URL

THE URBAN RIVER LAB

www.urbanriverlab.com

Miquel Ribot (CEAB-CSIC)

Supporting Institutions:

CENTRE D'ESTUDIS AVANÇATS DE BLANES

CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

UNIVERSITAT DE BARCELONA

naturalea

CONSORCI Besòs Tordera

Ajuntament de Montornès del Vallès

URL
THE URBAN RIVER LAB

Streams in Mediterranean urban landscapes

- Mediterranean region has been populated for ages
- Most urban development is concentrated along the fluvial networks

Urban areas have high water demand from rivers and groundwater

Urban areas generate large amounts of wastewater, which return to rivers via wastewater treatment plants (WWTP) effluents

Water quality in WWTP-influenced streams

- WWTP effluents are sources of nutrients, emergent pollutants and microorganisms (some pathogen)

- WWTP effluents influence the chemistry and hydrology of the receiving streams

- The influence of WWTPs effluents is more pronounced in regions with water scarcity such as the Mediterranean zone

Next question: how we can reduce the effects of WWTP effluents in streams?

URL
THE URBAN RIVER LAB

River restoration from a functional perspective: the use of bioengineering techniques

Understand the functional role of helophytes used in bioengineering techniques on stream water chemistry

URL
THE URBAN RIVER LAB

Urban River Lab experimental facility (WWTP of Montornès del Vallès, N Barcelona)

URL as an experimental facility to generate empirical knowledge

CENTRE D'ESTUDIS AVANÇATS DE BLANES

CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

UNIVERSITAT DE BARCELONA

naturalea

CONSORCI Besòs Tordera

Ajuntament de Montornès del Vallès

URL THE URBAN RIVER LAB

Multidisciplinary perspective

- **Science**: Understanding the effects of WWTP effluents on receiving streams
- **Application**: Understanding how application of bioengineering techniques for river restoration influences nutrient dynamics in urban streams
- **Management**: Strategies to decrease effects of urban inputs to streams and increase stream ecosystem integrity
- **Society**: Disseminate knowledge on effects of urban activity on streams and ways to improve it

CEAB CENTRE D'ESTUDIS AVANÇATS DE BLANES

CSIC CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

UNIVERSITAT DE BARCELONA

naturalea

CONSORCI Besòs Tordera

Ajuntament de Montornès del Vallès

Urban River Lab experimental facility (WWTP of Montornès del Vallès, N Barcelona)

Channels (12 and 35 m)

Wetlands

Fed by treated water from the WWTP effluent

Experimental results so far… (2015 - 2016)

Control

Iris

Scirpus

Phragmites

Goal:

- Effect of helophytes used in bioengineering techniques on carbon and nitrogen removal

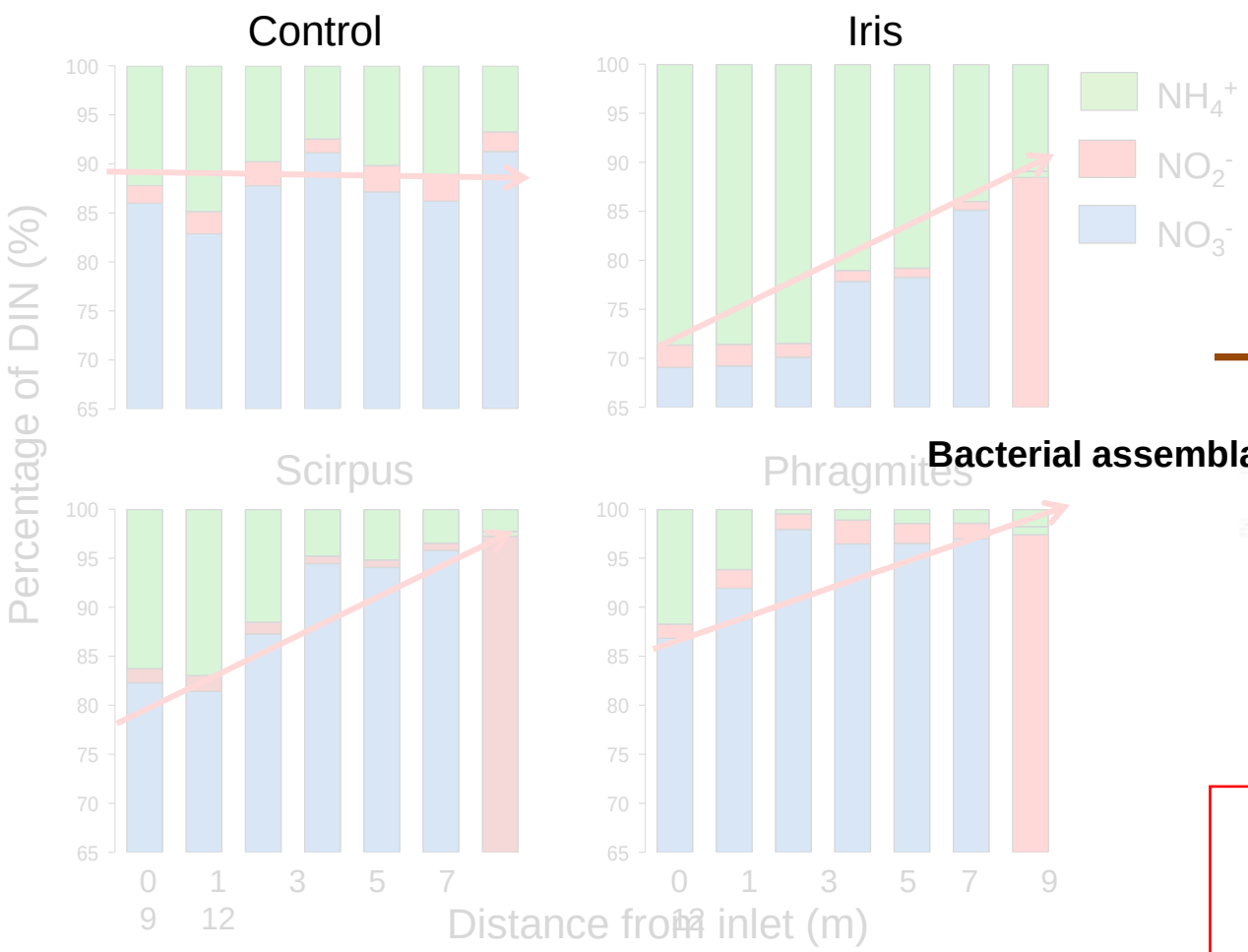
Experimental setting:

- 12 channels with sub-surface flow.
- 4 treatments: Control, *Iris*, *Scirpus* and *Phragmites*

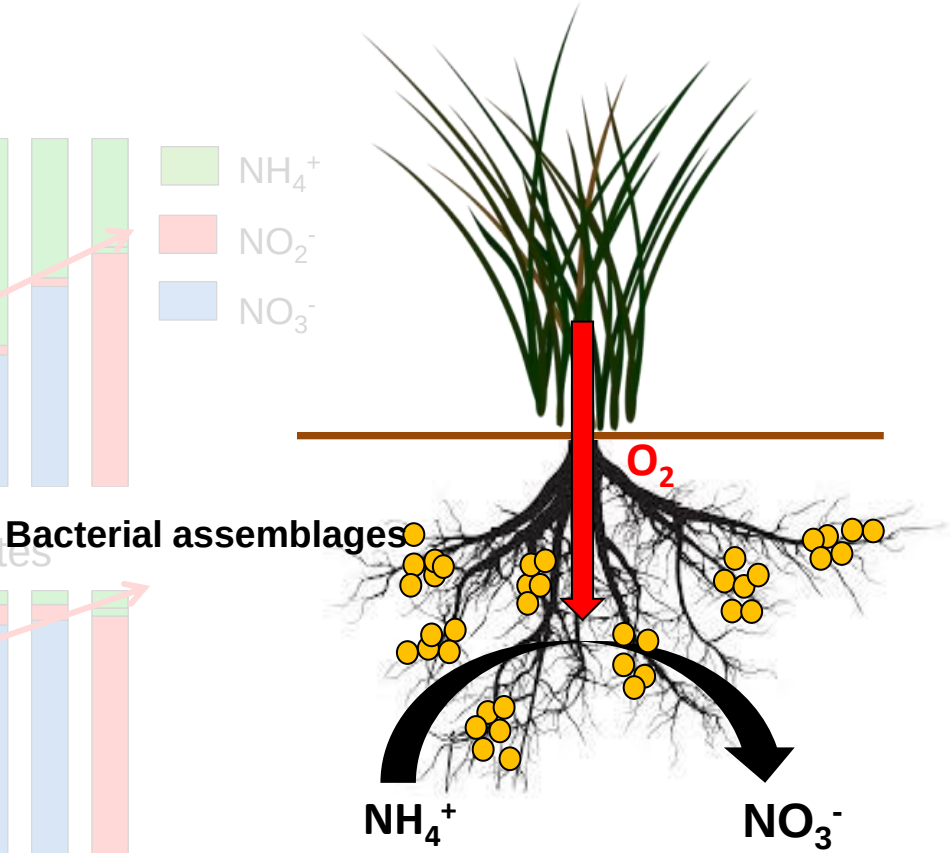
Experimental approach:

- Examine carbon and nitrogen longitudinal profiles

Nitrogen transformation

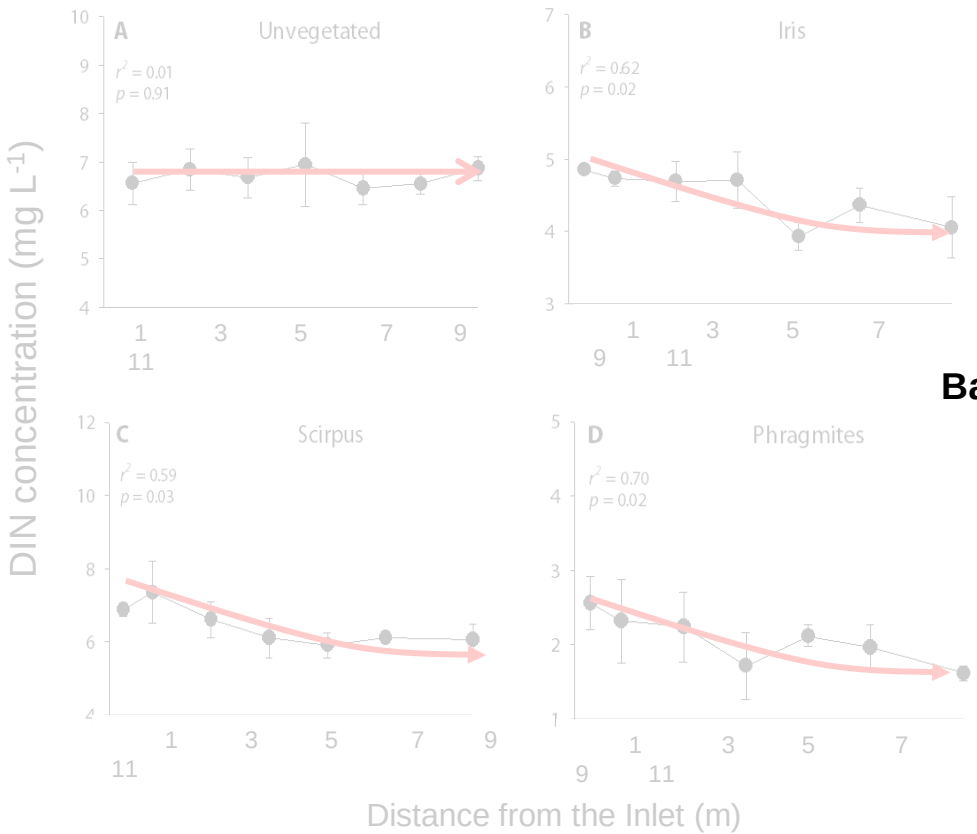


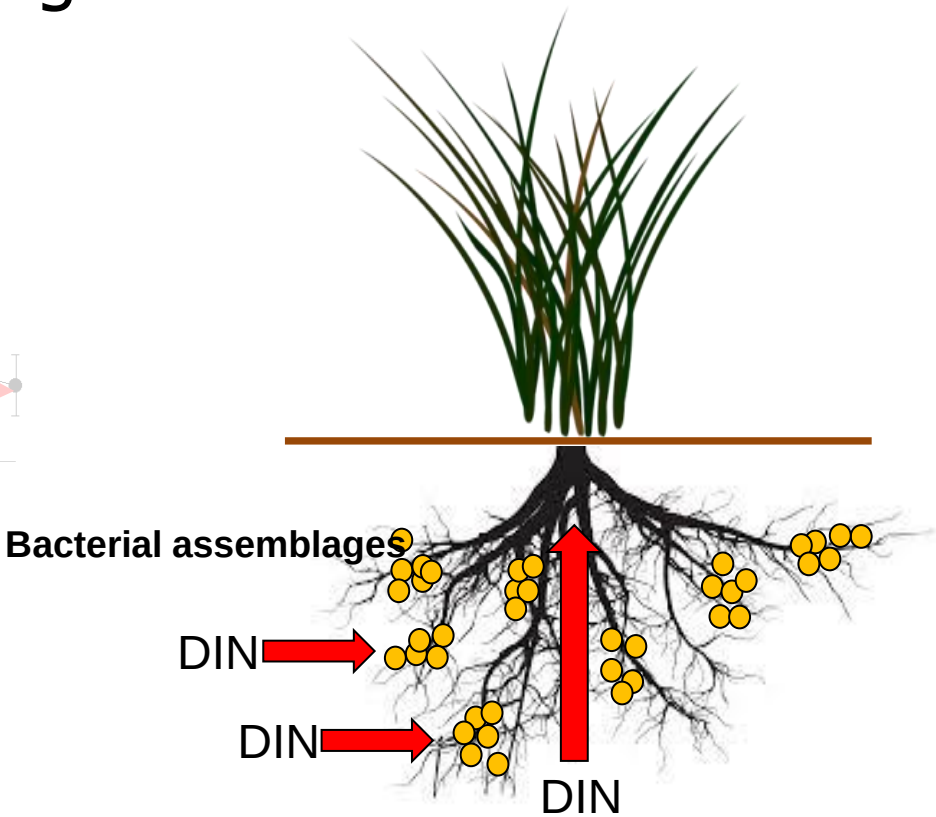
Transformation of NH_4^+ to NO_3^- ONLY in vegetated flumes!!



Helophyte translocate O_2 from shoots to roots generating aerobic microenvironments that enhances NITRIFICATION

Nitrogen removal

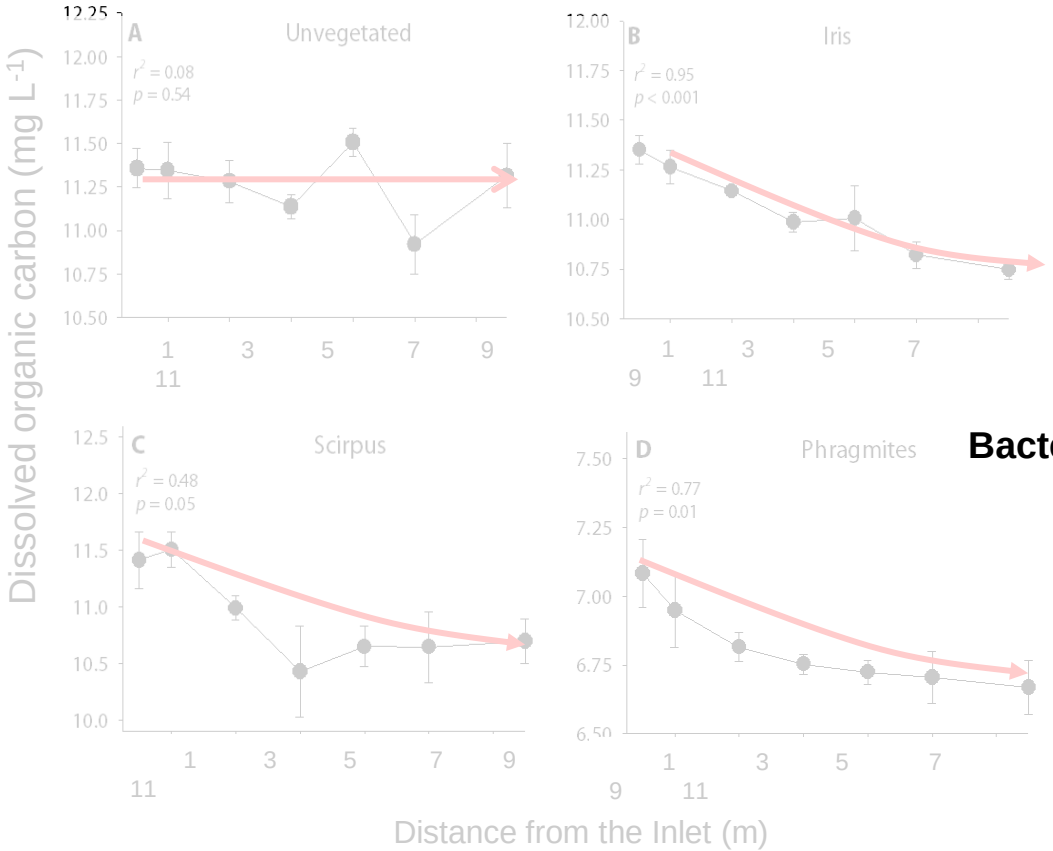


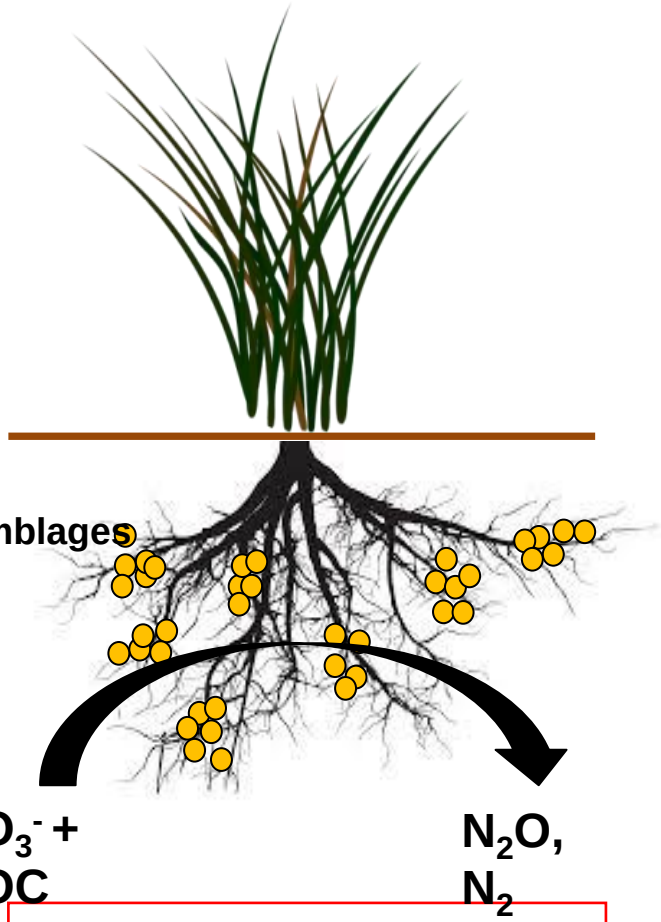


Direct (helophytes) and indirect (biofilm in the rhizosphere)
ASSIMILATORY UPTAKE

Decreases in DIN concentration ONLY in vegetated flumes!!!

Carbon removal

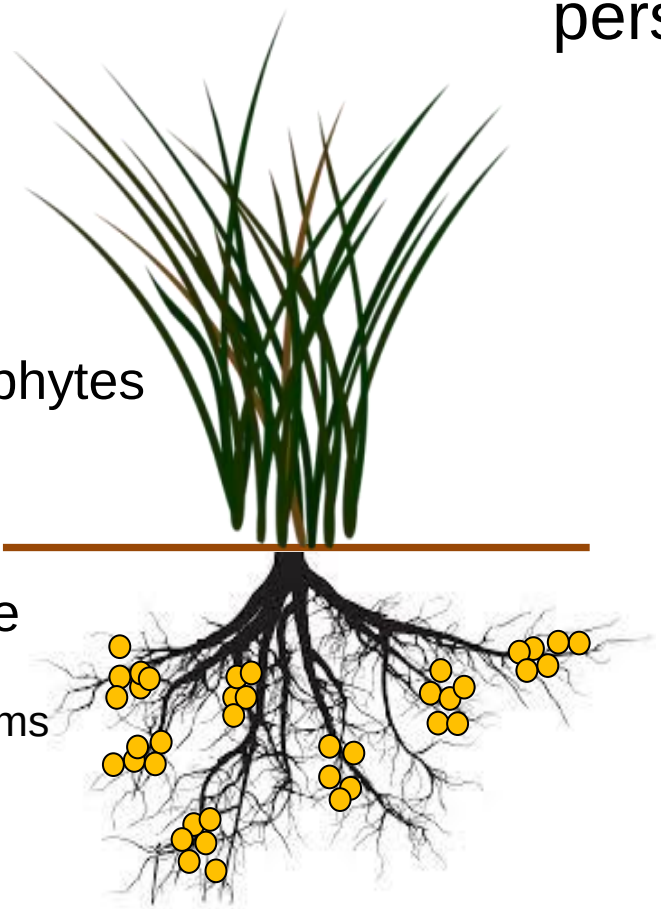




Helophytes may enhance DINITRIFICATION, thus the permanent DIN removal

Decreases in DOC concentration ONLY in vegetated flumes!!!

Bioengineering techniques from a functional perspective



Bioengineering techniques can enhance the removal of N and C in streams receiving inputs from WWTP

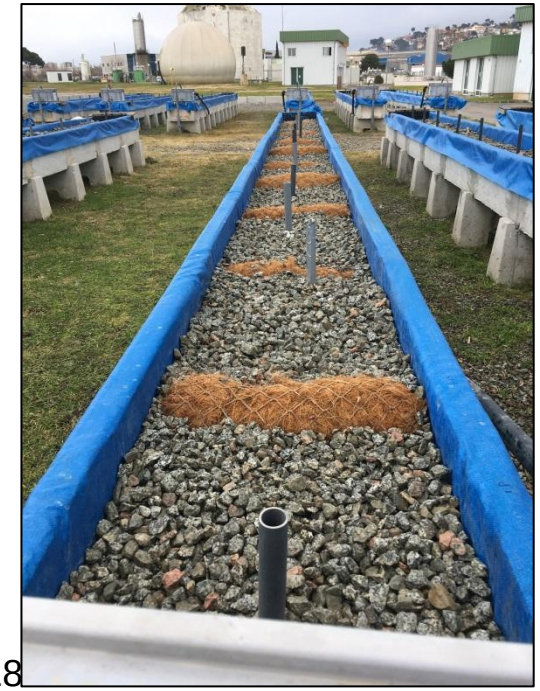
Importance of the rhizosphere as hotspots of microorganisms activity!!!

Ongoing research: effect of substrata on solute retention

Fiber rolls as substrata for plant
deployment in streams

Effect of substrata on biofilm development and activity

Fiber roll



Rock roll

Experimental setting 2017-2018

Nutrients, metals, pharmaceutics and pathogen retentio

URL
THE URBAN RIVER LAB

Thanks for your attention!

We welcome collaborative research at URL!!
www.urbanriverlab.com