

Country /City ..... Italy, Ferrara

University / School ..... University of Ferrara

Academic year ..... 2020/2021

Title of the project ..... Hydrophilia : the future of the agricultural landscape for the water resources management and the environmental protection of the Comacchio Valli and the Mezzano lands

Authors ..... Margherita Bonifazzi



## TECHNICAL DOSSIER

**Title of the project** Hydrophilia : the future of the agricultural landscape for the water resources management and the environmental protection of the Comacchio Valli and the Mezzano lands

**Authors** Margherita Bonifazzi

**Title of the course** Landscape architecture and infrastructure

**Academic year** 2020/2021

**Teaching Staff** Luca Emanuelli, Gianni Lobosco, Massimo Tondello

**Department / Section / Program of belonging** Department of Architecture, Sealine research center

**University / School** University of Ferrara



### Written statement, short description of the project in English, no more than 250 words

According to the future scenarios, climate change and the constant ocean level rise will put a strain on agricultural activities and habitats located in coastal areas. To date, these critical issues have been faced only marginally, and with a conservative approach largely due to the presence of restriction paradoxically linked to the biodiversity protection regulations in the Po Delta Park. Precisely for this reason this thesis face the problem by adopting a solution that make these territories increasingly resilient to the sea water intrusion. The study area is represented by the Valli di Comacchio, which returns to being a habitat of land and water as it was originally, converting the territory to conservative agriculture practices which, combined with the inclusion of AFI (Infiltration Forest Areas) and wetland are a useful tool to build a freshwater barrier that safeguards cultivated land from interaction with the brackish interface, and contrasts the eutrophication processes of the Valli di Comacchio. The inclusion of these landscape-environmental devices, while subtracting surface area from agricultural space, can increase its productivity (and resilience) by acting as a water reserve and habitat for animal and plant species essential to the ecological balance of these transition areas between land and sea.

For further information

**Máster d'Arquitectura del Paisatge - UPC**

Contact via email at:  
master.paisatge.comunicacio@gmail.com

biennal.paisatge@upc.edu

**Máster d'Arquitectura del Paisatge - UPC**

Sede ETSAB - Universitat Politècnica de Catalunya

Calle Jordi Girona, 15. Edificio Omega 1-3  
08034 Barcelona - Spain

COAC - Colegi oficial d'Arquitectes de Catalunya

Carrer Arcs, 1-3  
08002 Barcelona - Spain

**12th International Biennial Landscape Barcelona**

**Barcelona November 2023**

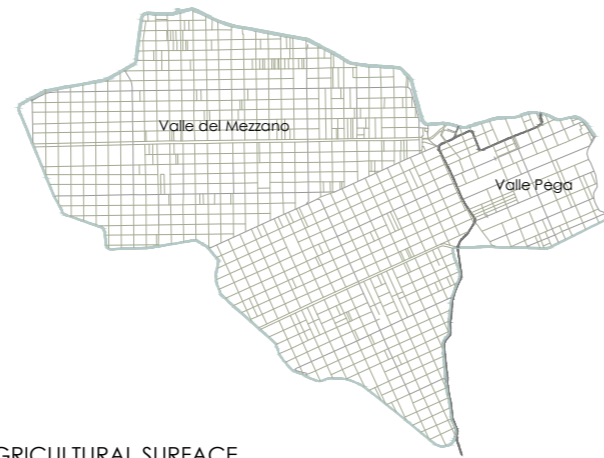
**SCHOOL PRIZE**

## LOCATION

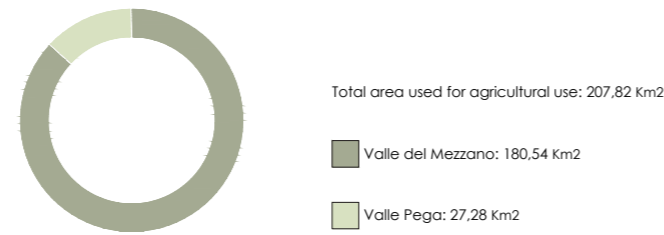


The study site is the one of the Valli di Comacchio and Mezzano lands, located within the Po Delta Park of Ferrara (Emilia Romagna). This coastal area has historically been characterized by the presence of numerous stretches of brackish water, represented, in Emilia Romagna, by all those coastal basins commonly referred with the term "Valli". An important landscaperelict of this former coastal environment is the presence of the paleodunes, ancient sand dunes (now incorporated into the agricultural landscape) characterized by a large capacity for infiltration of fresh water, thus counteracting groundwater salinization.

## AGRICULTURE



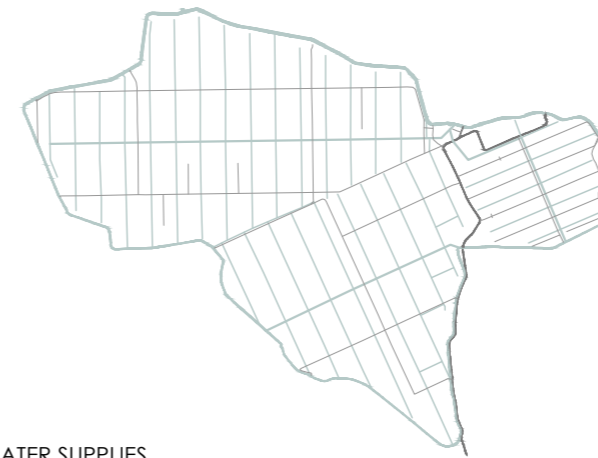
### AGRICULTURAL SURFACE



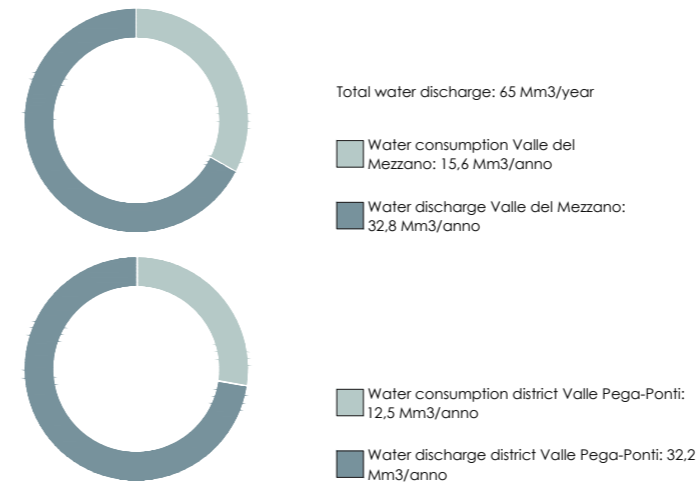
The surface of the Valle del Mezzano and of Valle Pega consists of an area of about 210 Km<sup>2</sup> used for agricultural purposes.

This area is characterized by a subdivision based on large surfaces, about 10-12 ha, in which the technique of intensive agriculture is used in a widespread manner.

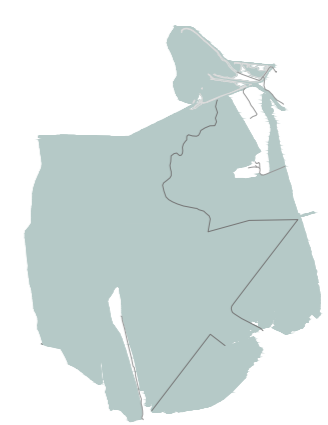
## WATER RESOURCES USE



### WATER SUPPLIES



## VALLI DI COMACCHIO

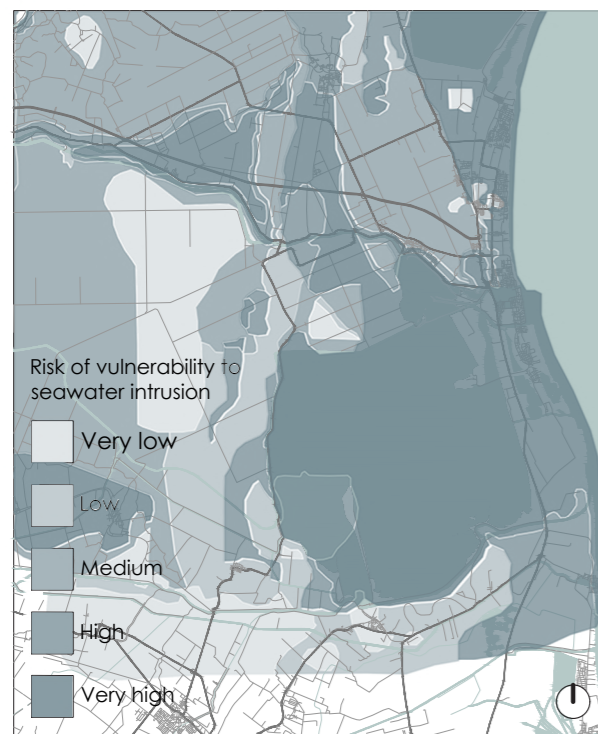


### WATER QUALITY

- Excessive inputs of nutrients, such as loads of nitrogen and phosphorus that come from agricultural treatments and by leaching enter water bodies;
- Poor biodiversity and lack of microorganisms such as: Phytoplankton, Macrobenothos, Macrophytes;
- Strong subsidence of both anthropic and natural origin, which mainly causes the loss of portions of the territory;
- poor supplies of fresh water, which come almost exclusively from the agricultural context;
- Poor hydraulic maintenance with consequent water circulation problems;

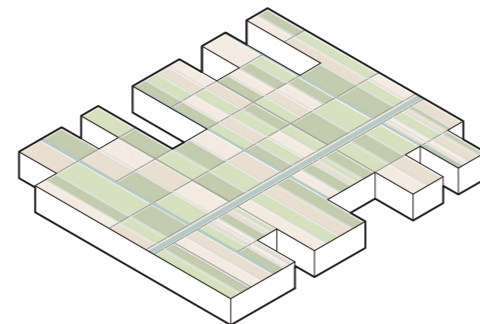
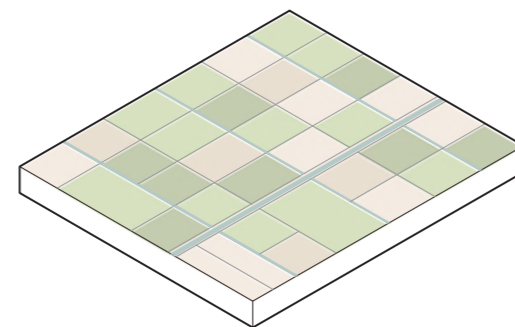
The report carried out by Apae in the three-year period 2017-2019 shows a "bad" ecological status of the transition waters as shown in the table.

term 2017-2019	Phytoplankton	Macrobenothos	Macrophytes	ECOLOGICAL STATUS
Water basin Valli di Comacchio	Bad	Poor	Bad	Bad

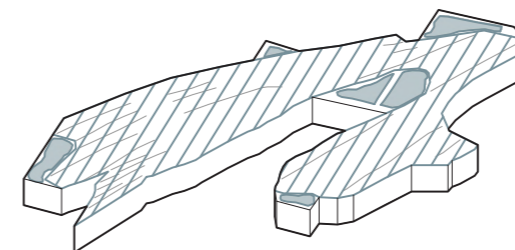
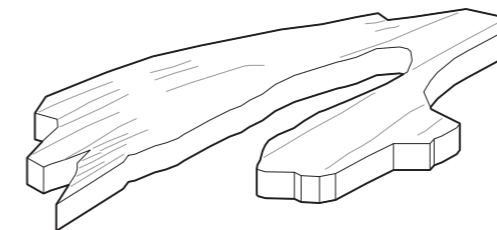


Vulnerability to sea levels rising

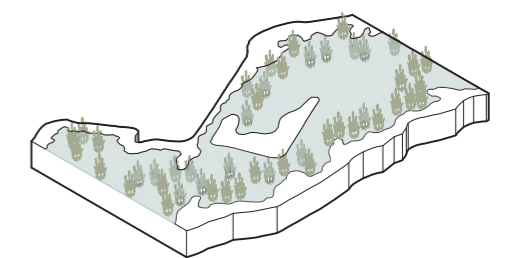
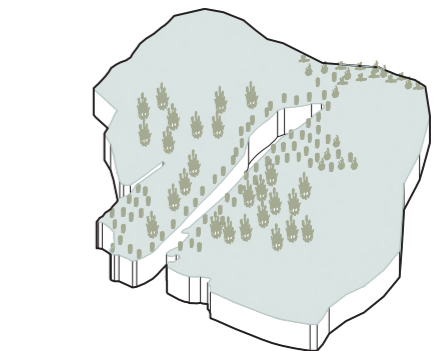
The aquifer is vulnerable to marine intrusion from coastal aquifers. However, in several cases seawater can indirectly intrude into the aquifer flowing from surface water bodies to groundwater. This phenomenon will be increasingly important due to global warming and rising ocean levels.



Transition from an agricultural fabric based on very large surfaces to a fabric based on micro-particles defined by homogeneous characteristics. This allows you to act in a targeted manner and reduce the presence of external inputs by creating the conditions for the proliferation of pollinators.



The forest infiltration systems are delineated by the organic shape of the paleodunes. This allows for the integration of agricultural fabric and forest fabric, creating continuity between the two habitats and triggering the ecosystem services generated by the interaction of different species.



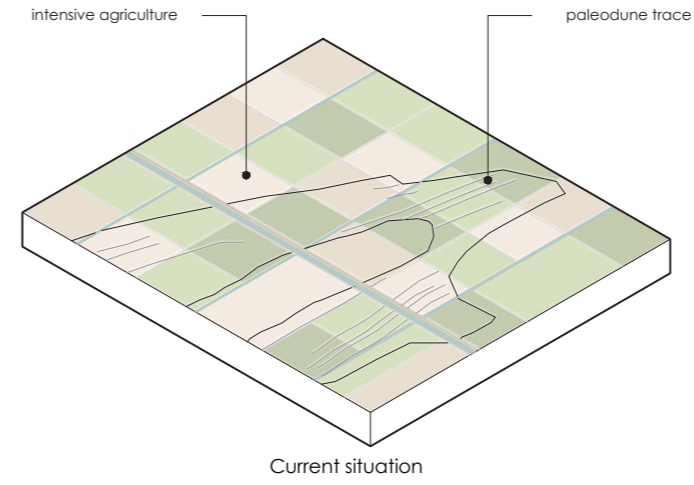
The inclusion of reed beds and marine phanerogams such as Ruppia Chirrosa, Zostera Noltei and Zostera marina; they improve the conservation status of the valley ecosystem, as they re-oxygenate the water column and trigger a phytoremediation action. Furthermore, the presence of this type of plant favors the establishment of bird species.



# PROJECT MASTERPLAN



AGRICULTURAL LANDSCAPE TRANSITION - Current situation

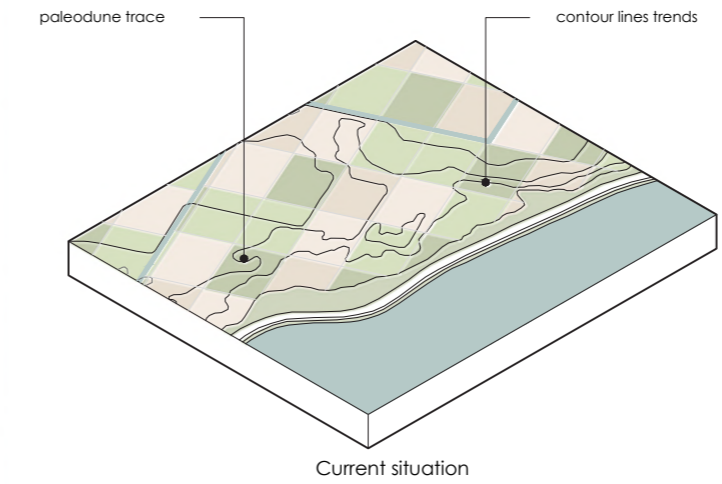
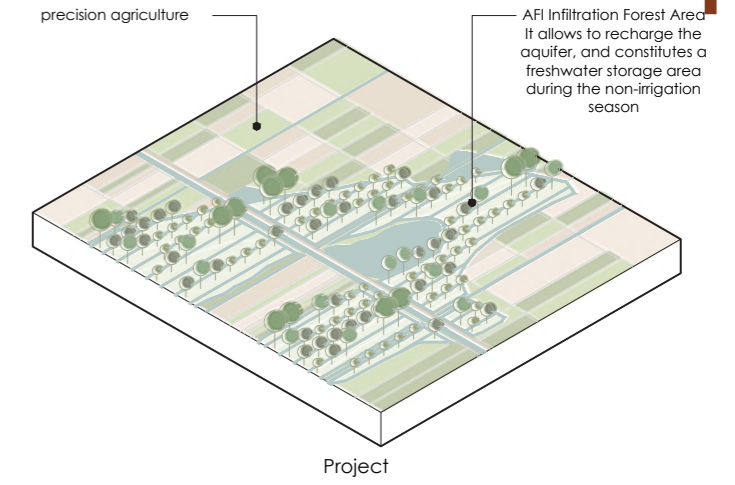


## AFI INFILTRATION FOREST AREA

### TARGET:

- Contrast the impact of intensive agriculture on the valley ecosystem;
- Contrast the sea water intrusion;

An adaptation strategy to the growing impact of the sea water intrusion is to insert infiltration forest area in correspondence with the palaeodunal deposits. Following this strategy, during the non-irrigation season, the water is diverted from the irrigation channels inside the infiltration forest area: in this way the presence of fresh water is maintained throughout the year; moreover, the root system of the trees increases the recharge power of the dune and at the same time

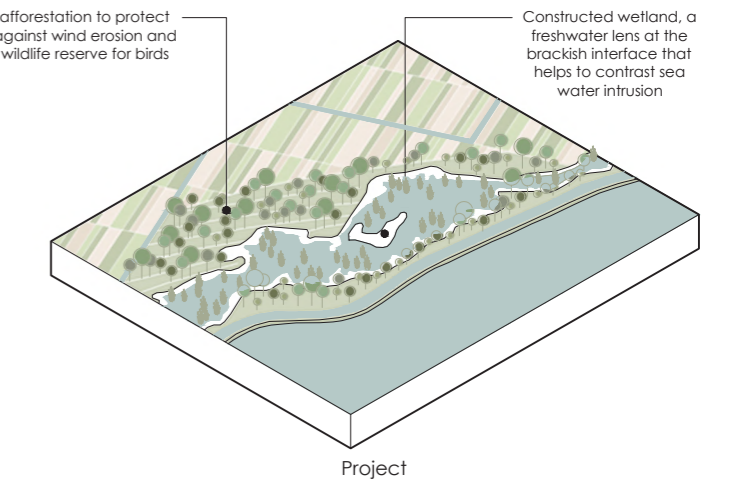


## CONSTRUCTED WETLAND

### TARGET:

- Contrast the sea water intrusion;
- Promote biodiversity;

The presence of wetlands is essential for the survival of Valli ecosystems. The inclusion of a constructed wetland within the Valle del Mezzano not only makes it possible to restore the ecosystem balance favored by biodiversity and the presence of water. But it makes it possible to purify the water coming from the cultivated areas before it is introduced into the Valli, to avoid episodes of hypersalinity. This action is essential especially during episodes of intense rain, in which the run-off phenomenon is greater. The purification and treatment process of the first rainfall takes place through the phytoremediation action of the marsh flora inserted inside the basin.



AGRICULTURAL LANDSCAPE TRANSITION - Project

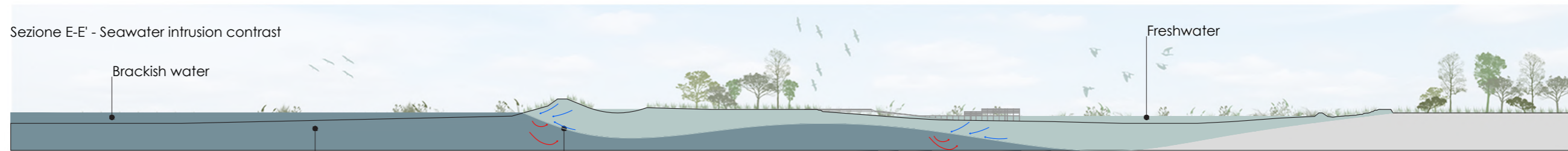
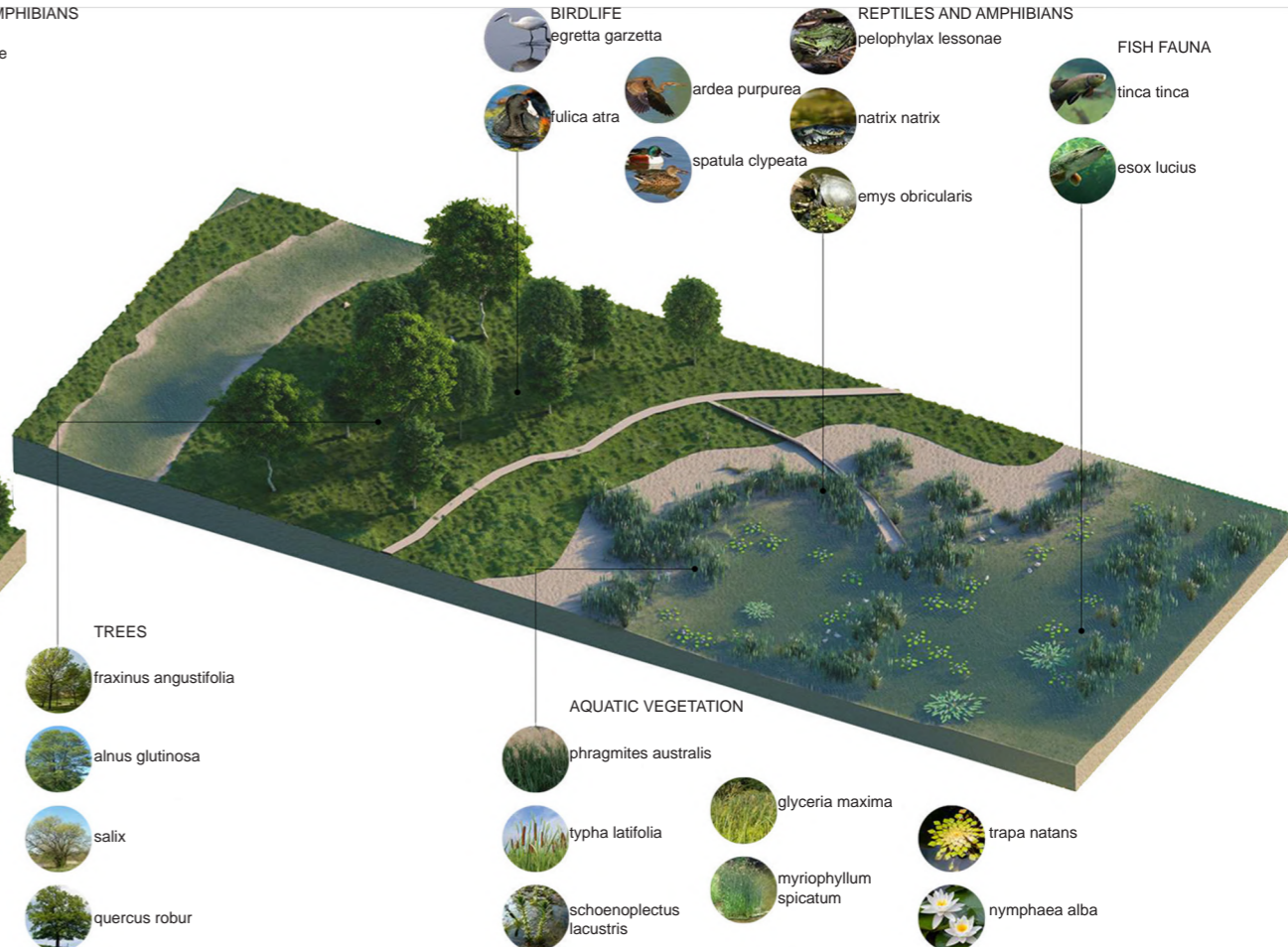
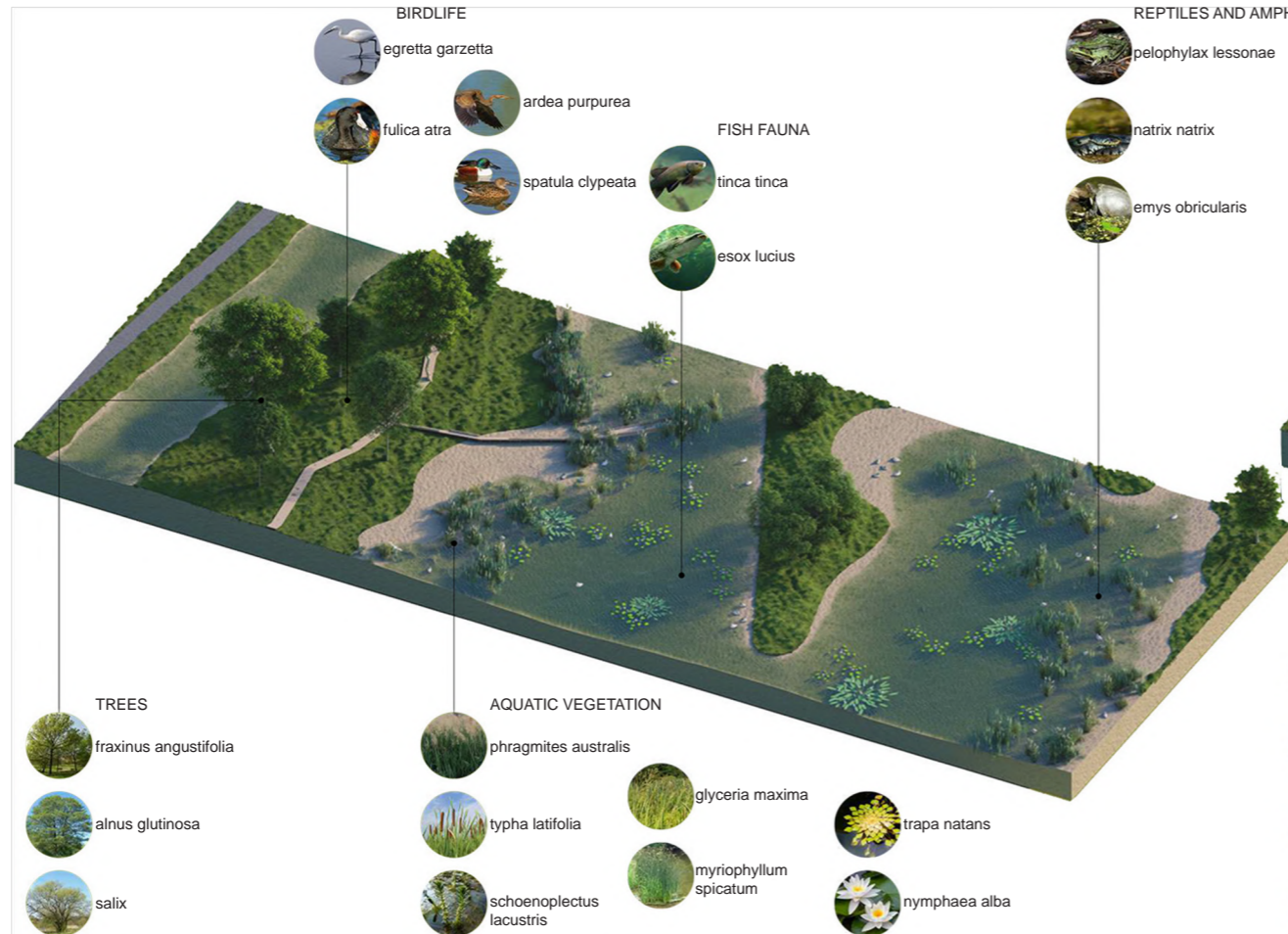
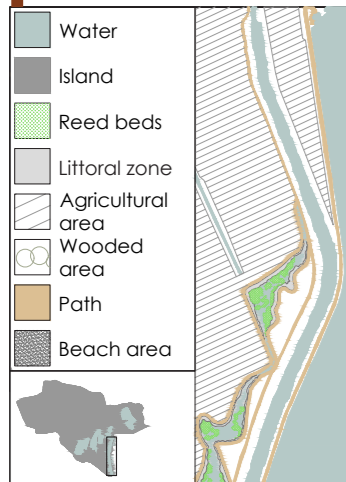




# CONSTRUCTED WETLAND

## HABITAT SIMULATION 01

## HABITAT SIMULATION 02



**FRESH-SALT-WATER INTERFACE**  
The presence of a freshwater lens near the brackish area of the Comacchio Valli makes possible to contrast saline intrusion by interacting with the unconfined aquifer.

