Employing species and life-form data to guide planting design and vegetation management in a Mediterranean city for plant species conservation

Moustapha Itani, Salma N. Talhouk and Mohammad S. Al-Zein
American University of Beirut, Lebanon

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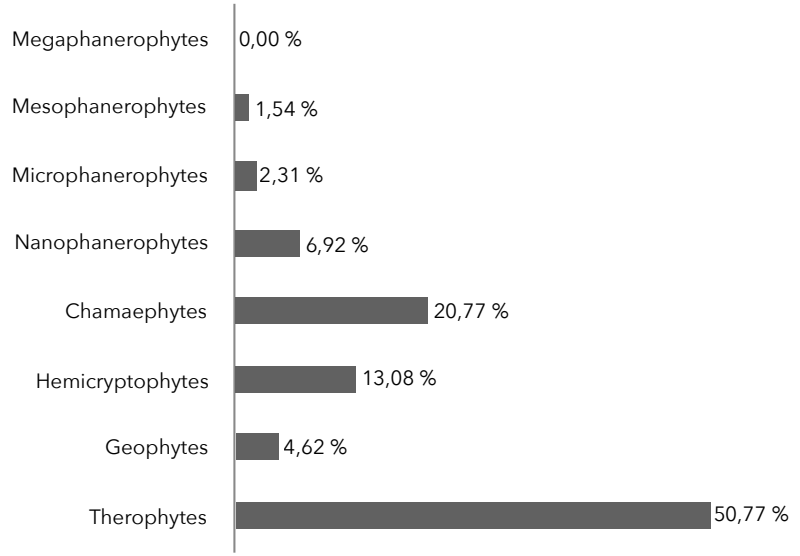
Vegetation in Cities *Probably Not Ideal*

- Abundance of invasive species
- Overrepresentation of ruderals

Raunkiaer Life-form Spectrum of Plots Surveyed in Beirut



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Vegetation in Cities *Not a Dog's Breakfast Either*

Type of City	Extensive Landscape Transformation from Native Vegetation	Driver for Transformation
Type I	Prior to 1600 AD	Agriculture
Type II	After 1600 AD but prior to the initial floristic survey	Agriculture in association with city establishment
Type III	After the initial floristic survey	City establishment

Ecology Letters, (2009) 12: 1165–1173

In Type III cities, small cityscape elements, such as public gardens and street medians, can serve as management units that possess conservation potential.

Greek City	Alien Species %	Endemic Species %	Reference
Ioannina	11.3%	4.8%	Kantsa et al. (2013)
Thessaloniki	14.5%	3.7%	Krigas (2004)
Patras	12.4%	3.2%	Chronopoulos (2002)
Alexandroupolis	8.7%	2.4%	Chronopoulos and Christodoulakis (2006)
Mesolongi	13%	0.9%	Tsiotsiou and Christodoulakis (2004)

Landscape and Urban Planning, (2013) 120, 129-137.

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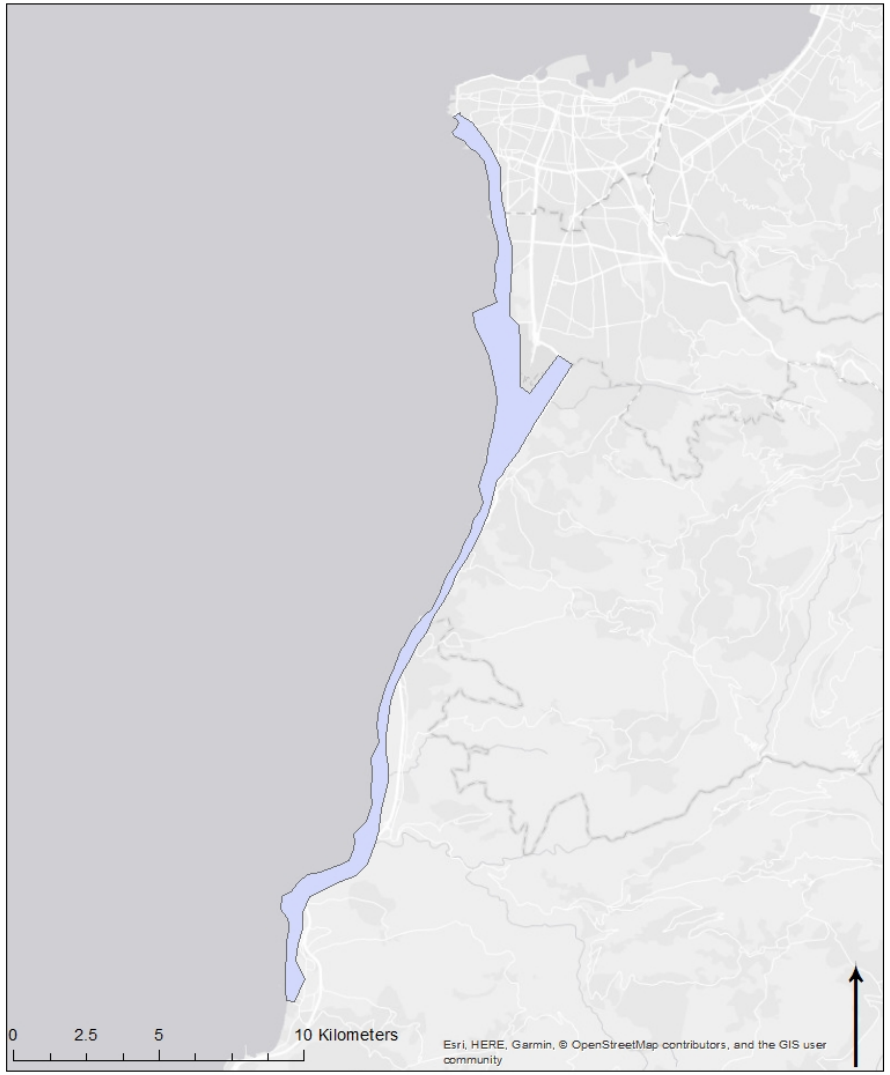
Beirut - Jiyyeh IPA



Disagreement on designation o this IPA

- Most urbanized
- Most fragmented

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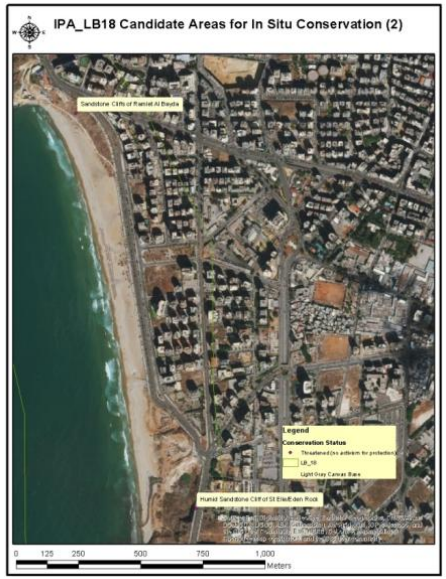
Agreement that remnant patches are of floristic value and their flora needs to be protected whether as the habitat patches as PMRs or ex situ

- Pigeon Rocks, Dalieh and Nearby Sea Cliffs
- Ramlet Al Bayda and St Elie Remnant Sandstone
- Rafic Hariri International Airport Landing Area
- Churchyard of St Georges Church



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Vegetation in Cities *Knowledge Gaps*

- Conservation and management strategies relevant to a range of functionally different taxa
- Guidance for conservation practice to realize opportunities that biodiverse urban areas could provide

Scientific Reports (2017), 7: 40970

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Vegetation in Cities *Managing Vegetation Structure and Diversity*

- Established to have positive effects on biodiversity at the landscape level in urban areas or negative ones if desired
  - ✓ Insect diversity increases with volume and floristic diversity of managed green urban green spaces
  - ✓ Tall trees or shrubs to exclude Canada geese

Ecol. Lett. (2015), 18, 581–592
Glob. Chang. Biol. (2015), 21,1652–1667
Scientific Reports (2017), 7: 40970

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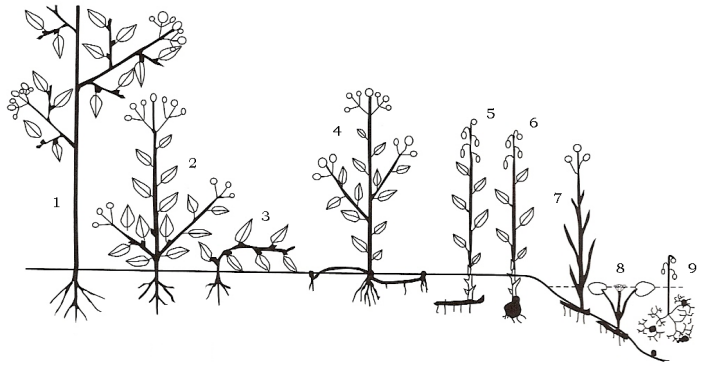
- Life form stronger predictor of underlying population processes than native status
- Life form and life history explain allelopathic potential



PloS one (2012), 7:8, e42906
Plant ecology (2014), 215:6, 661-672

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- Benefits of relying on life form and incorporating it in vegetation description in cities especially when studying plants that aren't therophytes

met T caesp	5.104.3	*Ochlopoa annua* (L.) H. Scholz; *Parapholis incurva* (L.) C. E. Hubb.; *Phleum subulatum* (Savi) Asch. & Graebn.
met T rept	5.204.2	*Rostraria smyrnacea* (Trin.) H. Scholz
met T rept	5.204.3	*Dactyloctenium aegyptium* (L.) Willd.; *Digitaria sanguinalis* (L.) Scop.; *Trifolium resupinatum* L.; *Trifolium scabrum* L.
met T scap	5.304.2	*Alyssum strigosum* Banks & Sol.; *Campanula stellaris* Boiss.; *Cerastium glomeratum* Thuill.; *Galium murale* (L.) All.; *Polycarpon tetraphyllum* (L.) L.; *Sagina apetala* Ard.; *Sagina maritima* Don; *Valantia muralis* L.
met T scap	5.304.3	*Cakile maritima* Scop.; *Crucianella aegyptiaca* L.; *Hymenocarpos circinnatus* (L.) Savi; *Lagurus ovatus* L.; *Lotus angustissimus* L.; *Lotus edulis* L.; *Lotus halophilus* Boiss. & Spruner; *Medicago littoralis* Loisel.; *Mercurialis annua* L.; *Onobrychis crista-galli* (L.) Lam.; *Salvia viridis* L.; *Sideritis romana* L.; *Silene aegyptiaca* (L.) L.; *Silene colorata* Poir.; *Trifolium glanduliferum* Boiss.; *Trifolium purpureum* Loisel.; *Veronica cymbalaria* Bodard
met T scap	5.304.4	*Aegilops geniculata* Roth, *Anagallis arvensis* L.; *Anisantha rigida* (Roth) Hyl.; *Anisantha tectorum* (L.) Nevski; *Avena sterilis* L.; *Euphorbia terracina* L.; *Hordeum vulgare* L.; *Hyoscyamus albus* L.; *Lycopersicon esculentum* Mill.*
met T scap	5.304.5	*Amaranthus hybridus* L.*
met T ros	5.314.3	*Plantago coronopus* L.; *Plantago lagopus* L.
met T sem	5.324.2	*Asteriscus aquaticus* (L.) Less.; *Cichorium pumilum* Jacq.
met T sem	5.324.3	*Cota palaestina* Kotschy; *Crepis aculeata* (DC.) Boiss.; *Hedypnois rhagadioloides* (L.) F. W. Schmidt; *Picris rhagadioloides* (L.) Desf.; *Senecio × berythaeus* A.Camus & Gomb.
met T sem	5.324.4	*Carthamus tenuis* (Boiss. & C. I. Blanche) Bornm.; *Crepis palaestina* (Boiss.) Bornm.; *Erigeron bonariensis* L.*; *Glebionis coronaria* (L.) Spach; *Heliotropium hirsutissimum* Grauer; *Hormuzakia aggregata* (Lehm.) Gușul.; *Malva oxyloba* Boiss.; *Malva* sp.; *Sisymbrium officinale* (L.) Scop.; *Sonchus oleraceus* L.; *Tordylium trachycarpum* (Boiss.) Al-Eisawi; *Urospermum picroides* (L.) F. W. Schmidt

64 species out of 125 that act as ruderals account for 11 therophytic life forms

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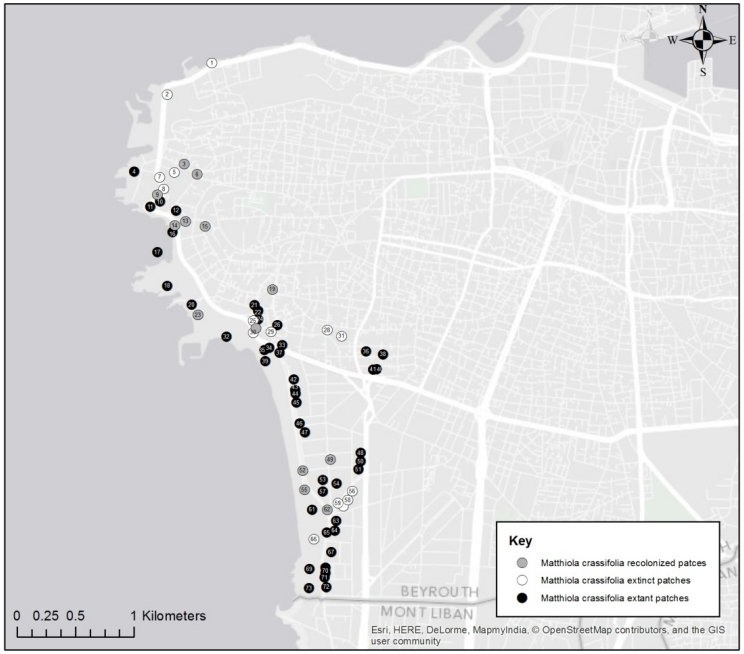
- With the exception of two recently described taxa of *Limonium*, only narrow endemic restricted to the Lebanese coast
- ONLY present in remnant semi-natural sites as well as anthropogenic ones
- Species exhibited usually clumped distribution in most sites



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- 78 quadrat samples intended to represent vegetation associated with and excluding the target species collected
- Sampling restricted to safely accessible sites

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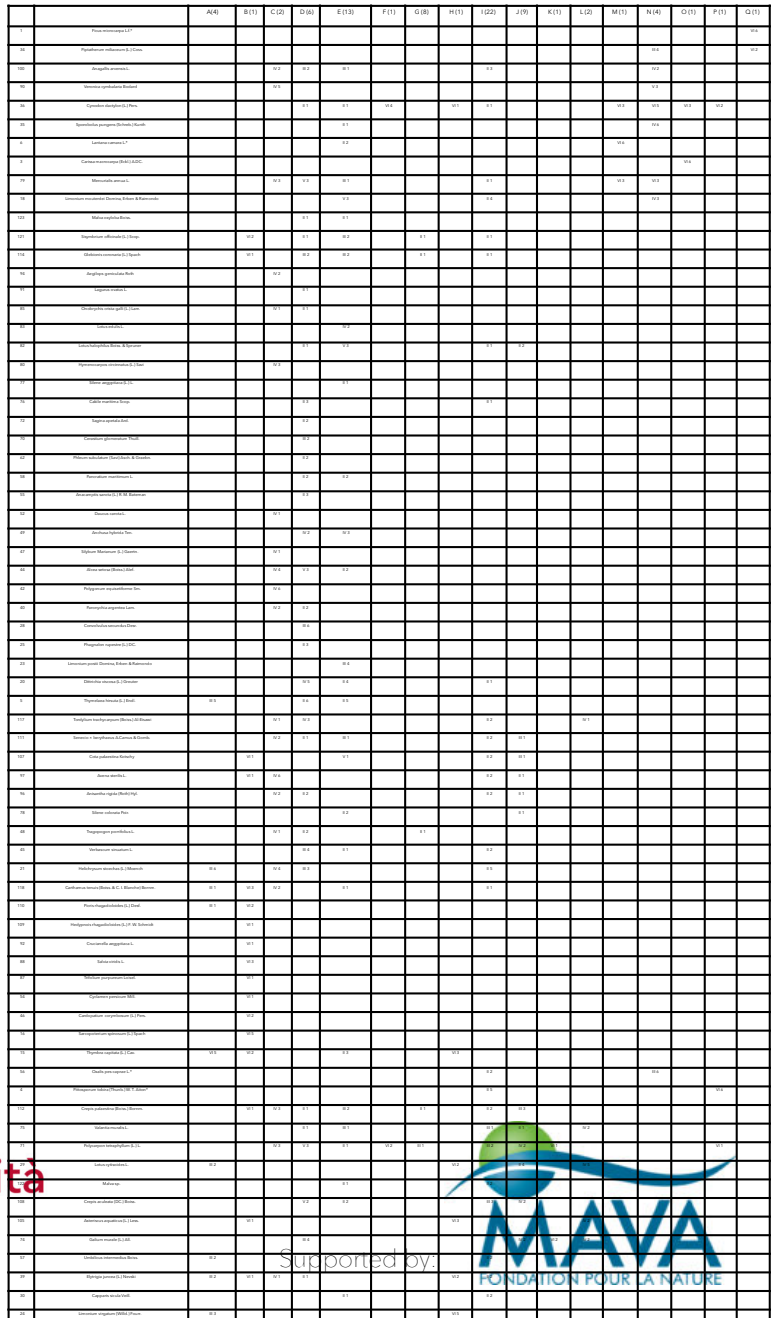
Vegetation Description in Cities *Relying on Floristics Alone*

Quadrat groups didn't represent communities

- TWINSPAN grouped quadrats on the basis on common ruderals, sometimes just the target species



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Vegetation Description in Cities *Integrating Life Form*

		A (1)	B (3)	C (9)	D (12)	E (26)	F (14)	G (4)	H (4)	I (2)	J (2)	K (1)
		-	VI 2	VI 4	V 4	VI 4	V 2	IV 3	-	-	-	-
8	Phaner08			IV 5								
9	Phaner09		V 5	II 1								
10	Phaner10		III 5	II 3								
25	Chamae13		III 6	IV 5								
38	Hemicr12		III 1	II 1		II 1						
31	Hemicr05			II 1		I 2						
17	Chamae05				II 6							
26	Chamae14				II 6							
29	Hemicr03				III 4	II 3						
45	Therop03				IV 2	I 1						
50	Therop08			II 1	V 3	I 1						
44	Therop02				IV 2	III 1						
7	Phaner07					I 6						
11	Phaner11					I 3						
12	Phaner12					II 6						
14	Chamae02					I 5						
21	Chamae09					I 1						
28	Hemicr02					II 2						
32	Hemicr06					I 6						
34	Hemicr08					III 3	II 1					
35	Hemicr09					III 2						
36	Hemicr10					I 2						
39	Geophy01					I 2						
48	Therop06				III 1	IV 3	II 1		III 2			
18	Chamae06				III 4	II 4		III 2				
43	Therop01	VI 1			II 2	I 2						
46	Therop04			III 1	VI 3	IV 2	III 1			VI 2		
27	Hemicr01			II 1	II 2	II 2		III 2				
42	Geophy04			III 3	III 1					IV 3		
53	Therop11		V 2	V 2	V 2	IV 3	IV 1					
20	Chamae08		VI 2	VI 4	V 4	VI 4	V 2	IV 3				
37	Hemicr11				II 1	IV 2	III 2					
52	Therop10				VI 2	IV 2	IV 1					
4	Phaner04				II 6	I 3				IV 6		
5	Phaner05					II 5	II 5					
13	Chamae01				III 4	II 4	II 3	IV 4				
16	Chamae04		V 4		II 4	III 3	III 3	VI 6				
19	Chamae07					I 2	II 1					
40	Geophy02					III 2	II 1		III 6			
47	Therop05				IV 1	IV 3	V 3	III 3	VI 4			
51	Therop09				II 2	I 1		III 3				
15	Chamae03					I 3	VI 4	III 2	III 3			
24	Chamae12					I 2	II 1			IV 6		
41	Geophy03						II 2					
3	Phaner03										IV 6	
6	Phaner06						II 2				IV 6	
23	Chamae11					I 1	II 1	III 2	VI 6	VI 3	VI 3	
30	Hemicr04	VI 6										
22	Chamae10								III 4			VI 2
1	Phaner01											VI 6

Life-form classification quadrat groups

Classification of life form data then forming quadrat groups that resulted from both classifications

Species classification quadrat groups

I (22) VI 4	D (6) VI 4	G (8) VI 4	B (1) VI 3	H (1) VI 2	J (9) V 4	E (13) V 2	A (4) IV 4	L (2) IV 3	C (2) -	F (1) -	K (1) -	M (1) -	N (4) -	O (1) -	P (1) -	Q (1) -
C (9) VI 4		GC (6) VI 4														
IC (3) VI 5																
E (26) VI 4	DE (5) VI 4		BE (1) VI 3		JE (1) VI 3	EE (2) IV 3	AE (2) VI 4		CE (2) -		KE (1) -					
IE (12) VI 4																
B (3) VI 2		GB (2) VI 3				EB (1) VI 2										
D (12) V 4					JD (7) V 5		AD (1) -	LD (1) VI 3								
ID (3) VI 4																
F (14) V 2	DF (1) VI 4					EF(10) V 2										
IF (3) VI 4																
G (4) IV 3				HG (1) VI 2			AG (1) -	LG (1) -								
IG (1) VI 3																
A (1) -					JA (1) -											
H (4) -													NH (4) -			
I (2) -										FI (1) -					PI - (1)	
J (2) -												MJ (1) -		OJ (1) -		
K (1) -																QK (1) -

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Target species very poorly represented in grasslands

- *Avena sterilis* dominated patches

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2nd Mediterranean Plant Conservation Week

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

Spreading Natives

Fear Your Neighbor

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2nd Mediterranean Plant Conservation Week

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

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- Shrubs with scale-like leaves, minimal litter, loose branches

Photo credit: Hicham Al Zein

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- Low-lying spreading succulents

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- Rosulate phanerophytes, or palm-like plants, none are native

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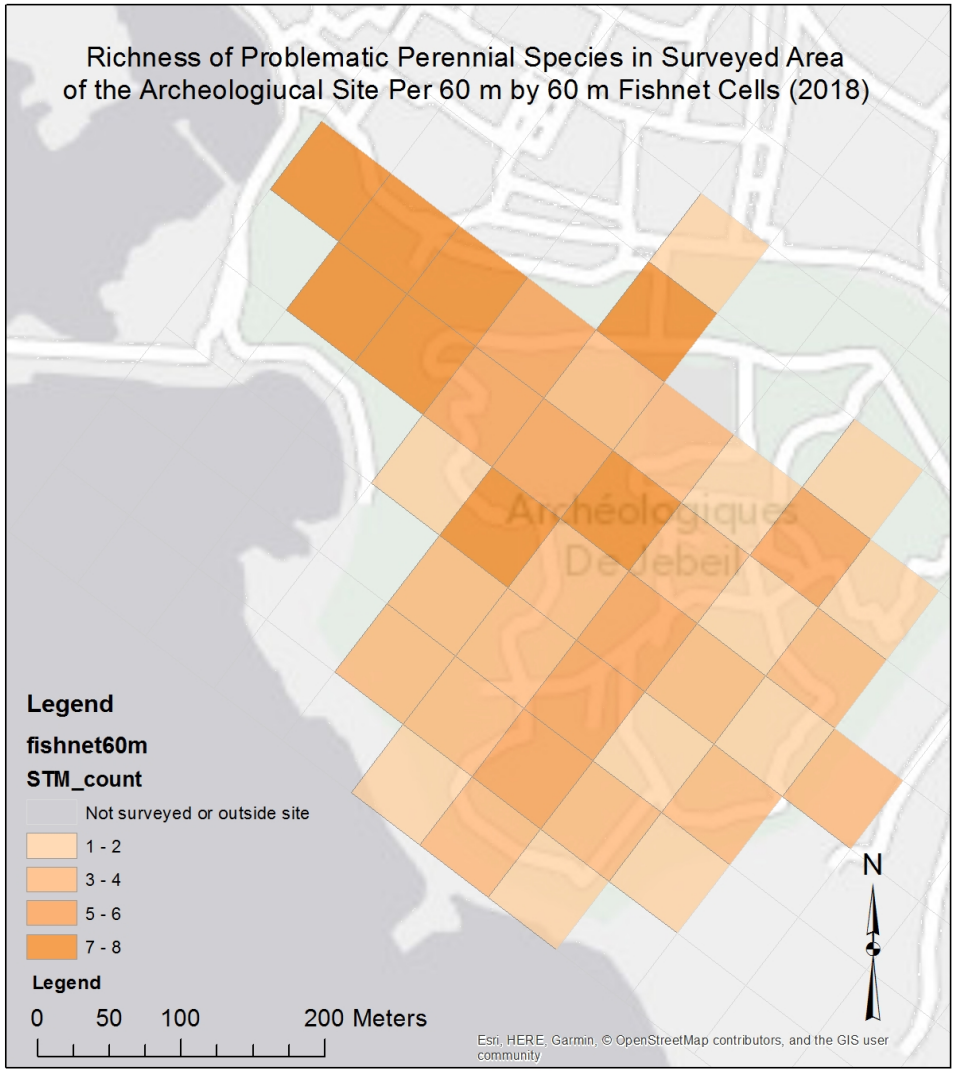
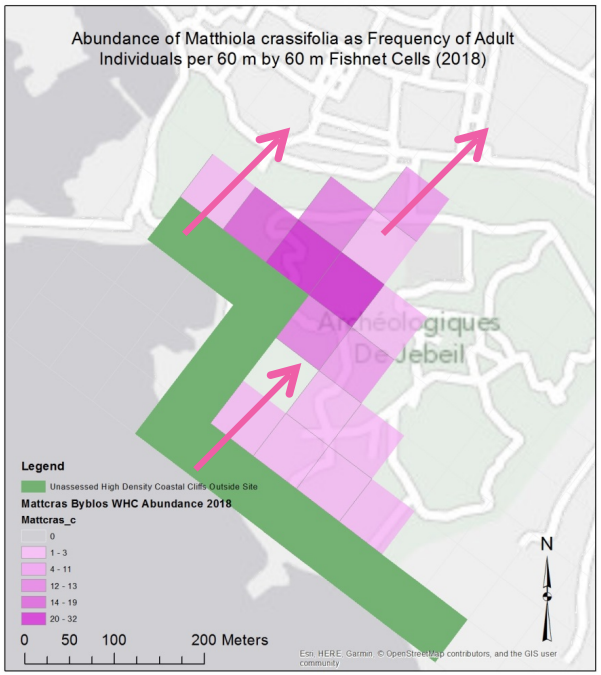


In managing small sites for the persistence of a plant species in cities, be them PMRs, ABGs etc. and to allow the matrix to be more hospitable

Perhaps we need to see the landscape from both the eyes of the plant and the people

And remember that plants don't profile each other based on country of origin



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