



LIFE12 NAT/IT/000331



# The Life “SeResto” project. A new strategic approach to meet HD & WFD objectives by SEagrass RESTORation

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Università  
Ca' Foscari  
Venezia



**ISPRA**

Istituto Superiore per la Protezione  
e la Ricerca Ambientale



Associazione Ambientalista  
per la salvaguardia, la tutela e la valorizzazione  
della Laguna veneziana, del bacino sciolante e delle zone umide



Provveditorato Interregionale per le Opere Pubbliche

# Background: seagrass reduction

Seagrasses are experiencing a global decline, due to anthropogenic threats (*i.e.* runoff of nutrients, increase of turbidity, pollution, global warming, conflicts with other water uses, etc.)

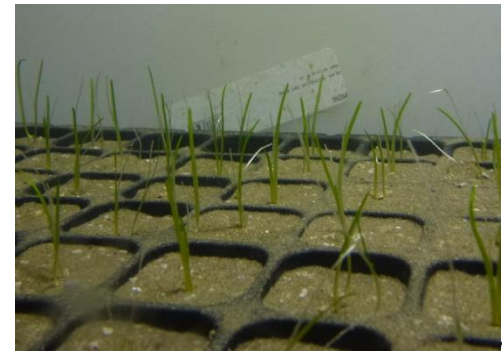
## Short and long terms consequences

- Loss of ecosystem services (biodiversity maintenance, regulation of water quality, food source, nursery, protection against erosion, CO<sub>2</sub> sequestration)
- Shift in communities dominance
- Direct and indirect loss of high valuable species and habitats

Restoration efforts are carried out worldwide using different techniques.

Success is highly dependent on habitat suitability.

Transplantation of large amount of sods and heavy mechanical equipment has consistent impact on donor sites.



# Background: Venice lagoon

Venice lagoon (55.000 ha) is characterized by a fragile complex of ecosystems with high environmental value suffering from multiple anthropogenic impacts (directly in the lagoon or, indirectly, in its watershed)



Historically, Venice lagoon was naturally rich in seagrass meadows but in the last decades a drastic decrease has been observed (particularly in the northern basin) with a shift toward other primary producers.

**Main factors: high nutrient inputs from the watershed, clam fishing, dredging**

At present most of these disturbing factors are drastically reduced and ecological conditions suitable for seagrass are now restored in the area



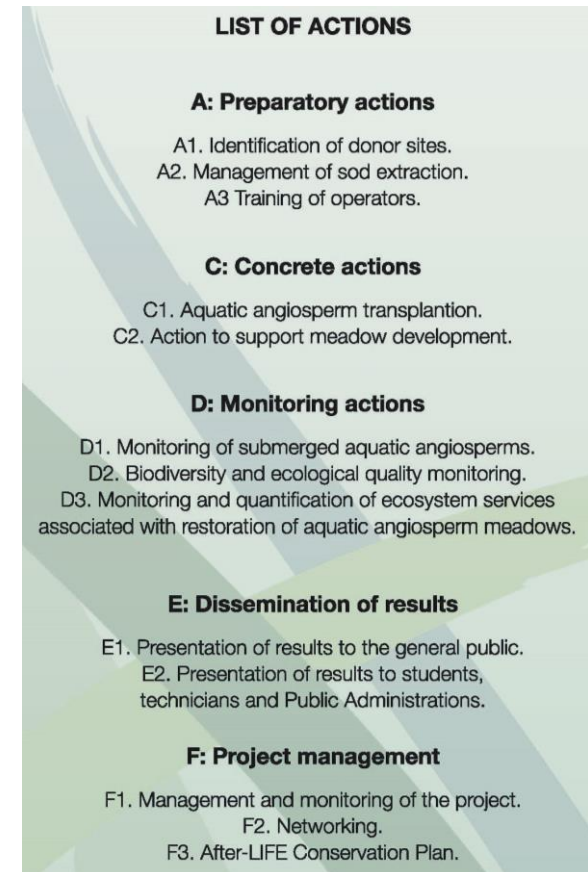


# Principles, Objectives and Actions of SERESTO Project

1. Consolidating and restoring aquatic habitat 1150\* (“Coastal lagoons”) via the **transplantation of submerged aquatic angiosperms**;
2. Contributing to the achievement of **good ecological status** in transitional water bodies according to WFD objectives;
3. Quantifying and making good use of the **ecosystem services provided by the lagoon environment and the aquatic angiosperms of habitat 1150\*** in particular.

## General scope

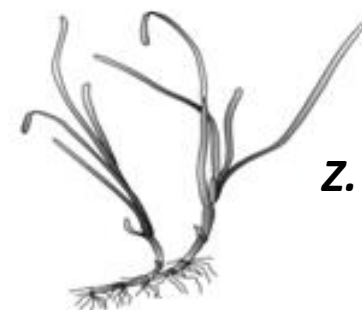
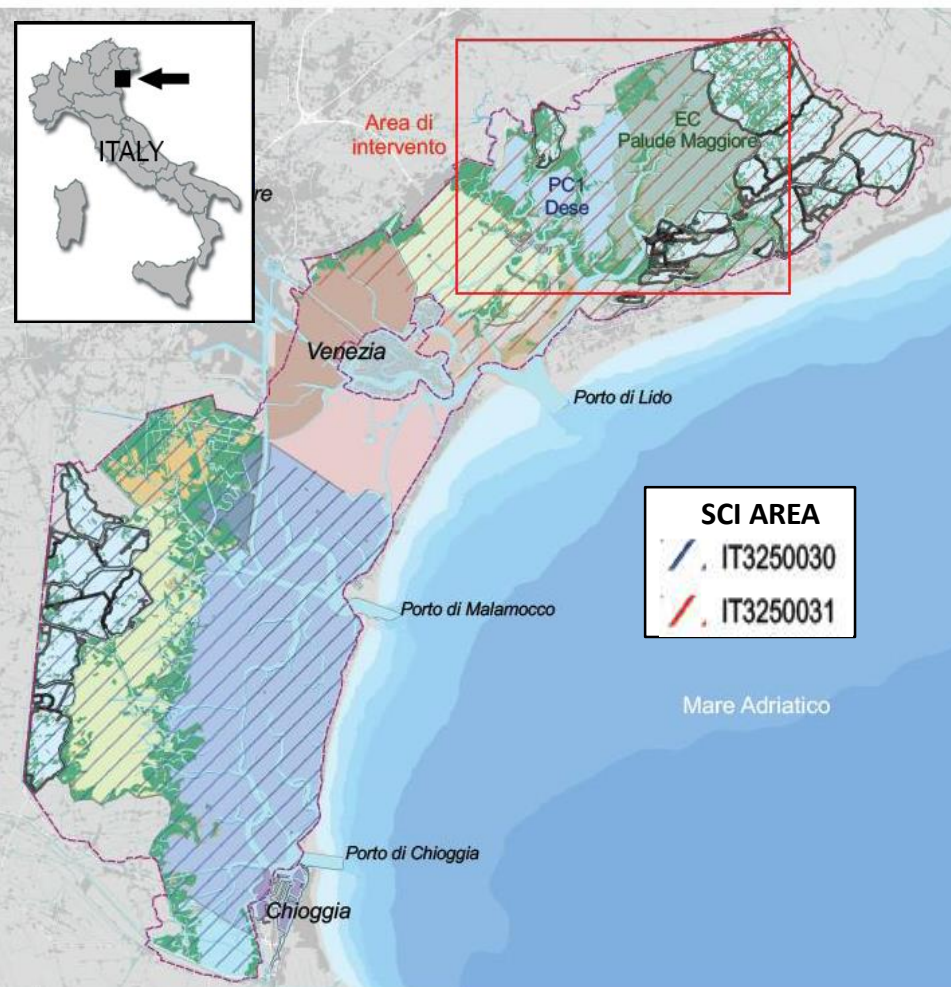
*LIFE+ Nature* projects aim to improve the conservation status of species / habitats of the Birds / Habitats Directives; the species and habitats targeted must be listed in the annexes of the EU Birds and Habitats Directives as follows:



**DURATION: 2014-2018**



# Natura 2000 site, Target Habitat and Species



***Z. marina***



***Z. noltei***



***C. nodosa***

**HABITAT 1150\*** "Coastal lagoons"  
**SCI IT3250031** "Northern Lagoon of Venice"

WFD Waterbodies **PC1, EC**

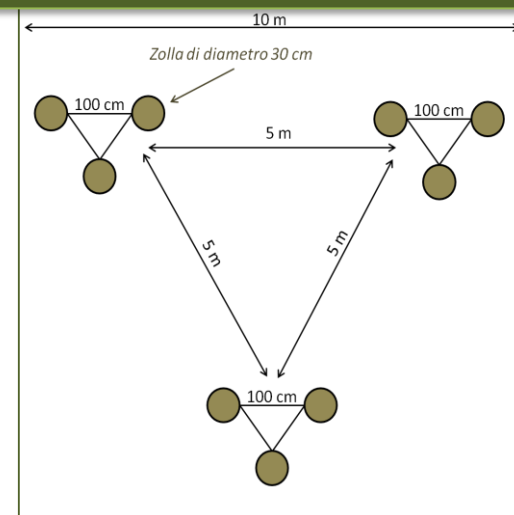


# Intervention strategy

## C1: Concrete Action

Trigger and support a process of seagrass recolonization through a network of small transplants widespread, low cost and low impact on the donor sites.

Transplantation of seagrasses to small sites distributed throughout the intervention area.



## C2: Actions to support meadow development

Manual dispersion of rhizomes to reinforce colonization



Protection of transplanted seagrass against weather distress and hydrodynamic forcing (bush bundles)



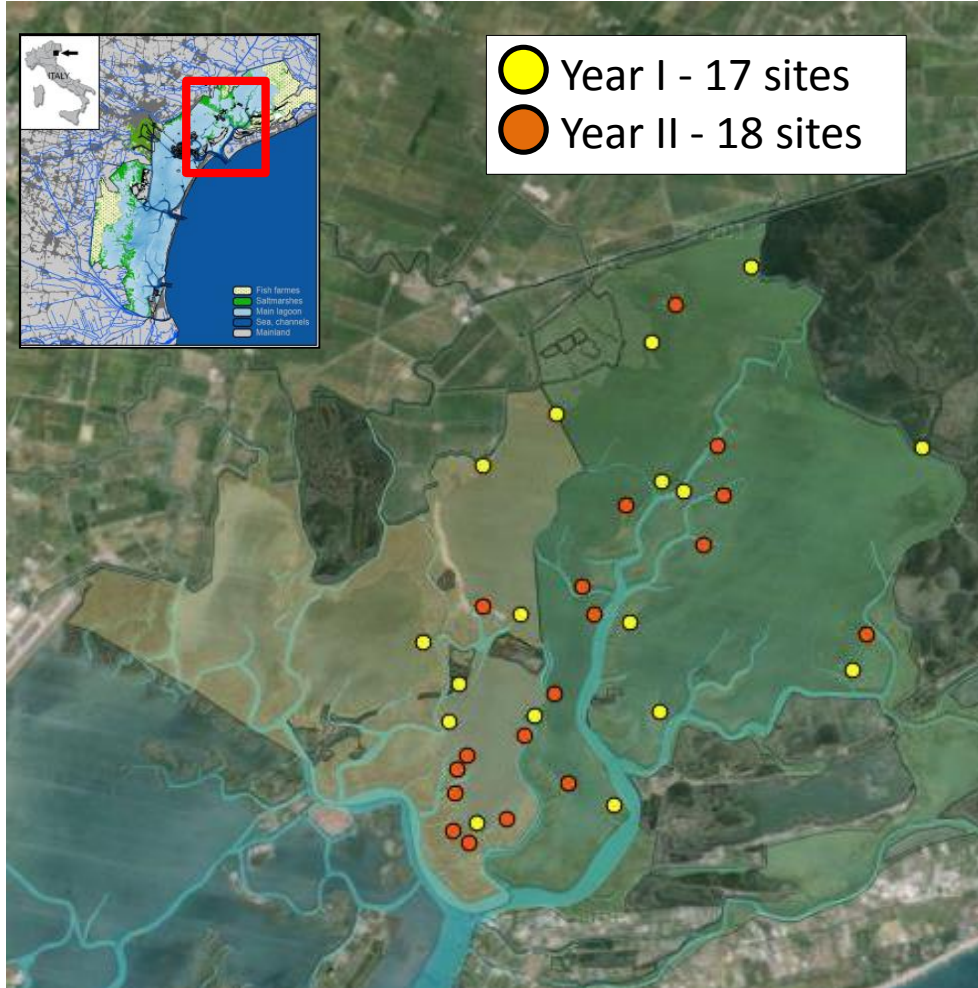
**Involvement of amateur fishermen and hunters Association**

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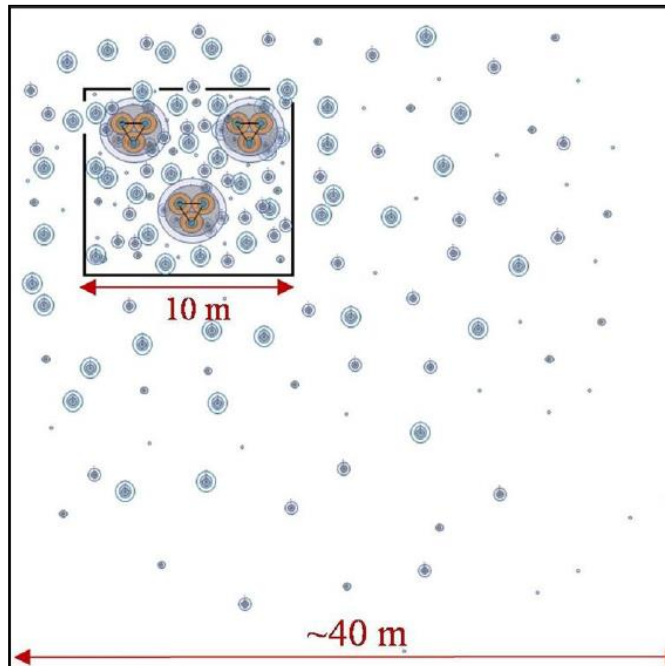
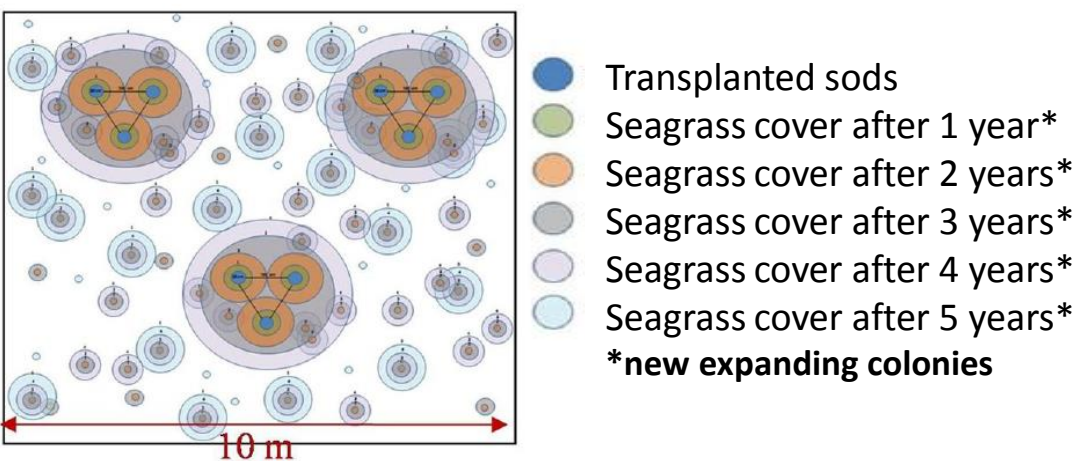


# Transplanting Sites



**315 small sods (approx. 30 cm diam.) for a total of 22-25 m<sup>2</sup>**

# Expected Results



## Following transplantation:

3,500 m<sup>2</sup> of very sparse cover (transplanted sods, rhizomes);

## 2 years after transplantation:

3,500 m<sup>2</sup> with ca. 20% plant cover and new growing points in an area of ca. 14 ha;

## 4 years after transplantation:

3,500 m<sup>2</sup> with ca. 80% plant cover and new growing points in an area of 140 ha;

## 10 years after transplantation:

25-30% of the intervention area colonized by aquatic angiosperms at varying levels of development.



# The planting activity

## Transplantation of sods



Donor site



Removal



Transport



Installation

## Grafting of rhizomes



Harvest



Installation



Grafted rhizomes

# The planting activity - Year I

## First transplantations May-June 2014



- In 16 sites, at least 3 sods of *Z. noltei* were planted.
- In 12 sites, *Z. marina* was also included.
- In 3 sites some attempts with *C. nodosa*
- In 3 sites some attempts with *R. cirrhosa*



# Preliminary results - Transplanted sods

(survival, growth, cover)

## 1<sup>st</sup> monitoring (Sept 2014)

- 0/9
- 1-3/9
- 6-9/9

## Extra planting (Oct 2014)

## 2<sup>nd</sup> monitoring (Jan 2015)

- 2-5/9
- 6-9/9

Survival next to 100% for *Z. marina*  
and to 80% for *Z. noltei*



Some large patches found as result of confluence of single sods

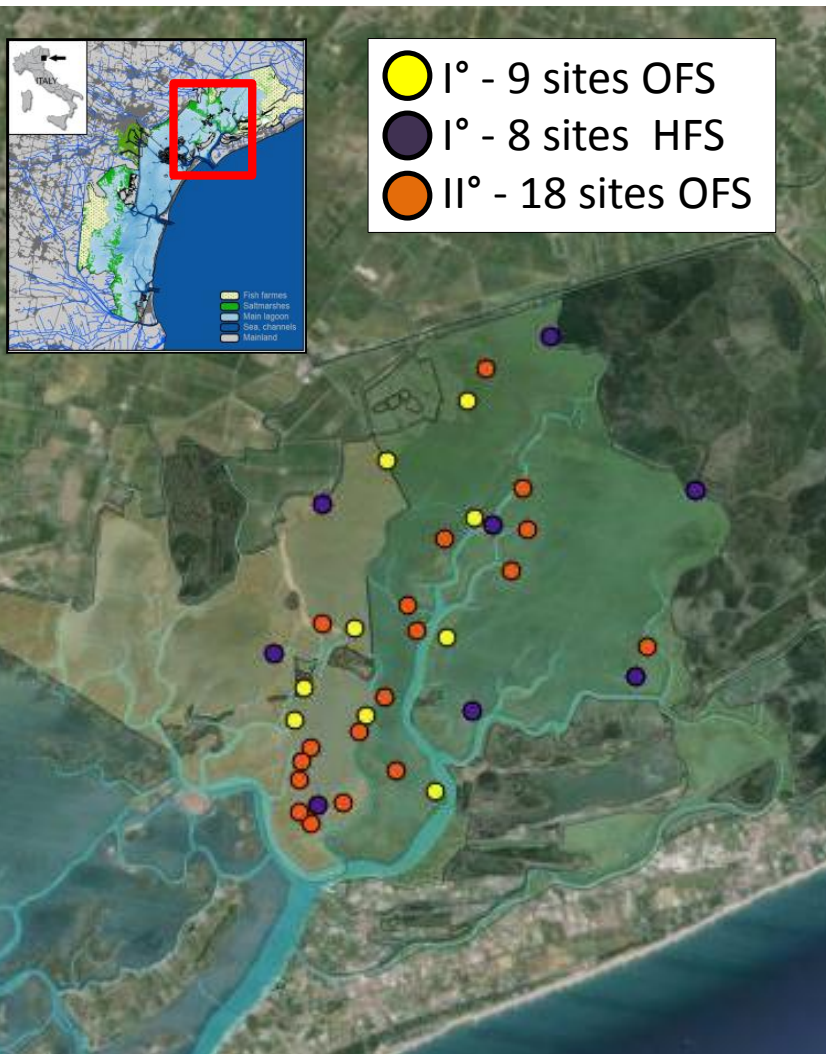


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# Monitoring of Ecological quality & Biodiversity



## Sediment

(C, N and P compounds, fine fraction (%), density, pH, Eh, moisture, porosity, density)

## Water

(C, N and P compounds,  $\text{SiO}_4$ , T, DO, pH, Eh, salinity, TSS, SPM, Chla)

## Biological Quality Elements

- ✓ Macrophytes (Macrophyte Quality Index)
- ✓ Benthic macroinvertebrates (M-AMBI, BITS)
- ✓ Fish fauna (Habitat Fish Index)

## Ecosystem services

- ✓ Total seagrass biomass
- ✓ Sedimentation, turbidity
- ✓ Fish productivity

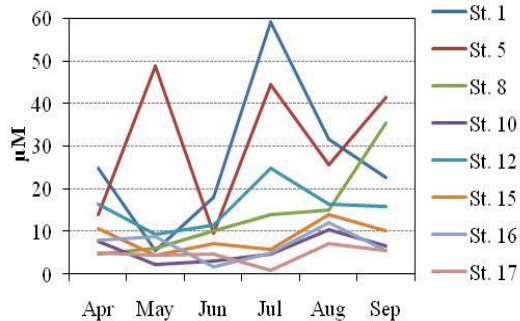
# Year I – Water and Sediments

Unsuccessful sites were those more influenced by freshwater inputs.

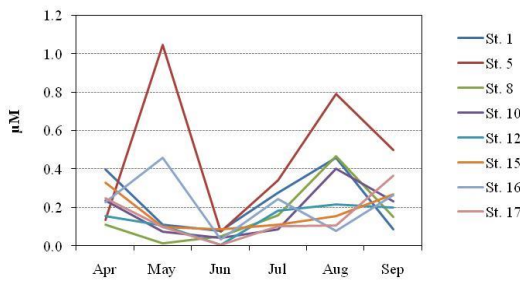
Unusual meteorological and environmental conditions (unexpected high rainfall in July) led to a low of salinity, to an increase of nutrients (sediment, water) and, hence, to high *Ulva* biomass development.

## WATER

### DIN



### Reactive Phosphorus



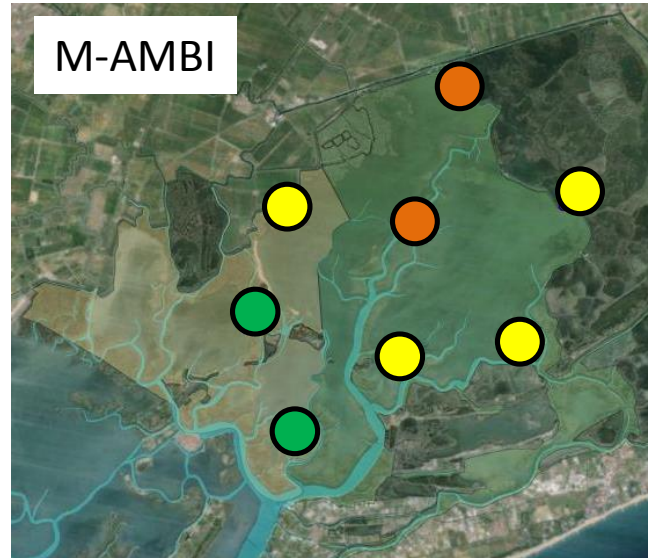
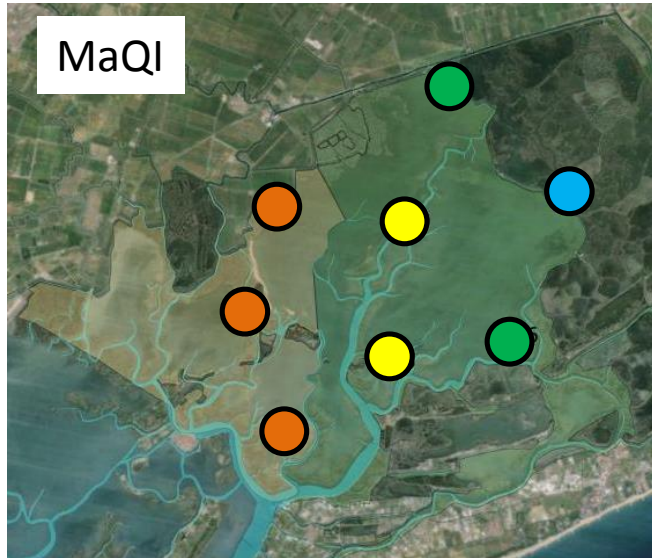
## SEDIMENT

St.	TP µg/g	IP µg/g	OP µg/g	OP %
1	385	265	120	31.2
2	355	261	95	26.6
3	253	227	26	10.4
4	467	296	171	36.6
5	487	180	307	63.0
6	484	221	262	54.3
7	414	239	174	42.1
8	297	224	73	24.5
9	332	224	108	32.6
10	277	246	31	11.2
11	328	259	69	21.1
12	309	260	49	15.9
13	277	229	48	17.4
14	309	255	54	17.5
15	313	261	52	16.6
16	295	263	31	10.7
17	273	222	51	18.6

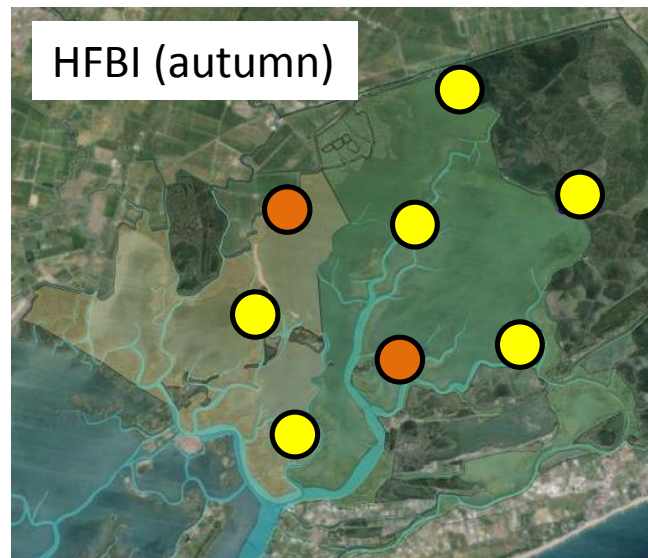
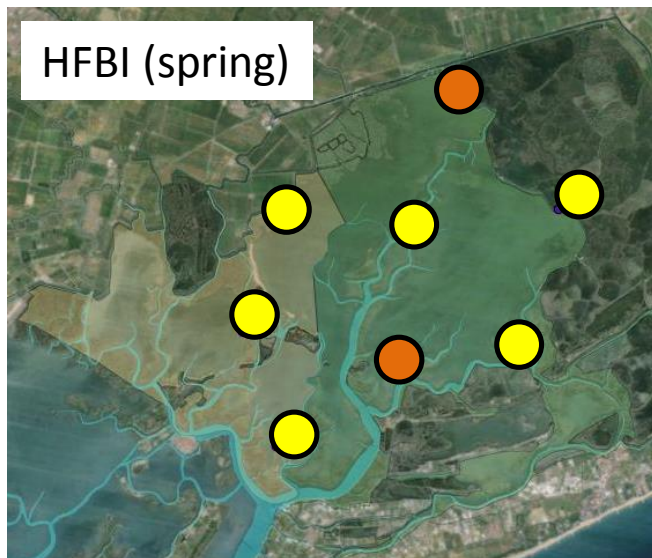




# Year I – EQB's



	WFD ecological status classification
Blue	High
Green	Good
Yellow	Moderate
Orange	Poor
Red	Bad



According to WB  
typology differences  
detected for  
Macrophytes and  
Macrozoobenthos



- ✓ **THE NEW 18 STATIONS ARE BEING TRANSPLANTED IN THESE DAYS**
- ✓ **RHIZOME DISPERSION IS A CONTINUOUS ACTIVITY CARRIED OUT ALL ALONG THE PROJECT**
- ✓ **OTHERS ACTIVITIES (MONITORING, DISSEMINATION, ETC.) ARE IN PROGRESS, ACCORDING TO THE PROPOSED WORKING PLAN**

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# THANK YOU FOR YOUR ATTENTION

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