Soil & water bioengineering techniques to solve hydraulic problems and slope river stability improving landscape and biodiversity

naturalea

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What are Soil & water bioengineering techniques

The soil & water bioengineering is the constructive discipline that pursues technical, ecological, aesthetic and economic objectives, using mainly living materials such as seeds, plants, parts of plants and plant communities, alone or in combination. with inert materials such as stone, earth, wood, iron or steel, as building elements.

H. M. Schiechteln

Works from Schiechteln Austria

Soil bioengineering, one old modern discipline: The roots of willows prevent the collapse of banks of canals and branches of willows that are placed in the margins and then cut each year and become dense and thus yields a margin of lives in one piece.

Léonardo da Vinci

Plants, the base of Soil & water bioengineering techniques

Selection criteria of the plant

Physical Conditioners

Weather
Land relief
Lithology
Edaphology
Hydraulics

Phytogeography

Species

Biological
Landscape
Engineering

List of suitable species

Introduction technique

Which plants?

Biotechnical characteristics

A series of characteristics that make them especially interesting for stabilization:

Faculty to colonize degraded lands (pioneer species)

Adventitious root emission capacity

Rooting ability of steams and branches

Mechanical tensile strength of roots and Stems

Resistance to falling stones

Surface coverage capacity

Survival capacity after planting

Resistance to watering

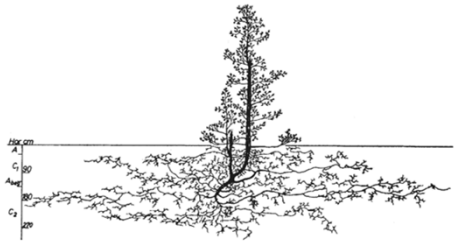


Figura 3.6: Juniperus communis ssp. communis (Kutschera –Sobot ik, 1997)

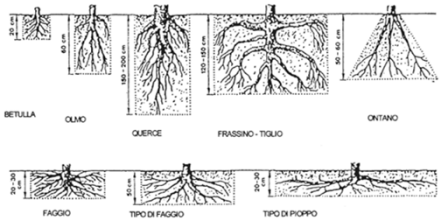


Figura 3.7: Confronto tra i diversi apparati radicali delle diverse specie di alberi (Mathey, 1929)

Importance of the relation between the volume of the radical part and the aerial part of several plants:

Arbusti e alberi		*Piante erbacee*	
Salix glabra	2,4	*Stipa species*	5-15
Viburnum Lantana	2,3	*Equisestum arvense*	5,5
Erica carnea	2,0	*Rumes scutatus*	5,5
Salix eleagnos	1,8	*Deschampsia caespitosa*	1,6
Salix nigricans	1,8	*Festuca ovina*	1,1
Alnus viridis	1,6	*Anthyllis vulneraria*	0,8
Salix purpurea	1,5	*Achillea millefolium*	0,7
Fraxinus excelsior	1,5	*Lotus corniculatus*	0,7
Ligustrum vulgare	1,2		
Acer pseudoplatanus	1,1		
Hippophae rhamnoides	1,0		
Berberis vulgaris	0,6		
Salix alba	0,5		

Fonte: da Schiechtl, 1973

- Mechanical tensile strength
- Consolidating action of the soil: Depends on the shape of the root apparatus, rooting density and root mass
- Edaphology strength: the action of improvement of the land that allows through the succession to pass from the pioneer species to other stages of vegetation more evolved thanks to the climatic and soil improvement, thanks to either the root symbiosis for the fixation of Nitrogen (Legumes) or to the loss of leaves (Alnus)

Working with hydrophytes

Phalaris arundinacea

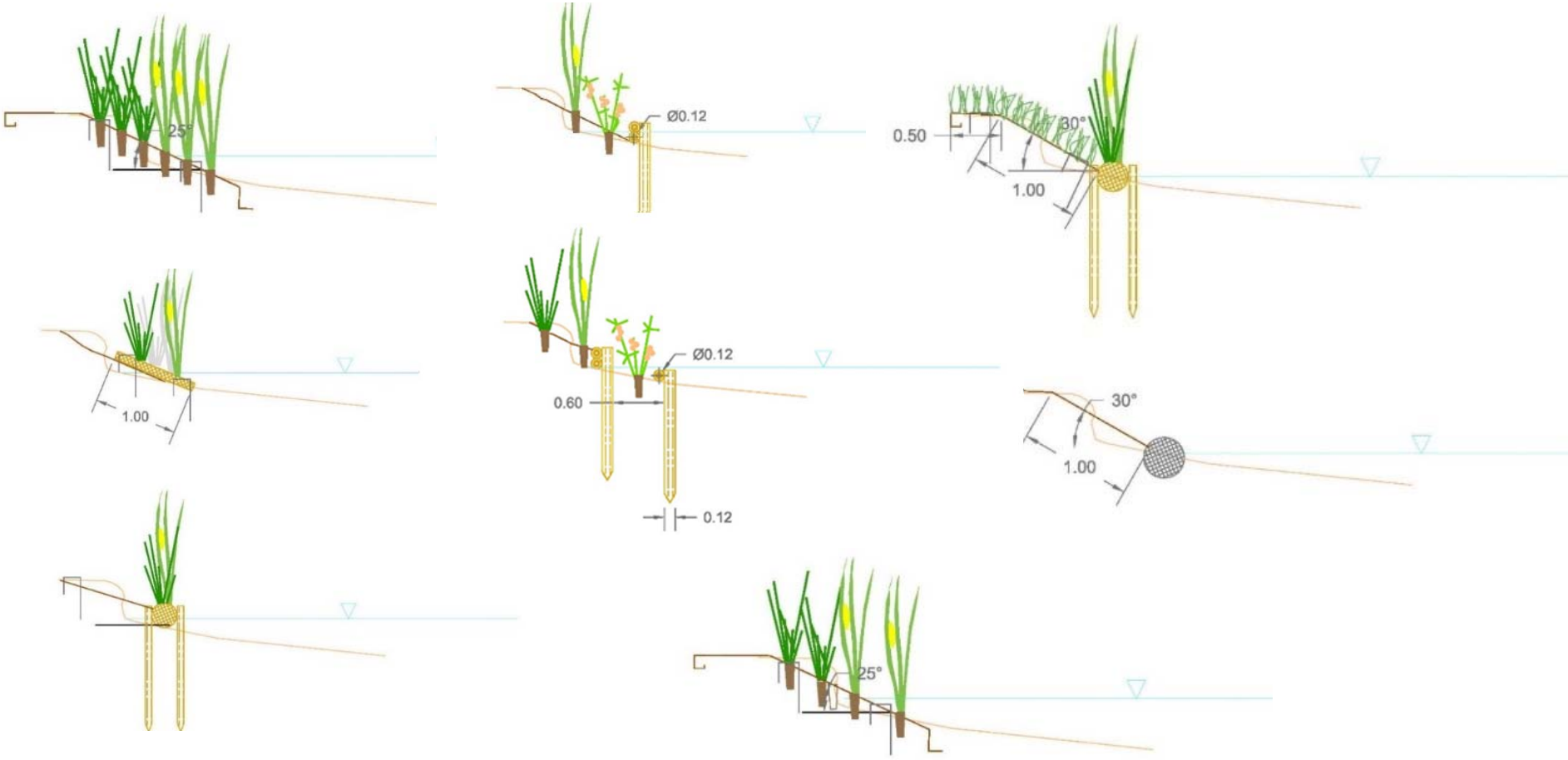
Phragmites australis

Typha latifolia

Images: Dr. Florent Chazarenc. GEPEA. Ecole de Mines. Nantes

Parc Agrari del Llobregat, Barcelona

Iris pseudacorus, Scirpus lacustris and *Sparganium erectum*



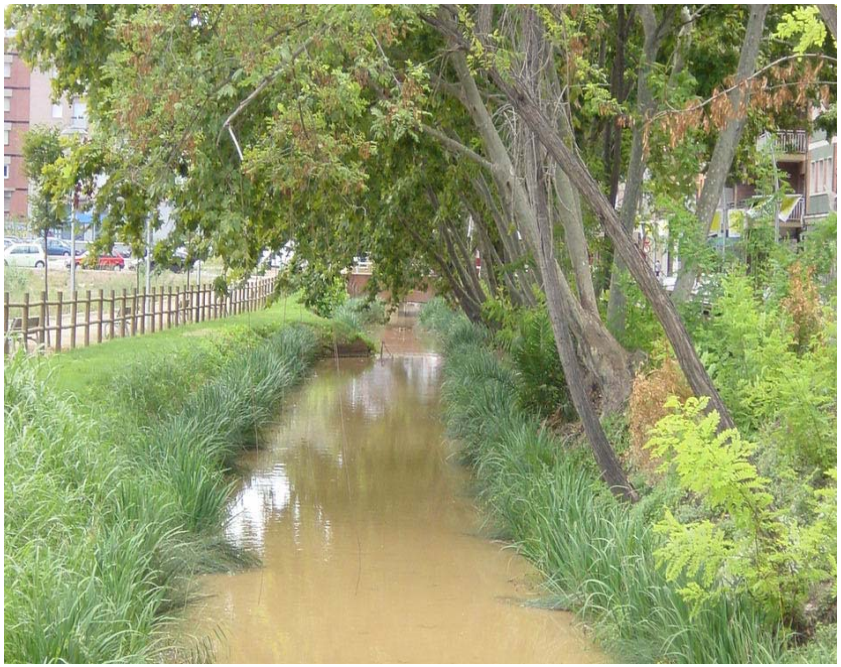
Parc Agrari del Llobregat, Barcelona





Parc Agrari del Llobregat, Barcelona

Sant Boi de Llobregat channels



Slope grid in Palma de Cervelló, Barcelona

Congost River, La Garriga, Barcelona

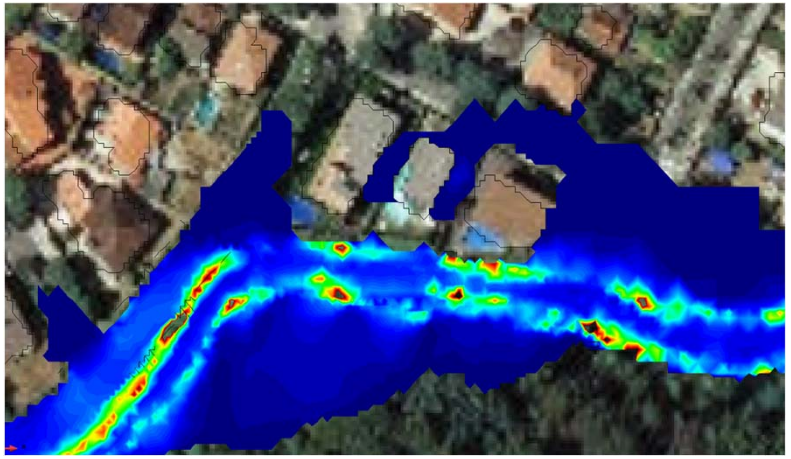
Tenes River, Santa Eulàlia de Ronçana

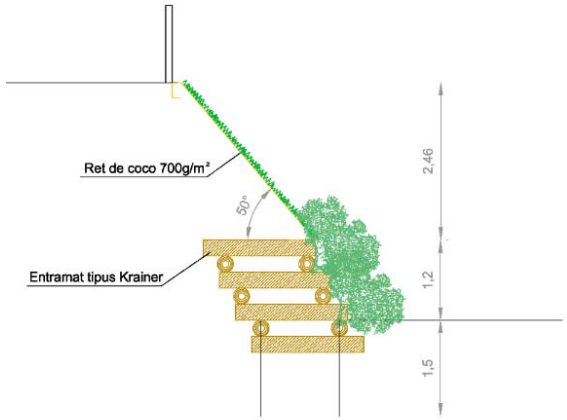





Tenes River, Santa Eulàlia de Ronçana

Can Cabassa Stream, Sant Cugat del Vallès



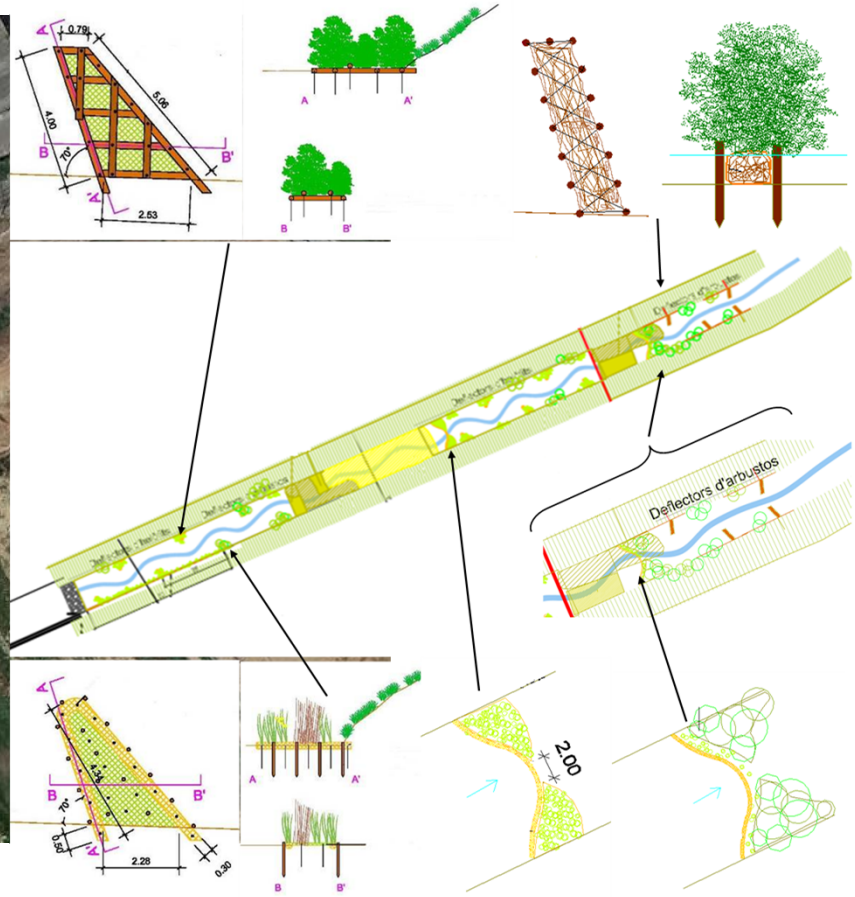


Can Cabassa Stream, Sant Cugat del Vallès

Sant Antoni de Vilamajor, Barcelona

Viladecans, Barcelona

Esquema de la intervención:



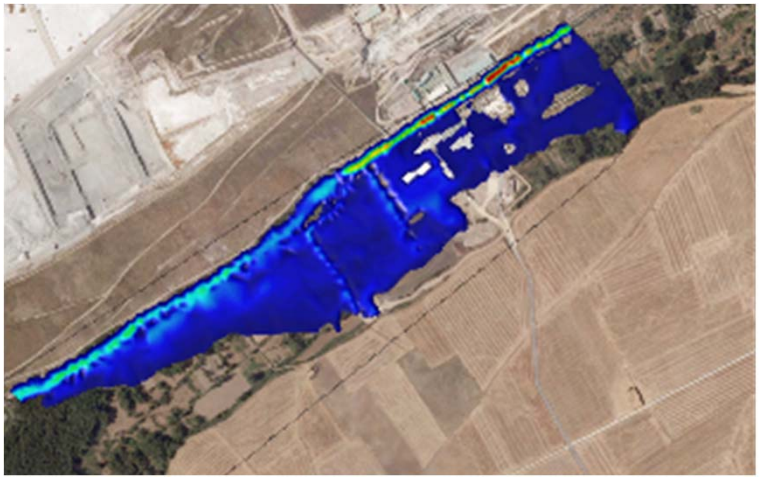
Viladecans, Barcelona 2016-2017-2020

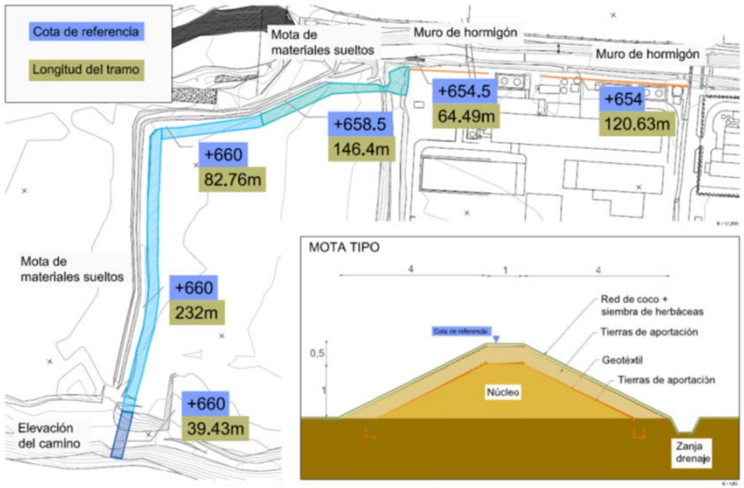


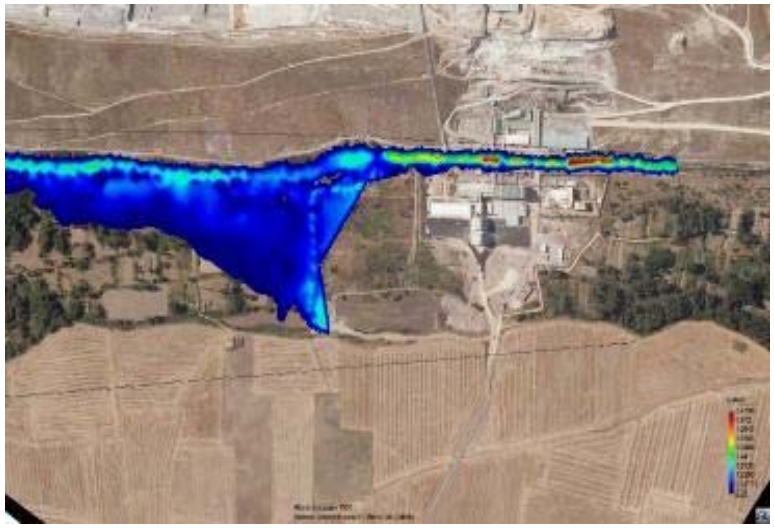




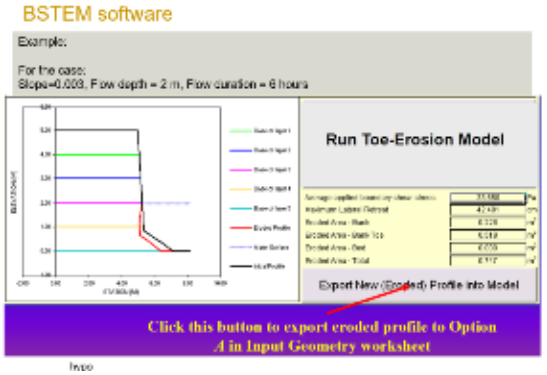
Tiron River, Burgos

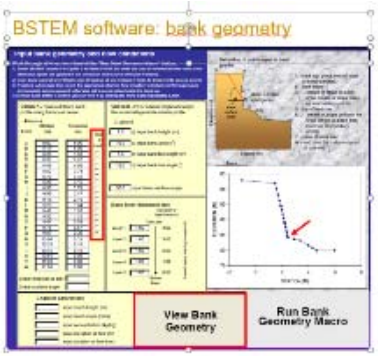


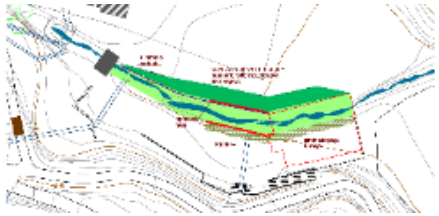


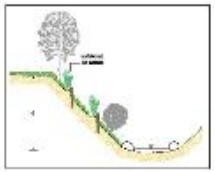


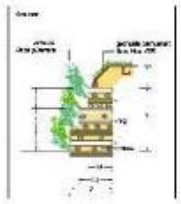
Sant Hilari Sacalm, Girona



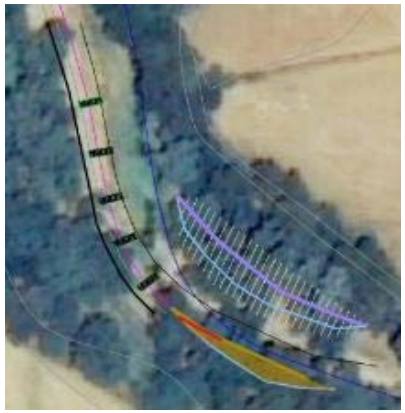








Sentmenat Stream, Palau-solità i Plegamans



Besalú, Girona

Thank you!

naturalea

25 years of experience working for landscape improvement

A company located in Castellar del Vallès, Barcelona, specialized in the design and execution of systems for landscape restoration and conservation and urban spaces naturalization, prioritizing the use of Nature-Based Solutions (NBS).
Pioneers in soil and water bioengineering techniques implementation.
Twenty-five years' experience in the field, with more than a thousand executed works and hundreds of drafted projects developed.

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