



MAGISTRATO ALLE ACQUE DI VENEZIA



CONSORZIO VENEZIA NUOVA

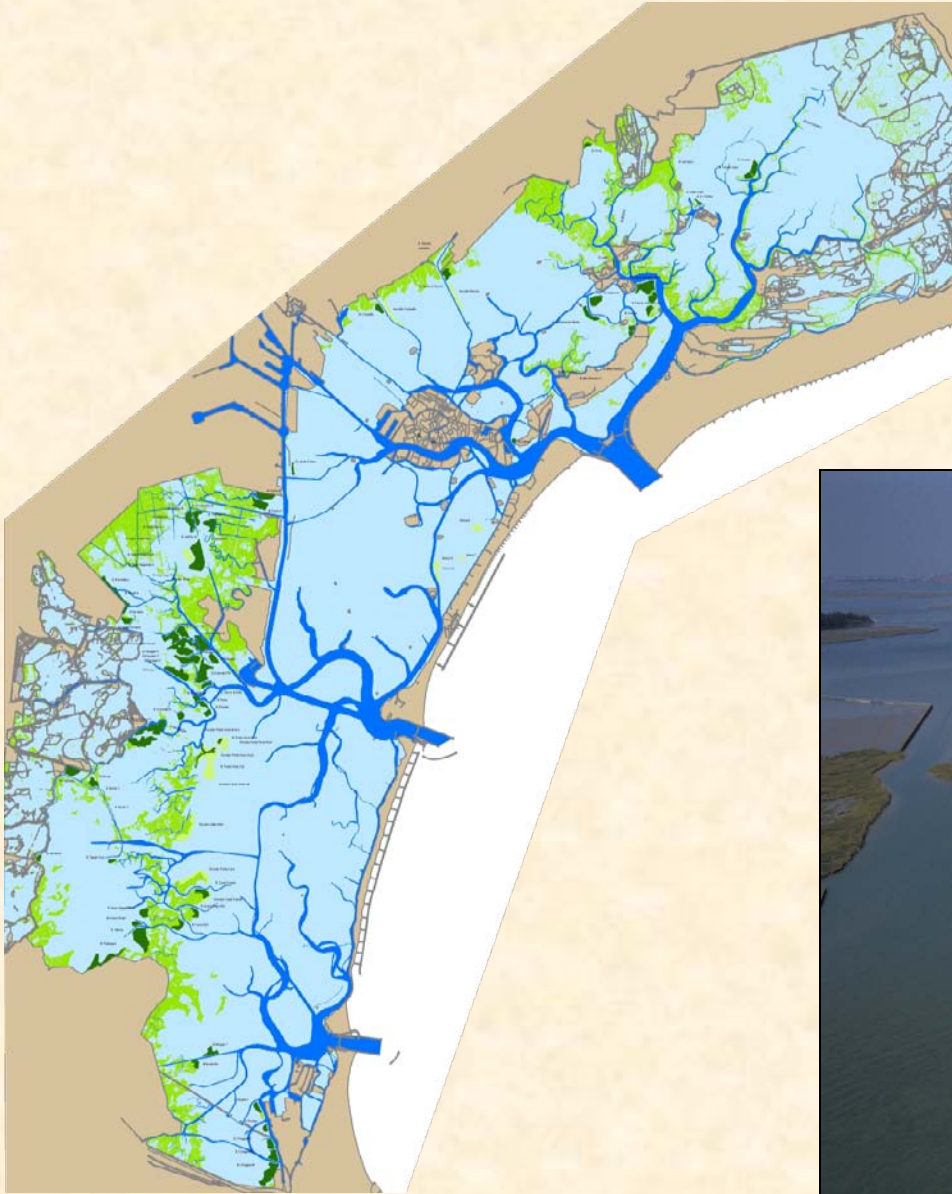
Evaluation of the ecological status of reconstructed habitats in the Venice lagoon

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7° international SedNet event 6-9 April 2011
Venice, Italy



CONSTRUCTED SALTMARSHES



19.5 million m³ of sediments have been re-used for constructing 123 units of tidal flats and salt marshes over a period of 25 years:

- 11 Km² of salt marshes
- 2 km² of tidal flats

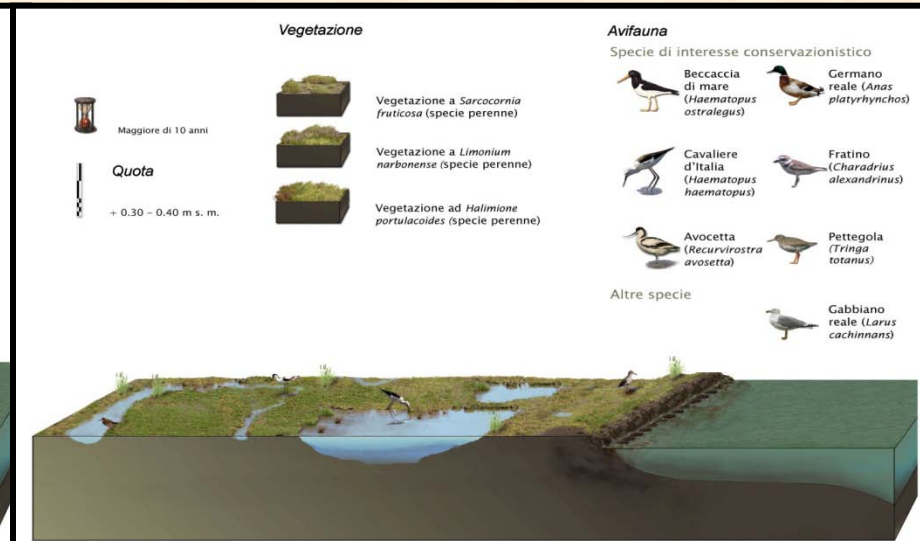
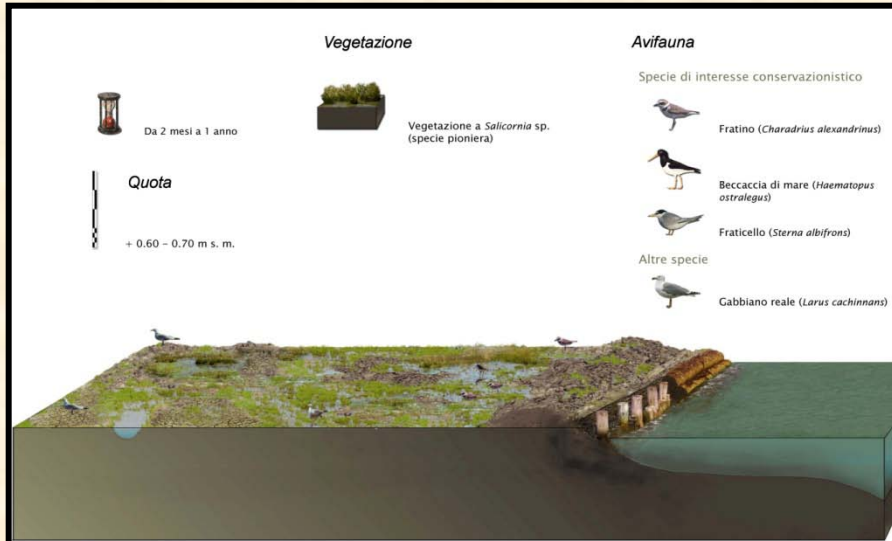


The monitoring of constructed salt marshes:

- **Habitat evolution** in accordance with well defined expected stages
- **Biodiversity** induced by adaptive and protective works



Expected stages of constructed salt marsh



STAGE 1: up to 1 year after sediment filling

STAGE 5: after 10 years

Nesting

In the stage 1 the bare soil is a nesting habitat for: Kentish plover (*Charadrius alexandrinus*), Little tern (*Sterna albifrons*), Eurasian Oystercatcher (*Haematopus ostralegus*) and Yellow-legged gull (*Larus michahellis*) occasionally

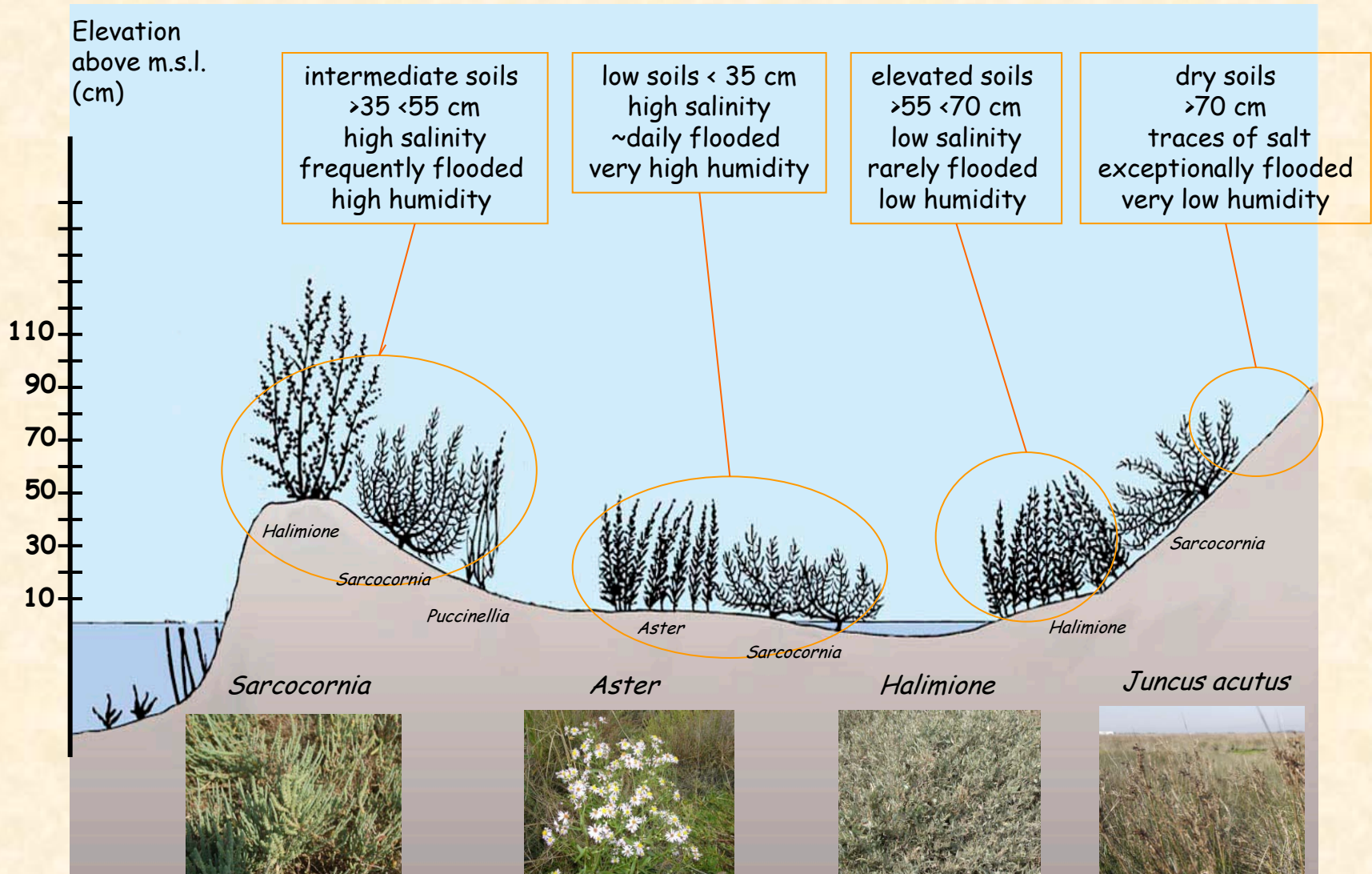
Little tern



Avocet



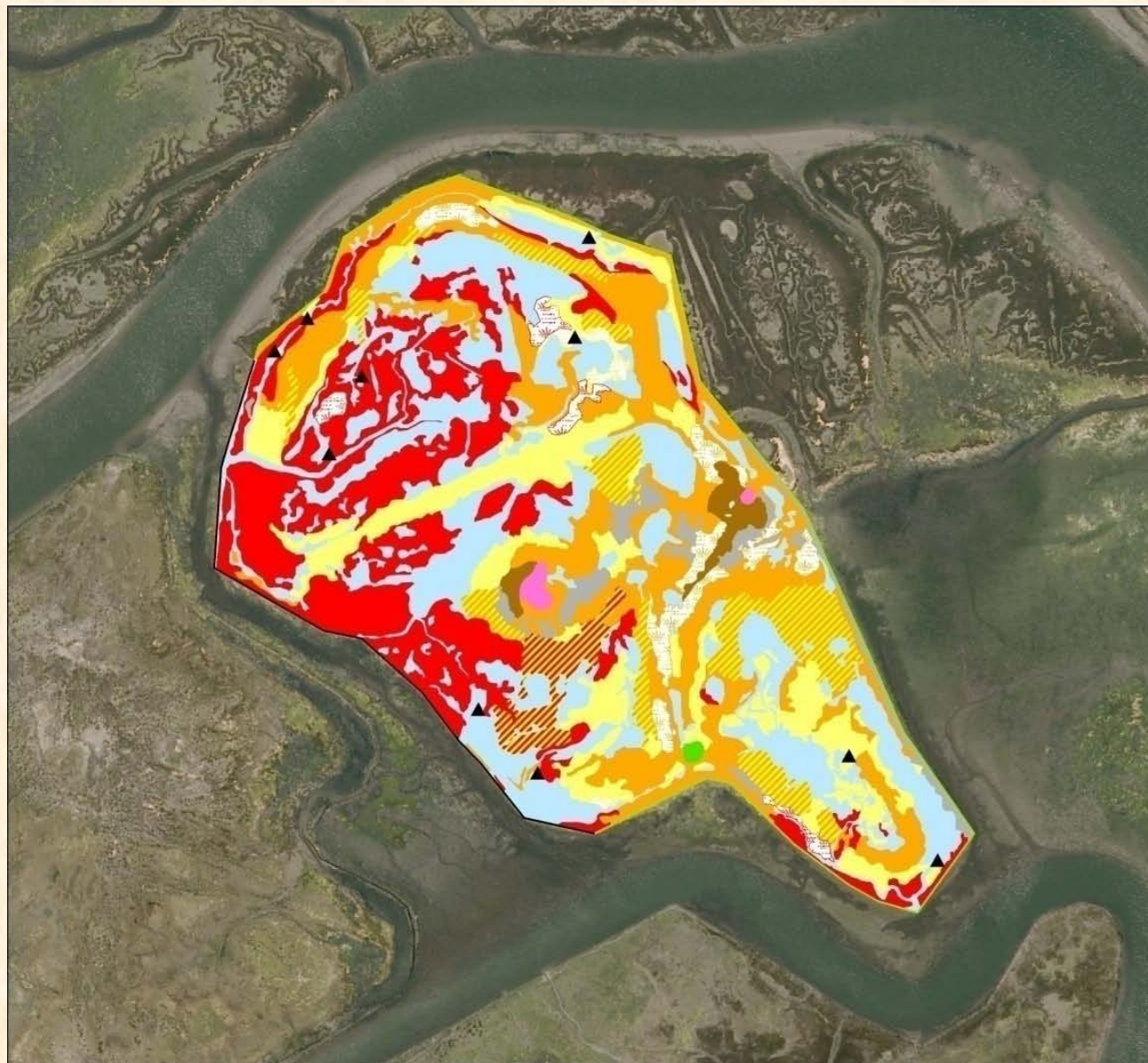
Alophilus Vegetation



Distribution of halophilous species is driven by the elevation of the soil. Each species is adapted to a short range of elevation of ± 5 cm.

Alophilus Vegetation

Tezze Fonde marsh 15 years after sediment filling



BARENA TEZZE FONDE

LEGENDA

VEGETAZIONI PURE A DOMINANZA DI:

- Suaeda maritima*
- Salicorniasp.*
- Salicornia sp.* a copertura rada (<25%)
- Spartina maritima*
- ▲ *Spartina x townsendii /Spartina anglica* (presenza puntiforme)
- Limonium narbonense*
- Limonium narbonense* a copertura rada (<25%)
- Juncus maritimus*
- Aster tripolium*
- Sarcocornia fruticosa*
- Sarcocornia fruticosa* a copertura rada (<25%)
- Halimione portulacoides*
- Specie ruderali (*Elymetum atherici, Phragmites australis*, ecc.)
- *Baccaris halimifolia* (presenza puntiforme)

MOSAICI VEGETAZIONALI A DOMINANZA DI:

- Limonium narbonense/Aster tripolium*
- Limonium narbonense/Juncus maritimus*
- Salicorniasp./Limonium narbonense*
- Salicorniasp./Aster tripolium*
- Salicorniasp./Limonium narbonense/Aster tripolium*
- Sarcocornia fruticosa/Limonium narbonense*
- Sarcocornia fruticosa/Halimione portulacoides*
- Sarcocornia fruticosa/Salicorniasp.*
- Sarcocornia fruticosa/Salicorniasp./Aster tripolium*

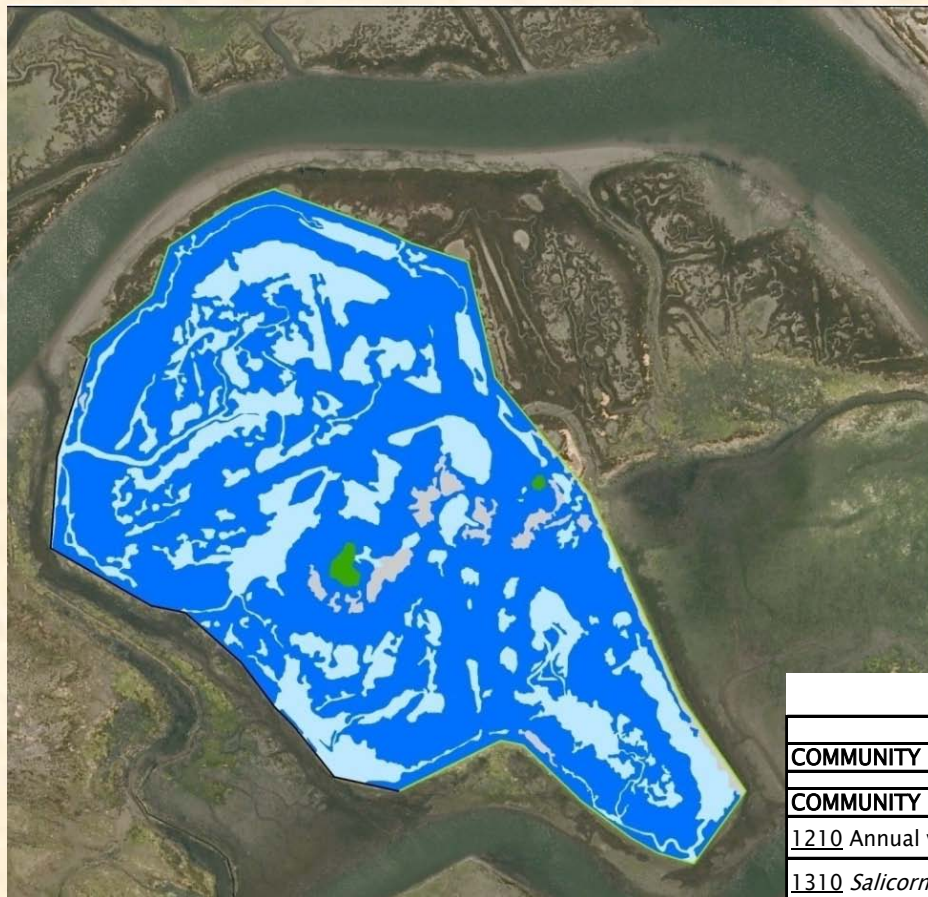
ALTRE CATEGORIE

- Zone prive di vegetazione
- Superfici ad acqua

CONTERMINAZIONI

- Conterminazione
- Confine con barena naturale
- Taglio palificata a quota barena

Habitat of interest in according to 92/43/EU Directive



BARENA TEZZE FONDE

HABITAT COMUNITARI secondo Direttiva 92/43/CE

- COMUNITARI NON PRIORITARI**
- 1210-Vegetazione annua delle linee di deposito
 - 1310-Vegetazione pioniera a *Salicornia* e altre specie annuali delle zone fangose e sabbiose
 - 1410-Pascoli inondati mediterranei (*Juncetalia maritimi*)
 - 1420-Praterie e fruticeti alofili mediterranei e termo-atlantici (*Sarcocornetea fruticosi*)
- NON COMUNITARI**
- Specie ruderali (vegetazione erbacea, canneto, ecc.)

ALTRE CATEGORIE

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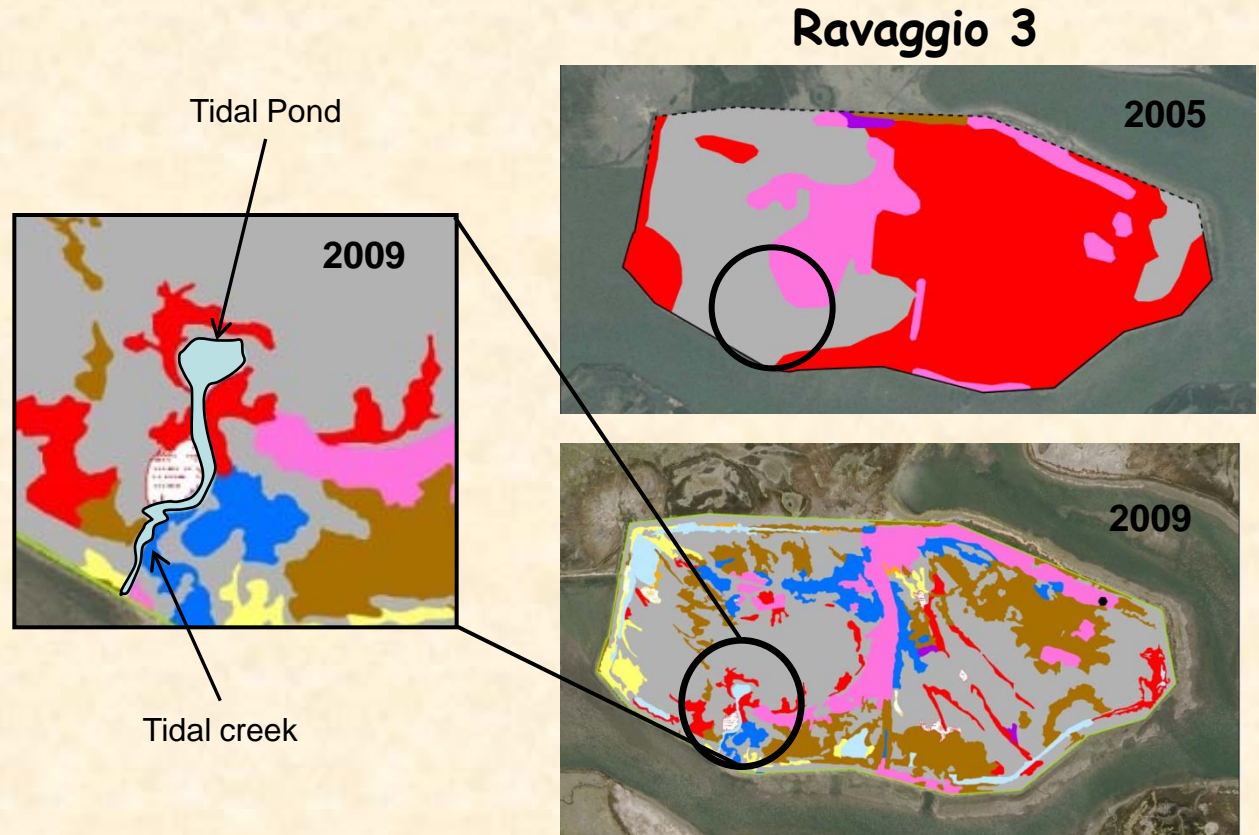
	COMMUNITIES DOMINATED BY:
COMMUNITY PRIORITY HABITATS	Absent
COMMUNITY HABITATS NON PRIORITY	
<u>1210</u> Annual vegetation of drift lines	<i>Suaeda maritima</i>
<u>1310</u> <i>Salicornia</i> and other annuals colonising mud and sand	<i>Salicornia</i> sp.
<u>1410</u> Mediterranean salt meadows (<i>Juncetalia maritimi</i>)	<i>Limonium narbonense</i> <i>Puccinellia palustris</i> <i>Aster tripolium</i> <i>Juncus maritimus</i> <i>Spartina maritima</i>
<u>1420</u> Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>)	<i>Sarcocornia fruticosa</i> <i>Halimione portulacoides</i>
Mosaic of Habitats <u>1210/1310/1410/1420</u>	Mosaics of the above communities
NON COMMUNITY HABITATS	Ruderal species

Adaptative works leading to biodiversity through temporary disturbances

Excavation of a creek and pond in salt marsh Chioggia B1



The new tidal flow and different soil elevation contribute to the formation of suitable habitats for fishes, birds and vegetation



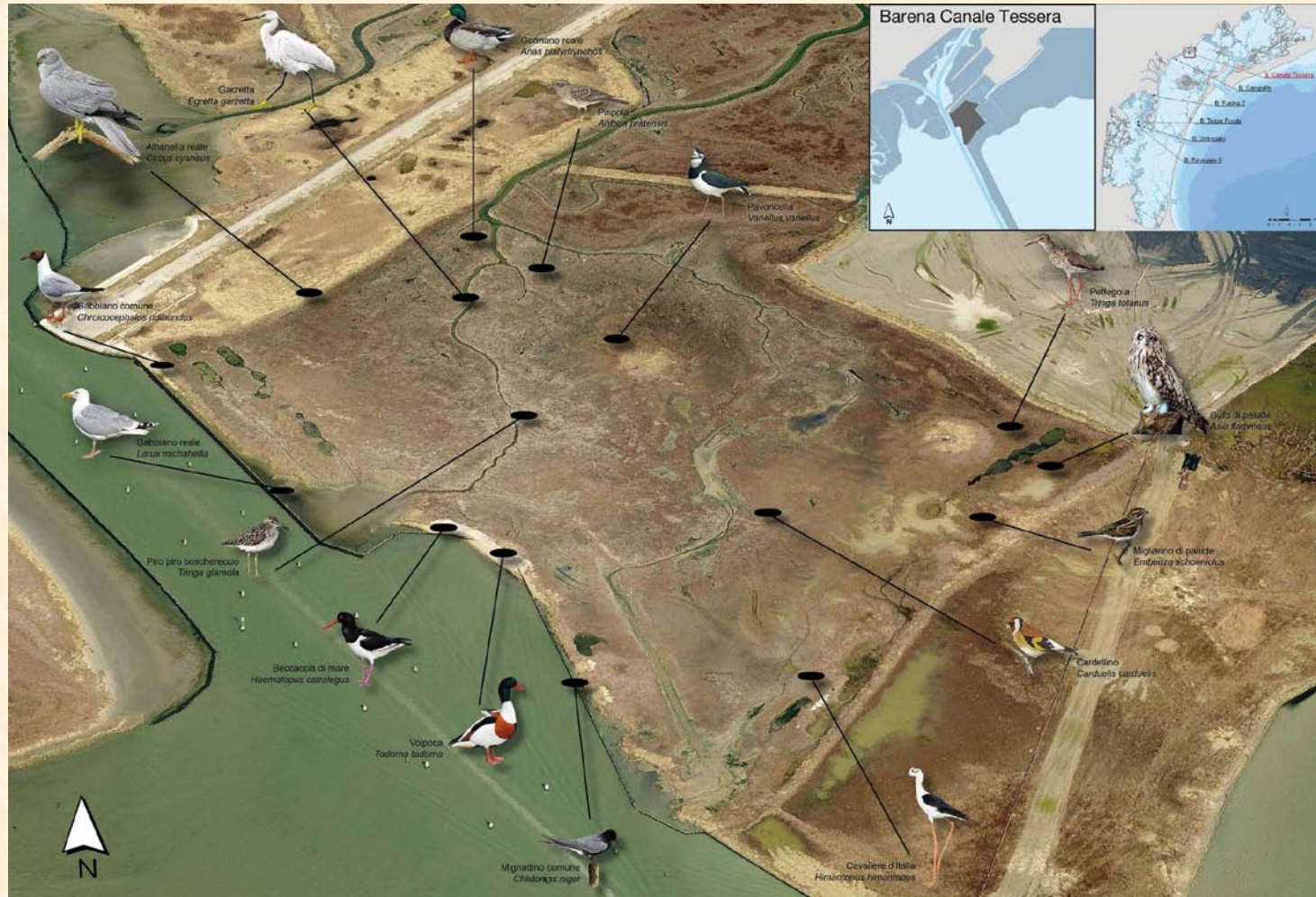
Birds

Overall, the constructed salt marshes have a mosaic of habitats, that can support several guilds of birds, since they can exploit many different patches.

Tidal Ponds and creeks habitat are used by waterbirds for feeding;

Fence and mounds with drift lines are used by Passerines for feeding.

CANALE TESSERA SALT MARSH



Fishes

Constructed salt marshes host a diverse and abundant fish community similarly to natural salt marshes:

4 endangered species: nono (*Aphanius fasciatus*), ghiozzetto di laguna (*Knipowitschia panizzae*), ghiozzetto cinerino (*Pomatoschistus canestrinii*) and cavalluccio marino (*Hippocampus guttulatus*).

many species of commercial interest both adults and juvenile: latterino (*Atherina boyeri*), ldiverse species of cefalo (*Liza spp.*, *Chelon labrosus*), gamberetto di laguna (*Palaemon sp.*), gamberetto grigio (*Crangon crangon*) e l'orata (*Sparus aurata*)

Sheltering effect of hard structure

Protection and confined water body provide shelter for many fish species



Terrestrial invertebrates

Dry patches at an elevation above the tidal range and drift lines increase local biodiversity allowing the survival of endangered insects of nice coastal ecosystem



Anisodactylus poeciloides

Conclusions

- The reuse of large volumes of sediment has produced an increase of 32% of salt marshes and tidal flats of Venice Lagoon creating EU community habitats of alophilus vegetation that sustain birds and fishes listed in protection list (92/43/EU and EC Birds Directive)
- The new habitat contribute to improve water quality of the lagoon according to the Water Framework Directive, reducing the risk of anoxia.
- The techniques have been improved over a period of 25 years of monitoring and adaptation measures.
- Adaptation on protection works are essential to trigger the naturalization processes and the biodiversity with a limited disturbance.
- Moreover biodiversity is locally increased by the new activities of fencing works in according to the ecological principles for habitat protection also using biostabilizing structures:
 - ✓ Sandy beaches and screens to create drift lines above high tide for birds and insects;
 - ✓ Channeling protections with living bivalves;
 - ✓ Fresh water inputs to support fragmites;
 - ✓ Microbial mats development;
 - ✓ Seagrass transplanting.