Biologia Quantitativa

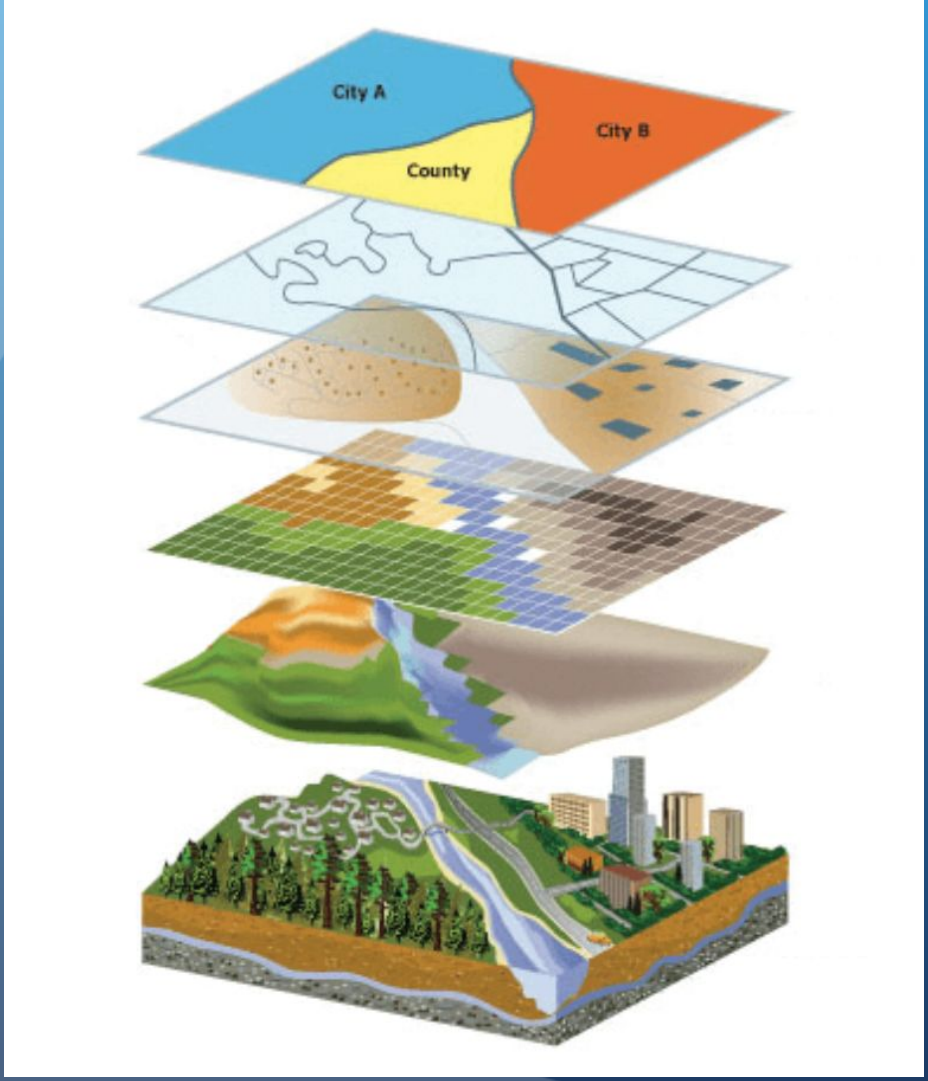
Análises Ecológicas e Sistemas de Informação Geográfica

Depto de Zoologia
30 de julho de 2024

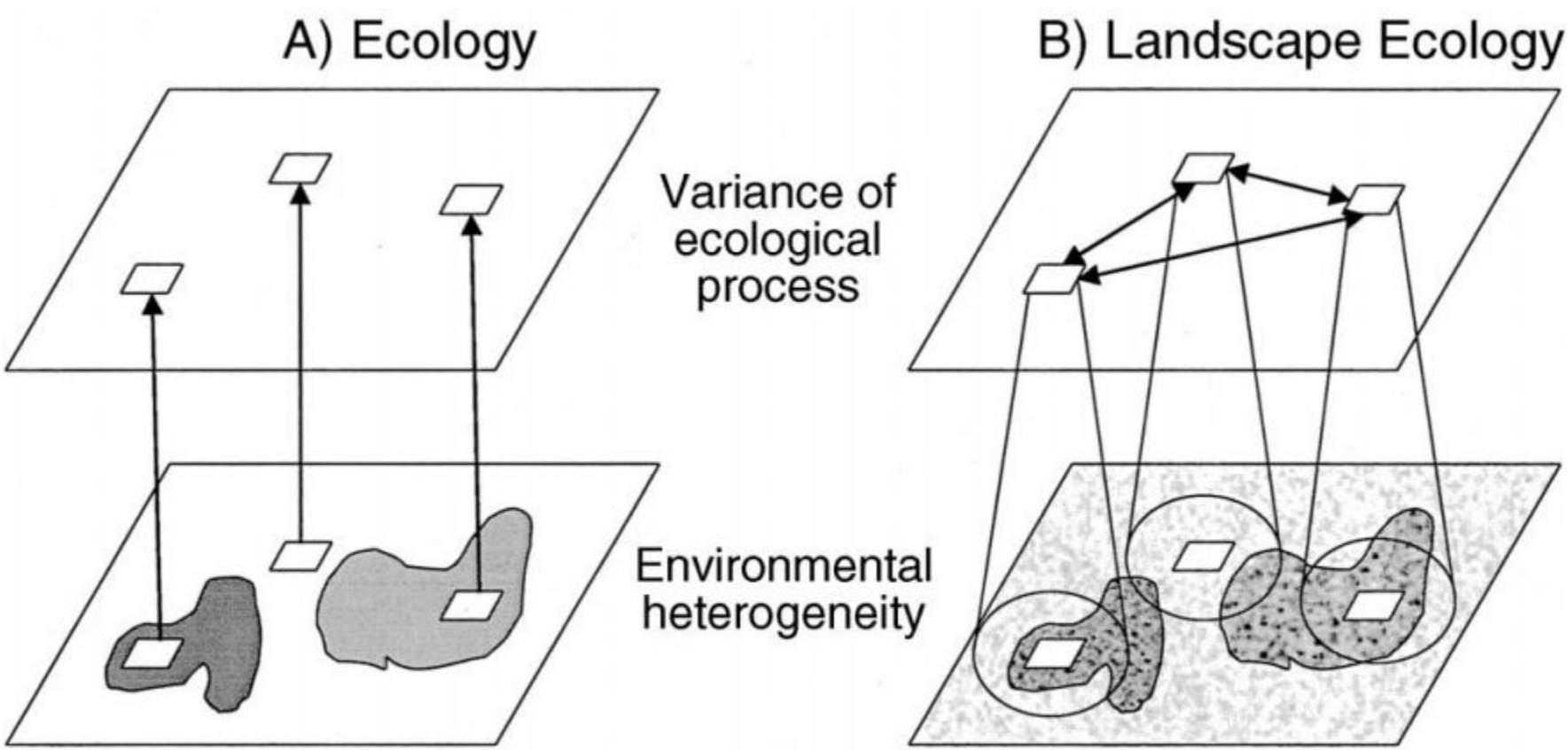
Roteiro da Aula

- Vamos apresentar geoprocessamento e SIG
- medidas de paisagem
- corredores
- combinar dados raster e vetoriais
- modelagem
- análises usando imagens de satélite

Conceito de Camadas em SIG



Dados Ecologicos e Paisagem



Nomenclaturas trad e moderna

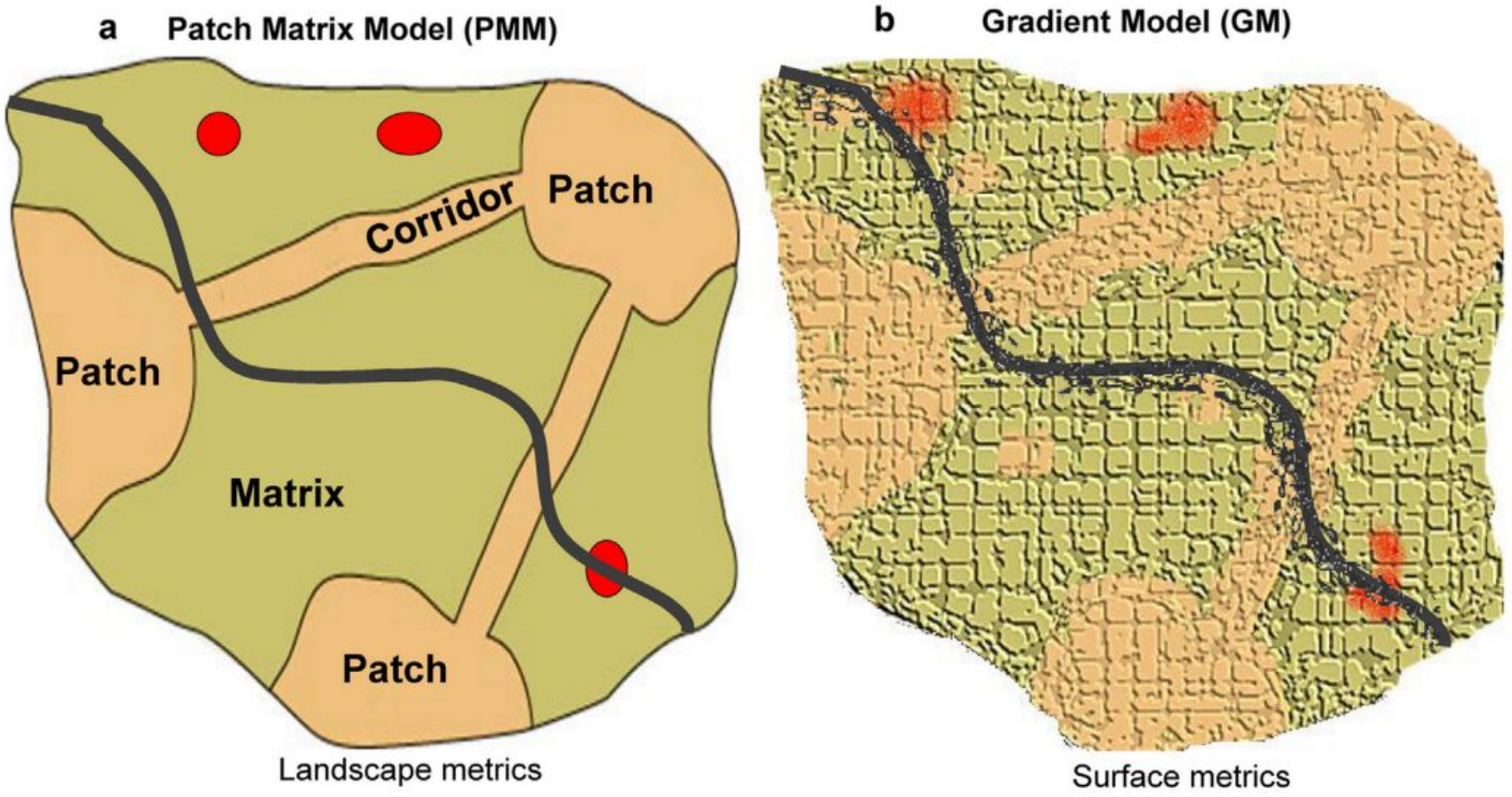


Fig. 1. Representation of landscape structure: (a) Patch matrix model (PMM), (b) Gradient model (GM).

Tipos de Operações

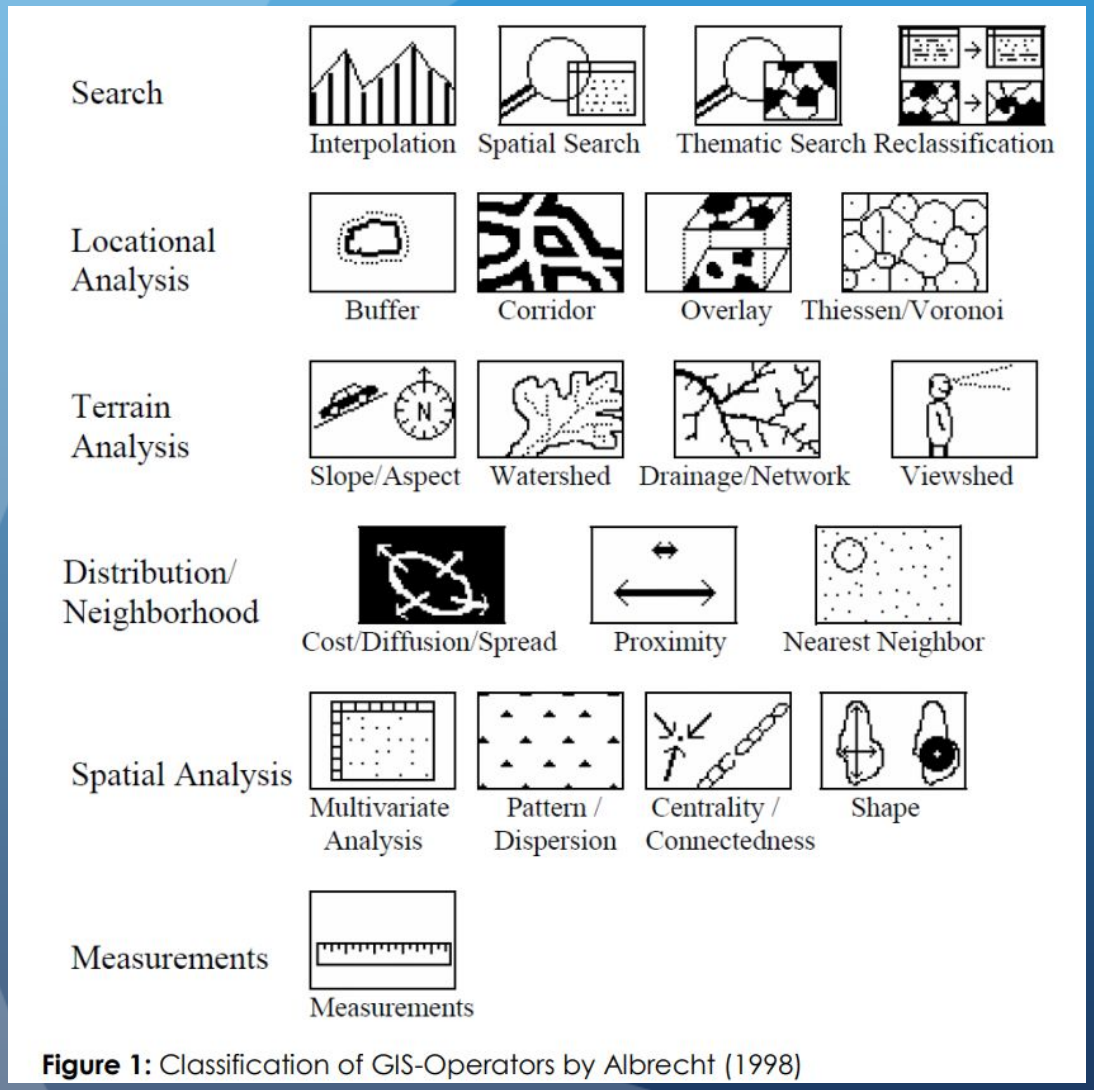
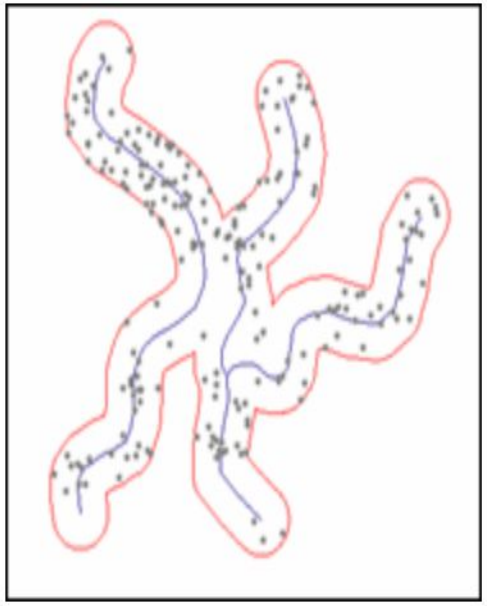


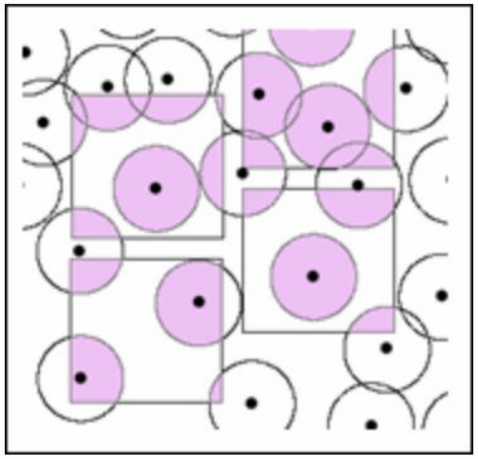
Figure 1: Classification of GIS-Operators by Albrecht (1998)

Exemplos de Operações

Below is an example of a study area clipped to a buffer area:



Below is an example of buffered points overlaid with polygon features:



Combinar dados raster e vetor

Table 2. Statistics of the study area using the grid-based land use classification.

1	2	3	4	5	6
Land use type, t	Land use type	Imperviousness index, f_t	Number of polygons	Area (m^2)	Area ratio (%)
1	Building	1.0	34 054	3 382 235	29.39
2	Parking lot (Pervious)	0.0	177	60 351	0.52
3	Parking lot (Impervious)	1.0	635	207 213	1.80
4	Athletic field (Pervious)	0.0	568	225 656	1.96
5	Athletic field (Impervious)	1.0	48	23 288	0.20
6	Forest	0.0	3 185	1 041 020	9.05
7	Grass	0.0	409	171 526	1.49
8	Field	0.0	483	188 587	1.64
9	Park	0.0	310	104 735	0.91
10	Cemetery	0.0	171	70 392	0.61
11	Paved area	1.0	1 157	379 521	3.30
12	Rail	1.0	570	149 388	1.30
13	Private premises (except buildings)	0.5	16 765	3 432 446	29.83
14	Tennis court (Pervious)	0.0	108	54 613	0.47
15	Tennis court (Impervious)	1.0	62	30 383	0.26
16	Bare land	0.0	117	52 714	0.46
17	Pool	1.0	27	11 750	0.10
18	Road	1.0	45 104	1 785 662	15.52
19	Pond	1.0	85	36 205	0.31
20	River	1.0	307	99 704	0.87
	Total	—	104 342	11 507 390	100.00

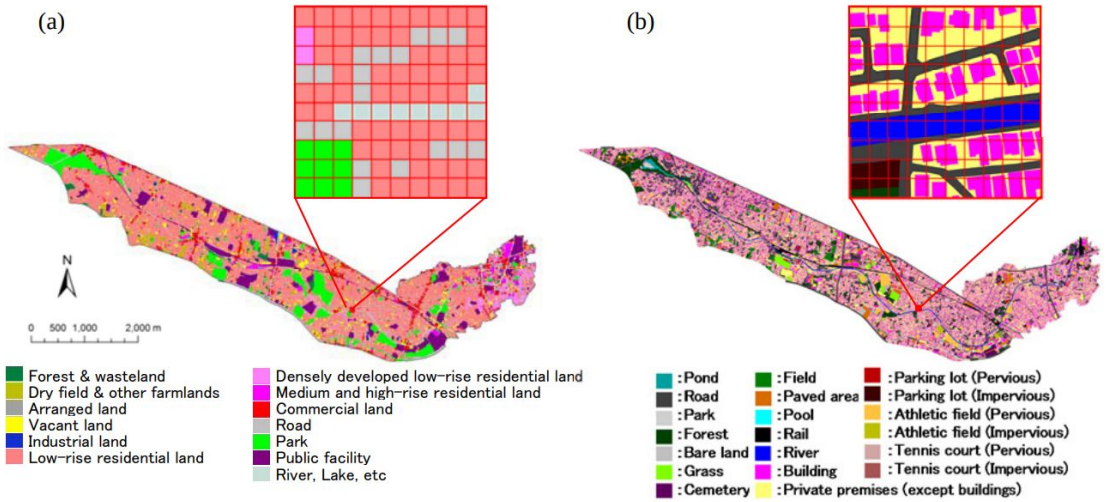


Fig. 1. Spatial distribution of (a) 13 grid-based land use classifications, and (b) individual land surface features of 20 land use types by urban

Combinar dados numéricos e espaciais

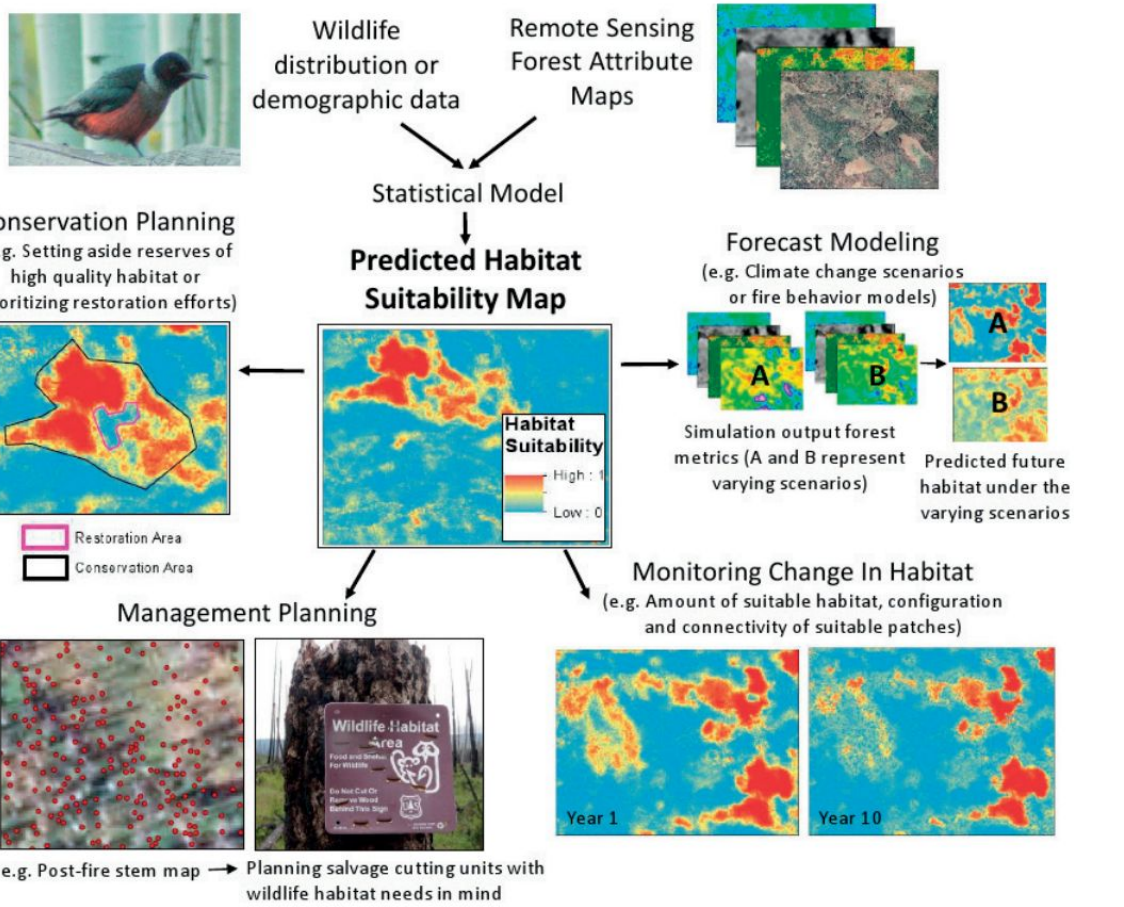
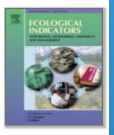


Figure 1. Conceptual figure on the creation of predicted habitat maps using remotely sensed forest predictors and potential management and conservation applications.

Corredores Ecológicos

ELSEVIER

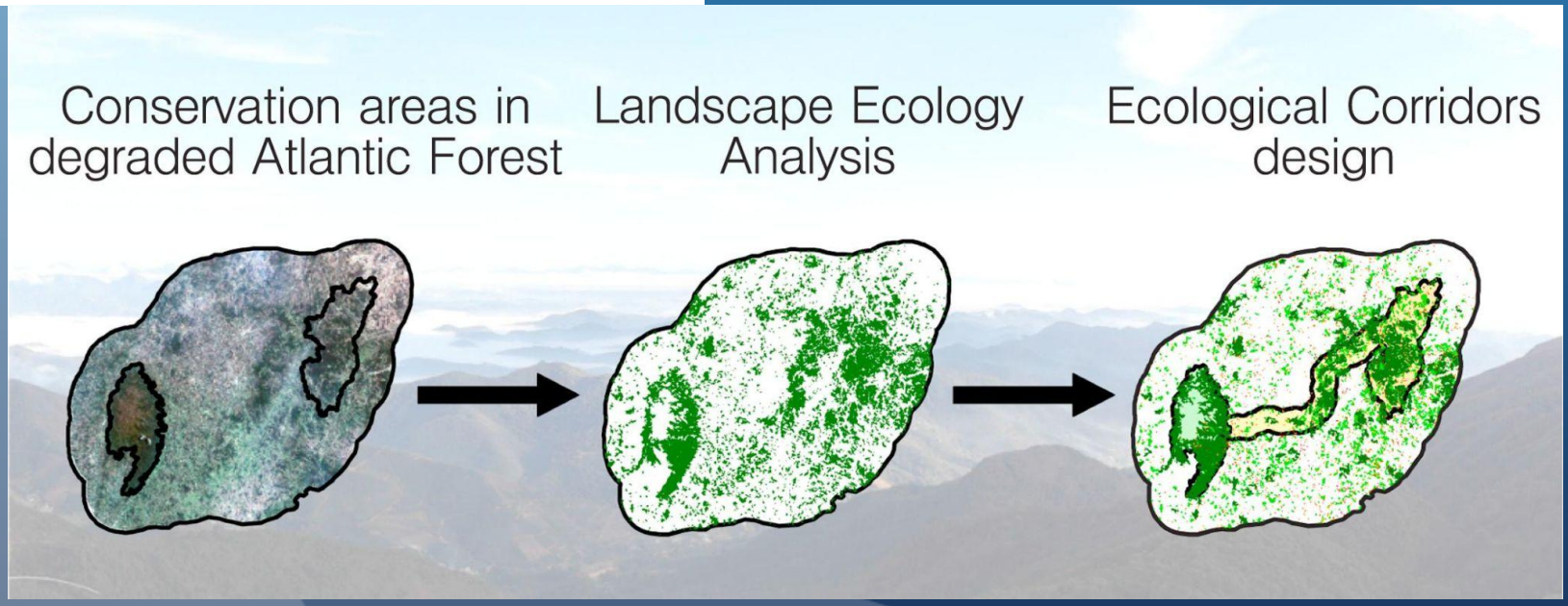
Ecological Indicators
Volume 88, May 2018, Pages 414-424



Original Articles

Delimitation of ecological corridors in the Brazilian Atlantic Forest

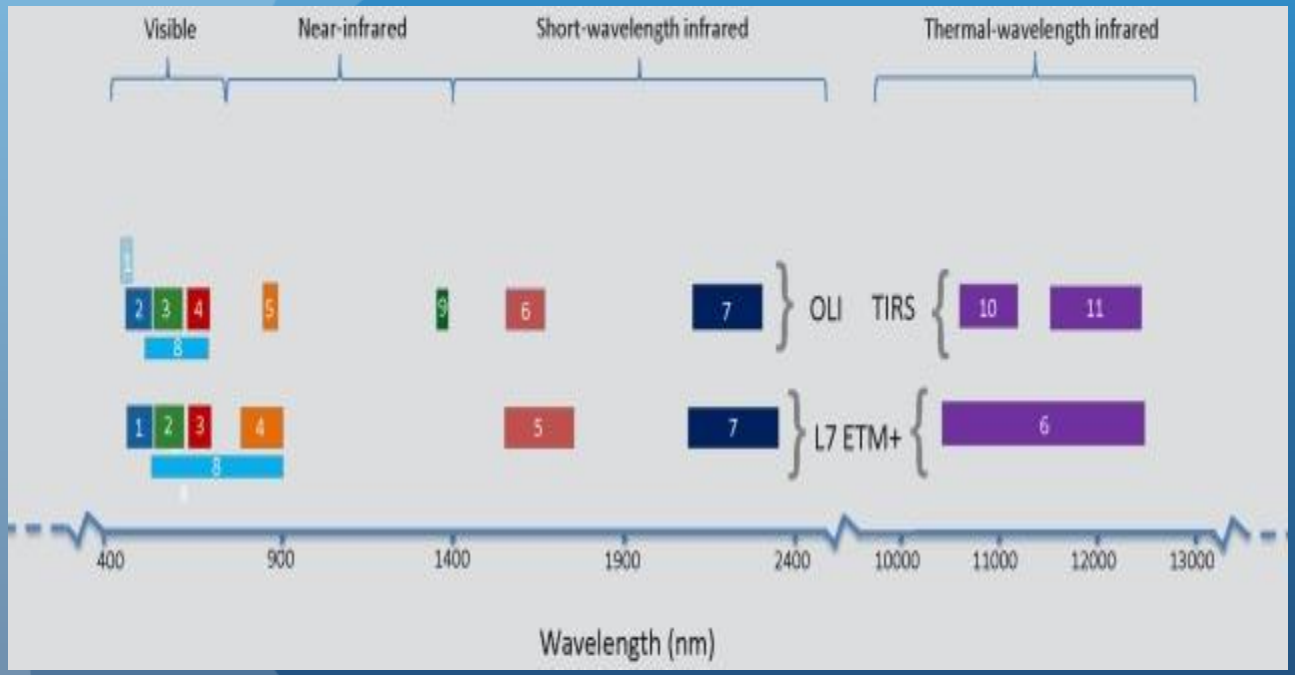
Jeangelis Silva Santos [a] ✉, Catherine Cristina Claros Leite [a] ✉, Julyana Cristina Cândido Viana [a] ✉, Alexandre Rosa dos Santos [b] ✉, Milton Marques Fernandes [c] ✉, Vítor de Souza Abreu [a] ✉, Timóteo Paladino do Nascimento [a] ✉, Leandro Soares dos Santos [a] ✉, Márcia Rodrigues de Moura Fernandes [a] ✉, Gilson Fernandes da Silva [a] ✉, Adriano Ribeiro de Mendonça [a] ✉



Corredores

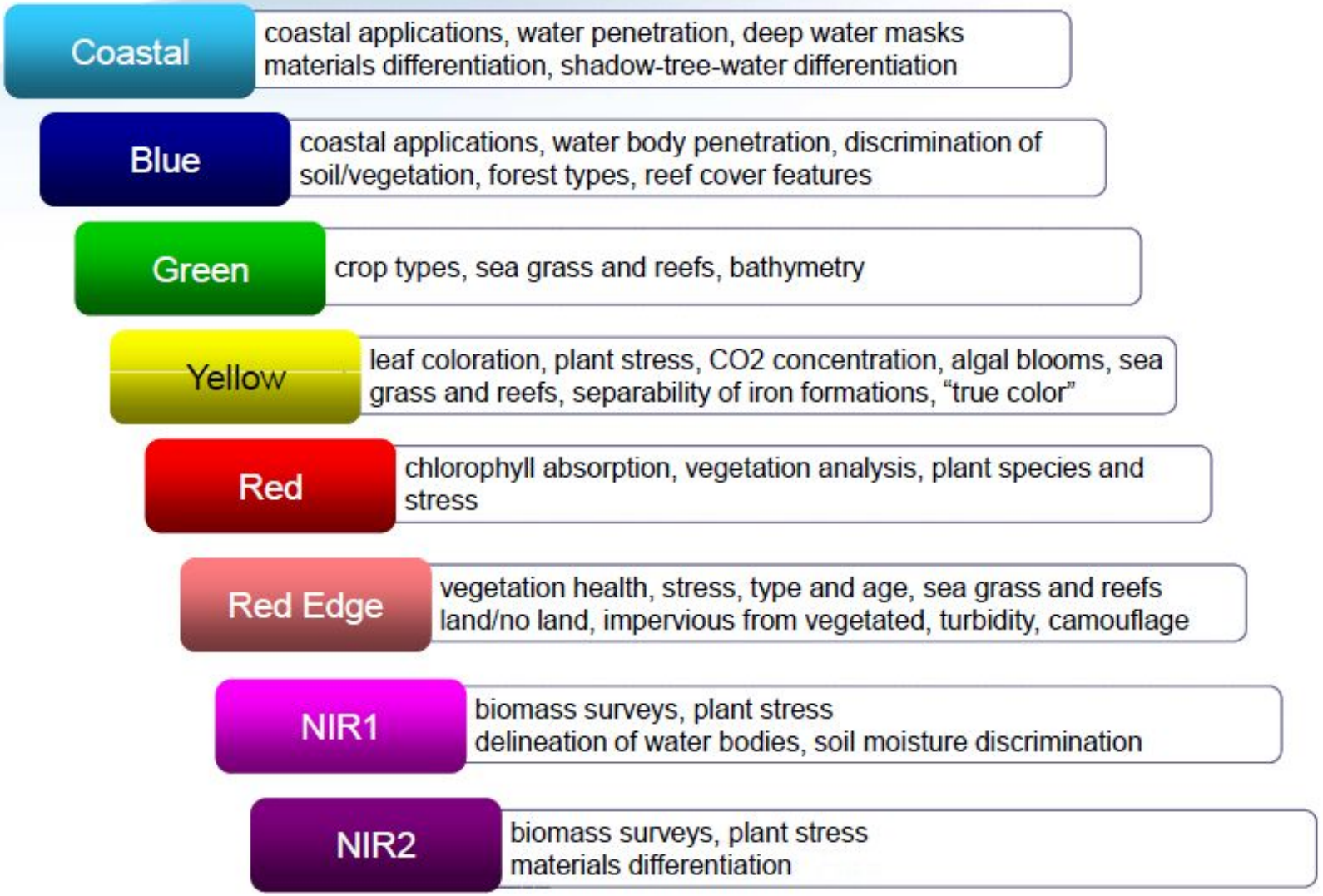
- Distrito Federal

Bandas Landsat



Wikimedia

Uso das Bandas de Satélite



Combo RGB Bandas de Satélite (fonte USGS)

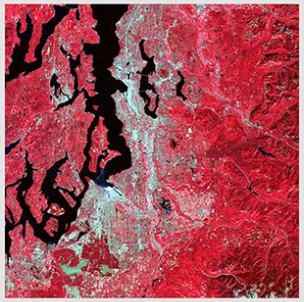
Common Landsat Band Combinations

Images: Landsat 8 Path 46 Row 27 acquired August 23, 2020. Band numbers displayed as R,G,B.

Natural Color

Landsat 8/9 OLI	4,3,2
Landsat 7 ETM+	3,2,1
Landsat 4-5 TM	3,2,1
Landsat 4-5 MSS	N/A
Landsat 1-3 MSS	N/A

Color Infrared (CIR)



Landsat 8/9 OLI	5,4,3
Landsat 7 ETM+	4,3,2
Landsat 4-5 TM	4,3,2
Landsat 4-5 MSS	3,2,1
Landsat 1-3 MSS	6,5,4

False Color (Urban)

Landsat 8/9 OLI	7,6,4
Landsat 7 ETM+	7,5,3
Landsat 4-5 TM	7,5,3
Landsat 4-5 MSS	N/A
Landsat 1-3 MSS	N/A

False Color (Vegetative Analysis)

Landsat 8/9 OLI	6,5,4
Landsat 7 ETM+	5,4,3
Landsat 4-5 TM	5,4,3
Landsat 4-5 MSS	4,3,2
Landsat 1-3 MSS	7,6,5

Shortwave Infrared

Landsat 8/9 OLI	7,5,4
Landsat 7 ETM+	7,4,3
Landsat 4-5 TM	7,4,3
Landsat 4-5 MSS	N/A
Landsat 1-3 MSS	N/A

Landscape Analyses in the Serra da Mesa Hydroelectric Reservoir, Brazil

Roberto B. Cavalcanti [1], Paulo R. Meneses [2], Francis J. Ahern [3],
Ricardo B. Machado [4]

Fig. 3. Serra da Mesa dam site . The images show: (A) TM RGB Composite R=band5 G=band4 B= band3; (B) RADARSAT; (C) RADARSAT -TM merge.

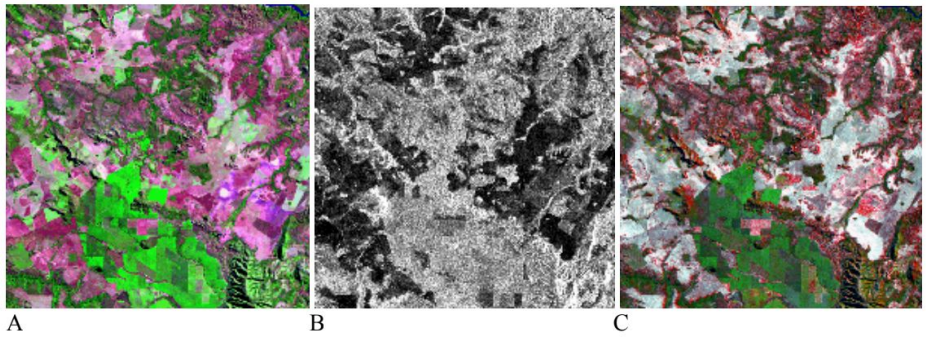


Fig. 4. Agricultural, afforestation and natural vegetation site at the Serra da Mesa reservoir region. The images show: (A) TM RGB Composite R=band5 G=band4 B= band3; (B) RADARSAT; (C) RADARSAT -TM merge.

Table 1. Loadings of the sensor band variables on each Principal Component

Sensor	Component		
	PC1	PC2	PC3
Radar	-0.551	-0.074	0.375
TM3	0.933	0.033	0.326
TM4	0.641	-0.543	-0.542
TM5	0.948	-0.099	0.262
Eigenvalue	2.483	0.862	0.609
% Variance	62.09	21.55	15.25

Table 2. Mean scores for each Region of Interest on Principal Component 1.

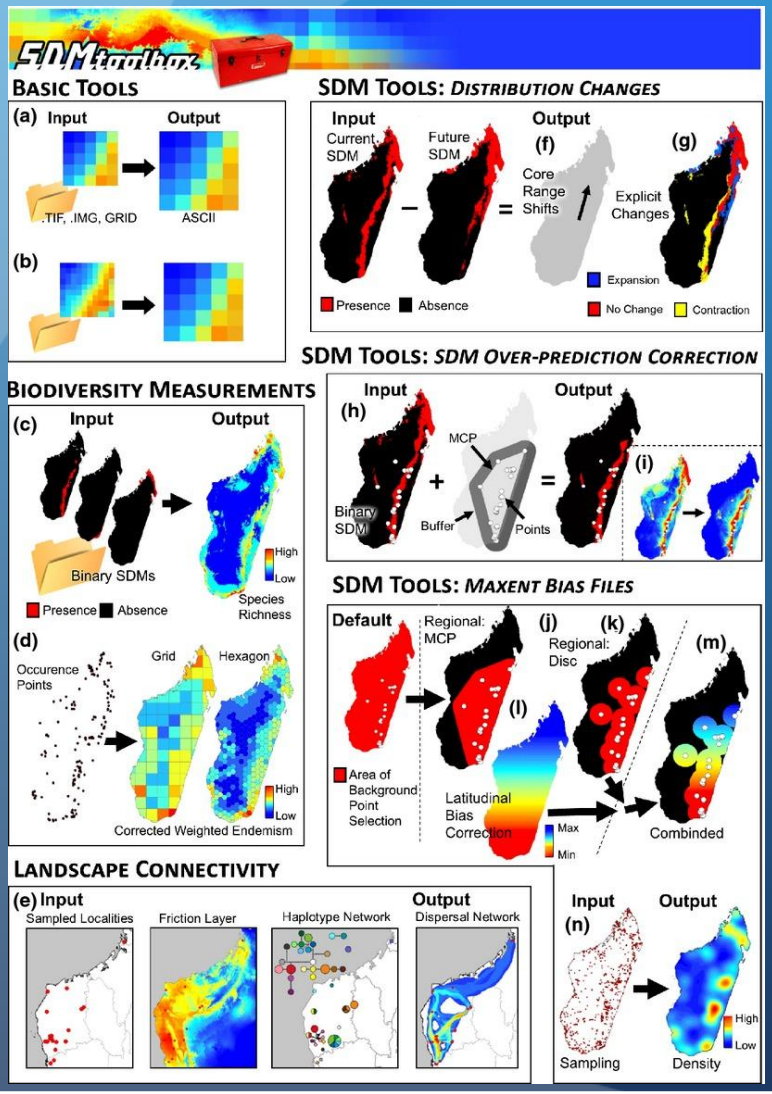
ROI	Average	Std. Dev.
Gallery Forest	-0.914	0.311
Planted Forest	-0.238	0.425
Cerrado	0.059	0.878
Naked Soil	2.489	0.267

Kruskall Wallis H test for all groups: $H_{3,4448} = 1902.14$; $p < 0.001$

Kruskall H test excluding degraded areas $H_{2,4068} = 1029.05$; $p < 0.001$

ROI = region of interest

Usar SIG para modelagem



Funções e Processos Ecológicos

- Dispersão de organismos
- Estrutura de metapopulações
- Redes tróficas e teias alimentares
- Transporte de água e nutrientes
- Fluxos de matéria e energia, carbono
- Interações predador-presa, polinização, transporte de propágulos
- Fixação de substratos, erosão

Dinâmica temporal da paisagem

- Sucessão ecológica local
- Extinções e Imigrações
- Adaptação e evolução de organismos
- Conectividade / fragmentação
- Diversidade alfa e beta
- Ciclos biogeoquímicos abertos /fechados
- Intensidade de interações com as sociedades humanas

Classificação da Paisagem

- Matemática algébrica ou matricial - métodos de álgebra linear
- Imagens digitais de satélite e sensores aerotransportados se prestam a análise usando vários pacotes de software comerciais ou de código aberto
- Processamento de imagens e geoprocessamento
- Classificação computarizada com validação de campo
- Sensores no espectro visível, IR, radar, laser, UV. Fotossíntese, água, atmosfera
- Ciclos biogeoquímicos abertos /fechados
- Intensidade de interações com as sociedades humanas

Fragmentação

- Prov Alberta, Canada. Ecol Soc America

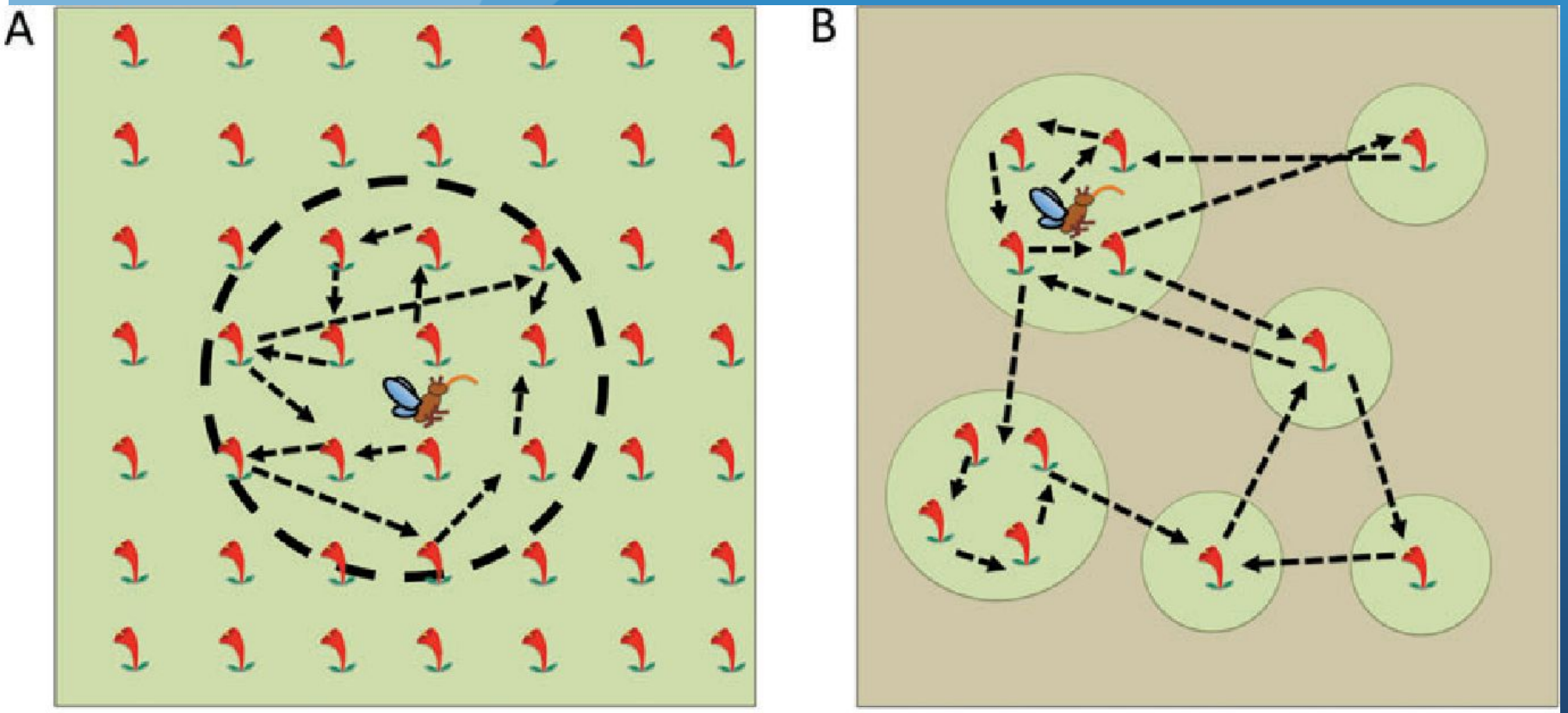
Fragmentação

- Cidade do Cabo, África do Sul

Wikimedia

Fragmentação

- Hadley e Betts 2012. Polinizadores



Wikimedia

Fragmentação

- Amazonia Brasileira

Wikimedia