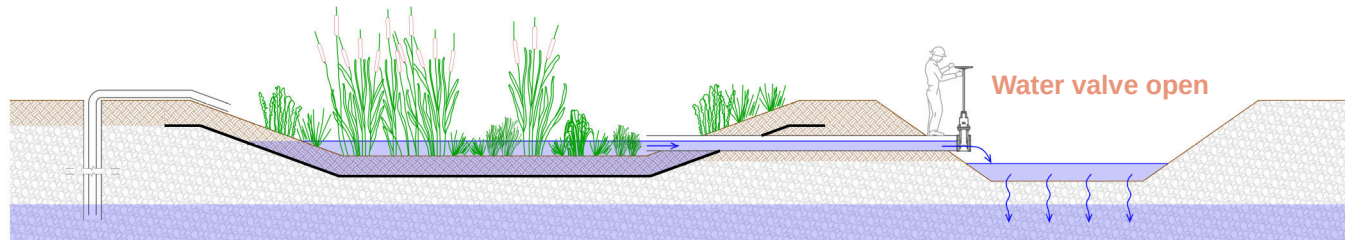
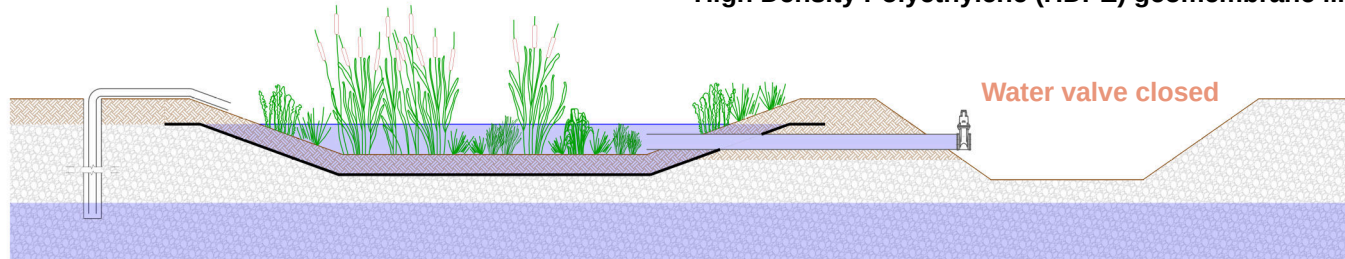
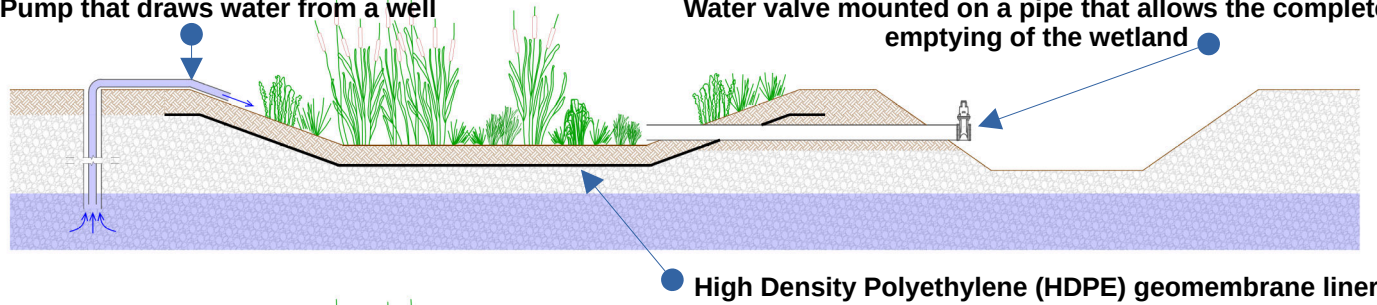


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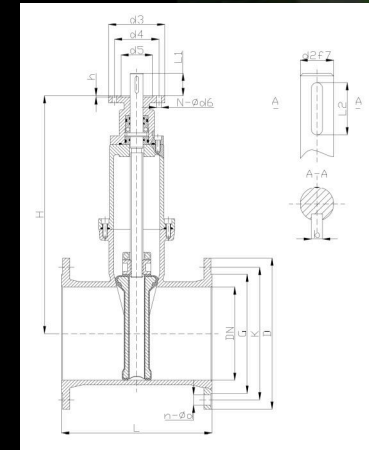


Pump that draws water from a well

Water valve mounted on a pipe that allows the complete emptying of the wetland



A) Artificial Zaboïna wetland, Cameri (Piemonte)





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A) Artificial - Zaboïna wetland, Cameri



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A) Artificial - Zaboïna wetland, Cameri



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A) **Artificial** - Zaboïna wetland, Cameri





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A) **Artificial** - Zaboïna wetland, Cameri



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A) **Artificial** - Zaboïna wetland, Cameri

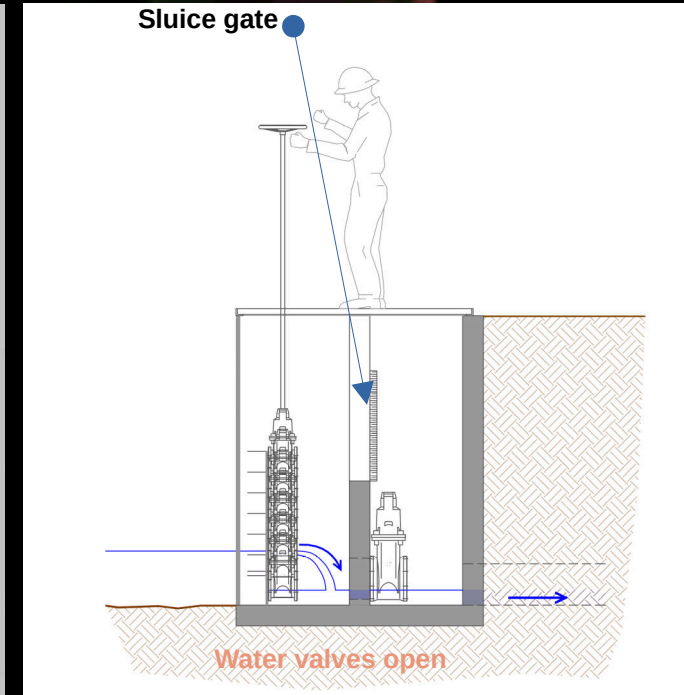
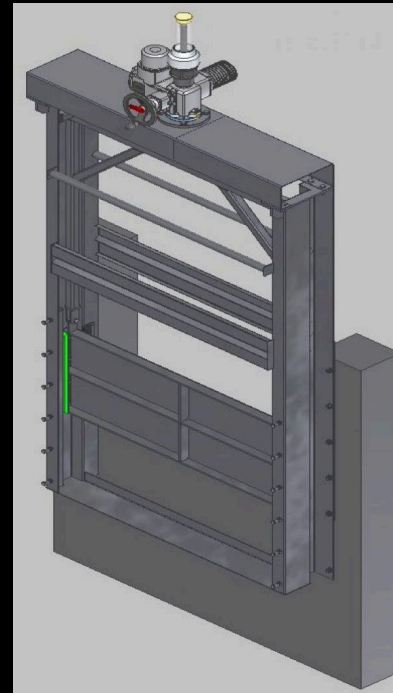
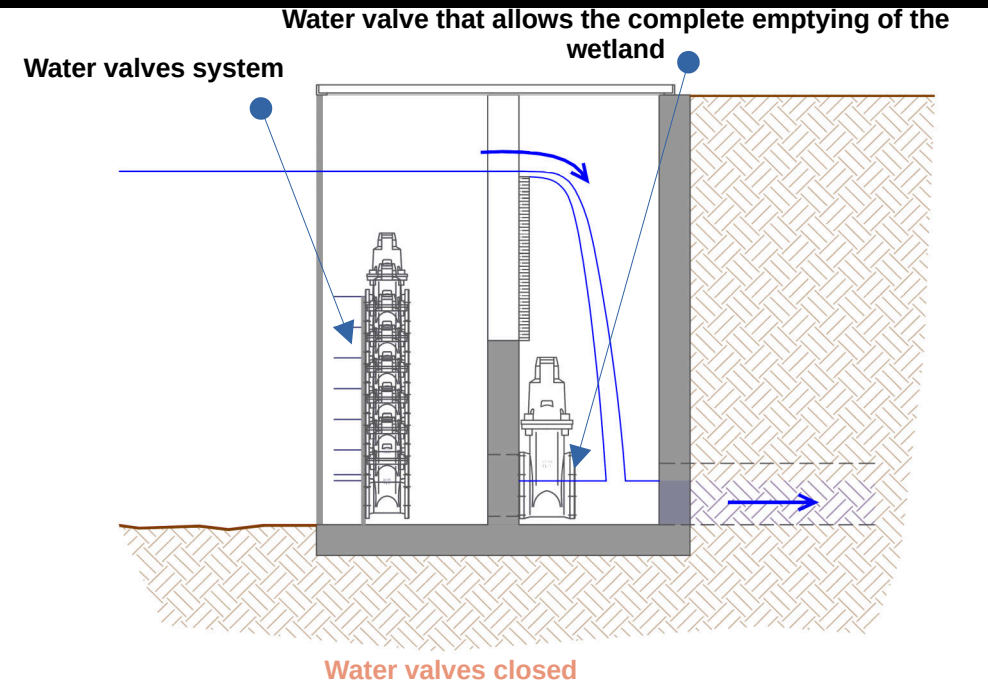


900 sqm; more than 500 individuals in 2024!

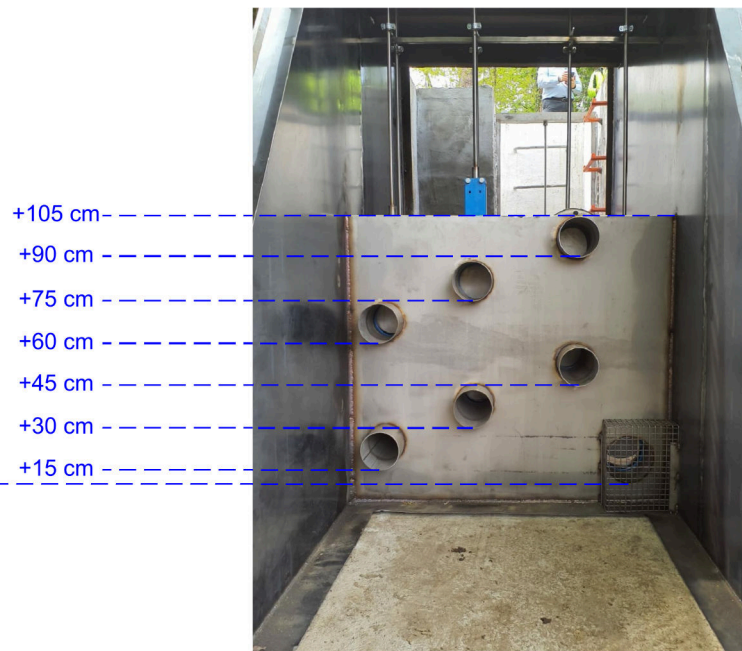
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B.1) Semi-Artificial - Peverascia marshland, Arsago Seprio (Lombardia)



B.1) Semi-Artificial - Peverascia marshland, Arsago Seprio





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B.1) Semi-Artificial - Peverascia marshland, Arsago Seprio



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B.1) **Semi-Artificial** - Peverascia marshland, Arsago Seprio





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B.1) **Semi-Artificial** - Peverascia marshland, Arsago Seprio

3,7 h; more than 1'500 individuals in 2023!

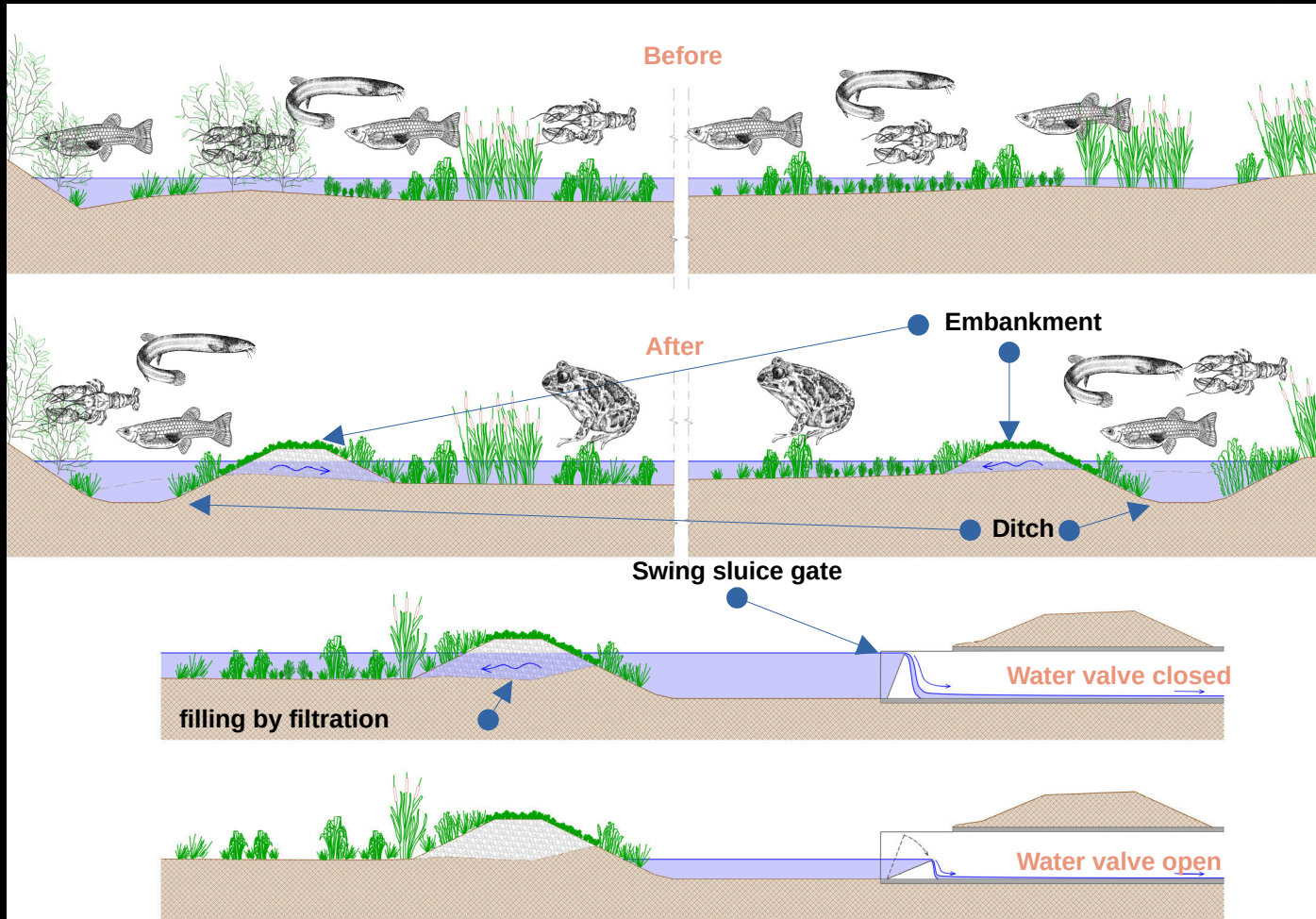




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B.2) Semi-Artificial - Stramazzo marshland, Cameri (Piemonte)



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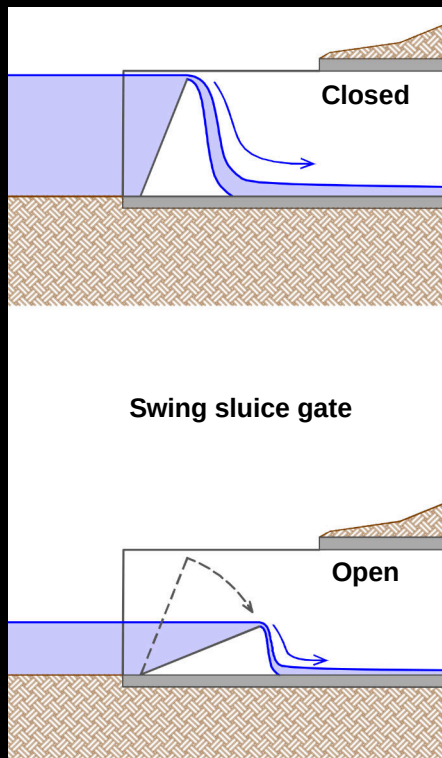
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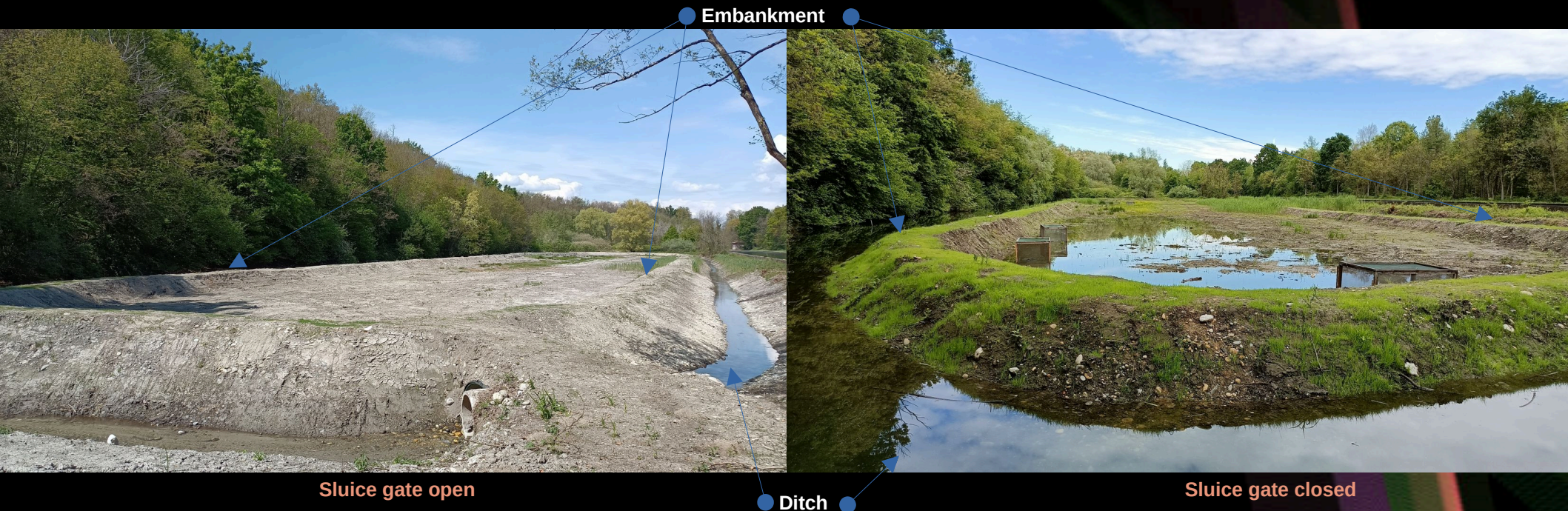
B.2) **Semi-Artificial** - Stramazzo, Cameri (Piemonte)



B.2) **Semi-Artificial** - Stramazzo marshland, Cameri (Piemonte)



B.2) Semi-Artificial - Stramazzo marshland, Cameri (Piemonte)





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B.2) **Semi-Artificial** – Stramazzo marshland, Cameri (Piemonte)





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B.2) **Semi-Artificial** – Stramazzo marshland, Cameri (Piemonte)



About 1 hectare; reintroduction in 2023-2024



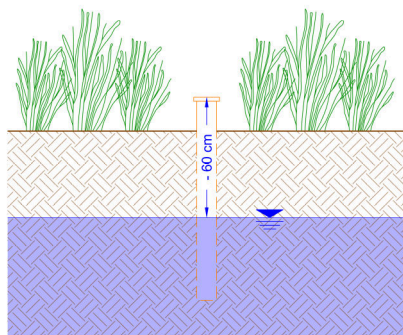
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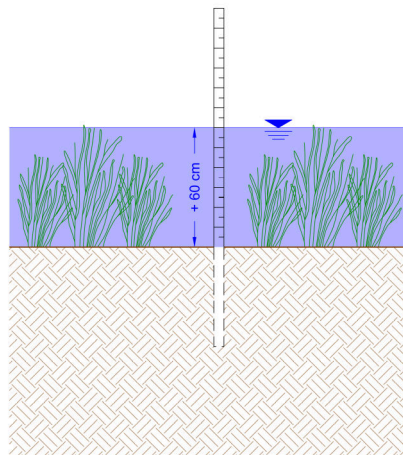
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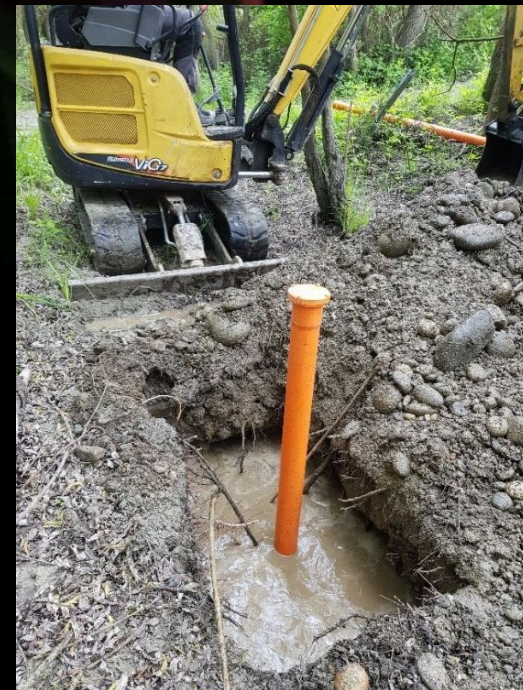
C) **Natural** – Paludina marshland, Saluggia (Piemonte)



Piezometer



Graduated rod





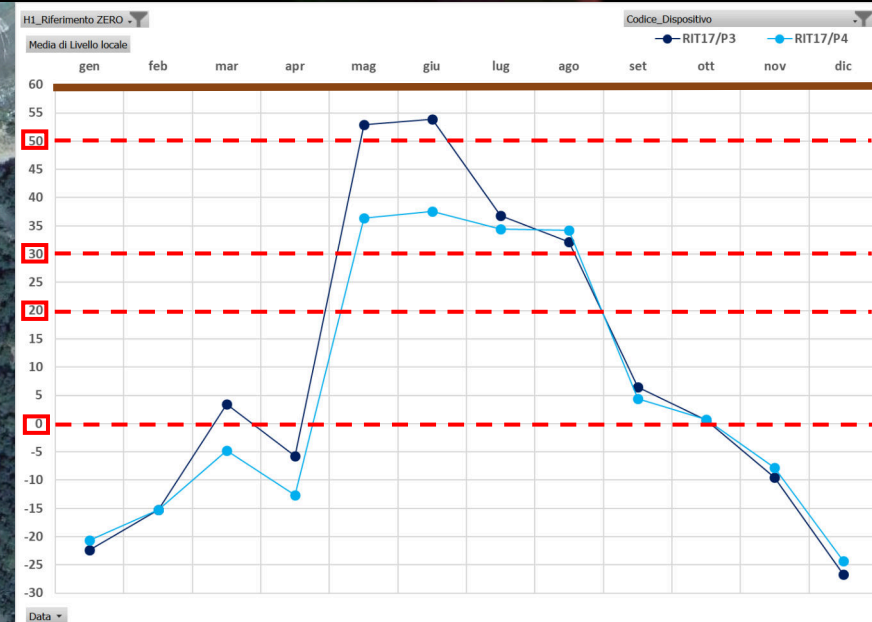
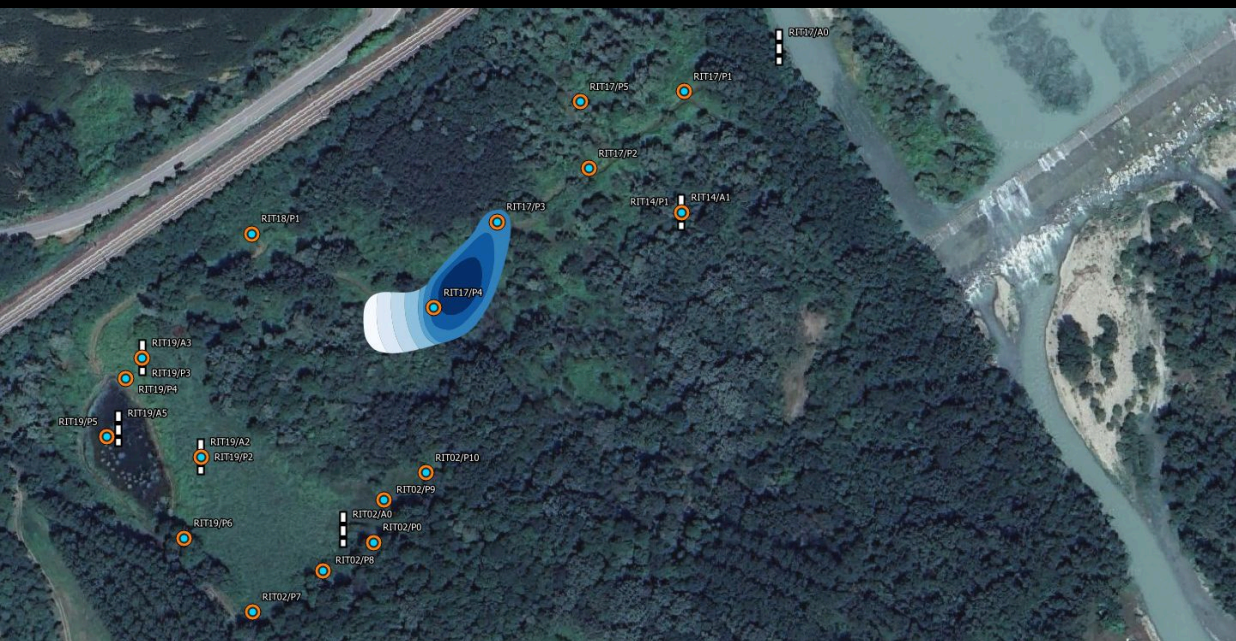
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C) **Natural** – Paludina marshland, Saluggia (Piemonte)





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C) **Natural** – Paludina marshland, Saluggia (Piemonte)



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C) **Natural** – Paludina marshland, Saluggia (Piemonte)



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2'000 sqm; 625
individuals in 2023!



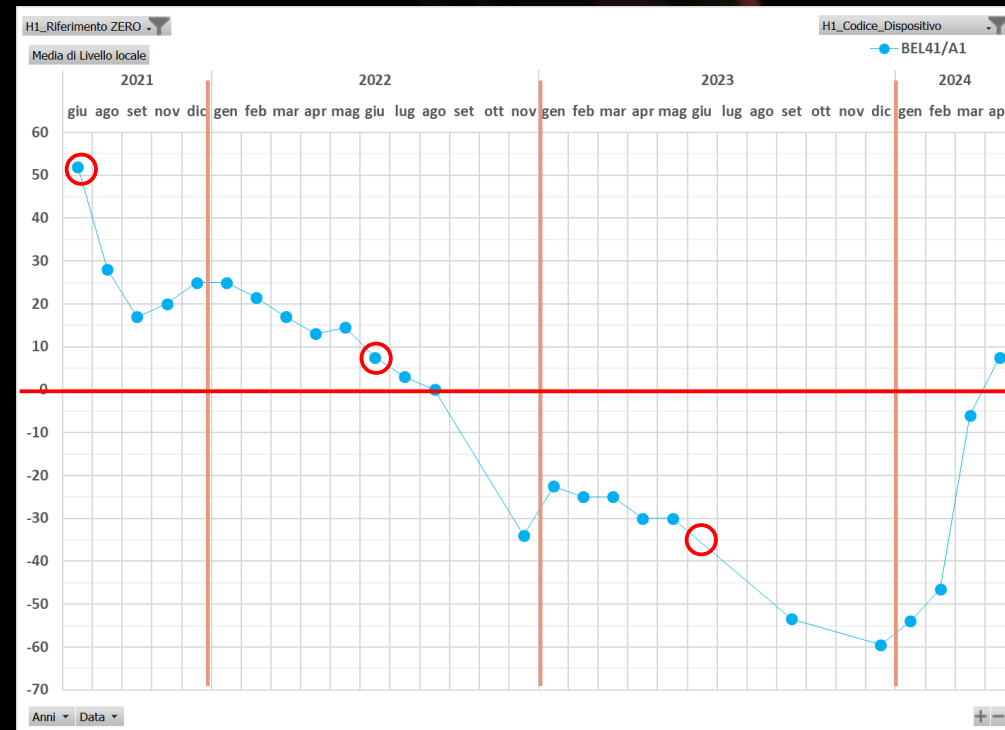
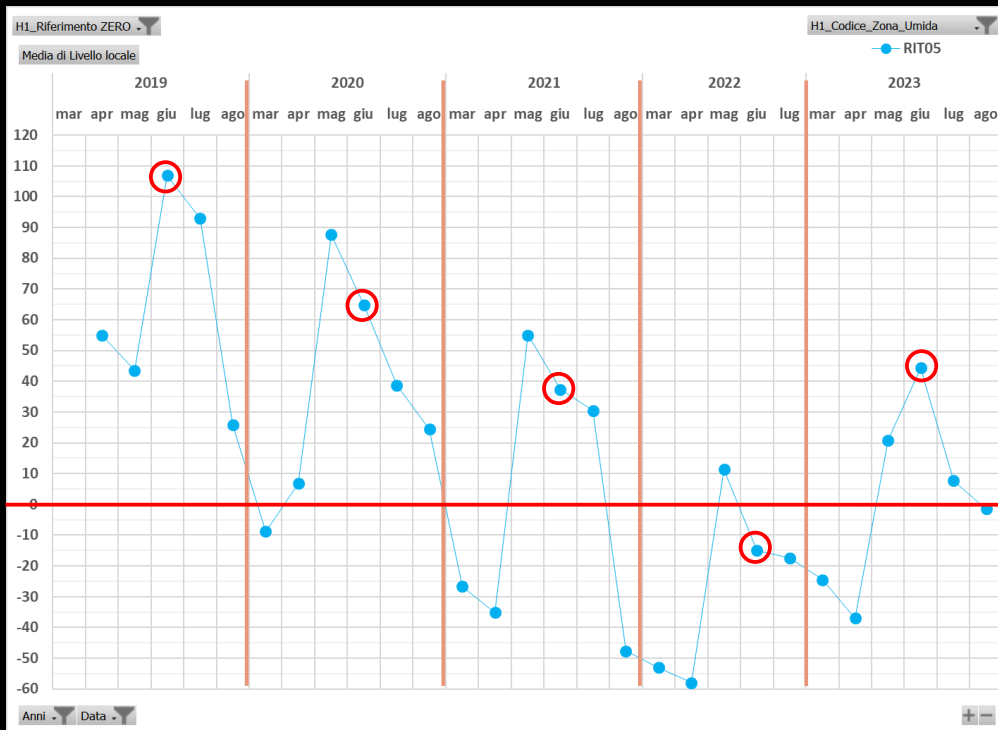
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Natural wetlands and climate change



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Key messages

- **Success of metamorphosis** is the best indicator of the effectiveness of a wetland restoration/creation
- The study of **larval ecology** is essential to obtain successful interventions
- Duration and timing of the **hydroperiod** a key factor in the success of wetland restoration interventions
- Restoration and creation of a natural wetland need multi-year **hydrological studies** (the duration must equal the longevity of the individuals of the target species)
- In artificial and semi-artificial restored wetland it's possible to mitigate the impacts of climate change and alien species **regulating the hydroperiod**



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THANKS!



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