2nd Mediterranean Plant Conservation Week
"Conservation of Mediterranean Plant Diversity: Complementary Approaches and New Perspectives"

STRUCTURAL BASIS OF A HABITAT: A MODEL TO CHOOSE SPECIES TO BE USED IN HABITAT RESTORATIONS.

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A basic, initial question!

How the species to be used in habitat restoration projects must be choosen?

(Election is not easy! .... Often only the main species seen in similar 'correct' habitats are used)

Restoration officers often only have two possible ways :

-only the main species seen in similar 'correct' habitats are used (particularly if they are already produced in nurseries).

-'copy and past' from former projects!

GENMEDOC project

GENMEDOC was a multinational project for Mediterranean centres of plant conservation developed in 2005-2006

It was funded by the European Union's Interreg IIIB MedOcc initiative

Interreg projects GENMEDOC and SEMCLIMED (2006-2008) were the starter projects to set up the current network GENMEDA

GENMEDOC project

-One of the main GENMEDOC actions consisted of the performance of habitat restoration projects

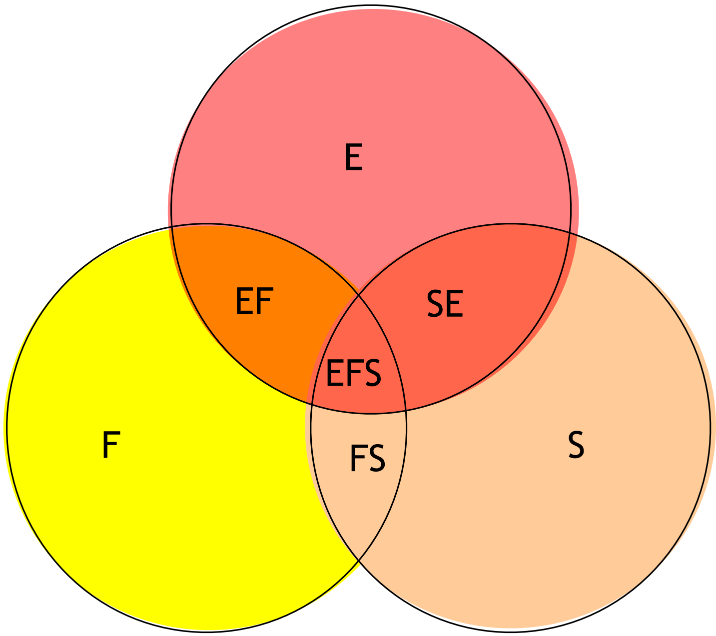
-Simultaneously, one of the GENMEDOC partners, developed a theoretical model to choose species for habitats restoration named **Structural Basis of a Habitat** (BEH)*

*Initial name in other languages:
Spanish: Base estructural de un hábitat (BEH)
French: Base structurale d'un habitat (BEH)

STRUCTURAL BASIS OF A HABITAT

BEH comes from a combination of 3 kinds of characters/role of each plant species forming part of a vegetation rélevée:

-Structure (E)
-Functional role (F)
-Singularity (S)



https://www.uv.es/elalum/documents/BaseEstructuralHabitat.pdf

HOW SPECIES ARE CHOOSEN

A joint index I^{beh} is obtained for each species after a rélevée (as more representative as possible) of the plant community to be restored.

Scores are different depending on components (=fractions) of SBH

Structure (E): Up to 16 points
Function (F): Up to 8 points
Singularity (S): Up to 7 points

At least 4-5 species having highest scores should be choosen (+ if desired, some species having the highest scores only for S fraction)

https://www.uv.es/elalum/documents/BaseEstructuralHabitat.pdf

STRUCTURAL FRACTION (E)

'Structural' species are those which dominate and physiognomically characterize a habitat / vegetation type

They have the higher abundance-dominance values in vegetation rélevées (i.e. using the Braun-Blanquet's phytosociological method; usually AD=3, 4 or 5)

Str

Phytosociological index AD Abundance-Dominance	**Phytosociological index Sociability**	**E score**
+	Any	0
1	1-3	4
	>3	6
2	1-3	8
	>3	10
≥3	1-3	12
	4-5	16

FUNCTIONAL FRACTION (F)

Based on the concepts of JONES et al. (1994)

'Engineer' species are those that built up the ecosystems, facilitating the establishment of other species thanks to positive interrelationships

'Not engineers' (=non-engineering species) are those which are benefited by other species but not facilitating the establishment of third ones

JONES, C. G., H. J. LAWTON & M. SHACHAK (1994). Organisms as ecosystem engineers. *Oikos* 69: 373-386.

FUNCTIONAL FRACTION (F)

Facilitation can be done in two ways:

'Autogenic' engineering: facilitation to other species is given thanks to the own structure (i.e. trees giving shade which benefits nemoral herbs)

'Allogenic' engineering: facilitation is given thanks to changes that they produce on the physical or chemical properties (i.e. species which acidify the soil, benefiting acidophilic species)

FUNCTIONAL FRACTION (F)

In addition, both autogenic and allogenic engineering species can perform their roles in two ways:

'Direct' engineering: facilitation to other species is given thanks to characteristics of the own engineer species (i.e. leaves of broadleaved species facilitate a quick incorporation of organic matter to soils)

'Indirect' engineering: the facilitation is performed thanks to third species or processes (i.e. tree branches serve as hangers to birds, which facilitate dispersal of endozoochorous seeds of third plant species)

Functionality			F score
Not engineer			0
Engineer	Indirect	allogenic	2
		autogenic	4
	Direct	allogenic	6
		autogenic	8

SINGULARITY FRACTION (S)

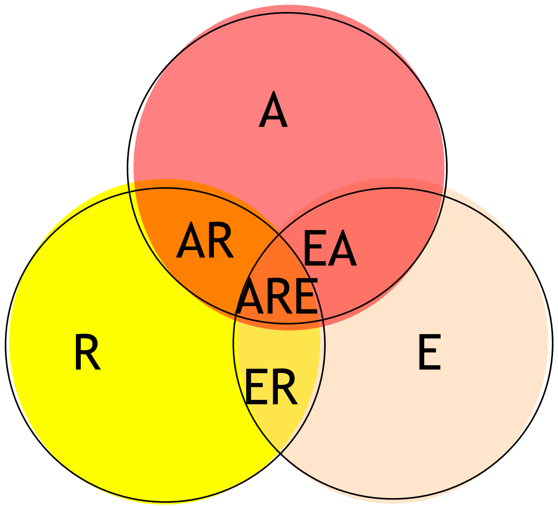
'Singular' species are those deserving special attention/care due to their conservation needs, rareness or endemicity degree

Three concepts are combined:

-Conservation risk (a): Threatened (A) vs Not threatened

-Rarity / Rareness (r): Rare (R) vs Not rare (common species)

-Endemicity (e): Endemic (E) vs Not endemic



SINGULARITY FRACTION (S)

Scores:

-Conservation risk (a): 0 (not threatened) to 4 (endangered of extinction)

IUCN VU: 3.33

IUCN EN: 3.66

IUCN CR: 4.00

-Rarity / Rareness (r): 0 (common) to 2 (very rare)

-Endemicity (e): 0 (not endemic) to 1 (endemic)

STRUCTURE [E] (0-16)	FUNCTION [F] (0-8)	SINGULARITY [S] (0-7)			FINAL SCORE = I^{beh} (0-31)
		CONSERVATION RISK [a] (0-4)	RARENESS [r] (0-2)	ENDEMICITY [e] (0-1)	
Structural (+16)	Engineer (+8)	Threatened (+4)	Rare (+2)	Endemic (+1)	31
				Not endemic (+0)	30
			Not Rare (+0)	Endemic (+1)	29
				Not endemic (+0)	28
		Not threatened (+0)	Rare (+2)	Endemic (+1)	27
				Not endemic (+0)	26
			Not Rare (+0)	Endemic (+1)	25
				Not endemic (+0)	24
	Not engineer (+0)	Threatened (+4)	Rare (+2)	Endemic (+1)	23
				Not endemic (+0)	22
			Not Rare (+0)	Endemic (+1)	21
				Not endemic (+0)	20
		Not threatened (+0)	Rare (+2)	Endemic (+1)	19
				Not endemic (+0)	18
			Not Rare (+0)	Endemic (+1)	17
				Not endemic (+0)	16
Not structural (+0)	Engineer (+8)	Threatened (+4)	Rare (+2)	Endemic (+1)	15
				Not endemic (+0)	14
			Not Rare (+0)	Endemic (+1)	13
				Not endemic (+0)	12
		Not threatened (+0)	Rare (+2)	Endemic (+1)	11
				Not endemic (+0)	10
			Not Rare (+0)	Endemic (+1)	9
				Not endemic (+0)	8
	Not engineer (+0)	Threatened (+4)	Rare (+2)	Endemic (+1)	7
				Not endemic (+0)	6
			Not Rare (+0)	Endemic (+1)	5
				Not endemic (+0)	4
		Not threatened (+0)	Rare (+2)	Endemic (+1)	3
				Not endemic (+0)	2
			Not Rare (+0)	Endemic (+1)	1
				Not endemic (+0)	0

How to proceed?

Evaluation table:

For each species, E, F and S (a, r and e) values must be calculated

SPECIES	Phytosociological Value (AD + Sociability)	STRUCTURE **(E)**	FUNCTION **(F)**	SINGULARITY **(S)**			FINAL SCORE (I^{beh})
				CONSERVATION RISK **(a)**	RARENESS **(r)**	ENDEMICITY **(e)**	
Sp1							
Sp2							
Sp3							
...							
...							

Taxon	AD	E	F	S			I_{beh}
				a	r	e	
Juniperus thurifera	3.2	12	8	-	2	-	**22**
Taxus baccata	3.2	12	-	-	2	-	**14**
Pinus nigra subsp. *salzmannii*	3.2	12	-	-	-	-	**12**
Juniperus communis subsp. *hemisphaerica*	2.2	8	-	-	2	-	**10**
Genista scorpius	2.2	8	-	-	-	-	8
Amelanchier ovalis	2.1	8	-	-	-	-	8
Lavandula latifolia	2.1	8	-	-	-	-	8
Helianthemum cinereum	1.2	4	-	-	-	-	4
Thymus vulgaris subsp. *vulgaris*	1.2	4	-	-	-	-	4
Carex halleriana	1.2	4	-	-	-	-	4
Satureja innota	1.1	4	-	-	-	-	4
Medicago sativa	1.2	4	2	-	-	-	6
Teucrium chamaedrys	1.2	4	-	-	-	-	4
Salvia lavandulifolia subsp. *aproximata*	1.1	4	-	-	2	1	7
Rhamnus saxatilis	+.2	-	8	-	2	-	**10**
Anthyllis montana subsp. *hispanica*	+.2	-	-	-	2	-	2
Scabiosa turolensis	+.2	-	-	-	-	1	1
Teucrium expassum	+.2	-	-	-	-	1	1
Ilex aquifolium	+	-	8	-	2	-	**10**
Centaurea pinae	+	-	-	-	2	1	3
Prunus mahaleb	+	-	-	-	2	-	2
Acer campestre	+	-	-	-	2	-	2
Ribes uva-crispa	+	-	-	-	2	-	2

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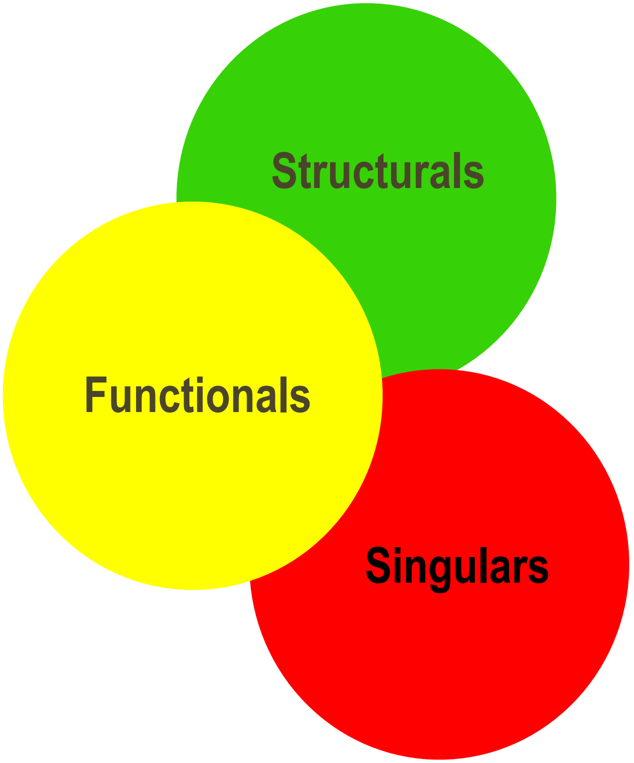
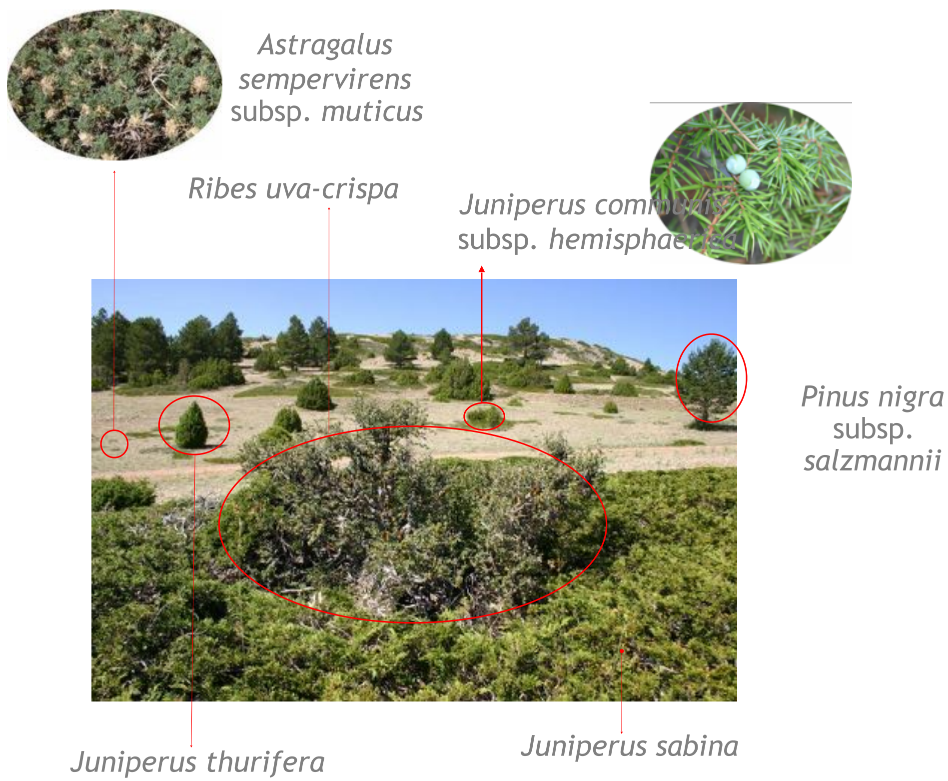
Taxon	Phyt.	E	F	S			I_{beh}
				a	r	e	
Juniperus sabina	3.3	12	8	-	2	-	22
Juniperus thurifera	2.3	8	-	-	2	-	10
Juniperus communis subsp. *hemisphaerica*	2.2	8	-	-	-	-	8
Pinus nigra subsp. *salzmannii*	2.2	8	-	-	-	-	8
Astragalus sempervirens subsp. *muticus*	+.1	-	-	-	2	1	3
Ribes uva-crispa	1.2	4	-	-	2	-	6





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Final remarks:

This proposal is still under drafting, you also can send us comments or ideas to improve the method !

Final election of species can also depend on external reasons such as seed availability, former experience using the same species, etc.

To grow some remarkable species in nursery, and/or to ensure the successful plantation, you can need also a support knowledge on plant biology (i.e. for *Leguminosae*, whose species often need an early association with soil rhizobia,

Please remind that:

Habitat restoration using native plants does not only consist of plant production and plantation.

To ensure the correct evolution of the restoration process, lots of interspecific relationships must be also established o restored, so you maybe also must care to re-establish bird colonies, insect populations, plant-mycorhiza interactions etc.

For further information:

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Many thanks for your attention

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