Planejamento Sistemático de Conservação

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Disciplina: Biodiversidade, Geodiversidade e Paisagem

Bacharelado em Planejamento Territorial

Universidade Federal do ABC

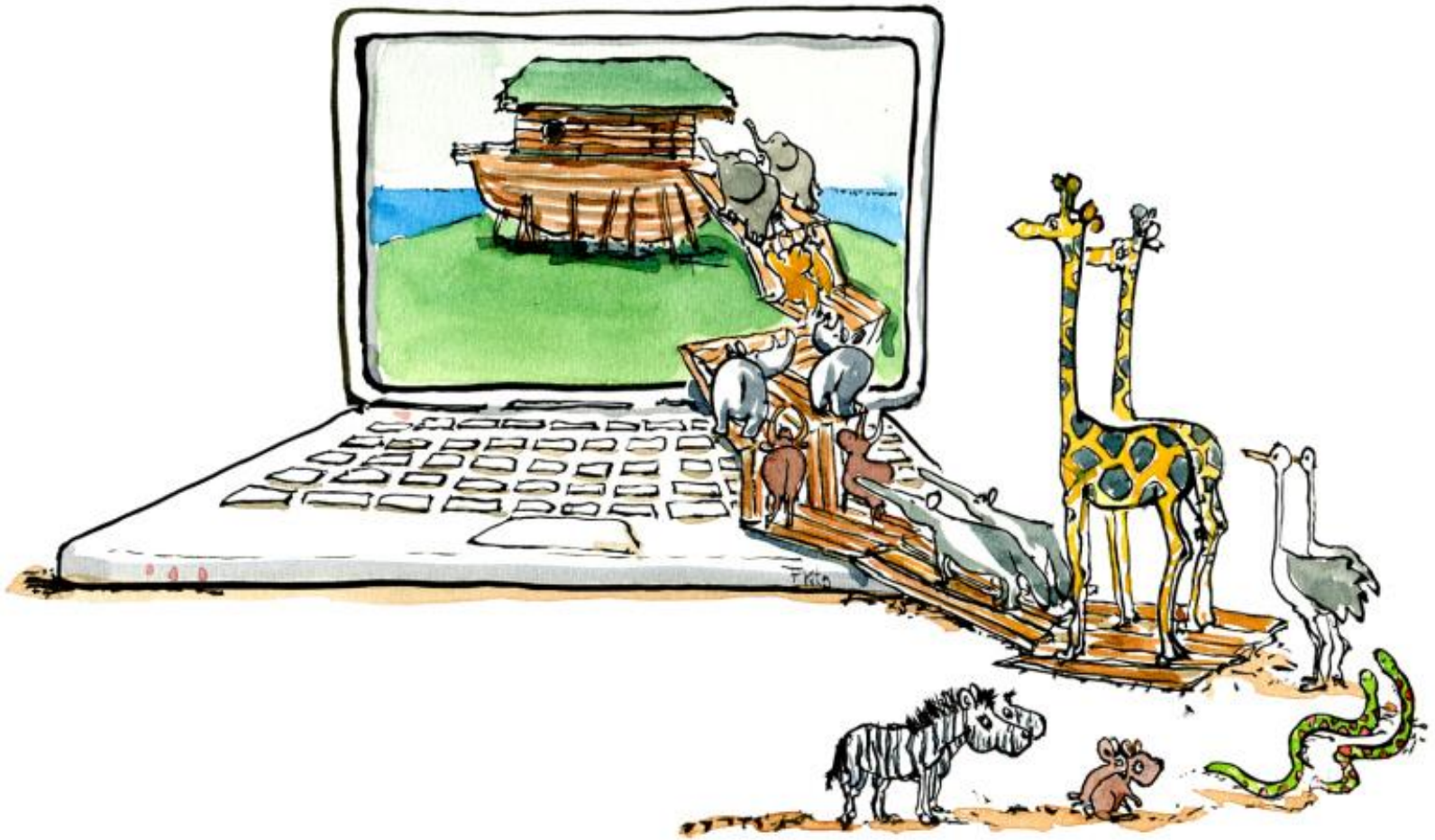
Fevereiro, 2024

São Bernardo do Campo - SP

Conteúdo

- Planejamento Sistemático de Conservação
- Prática com o Marxan

Planejamento Sistemático de Conservação



AHLEFELDT, Frits. 2011. Noah's Digital Ark for Threatened Animals illustration. https://hikingartist.com/2011/12/13/noahs-digital-ark-for-threatened-animals-illustration/

Planejamento Sistemático de Conservação

- Pergunta básica: Quais são as áreas mais adequadas para preservação ambiental?
- Uso de modelos espaciais + técnicas participativas
- Princípios
  - Representatividade
  - Vulnerabilidade
  - Eficiência
  - Complementaridade
  - Flexibilidade
  - Insubistituibilidade
  - Compacidade

Possingham, H., Wilson, K. A., Andelman, S. J. and Vynne, C. H. (2006). Protected areas: Goals, limitations, and design. In Martha J. Groom, Gary K. Meffe and C. Ronald Carroll (Ed.), *Principles of Conservation Biology* 3rd ed. ed. (pp. 507-549) Sunderland, Massachusetts, U.S.: Sinauer Associates.

Representatividade

- As áreas selecionadas para conservação devem representar a diversidade da região

- **Alvo**: O que queremos preservar?

  Ex: Bioma da Mata Atlântica

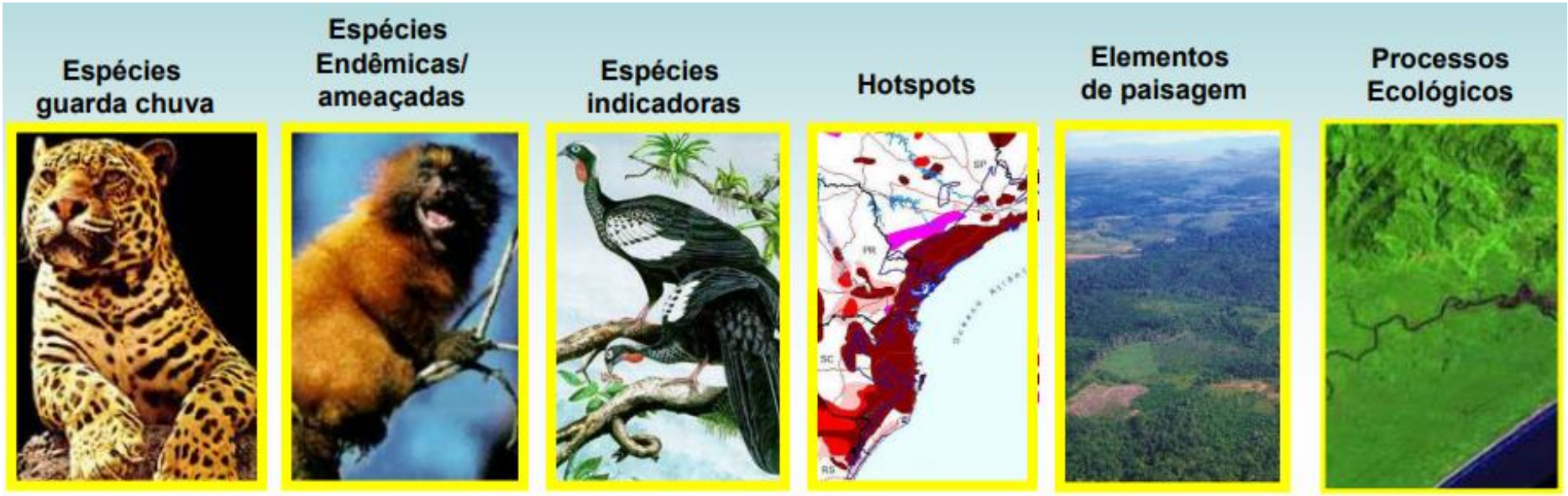
- **Meta**: Quanto queremos preservar?

  Ex: 20 % dos remanescentes de Mata Atlântica

Possingham, H., Wilson, K. A., Andelman, S. J. and Vynne, C. H. (2006). Protected areas: Goals, limitations, and design. In Martha J. Groom, Gary K. Meffe and C. Ronald Carroll (Ed.), *Principles of Conservation Biology* 3rd ed. ed. (pp. 507-549) Sunderland, Massachusetts, U.S.: Sinauer Associates.

Representatividade

Exemplos de alvos de conservação



Hotspots: áreas com alta diversidade e grande pressão de impacto

Possingham, H., Wilson, K. A., Andelman, S. J. and Vynne, C. H. (2006). Protected areas: Goals, limitations, and design. In Martha J. Groom, Gary K. Meffe and C. Ronald Carroll (Ed.), *Principles of Conservation Biology* 3rd ed. ed. (pp. 507-549) Sunderland, Massachusetts, U.S.: Sinauer Associates.

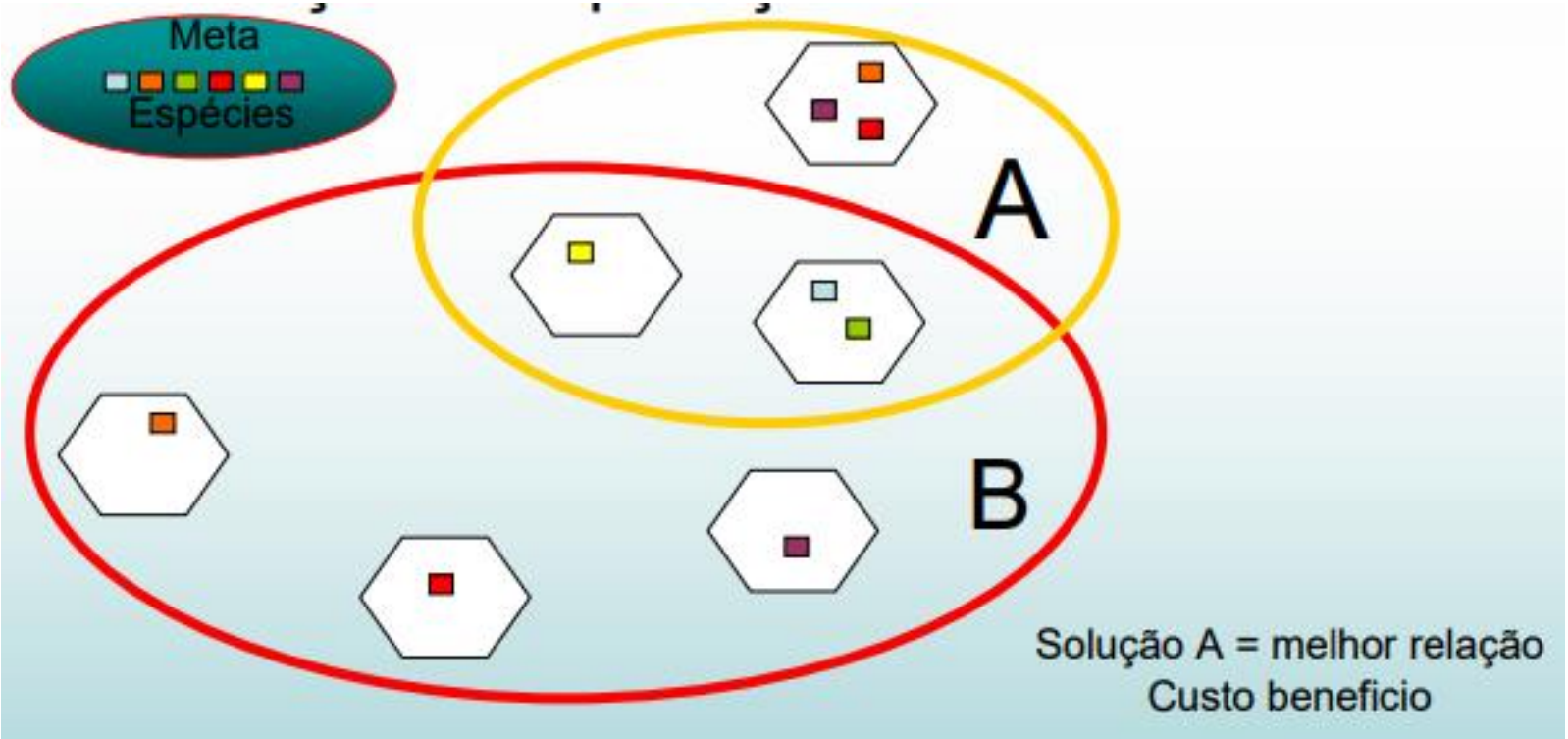
Vulnerabilidade

- Priorizar as áreas com maior probabilidade ou iminência da destruição ou alteração
- Parâmetros:
  - Espécies ameaçadas de extinção
  - Fragmentação
  - Taxa de desmatamento
  - Potencial agrícola

Possingham, H., Wilson, K. A., Andelman, S. J. and Vynne, C. H. (2006). Protected areas: Goals, limitations, and design. In Martha J. Groom, Gary K. Meffe and C. Ronald Carroll (Ed.), *Principles of Conservation Biology* 3rd ed. ed. (pp. 507-549) Sunderland, Massachusetts, U.S.: Sinauer Associates.

Eficiência

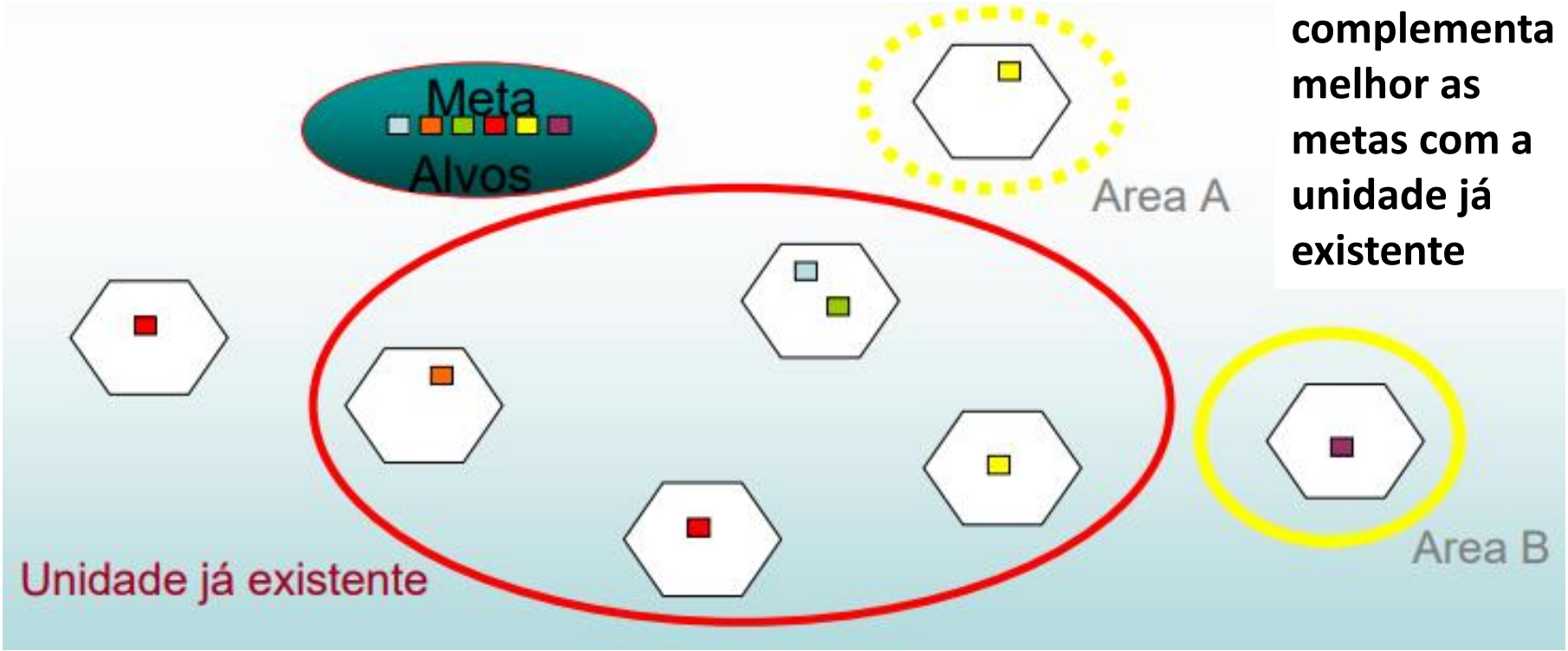
Máxima proteção da biodiversidade com o menor número de unidades e com a melhor relação área/proteção



Possingham, H., Wilson, K. A., Andelman, S. J. and Vynne, C. H. (2006). Protected areas: Goals, limitations, and design. In Martha J. Groom, Gary K. Meffe and C. Ronald Carroll (Ed.), *Principles of Conservation Biology* 3rd ed. ed. (pp. 507-549) Sunderland, Massachusetts, U.S.: Sinauer Associates.

Complementaridade

Incorporar novas áreas para maximizar o número de alvos/metas de conservação atingidas

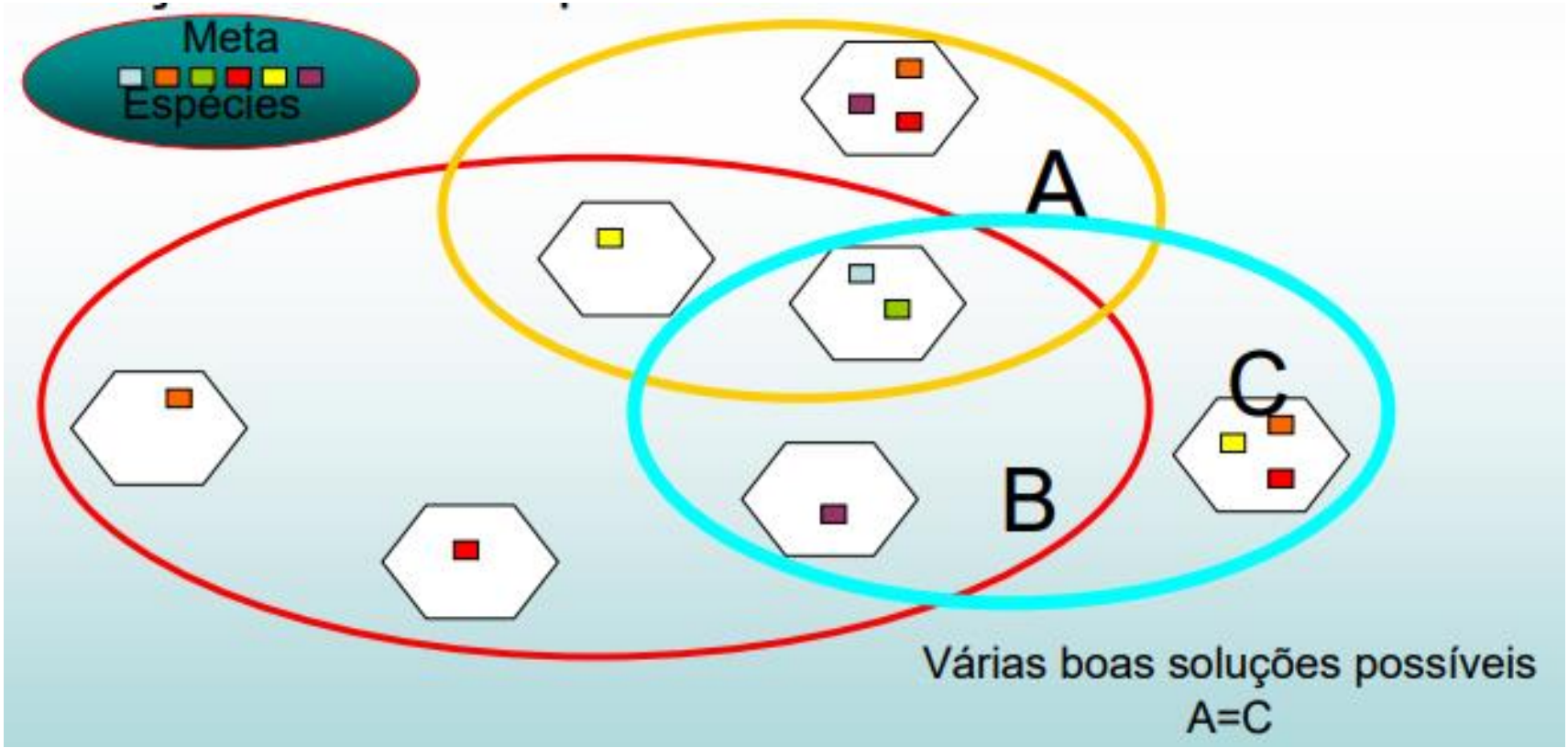


Área B complementa melhor as metas com a unidade já existente

Possingham, H., Wilson, K. A., Andelman, S. J. and Vynne, C. H. (2006). Protected areas: Goals, limitations, and design. In Martha J. Groom, Gary K. Meffe and C. Ronald Carroll (Ed.), *Principles of Conservation Biology* 3rd ed. ed. (pp. 507-549) Sunderland, Massachusetts, U.S.: Sinauer Associates.

Flexibilidade

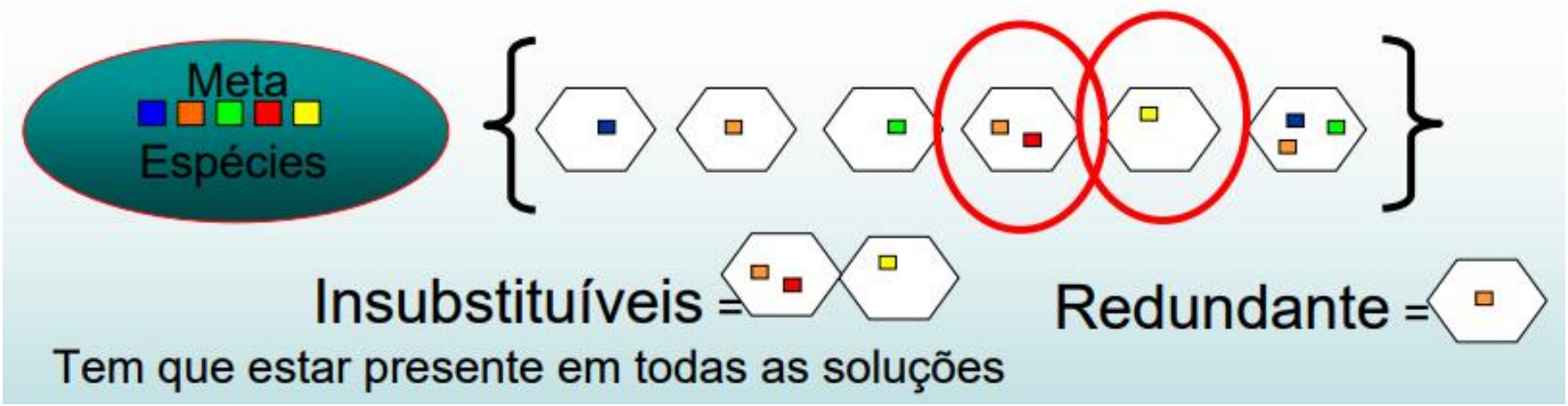
Metas de conservação podem ser atingidas por diversas combinações de áreas prioritárias



Possingham, H., Wilson, K. A., Andelman, S. J. and Vynne, C. H. (2006). Protected areas: Goals, limitations, and design. In Martha J. Groom, Gary K. Meffe and C. Ronald Carroll (Ed.), *Principles of Conservation Biology* 3rd ed. ed. (pp. 507-549) Sunderland, Massachusetts, U.S.: Sinauer Associates.

Insubistituibilidade

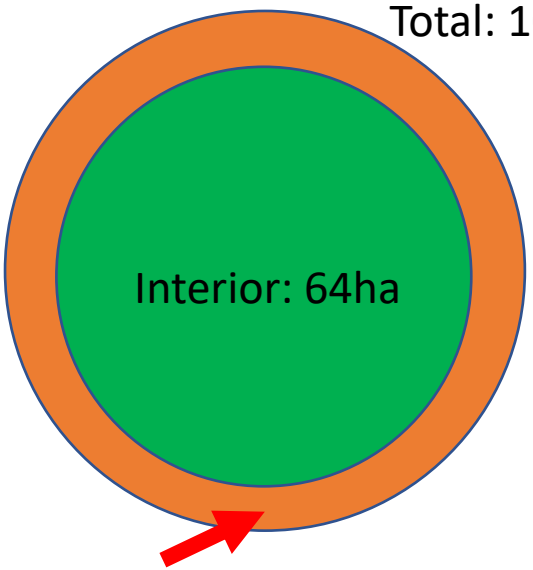
Probabilidade de uma determinada área ter de ser protegida para atingir um determinado conjunto de metas



Possingham, H., Wilson, K. A., Andelman, S. J. and Vynne, C. H. (2006). Protected areas: Goals, limitations, and design. In Martha J. Groom, Gary K. Meffe and C. Ronald Carroll (Ed.), *Principles of Conservation Biology* 3rd ed. ed. (pp. 507-549) Sunderland, Massachusetts, U.S.: Sinauer Associates.

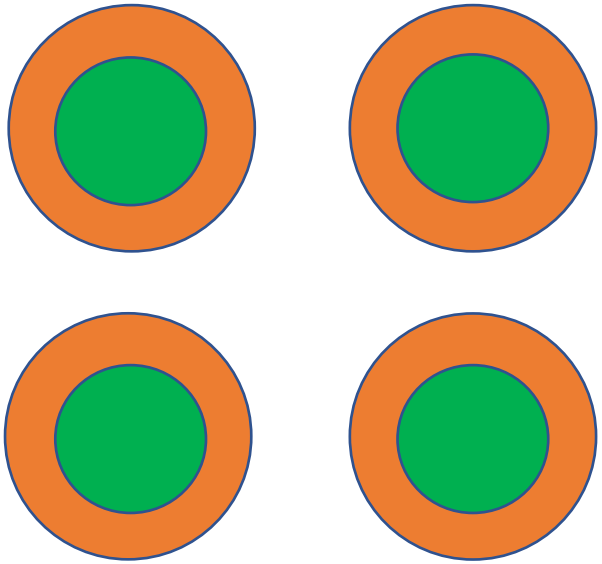
Compacidade

Melhor

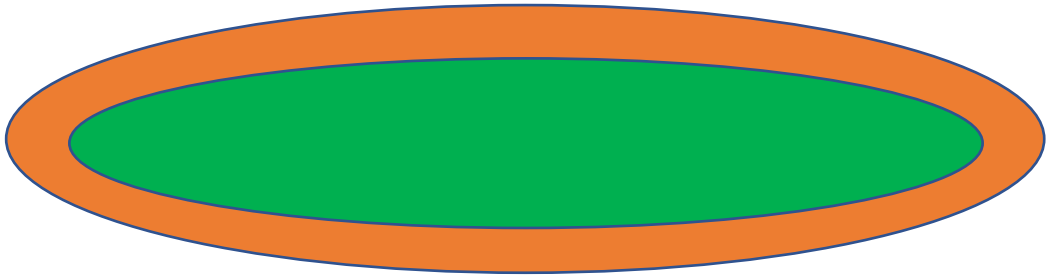


Pior

Interior: 34 ha
Efeito de Borda: 64 ha



ou

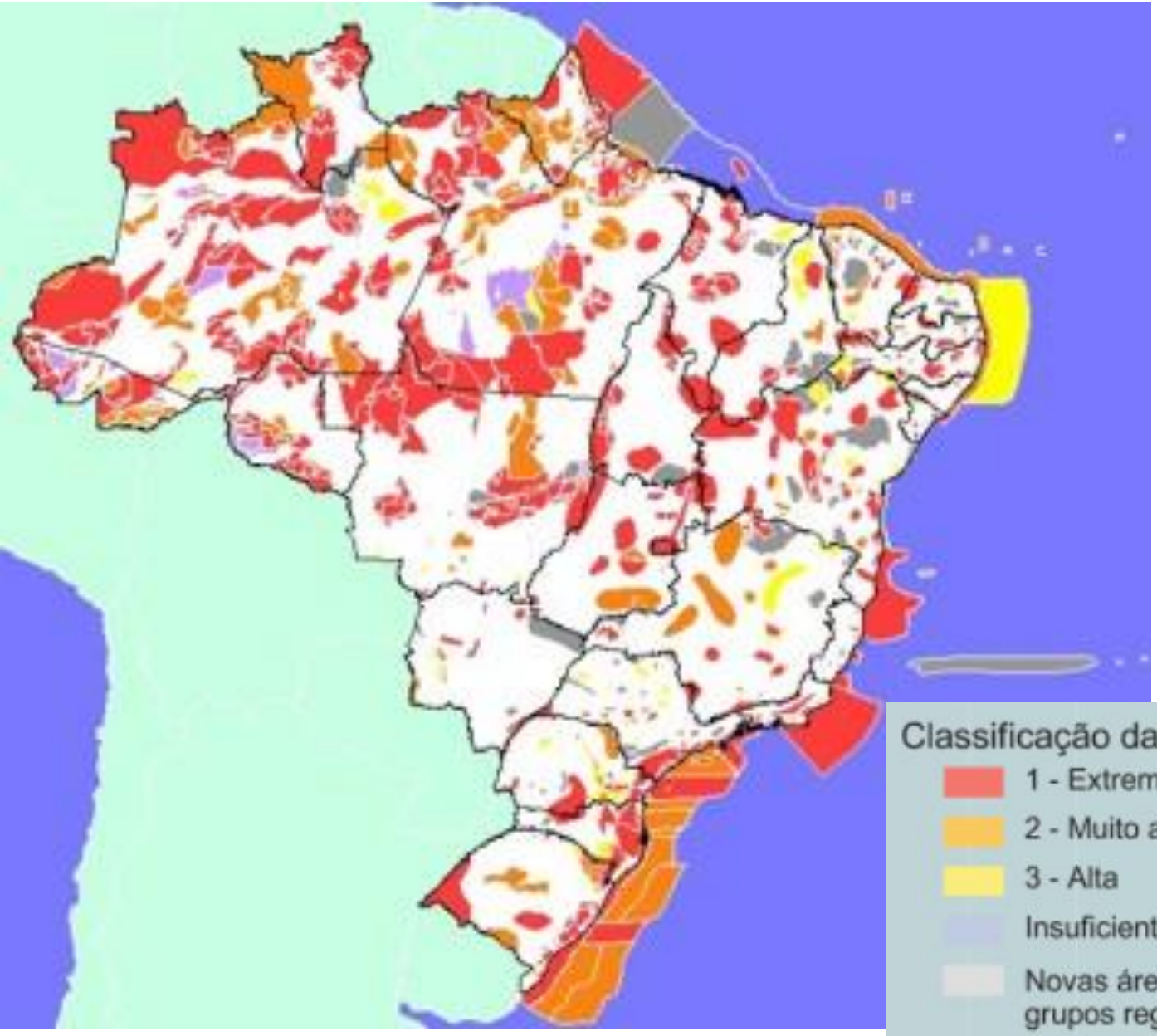


Interior: 55 ha
Efeito de Borda: 45 ha

Quanto menor o perímetro (borda), menos efeito de borda

PRIMACK, R. B.; RODRIGUES, E. Biologia da Conservação. Londrina: Gráfica Editora Midiograf, 2001

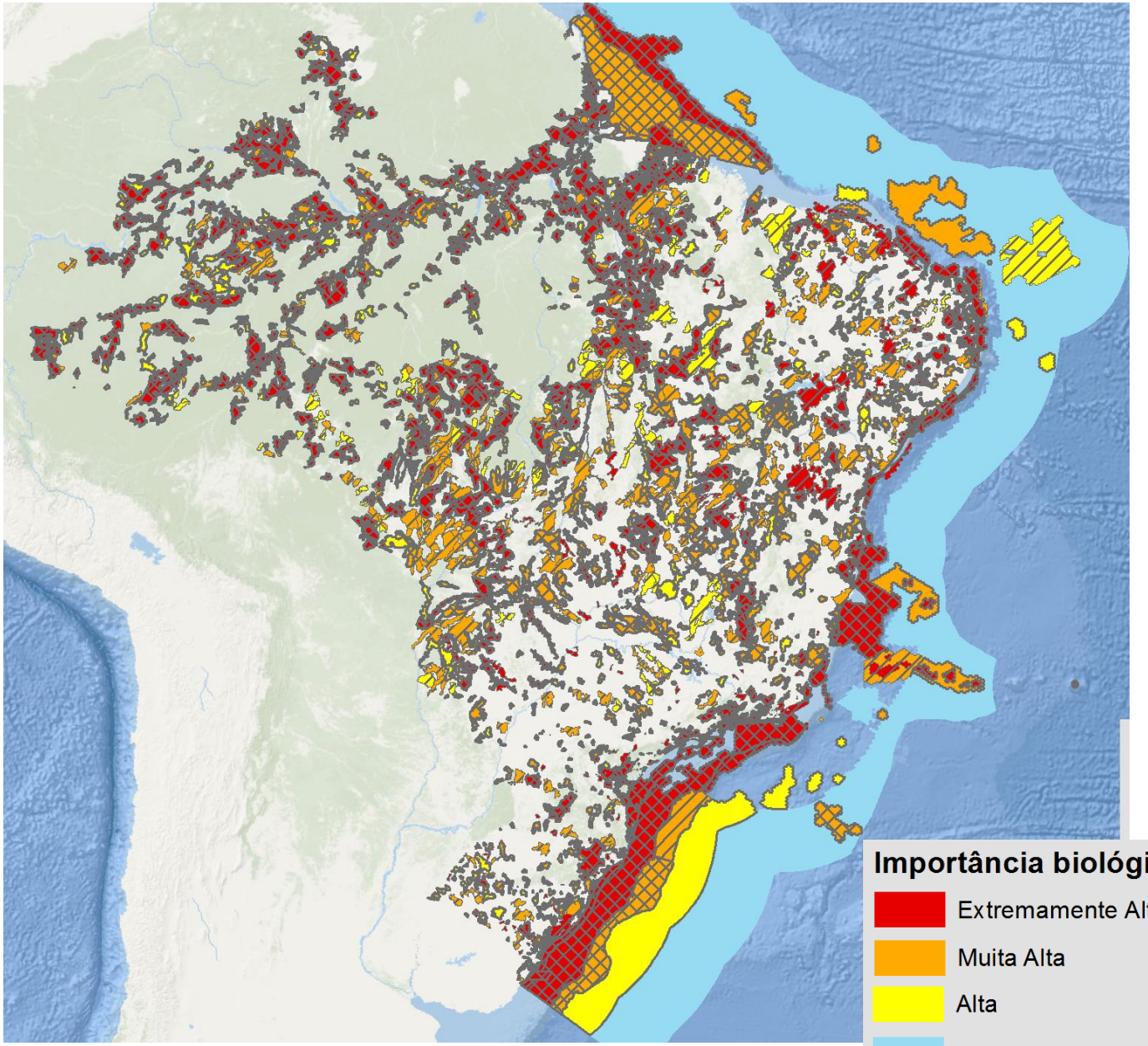
Áreas prioritárias para conservação (não-sistemático) - 2000



Baseado em consultas a pesquisadores

https://antigo.mma.gov.br/estruturas/chm/_arquivos/maparea.pdf

Áreas prioritárias para conservação (sistemático) - 2018



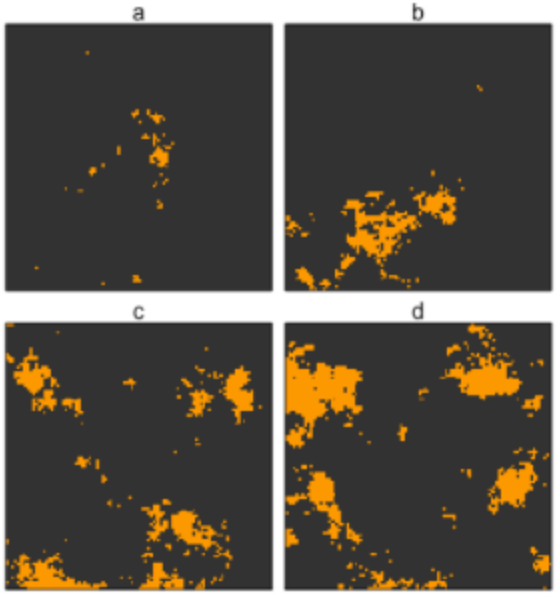
http://portalredd.mma.gov.br/2-atualizacao-das-areas-prioritarias

Questões de planejamento vs. Modelos

- Que áreas são mais insubstituíveis?
  = biodiversidade não encontrada em outras áreas
  - C-Plan
- Quais as melhores áreas para conservar para se obter metas de conservação com o menor custo para a sociedade?
  - Marxan, Prioritizr
- Quais as melhores áreas para conservar, dado um custo máximo tolerável para a sociedade
  - Zonation, Marxan e Prioritizr

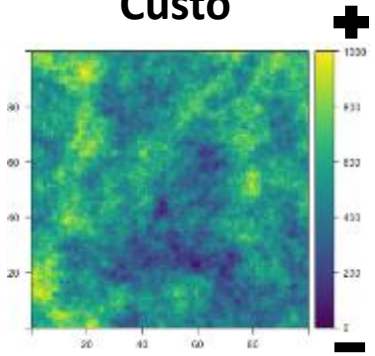
Marxan

Distribuição dos alvos de conservação



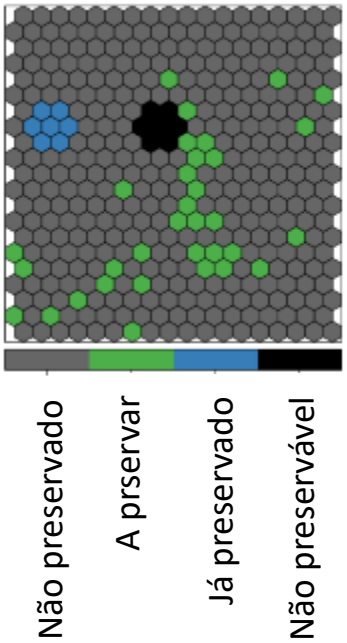
- Meta de conservação: 20%
- Custo para os serviços ecossistêmicos por % de meta não atingida

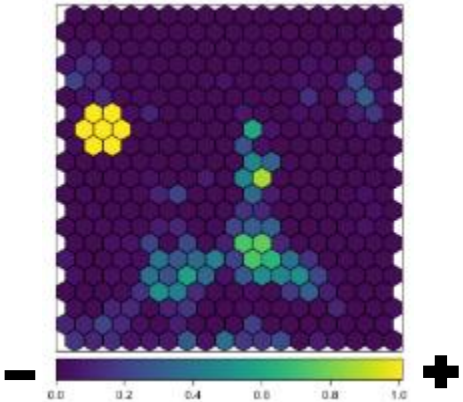
Custo



- Custo de aquisição
- Custo de gestão
- Custo de atividade econômica alternativa (pesca, agricultura, etc.)

Melhor alternativa



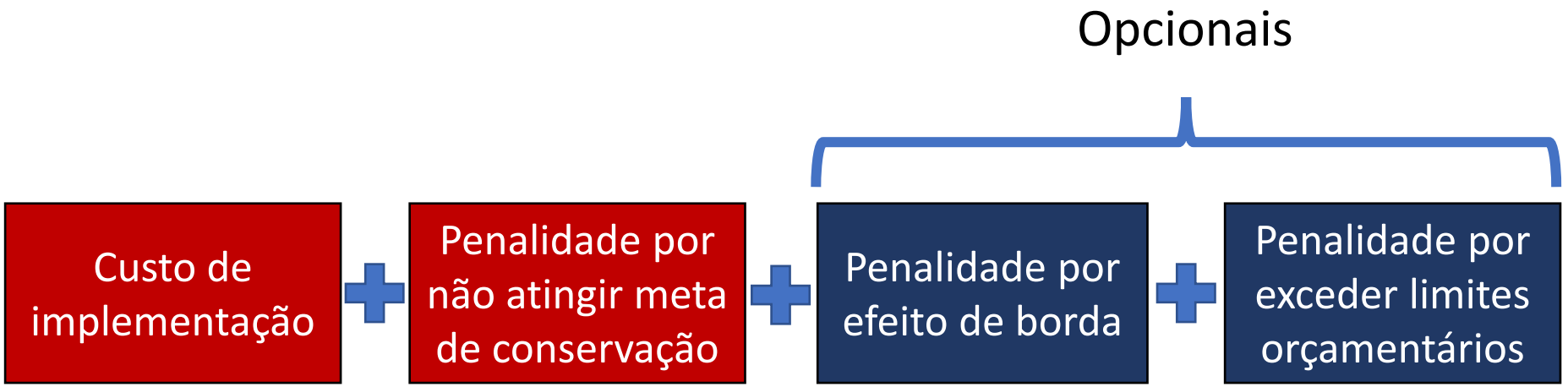


Frequência das 100 melhores alternativas

STRIMAS-MACKEY, M. Systematic Reserve Design: Emulating Marxan in R. 2016. http://strimas.com/r/marxan/

Marxan

Análise de custo-benefício:



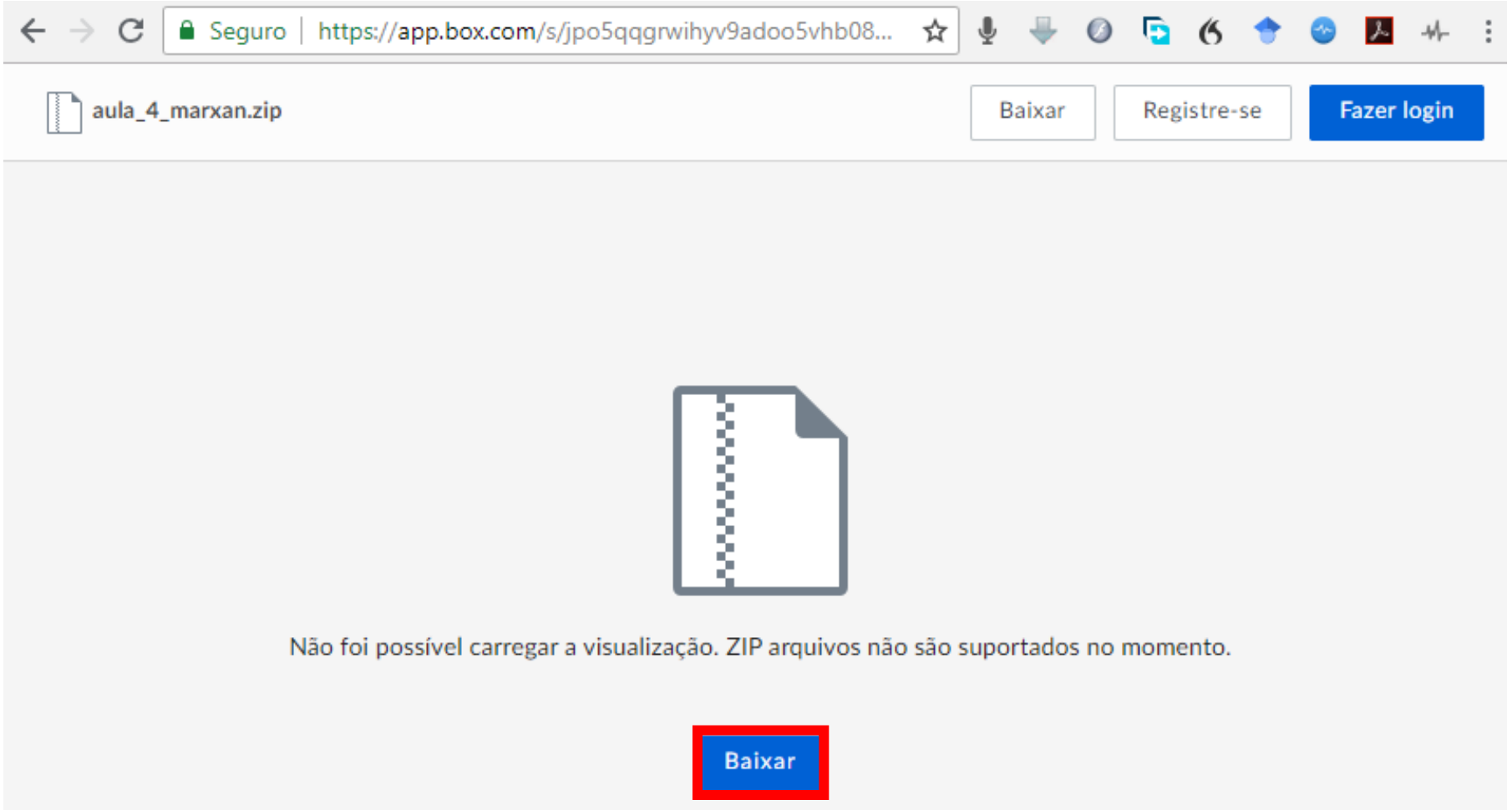
GAME, Edward T.; GRANTHAM, Hedley S. Marxan user manual. Univ. of Queensland, St Lucia, QLD, Australia, and Pacific Marine Analysis and Research Association, Vancouver, BC, Canada, 2008.

Ambientes do Marxan

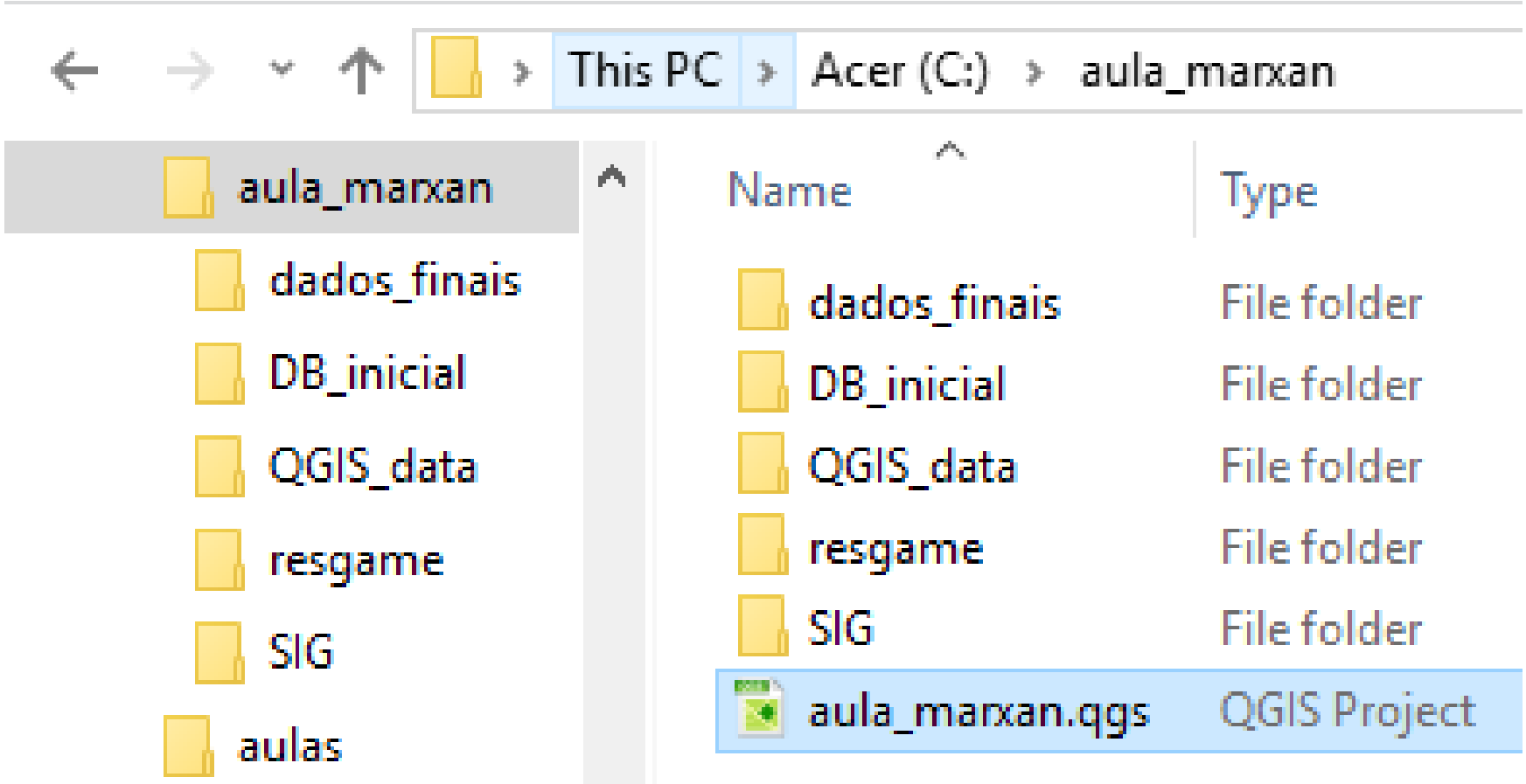
- Aplicativo DOS
- QMarxan Toolbox
  - Complemento do QGIS para editar os dados de entrada
- CLUZ
  - Complemento do QGIS para analisar os resultados
- Zonae Cogito
  - Editar dados de entrada e visualizar os resultados
- Marxan Planning
  - Aplicativo Web

Download do material de aula

https://app.box.com/s/lyupc1rgwq4spfc6e1ssafwkhtcegt2x



- Copie pasta “aula_marxan” para a raiz do drive de dados do seu computador



Prática com o Marxan

Acesse a página “Conservation Planning Exercise”

https://www.aproposinfosystems.com/en/solutions/marxan-demo/

0	0	0	0	0	0	0	0	1	0	0	0	89	0	12	30	48	0	69	4	5	0	0	0	0	0	0	0	0	0	91
	$347			$52			$585			$207			$276			$821			$122			$404			$300			$681		
0	0	0	0	0	0	0	0	0	0	0	0	71	43	12	99	0	1	0	0	0	17	0	0	0	0	35	31	0	0
	$813			$537			$931			$653			$919			$826			$455			$983			$731			$875		
0	0	0	55	40	0	0	0	0	0	2	27	70	0	0	37	0	56	0	0	0	0	0	33	0	41	0	54	0	0
	$247			$462			$287			$988			$85			$736			$681			$479			$459			$615		
0	0	0	80	8	0	0	47	0	0	0	0	0	78	0	0	0	87	66	0	38	0	0	0	0	0	0	0	91	0
	$378			$586			$887			$392			$526			$783			$224			$145			$268			$90		
0	0	0	0	0	73	0	60	0	25	75	0	0	0	0	11	0	8	0	0	0	0	0	0	0	0	0	0	0	53
	$577			$74			$53			$390			$619			$773			$952			$738			$897			$580		
76	34	0	0	90	0	0	84	0	0	0	82	0	72	26	0	0	0	0	0	21	58	0	0	0	0	0	0	54	59
	$969			$76			$147			$870			$350			$543			$607			$375			$503			$790		
75	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51	0	0	0	0	57	0	42	97	0	0	7
	$729			$492			$303			$289			$490			$599			$407			$651			$709			$365		
0	0	0	0	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	0	41	0	81	0	37
	$571			$931			$353			$64			$955			$950			$855			$886			$840			$598		
0	0	12	0	0	0	0	0	0	0	53	24	0	72	0	0	93	0	0	0	0	0	23	59	0	0	0	0	0	0
	$422			$252			$941			$152			$353			$123			$716			$587			$346			$318		
0	0	0	11	0	0	0	14	50	0	0	0	0	0	88	0	0	0	0	0	0	48	0	0	0	0	0	0	76	0
	$682			$891			$815			$818			$726			$372			$197			$89			$417			$975		

Features	Target	Current	Shortfall
A	267.4	0	267.4
B	251.2	0	251.2
C	243.0	0	243

Metas

Cost:		0
Boundary:	+	0
Shortfall Penalty:	+	761.6
Your Marxan Score:	=	761.6

Custo total

Marxan Results:

Once you meet your targets Marxan's results will appear here.

71 43 12

$919

Quantidade das três espécies

Custo de implantação

Versão sem considerar efeito de borda

0	0	0	0	0	0	0	0	1	0	0	0	89	0	12	30	48	0	69	4	9	0	0	0	0	0	0	0	0	91
	$347			$52			$985			$207			$276			$821			$122			$404			$300			$681	
0	0	0	0	0	0	0	0	0	0	0	0	71	43	12	99	0	1	0	0	0	17	0	0	0	0	35	31	0	0
	$813			$537			$931			$653			$919			$826			$455			$983			$731			$875	
0	0	0	55	40	0	0	0	0	0	2	27	70	0	0	37	0	56	0	0	0	0	0	33	0	41	0	54	0	0
	$247			$462			$287			$988			$85			$736			$681			$479			$459			$615	
0	0	0	80	8	0	0	47	0	0	0	0	0	78	0	0	0	87	66	0	38	0	0	0	0	0	0	0	91	0
	$378			$986			$887			$392			$526			$783			$224			$149			$268			$90	
0	0	0	0	0	73	0	60	0	25	79	0	0	0	0	11	0	8	0	0	0	0	0	0	0	0	0	0	0	53
	$977			$74			$53			$390			$619			$773			$952			$738			$897			$580	
76	34	0	0	90	0	0	84	0	0	0	82	0	72	26	0	0	0	0	0	21	58	0	0	0	0	0	0	54	59
	$969			$76			$147			$870			$350			$543			$607			$375			$903			$790	
75	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	91	0	0	0	0	57	0	42	97	0	0	7
	$729			$492			$303			$289			$490			$599			$407			$651			$709			$365	
0	0	0	0	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	0	41	0	81	0	37
	$571			$931			$353			$64			$955			$950			$855			$886			$840			$598	
0	0	12	0	0	0	0	0	0	0	53	24	0	72	0	0	93	0	0	0	0	0	23	59	0	0	0	0	0	0
	$422			$252			$941			$152			$353			$123			$716			$587			$346			$318	
0	0	0	11	0	0	0	14	50	0	0	0	0	0	88	0	0	0	0	0	0	48	0	0	0	0	0	0	76	0
	$682			$891			$815			$818			$726			$372			$197			$89			$417			$975	

Features	Target	Current	Shortfall
A	267.4	273	0
B	251.2	270	0
C	243.0	244	0

Cost:		1846
Boundary:	+	3600
Shortfall Penalty:	+	0
Your Marxan Score:	=	5446

Marxan Results:

Marxan uses the formula above with Cost, Boundary and Shortfall Penalty to evaluate the affects of selecting or deselecting an area; this is called the Objective Function.

Spatial Arrangement		Total Cost	Marxan Score
Unclumped:	hide solution	$1775	5175
Clumped:	show solution	$3140	5340

Versão considerando o efeito de borda

0	0	0	0	0	0	0	0	1	0	0	0	89	0	12	30	48	0	69	4	9	0	0	0	0	0	0	0	0	91
	$347			$52			$985			$207			$276			$821			$122			$404			$300			$681	
0	0	0	0	0	0	0	0	0	0	0	0	71	43	12	99	0	1	0	0	0	17	0	0	0	0	35	31	0	0
	$813			$537			$931			$653			$919			$826			$455			$983			$731			$875	
0	0	0	55	40	0	0	0	0	0	2	27	70	0	0	37	0	56	0	0	0	0	0	33	0	41	0	54	0	0
	$247			$462			$287			$988			$85			$736			$681			$479			$459			$615	
0	0	0	80	8	0	0	47	0	0	0	0	0	78	0	0	0	87	66	0	38	0	0	0	0	0	0	0	91	0
	$378			$986			$887			$392			$526			$783			$224			$149			$268			$90	
0	0	0	0	0	73	0	60	0	25	79	0	0	0	0	11	0	8	0	0	0	0	0	0	0	0	0	0	0	53
	$977			$74			$53			$390			$619			$773			$952			$738			$897			$580	
76	34	0	0	90	0	0	84	0	0	0	82	0	72	26	0	0	0	0	0	21	58	0	0	0	0	0	0	54	59
	$969			$76			$147			$870			$350			$543			$607			$375			$903			$790	
75	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	91	0	0	0	0	57	0	42	97	0	0	7
	$729			$492			$303			$289			$490			$599			$407			$651			$709			$365	
0	0	0	0	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	0	41	0	81	0	37
	$571			$931			$353			$64			$955			$950			$855			$886			$840			$598	
0	0	12	0	0	0	0	0	0	0	53	24	0	72	0	0	93	0	0	0	0	0	23	59	0	0	0	0	0	0
	$422			$252			$941			$152			$353			$123			$716			$587			$346			$318	
0	0	0	11	0	0	0	14	50	0	0	0	0	0	88	0	0	0	0	0	0	48	0	0	0	0	0	0	76	0
	$682			$891			$815			$818			$726			$372			$197			$89			$417			$975	

Features	Target	Current	Shortfall
A	267.4	287	0
B	251.2	268	0
C	243.0	258	0

Cost:		3140
Boundary:	+	2200
Shortfall Penalty:	+	0
Your Marxan Score:	=	5340

Marxan Results:

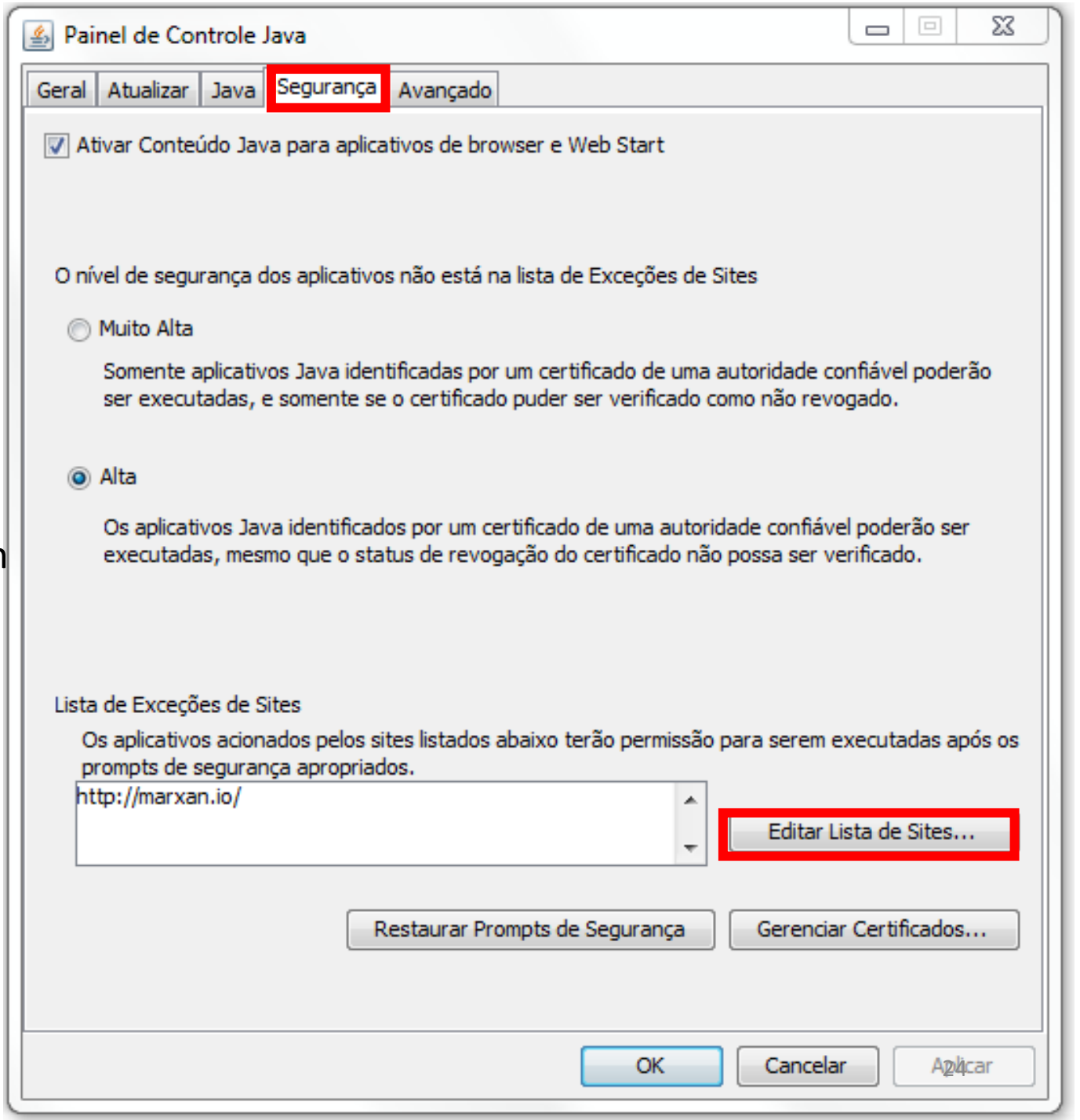
Marxan uses the formula above with Cost, Boundary and Shortfall Penalty to evaluate the affects of selecting or deselecting an area; this is called the Objective Function.

Spatial Arrangement		Total Cost	Marxan Score
Unclumped:	show solution	$1775	5175
Clumped:	hide solution	$3140	5340

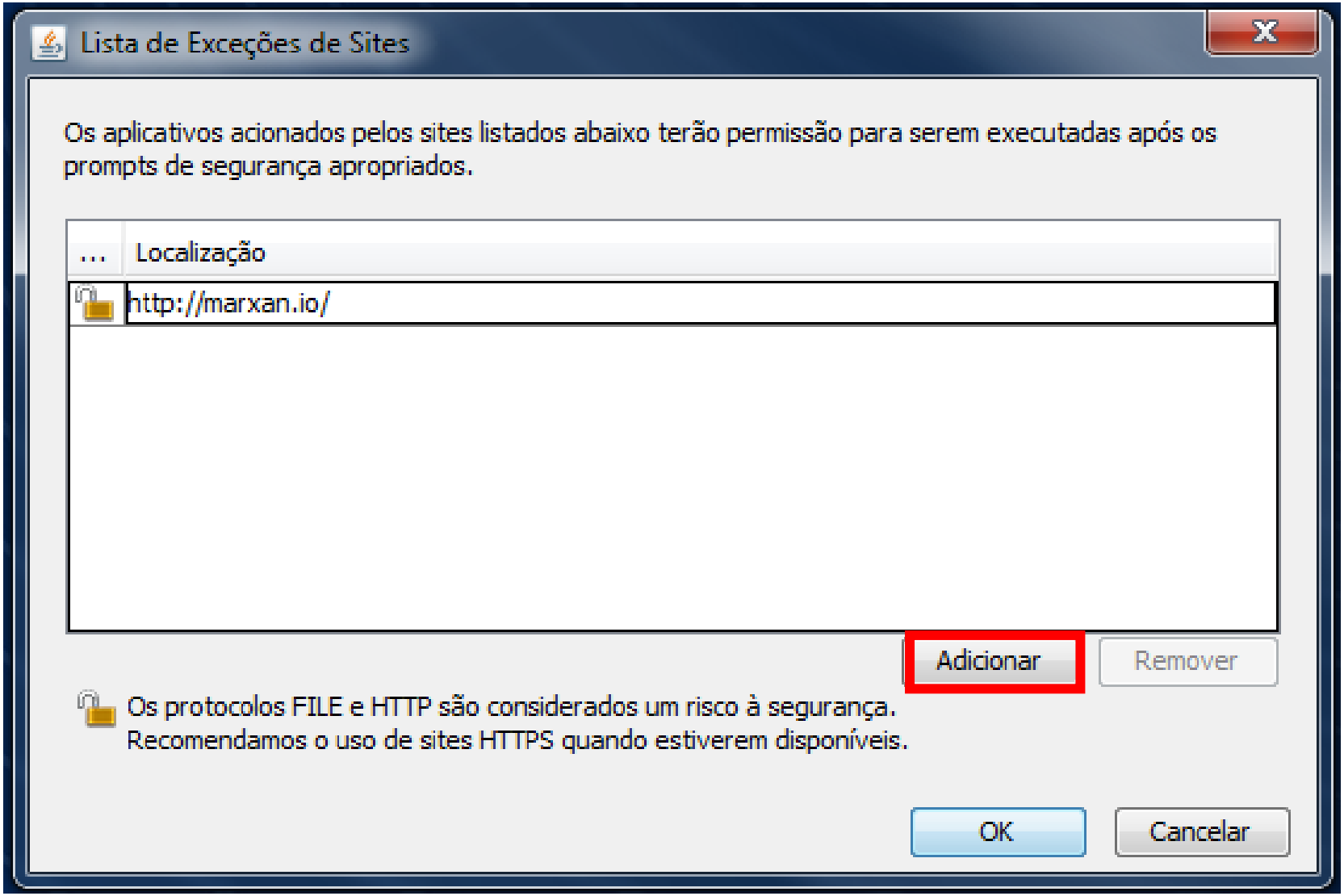
Reserve Design Game

resgame.jar

- Desenvolvido por Wayne Rochester em 2004
- Entre no aplicativo "Configurar Java" (Painel de Controle Java)
  -> Aba "Segurança"
  -> Editar lista de sites

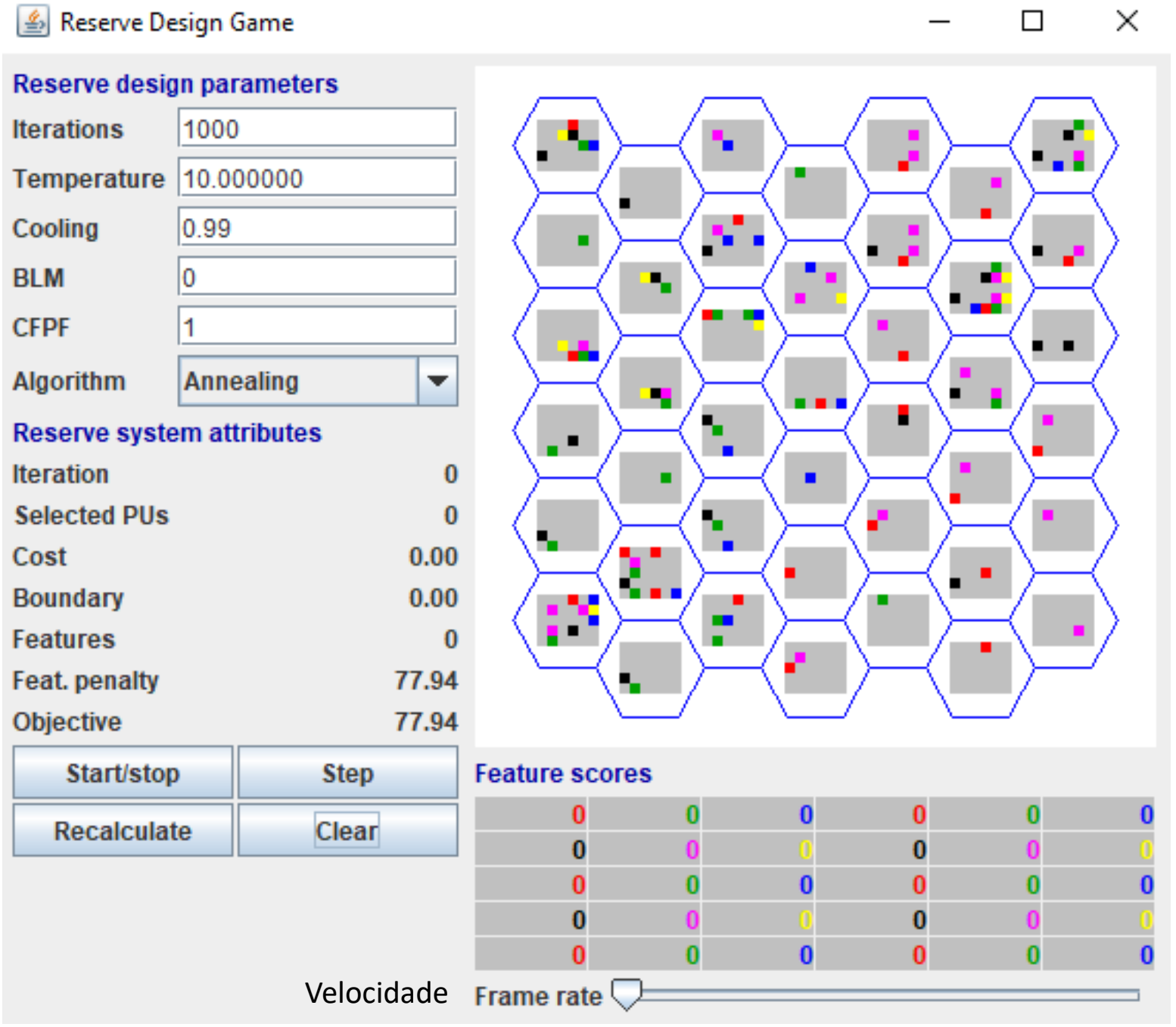


- Adicionar -> http://marxan.io/



- Abra o aplicativo resgame.jar

resgame.jar



Penalidade por borda

Penalidade por não atingir meta

Unidades conservadas

Custo

Espécies conservadas

Penalidade por não atingir meta

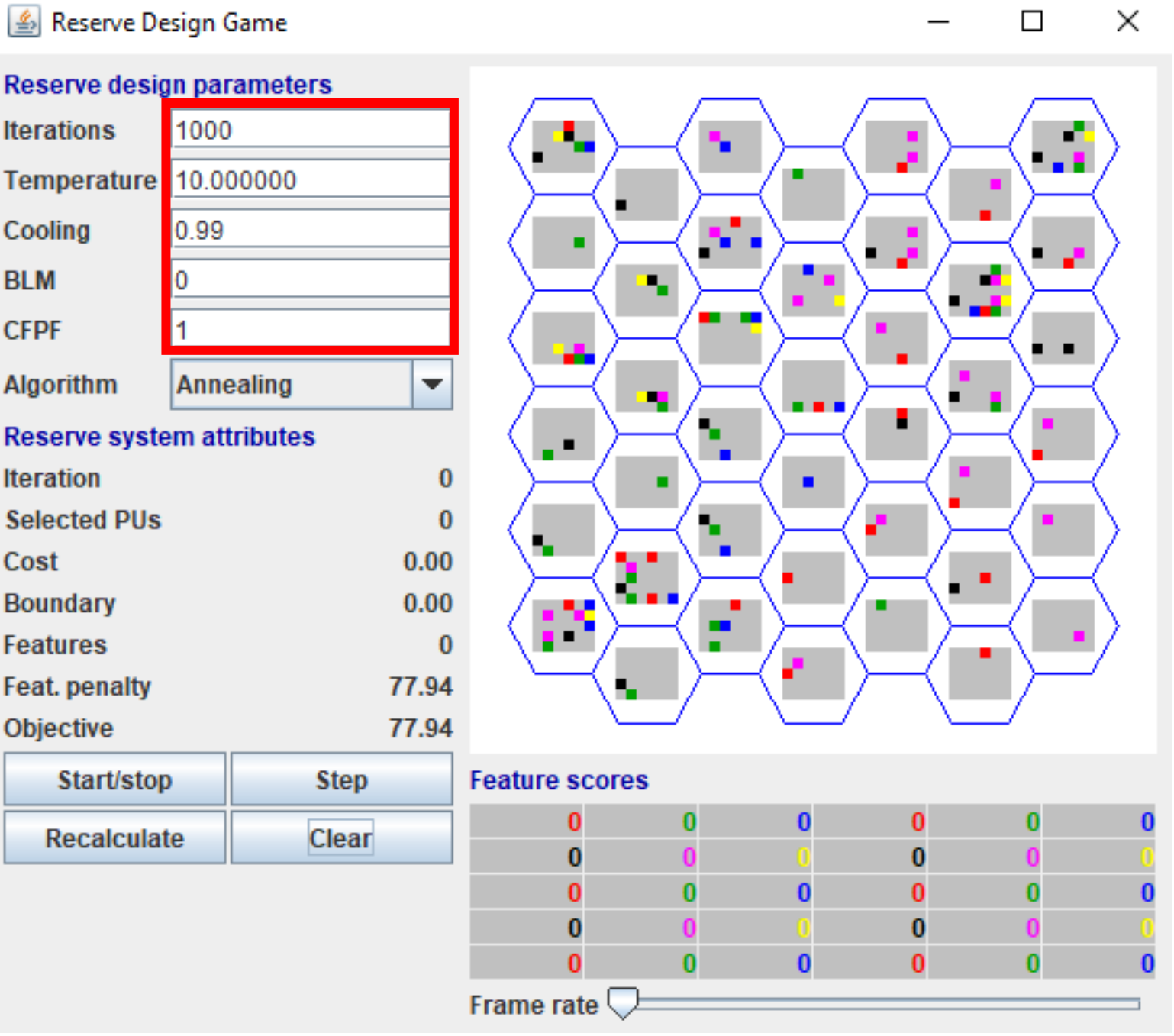
Pontuação final

Velocidade

- Selecione os parâmetros indicados
- “Start/stop”
- Modifique a velocidade
- Após 500 interações, aperte “Start/Stop” novamente.
- Analise os resultados

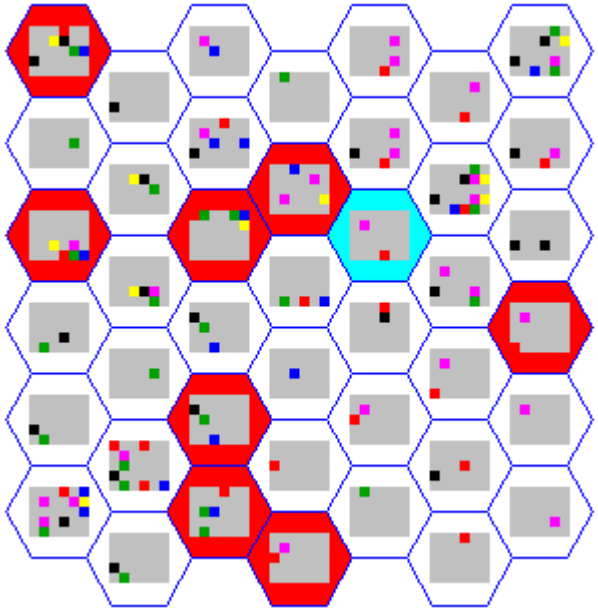
- Aperte Clear

- Retorne a temperatura para 10
- Teste com BLM 0.1 e 1



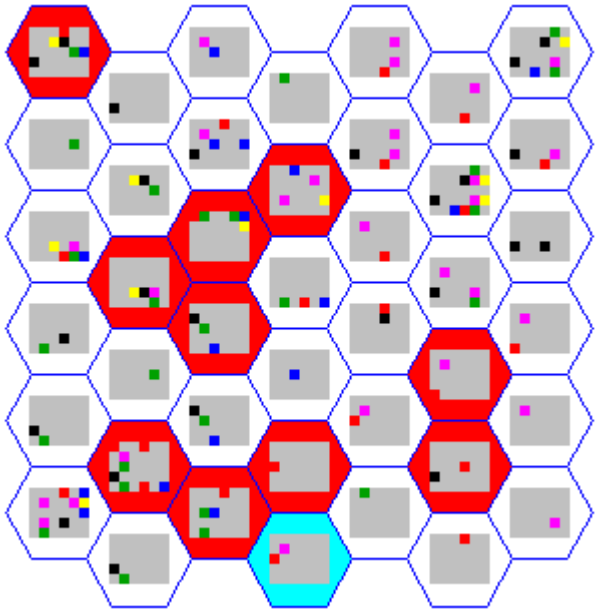
BLM – Boundary Layer Modifier

0



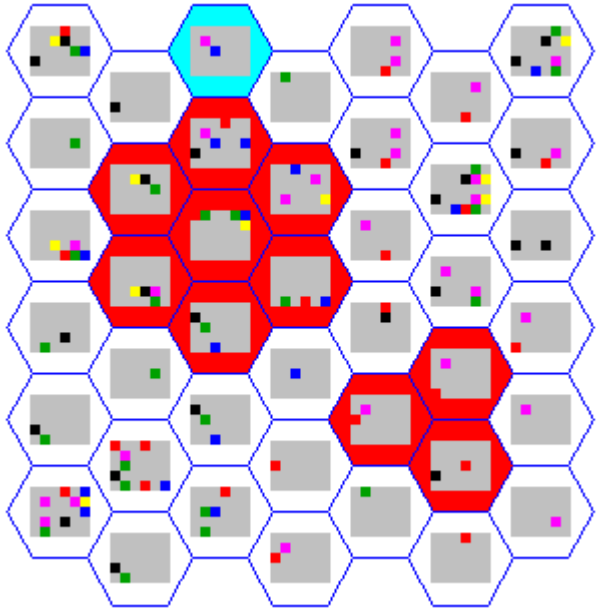
Reserve system attributes	
Iteration	500
Selected PUs	8
Cost	20.78
Boundary	42.00
Features	28
Feat. penalty	5.20
Objective	25.98

0.1



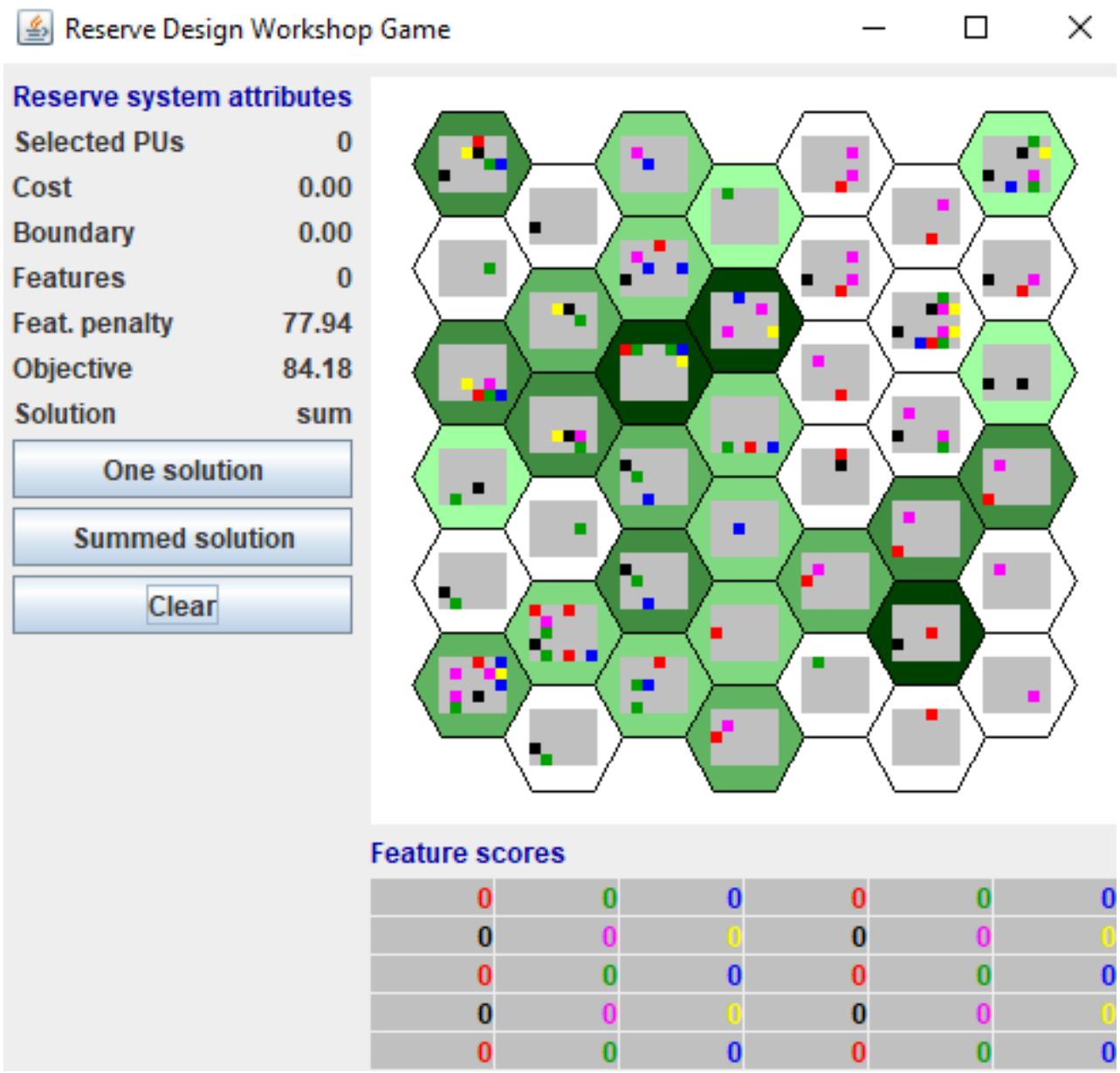
Reserve system attributes	
Iteration	500
Selected PUs	10
Cost	25.98
Boundary	46.00
Features	30
Feat. penalty	0.00
Objective	30.58

1



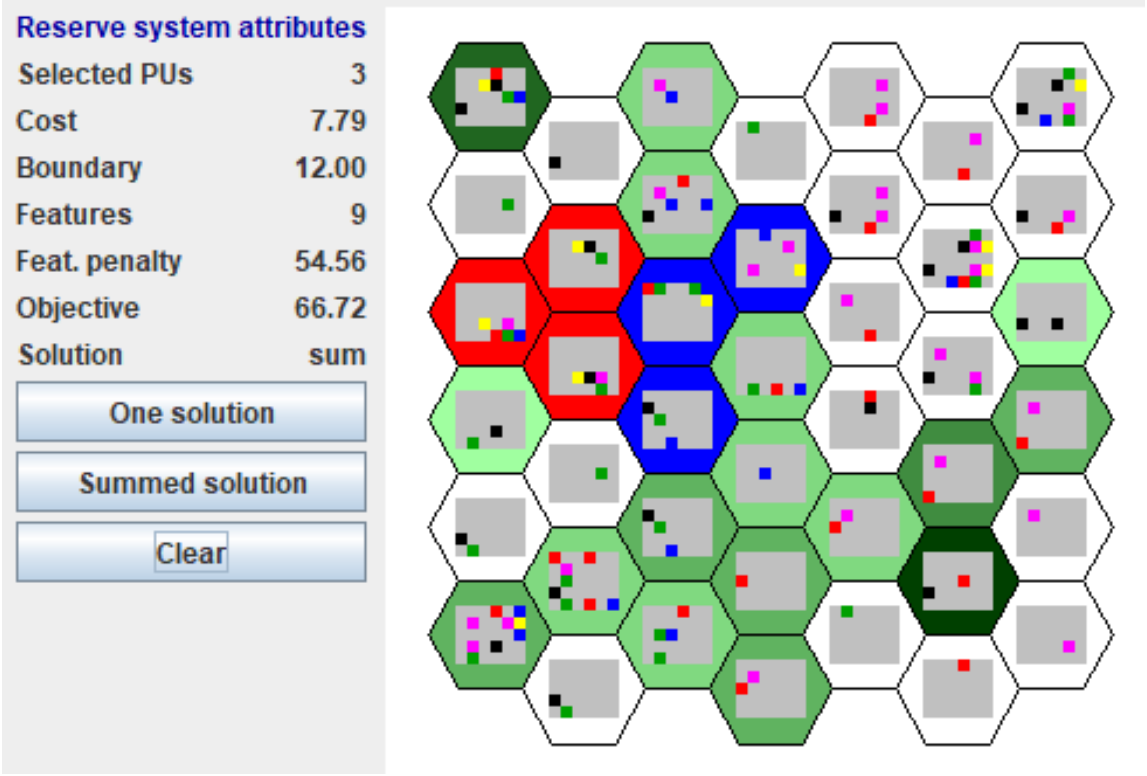
Reserve system attributes	
Iteration	500
Selected PUs	10
Cost	25.98
Boundary	30.00
Features	30
Feat. penalty	0.00
Objective	55.98

- Abra o aplicativo resgame_ws.jar



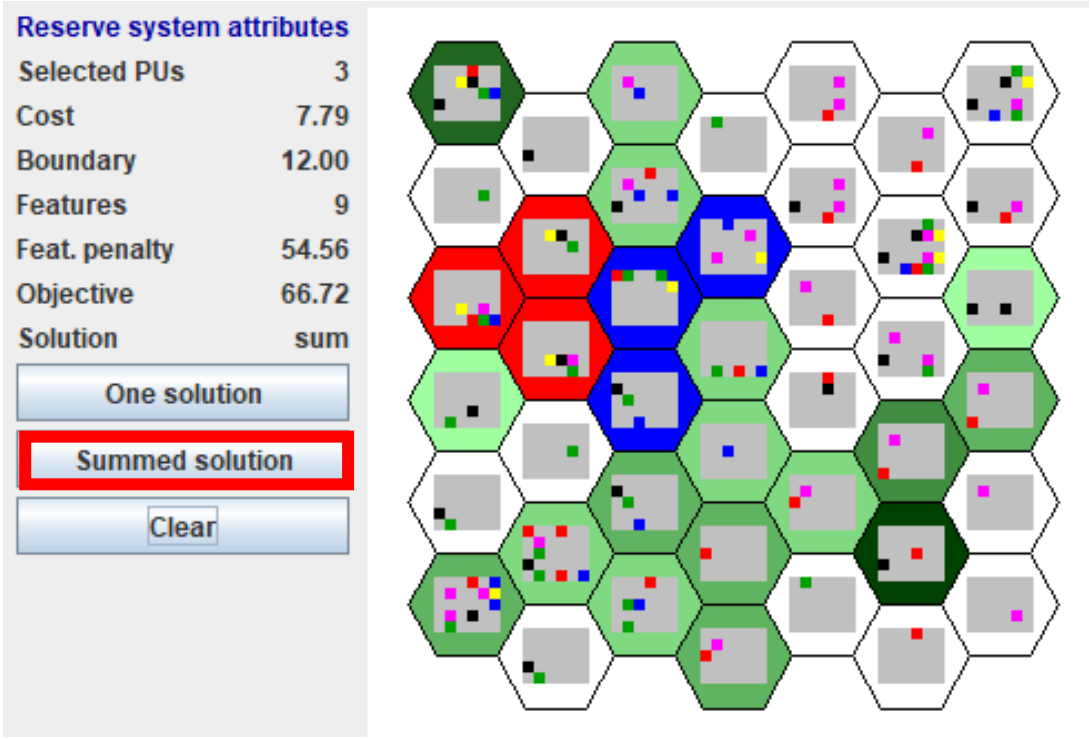
Contexto Participativo

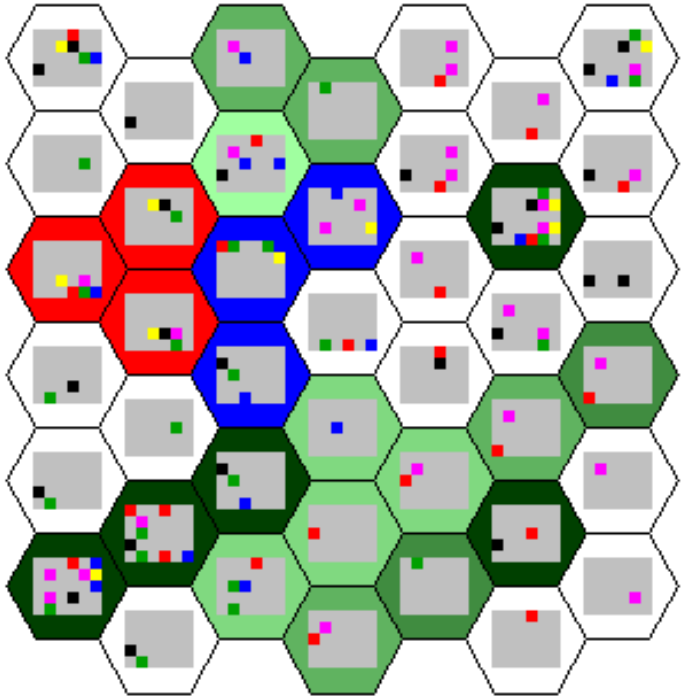
Em uma oficina, foi negociado com entre ambientalistas, moradores, governo e produtores rurais um consenso sobre algumas das áreas para conservação, e sobre a exclusão de outras áreas. Clique nos quadrantes para marcar a conservação (vermelho) e exclusão (azul).



- Clique em Summed Solution

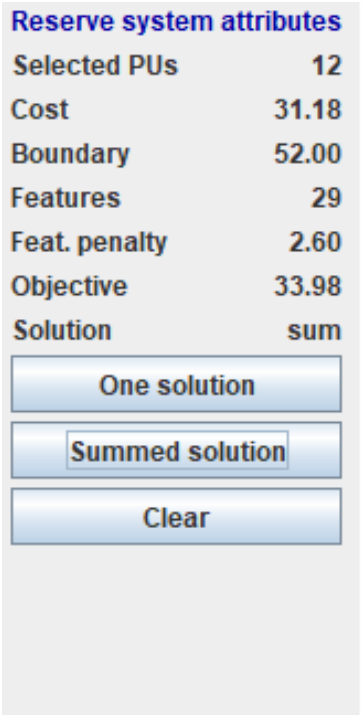
Novo resultado

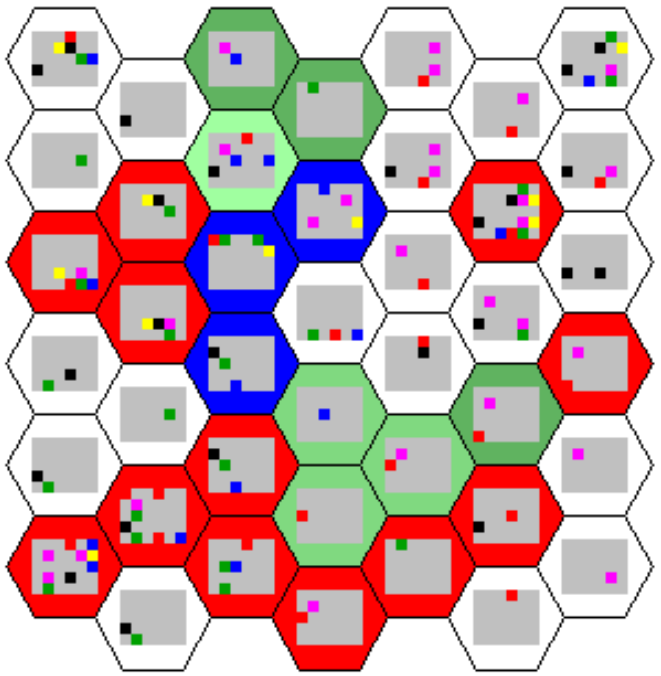




- Complete as demais unidades de conservação (do verde mais escuro para o mais claro), transformando-as em vermelho, até atingir a meta de conservação (*Feature penalty* = 0), ou até atingir o menor resultado possível (*Objective*)
- Observe o que ocorre com os resultados do modelo a cada passo

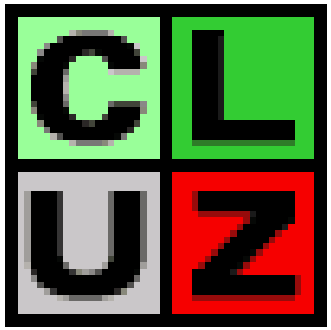
Resultado



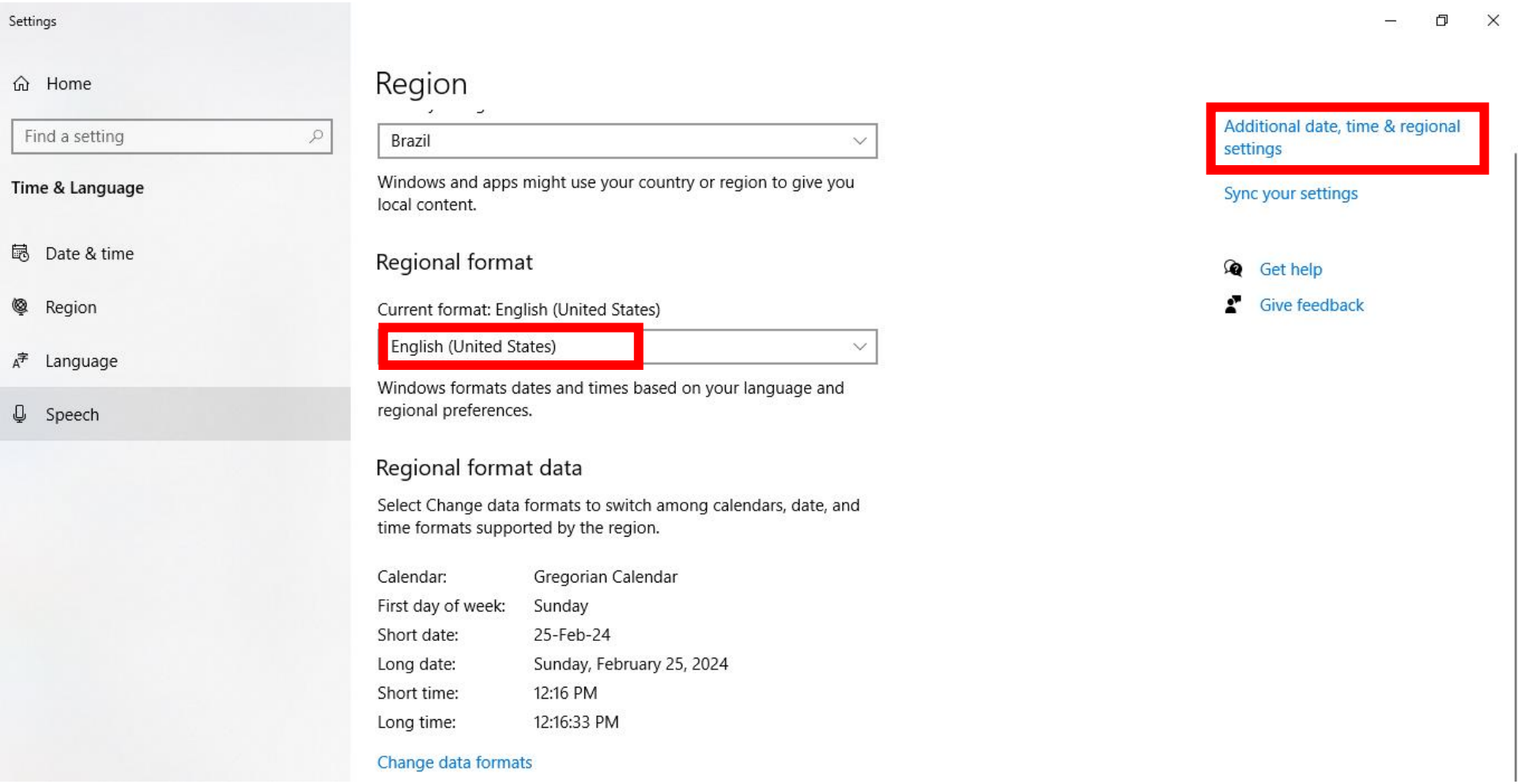


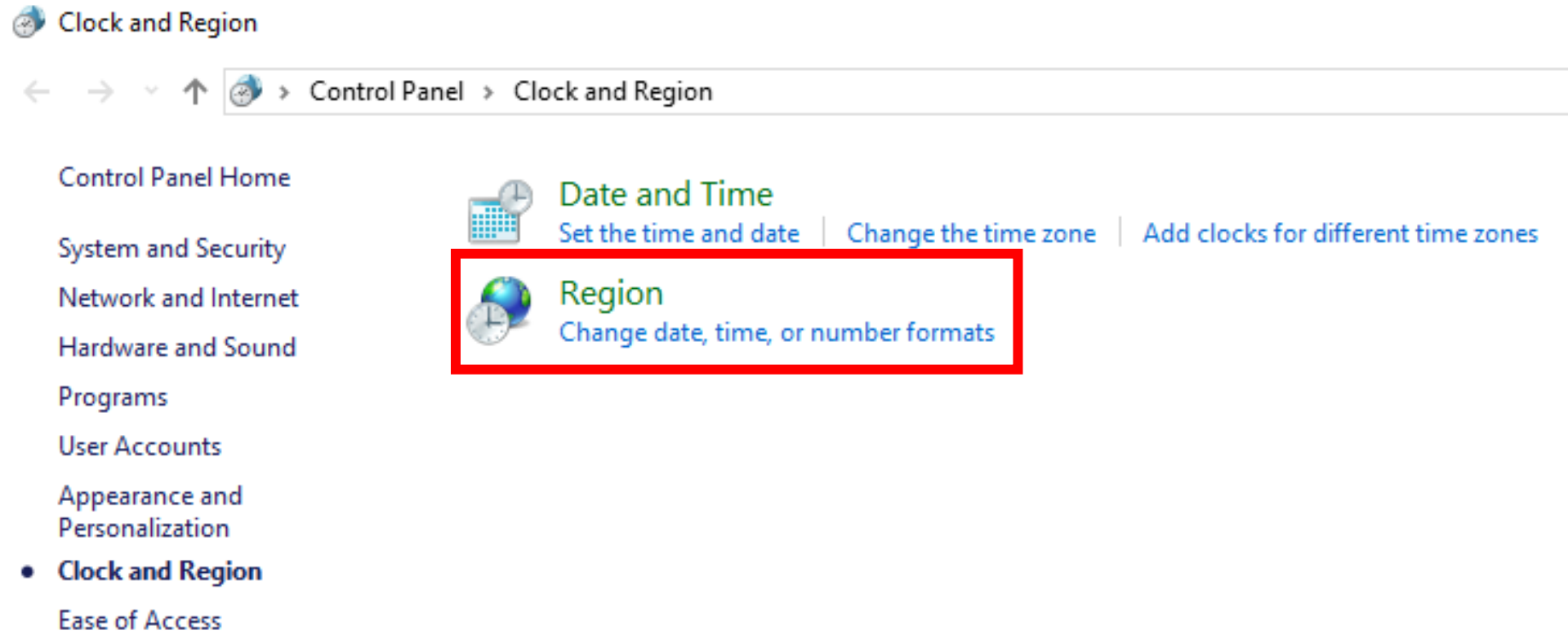
Atividade Prática - CLUZ

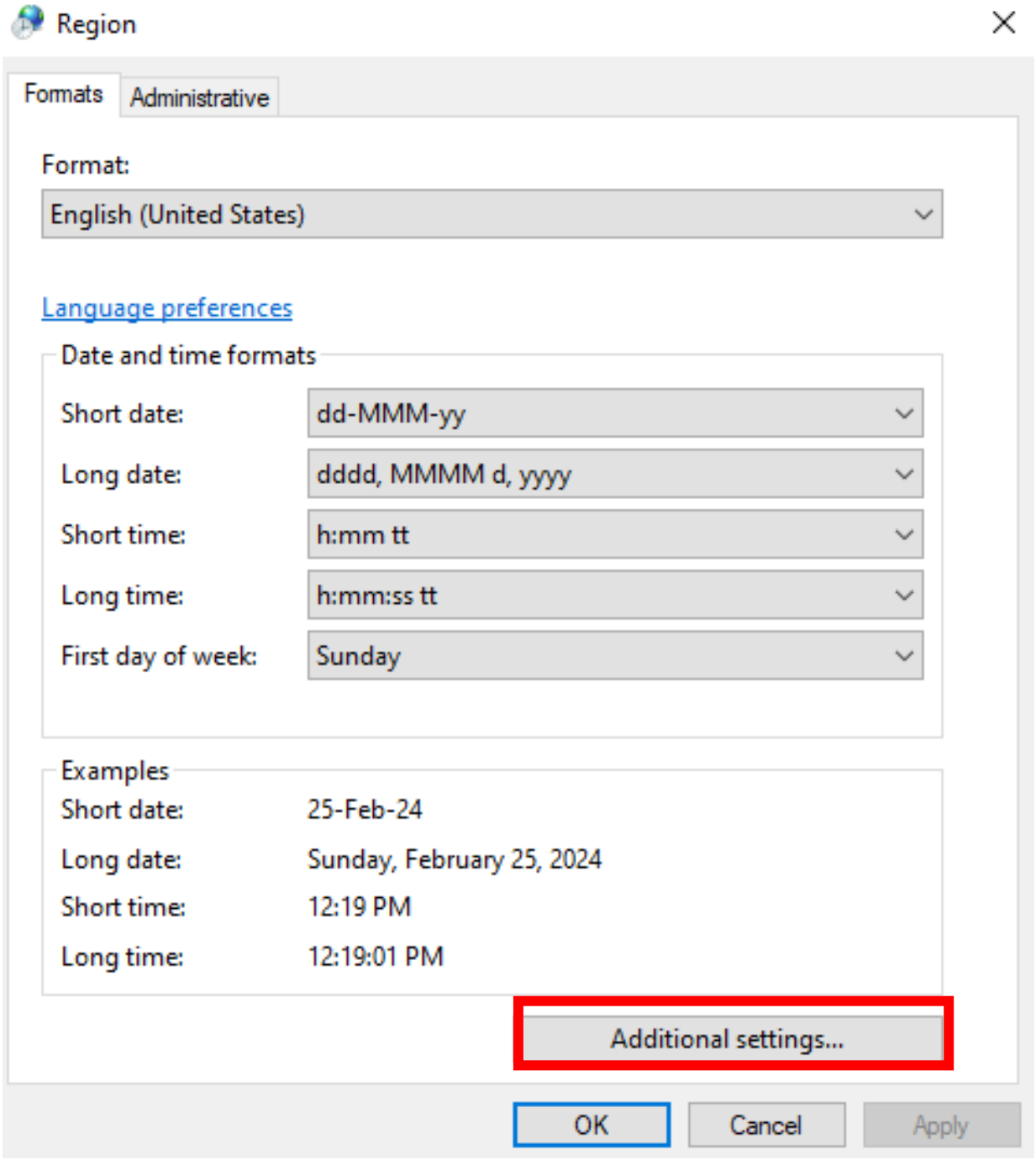
- Adaptado de https://anotherbobsmith.wordpress.com/software/cluz/

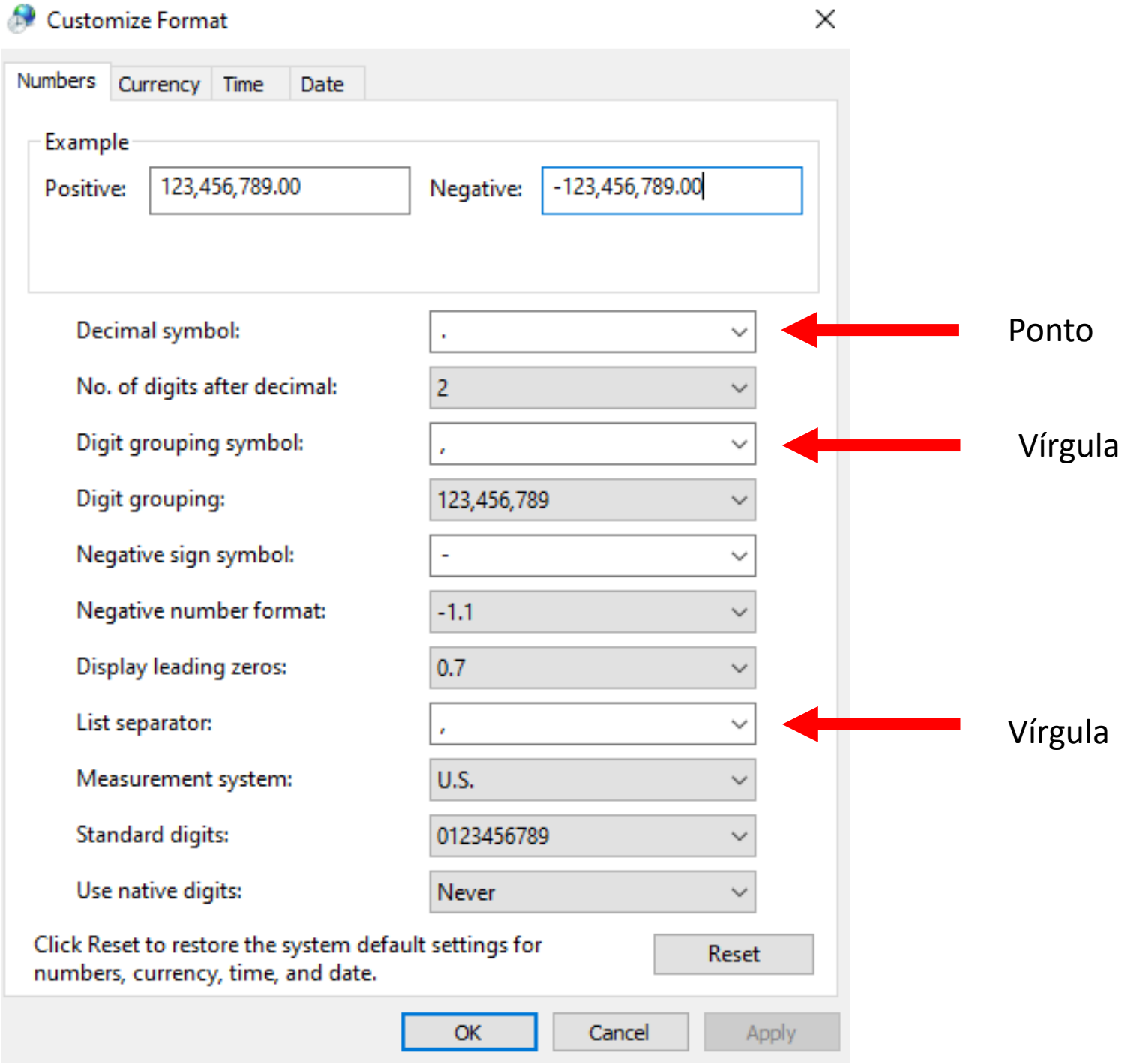


- Dica antes de começar: alterar as configurações de formato numérico do Windows para o formato americano.


Settings
Home
Find a setting
Time & Language
Date & time
Region
Language
Speech
Region
Brazil
Windows and apps might use your country or region to give you local content.
Regional format
Current format: English (United States)
English (United States)
Windows formats dates and times based on your language and regional preferences.
Regional format data
Select Change data formats to switch among calendars, date, and time formats supported by the region.
Calendar: Gregorian Calendar
First day of week: Sunday
Short date: 25-Feb-24
Long date: Sunday, February 25, 2024
Short time: 12:16 PM
Long time: 12:16:33 PM
Change data formats
Additional date, time & regional settings
Sync your settings
Get help
Give feedback


Clock and Region
Control Panel › Clock and Region
Control Panel Home
System and Security
Network and Internet
Hardware and Sound
Programs
User Accounts
Appearance and Personalization
Clock and Region
Ease of Access
Date and Time
Set the time and date
Change the time zone
Add clocks for different time zones
Region
Change date, time, or number formats


Region
Formats
Administrative
Format:
English (United States)
Language preferences
Date and time formats
Short date:
dd-MMM-yy
Long date:
dddd, MMMM d, yyyy
Short time:
h:mm tt
Long time:
h:mm:ss tt
First day of week:
Sunday
Examples
Short date:
25-Feb-24
Long date:
Sunday, February 25, 2024
Short time:
12:19 PM
Long time:
12:19:01 PM
Additional settings...
OK
Cancel
Apply


Customize Format
Numbers
Currency
Time
Date
Example
Positive:
123,456,789.00
Negative:
-123,456,789.00
Decimal symbol:
.
No. of digits after decimal:
2
Digit grouping symbol:
,
Digit grouping:
123,456,789
Negative sign symbol:
-
Negative number format:
-1.1
Display leading zeros:
0.7
List separator:
,
Measurement system:
U.S.
Standard digits:
0123456789
Use native digits:
Never
Click Reset to restore the system default settings for numbers, currency, time, and date.
Reset
OK
Cancel
Apply
Ponto
Vírgula
Vírgula

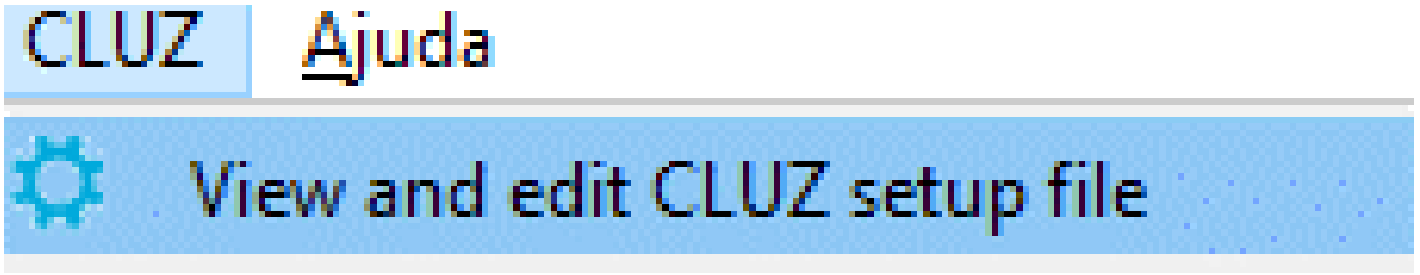
Partes

1. **Análise manual**
2. Análise sistemática

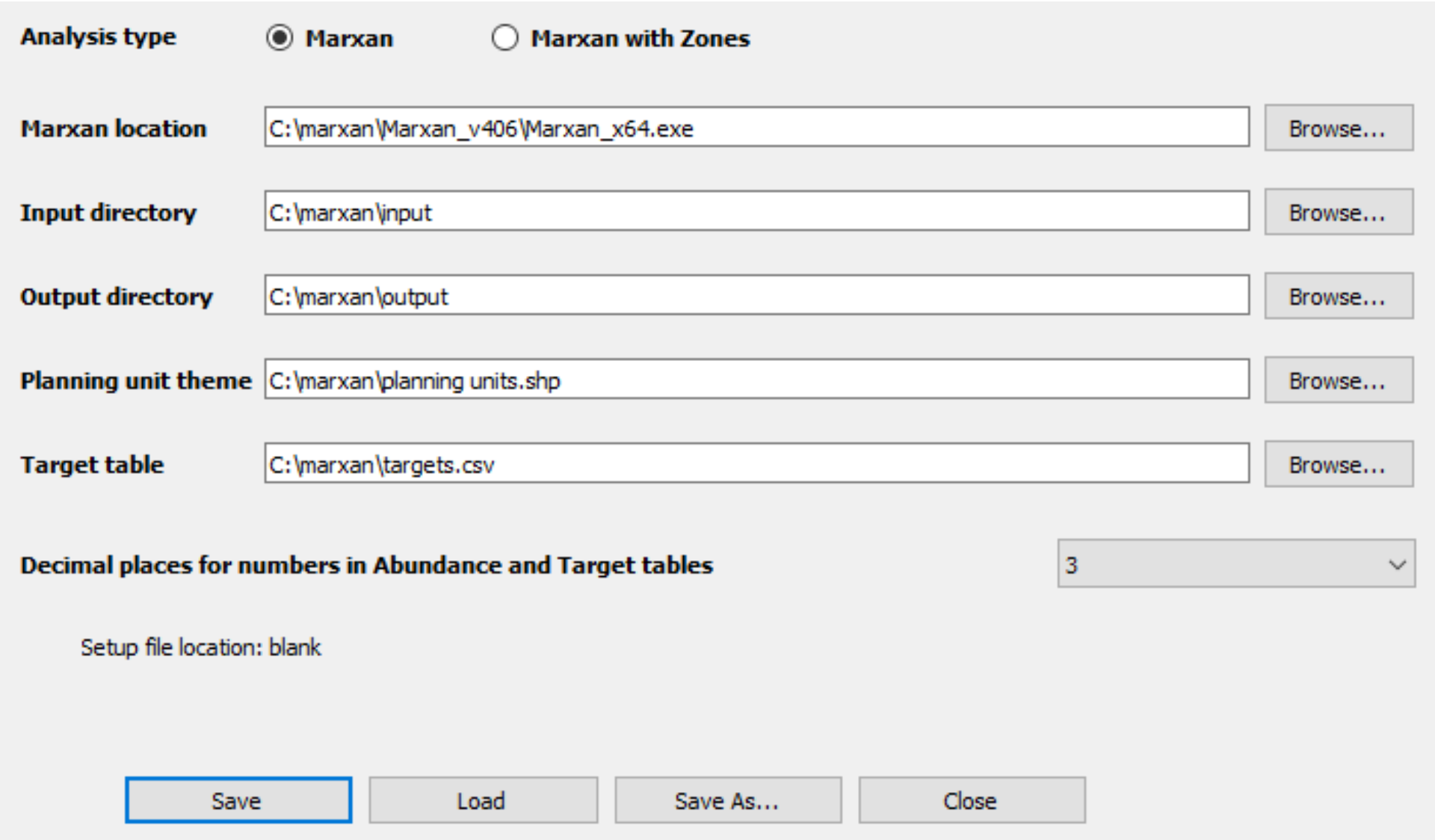
- Abra o QGIS Desktop
- Menu Complementos -> Gerenciar e Instalar Complemento

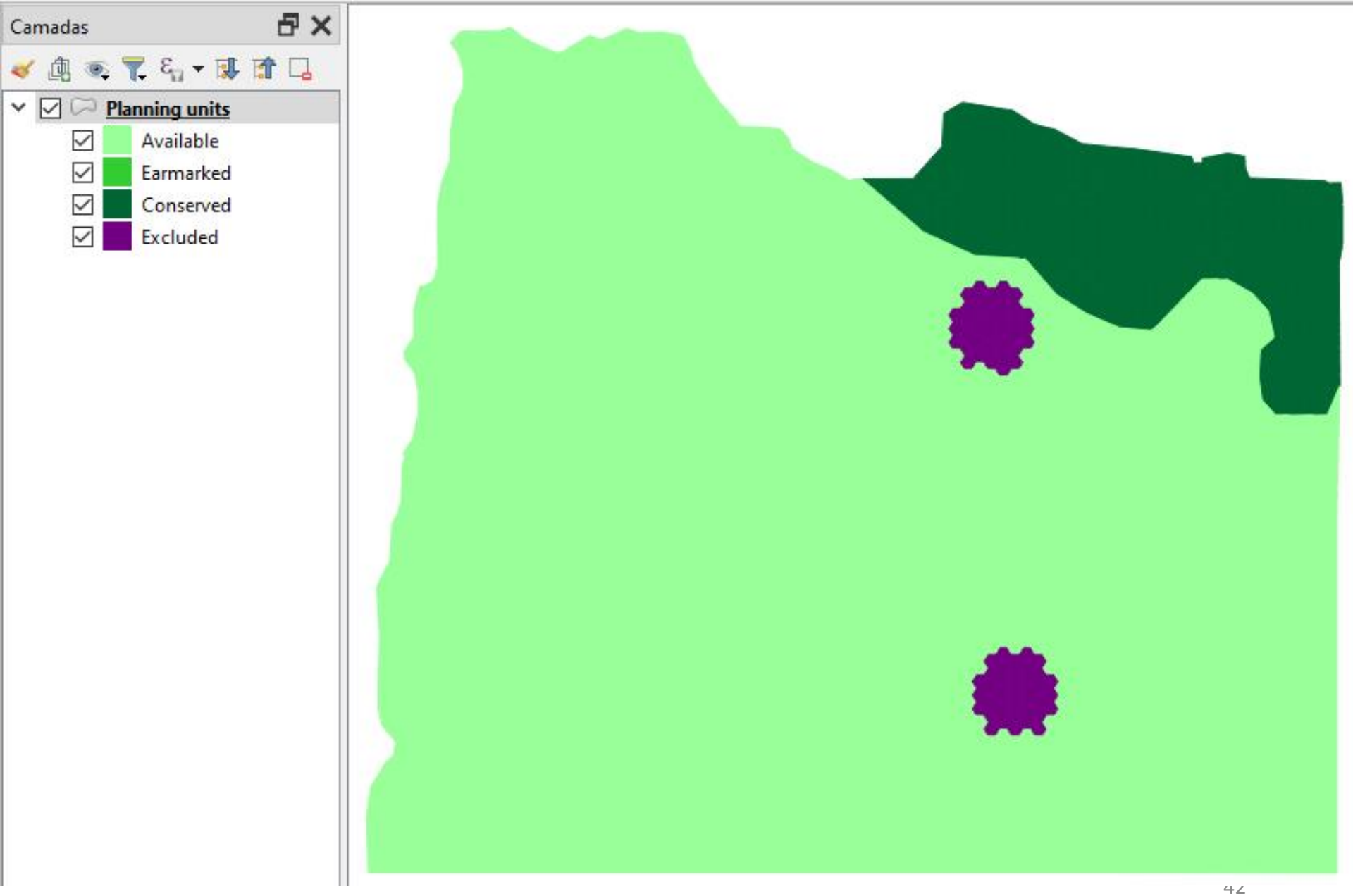
- Instalar complementos “CLUZ3”

- Menu “CLUZ” –> View and edit CLUZ setup file



Faça as configurações abaixo, clique em “Save as...” e grave o arquivo “marxan.clz” na pasta com os demais arquivos da aula. Depois clique em “Close”

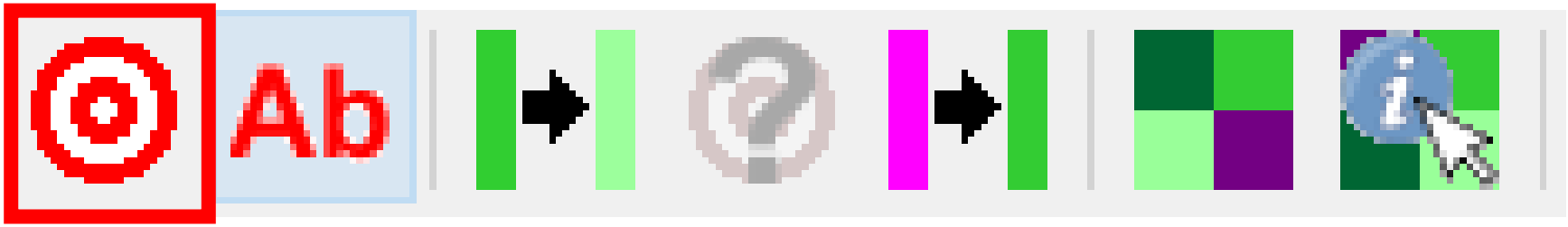



Camadas
Planning units
Available
Earmarked
Conserved
Excluded

Arquivo target.csv

Id	Name	Type	Target	Spf	Ear+Cons	Total	PC_target
1	Montane_aquatic	1	244,2625	10	0	1221,302	0
2	Rock_faces	1	158,025	10	0	790,123	0
3	Montane_grassland	2	136,025	10	0	340,062	0
4	Montane_woodland	1	4919,6125	10	0	24598,204	0
5	Montane_thicket	1	2055,7875	10	0	10278,94	0
6	Montane_forest	2	70,025	10	0	175,06	0
8	Acacia_woodland	1	1356,1625	10	1133,994	6780,803	83,618
9	Acacia_thicket	1	2020,125	10	2905,997	10100,617	143,852
11	Floodplain_grassland	2	1752,95	10	1399,376	4382,378	79,83
12	Reed_beds	2	655,7	10	925,871	1639,24	141,203
13	Riverine_thicket	2	589,375	10	418,568	1473,435	71,019
14	Riverine_forest	2	442,7	10	814,62	1106,741	184,012
18	Terminalia_woodland	1	1957,35	10	1545,001	9788,494	78,933
19	Woodland_on_red_sand	1	345,6	10	410,25	1727,999	118,707
21	Sand_forest	2	388,075	10	1,813	970,315	0,467
30	Subsistence_agriculture	0	0	10	752,937	32468,3349999999	-1
31	Commercial_agriculture	0	0	10	0	894,439	-1
33	Open_water	1	356,675	10	556,436	1783,374	156,006
105	F_splendens	3	2000	10	0	10784,516	0
107	A_gigantica	3	2000	10	0	4446,389	0
156	Vulture_nest	3	20	10	11	34	55

- Na barra de ferramentas do CLUZ, clique no ícone de Alvo (Target)

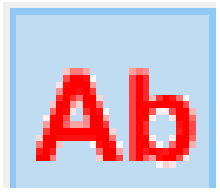


Id	Name	Type	Target	Spf	Ear+Cons	Total	PC_target
1	Montane_aquatic	1	244.262	10	0.0	1221.302	0.000
2	Rock_faces	1	158.025	10	0.0	790.123	0.000
3	Montane_grassland	2	136.025	10	0.0	340.062	0.000
4	Montane_woodland	1	4919.613	10	0.0	24598.204	0.000
5	Montane_thicket	1	2055.787	10	0.0	10278.94	0.000
6	Montane_forest	2	70.025	10	0.0	175.06	0.000
8	Acacia_woodland	1	1356.162	10	1133.994	6780.803	83.618
9	Acacia_thicket	1	2020.125	10	2905.997	10100.617	143.852
11	Floodplain_grassland	2	1752.95	10	1399.376	4382.378	79.830
12	Reed_beds	2	655.7	10	925.871	1639.24	141.203
13	Riverine_thicket	2	589.375	10	418.568	1473.435	71.019
14	Riverine_forest	2	442.7	10	814.62	1106.741	184.012
18	Terminalia_woodland	1	1957.35	10	1545.001	9788.494	78.933
19	Woodland_on_red_sands	1	345.6	10	410.25	1727.999	118.707
21	Sand_forest	2	388.075	10	1.813	970.315	0.467
30	Subsistence_agriculture	0	0.0	10	752.937	32468.335	-1
31	Commercial_agriculture	0	0.0	10	0.0	894.439	-1
33	Open_water	1	356.675	10	556.436	1783.374	156.006
105	F_splendens	3	2000.0	10	0.0	10784.516	0.000
107	A_gigantica	3	2000.0	10	0.0	4446.389	0.000
156	Vulture_nest	3	20.0	10	11.0	34.0	55.000

Arquivo puvspr2.dat, na pasta “input”

```
species,pu,amount
30,1,6.938
18,2,5.125
30,2,6.375
18,3,11.375
18,4,0.25
30,4,1.188
11,5,1.812
18,5,12.438
30,5,10.375
18,6,20.688
30,6,4.0
18,7,6.938
11,8,4.875
12,8,5.438
18,8,1.562
```

- Selecione o botão de Abundância



- Selecione uma ou mais metas e aperte “Ok”

Select features for Abundance table

written by
Bob Smith

DICE
University of Kent

funded by

DARWIN INITIATIVE

Display all or select conservation features to display in abundance table

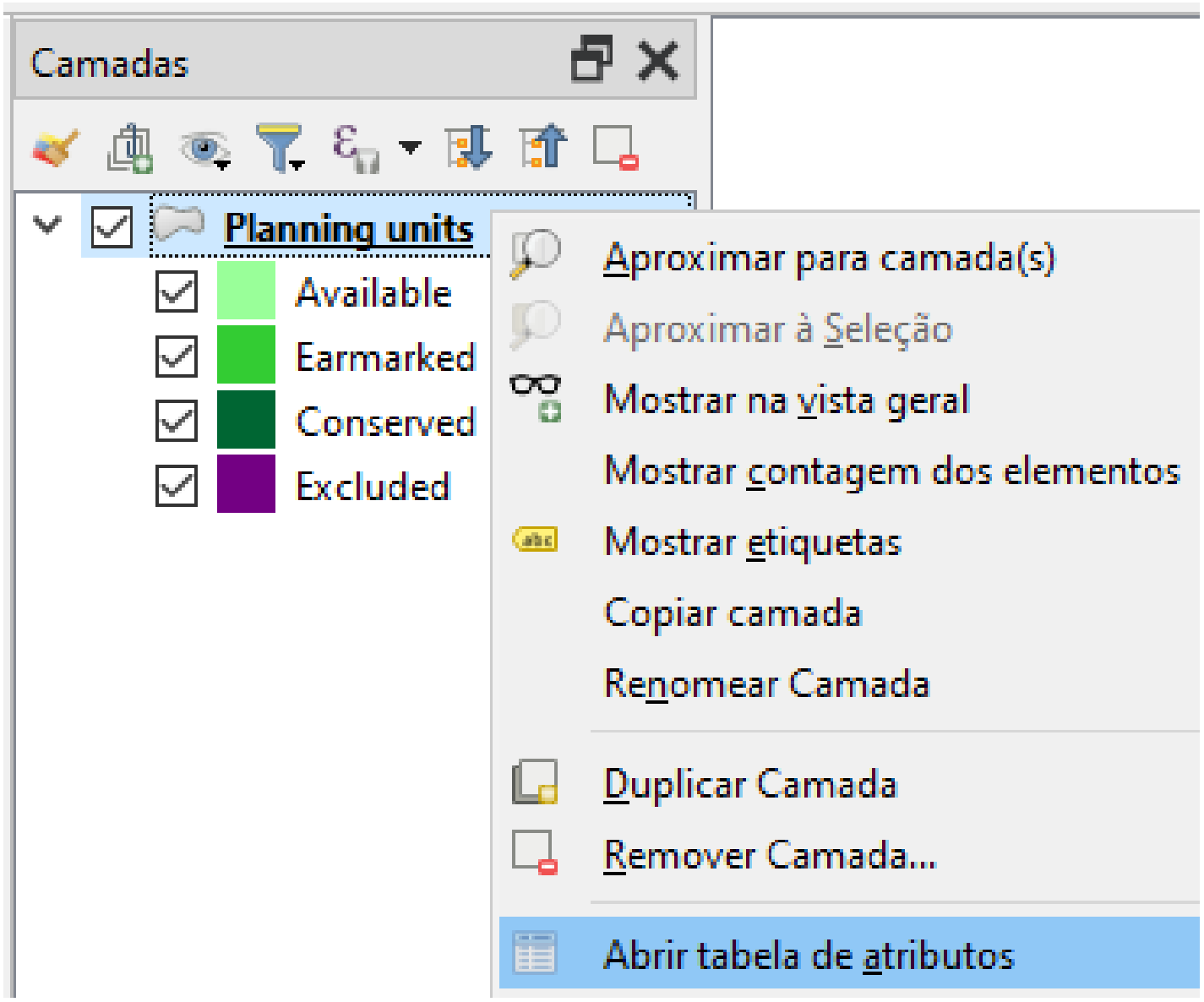
1 - Montane_aquatic
2 - Rock_faces
3 - Montane_grassland
4 - Montane_woodland
5 - Montane_thicket
6 - Montane_forest
8 - Acacia_woodland
9 - Acacia_thicket
11 - Floodplain_grassland
12 - Reed_beds
13 - Riverine_thicket
14 - Riverine_forest
18 - Terminalia_woodland
19 - Woodland_on_red_sands
21 - Sand_forest
30 - Subsistence_agriculture
31 - Commercial_agriculture
33 - Open_water
105 - F_splendens
107 - A_gigantica
156 - Vulture_nest

OK Cancel

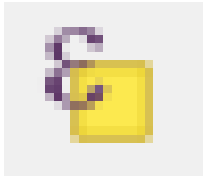
Abundance table

PU_ID	F_1	F_2	F_3	F_4	F_5	F_6	F_8	F_9	F_11	F_12
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.812	0.000
6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.875	5.438

- Clique com o botão direito na camada “Planning units” e escolha a opção “abrir tabela de atributos”



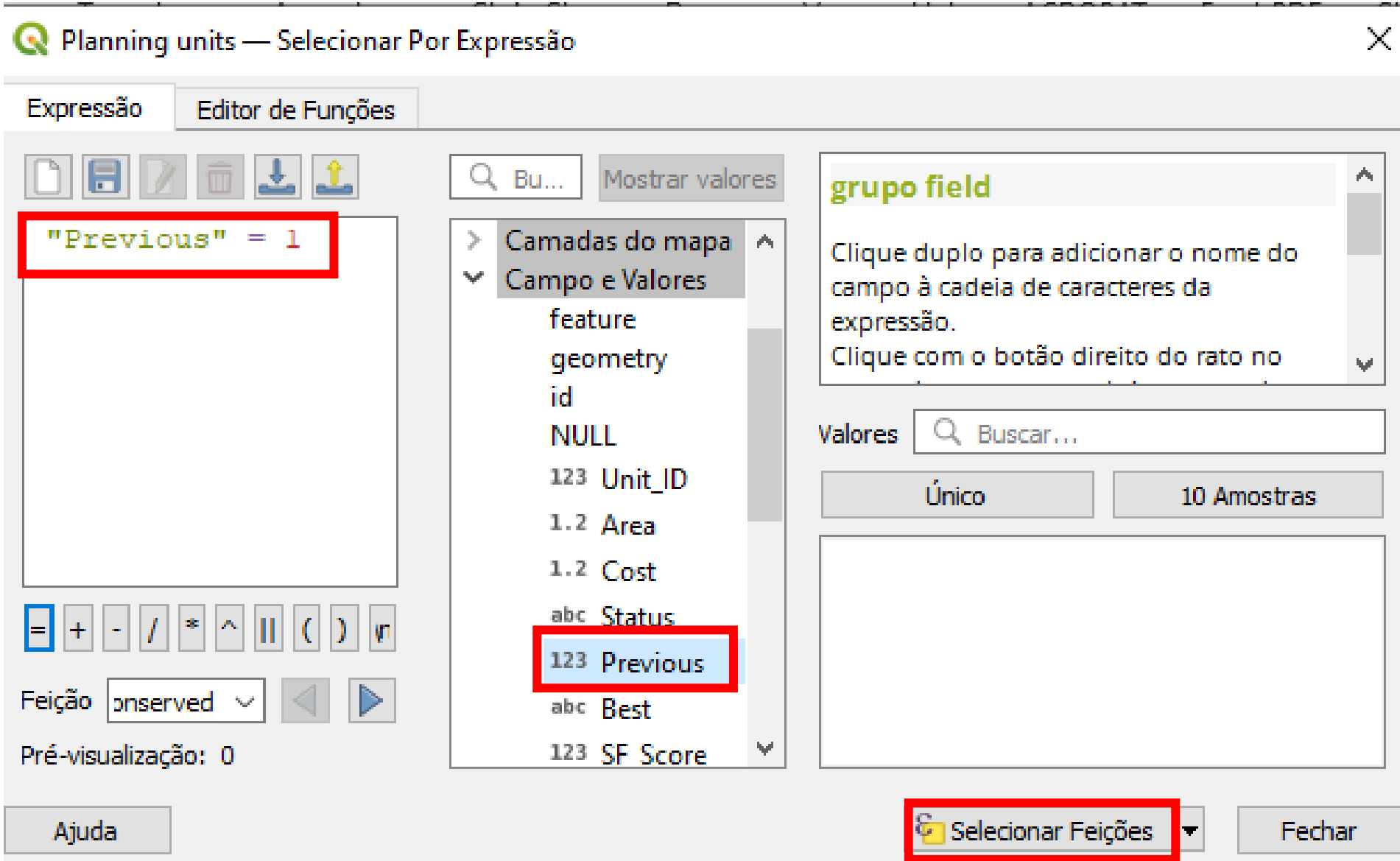
- Na tabela de atributos, clique no botão de “Selecionar por expressão”

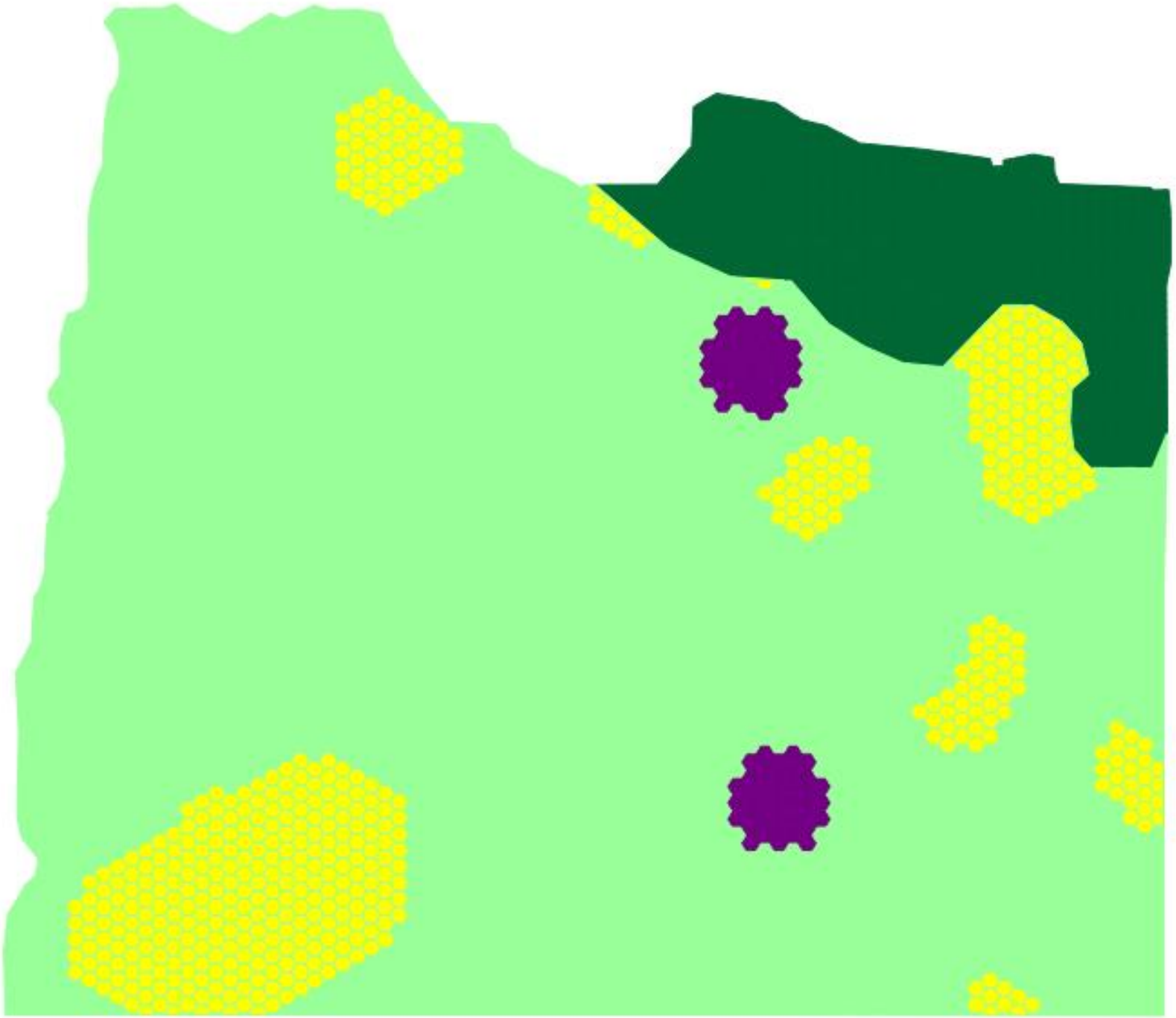


Planning units — Total de feições: 4661, Filtrado: 4661, Selecionado: 0

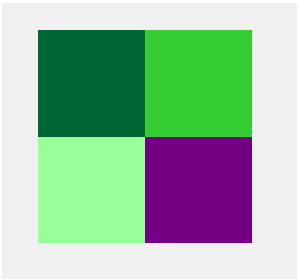
	Unit_ID	Area	Cost	Status	Previous
1	1	7,04	7,04	Conserved	0
2	2	11,67	11,67	Conserved	0
3	3	11,53	11,53	Conserved	0
4	4	1,35	1,35	Conserved	0

- Na pasta de “Campos e Valores”, dê um duplo clique no atributo “Previous”
- Escreva a expressão “Previous” = 1

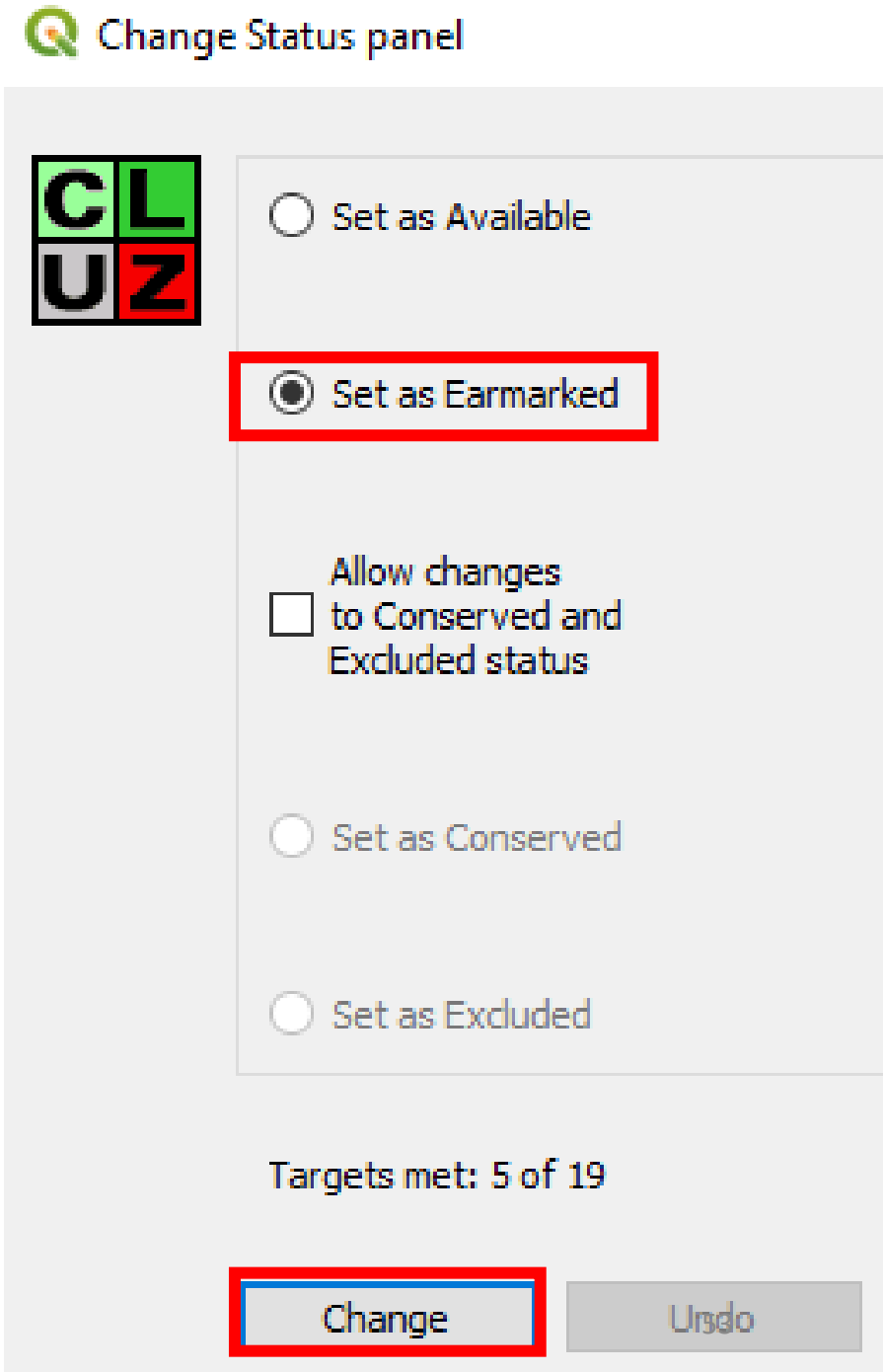


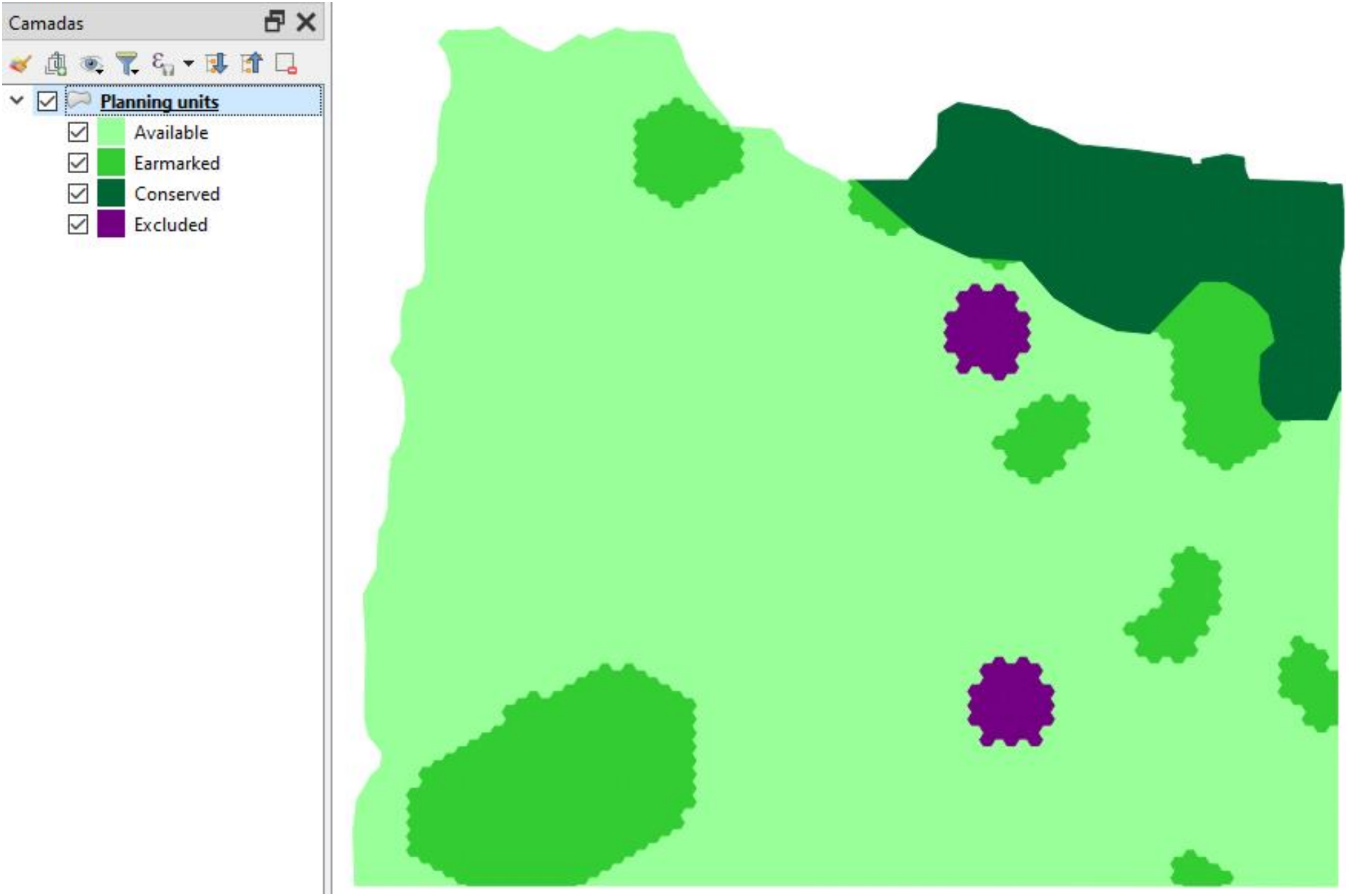


- Clique no botão “Change unit and status”

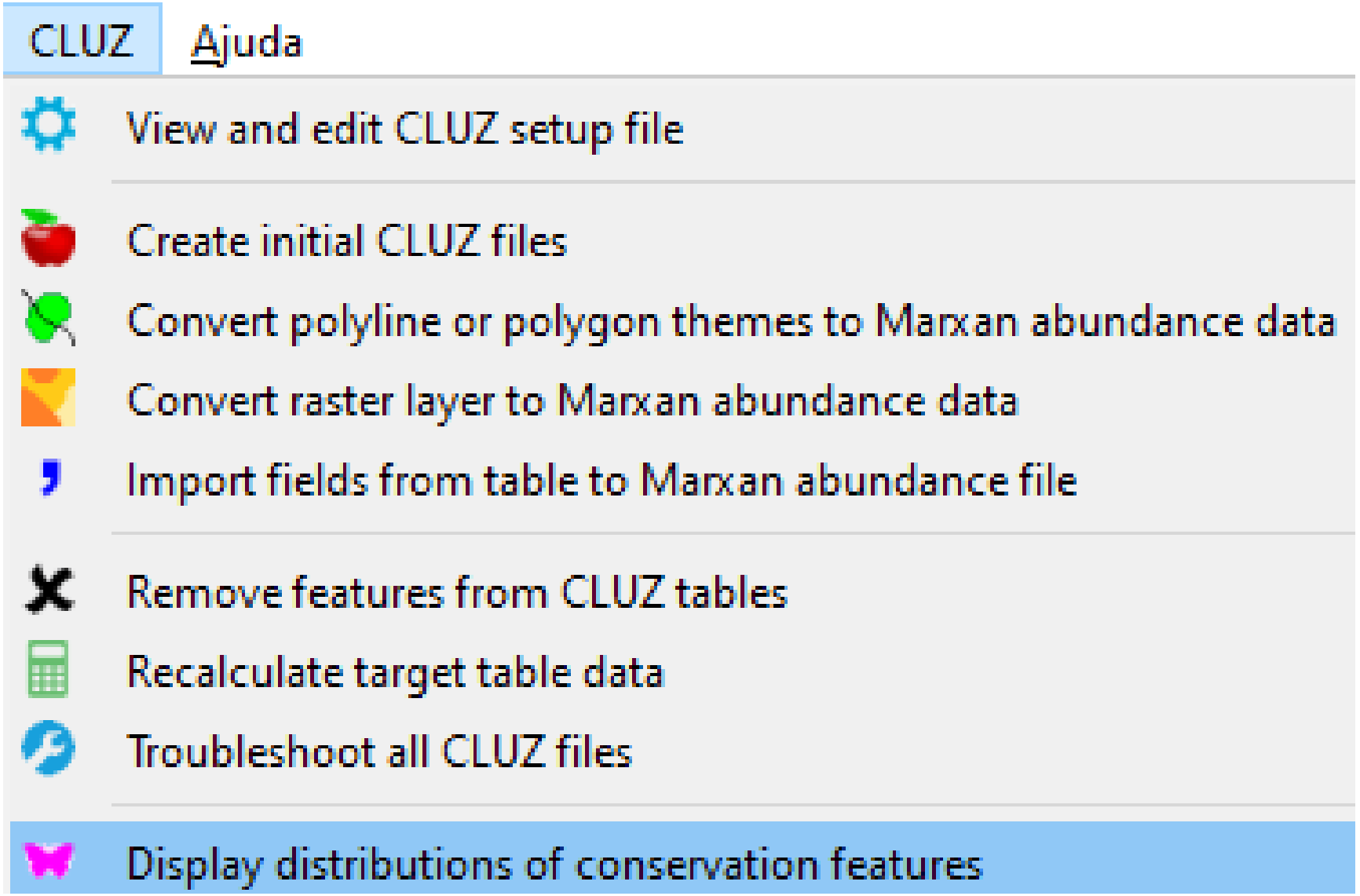


- Escolha a opção “Set as Earmarked”
- Observe a mudança nas metas (targets) atingidos




Camadas
Planning units
Available
Earmarked
Conserved
Excluded

- Menu “Display distribution of conservation features”



Show distribution of features

written by
Bob Smith

DICE
University of Kent

funded by

DARWIN INITIATIVE

Select conservation features to display

18 - Terminalia_woodland
19 - Woodland_on_red_sands
21 - Sand_forest
30 - Subsistence_agriculture
31 - Commercial_agriculture
33 - Open_water
105 - F_splendens
107 - A_gigantica
156 - Vulture_nest

Choose legend categories

(•) Equal interval

( ) Equal area

Name of shapefile that will be produced:

C:\marxan\cluz_dist1.shp

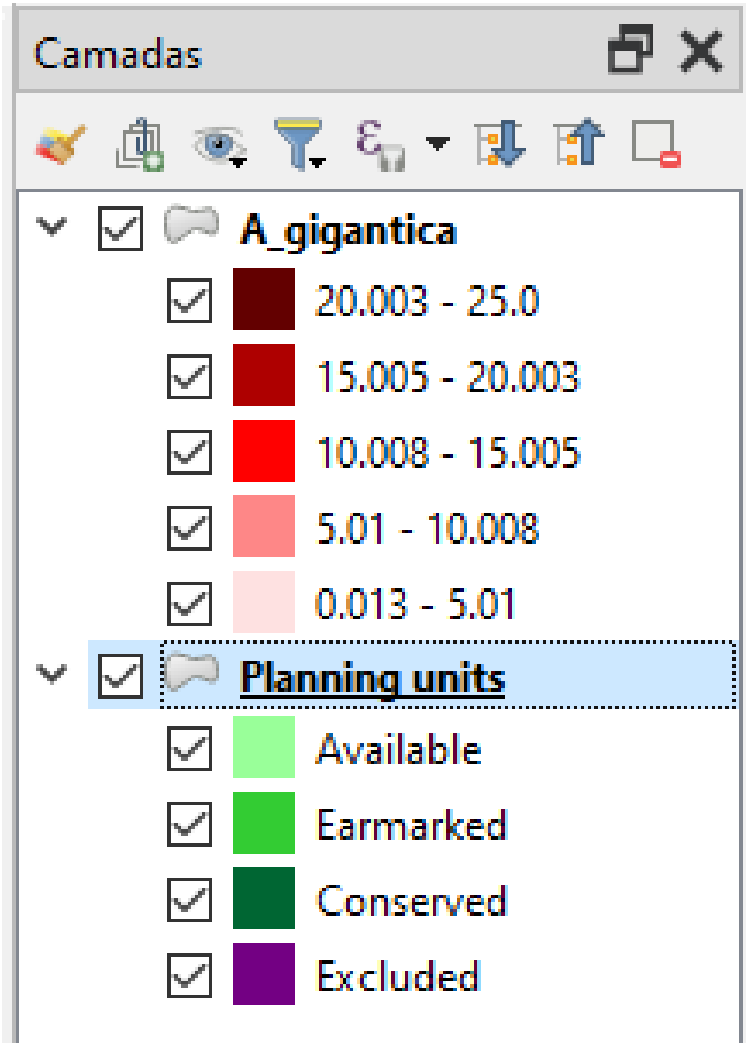
Browse

OK

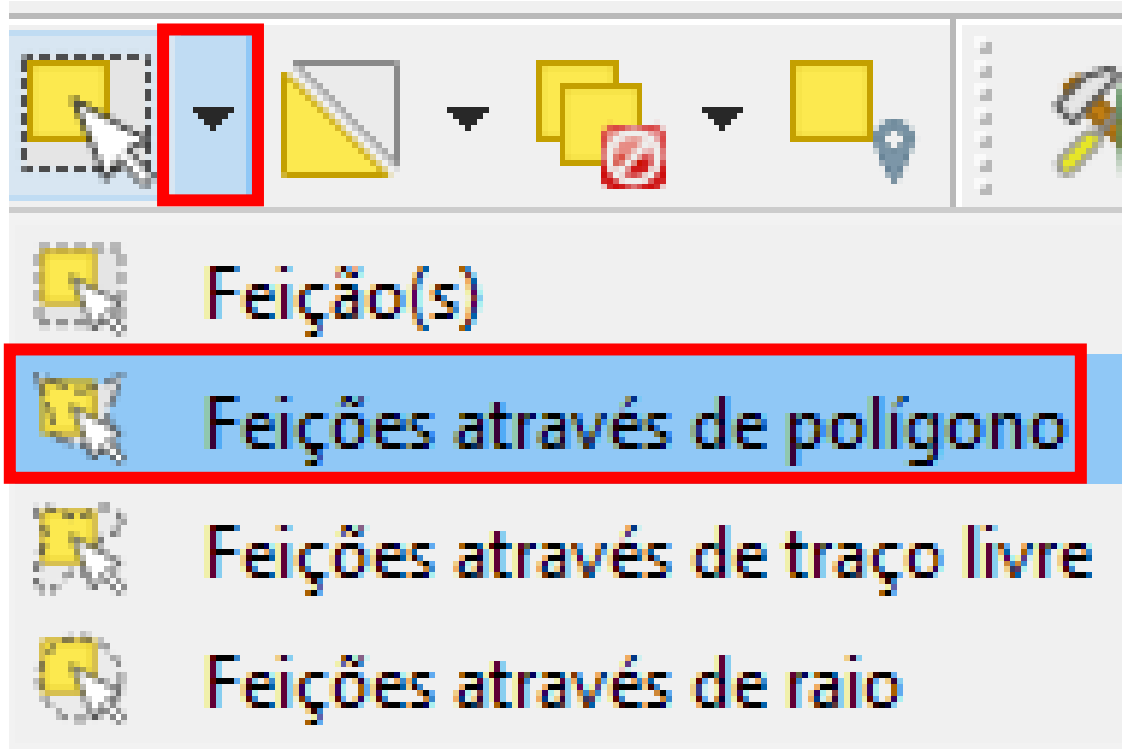
Cancel


Camadas
A gigantica
20.003 - 25.0
15.005 - 20.003
10.008 - 15.005
5.01 - 10.008
0.013 - 5.01
Planning units
Available
Earmarked
Conserved
Excluded

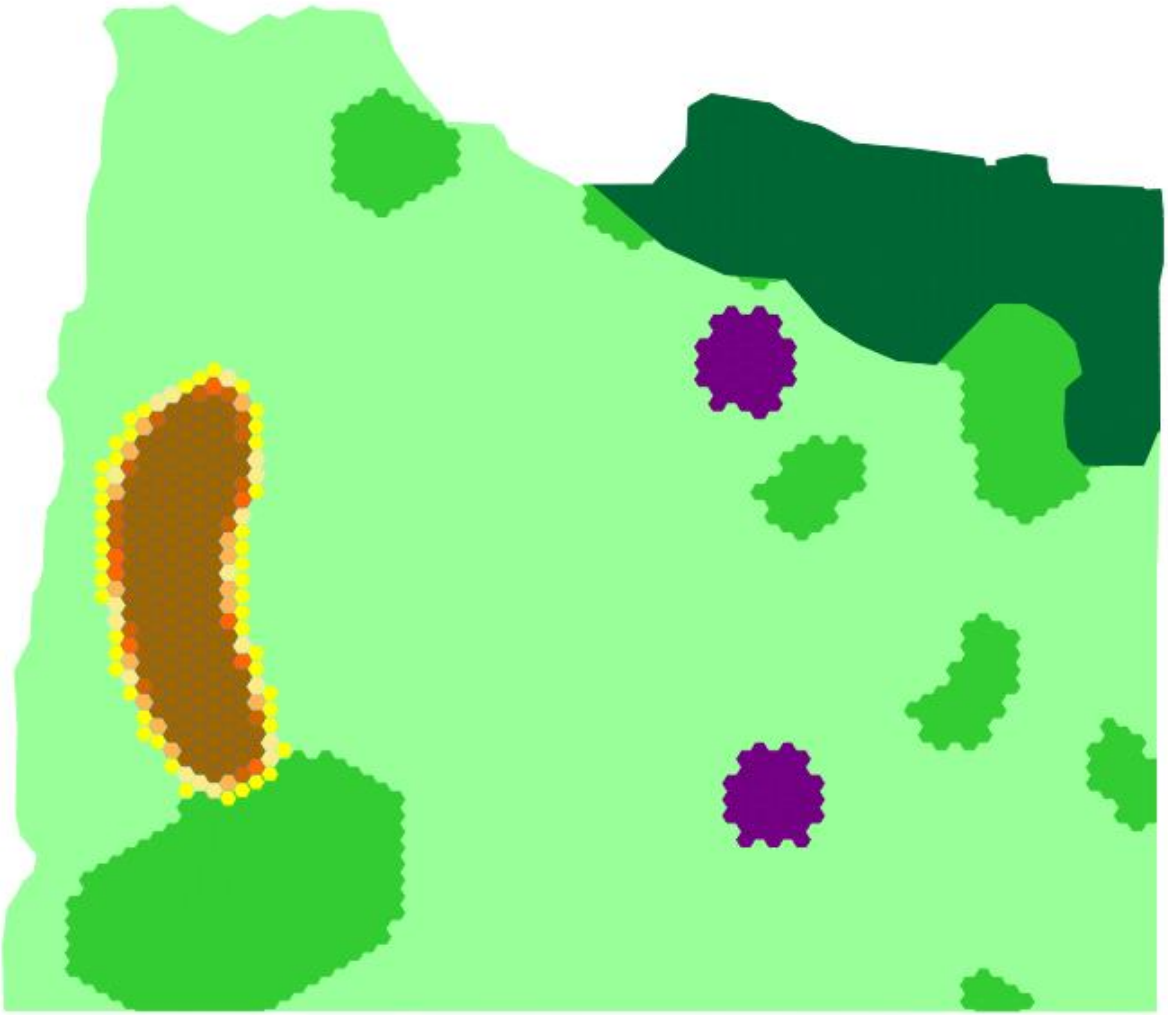
- Clique novamente na camada “Planning Units” para torná-la ativa



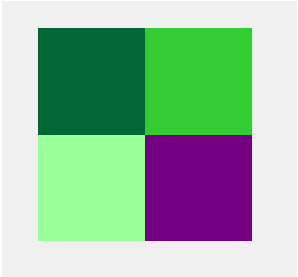
- Na barra de ferramentas de seleção, escolha a opção “Feições através de polígono”



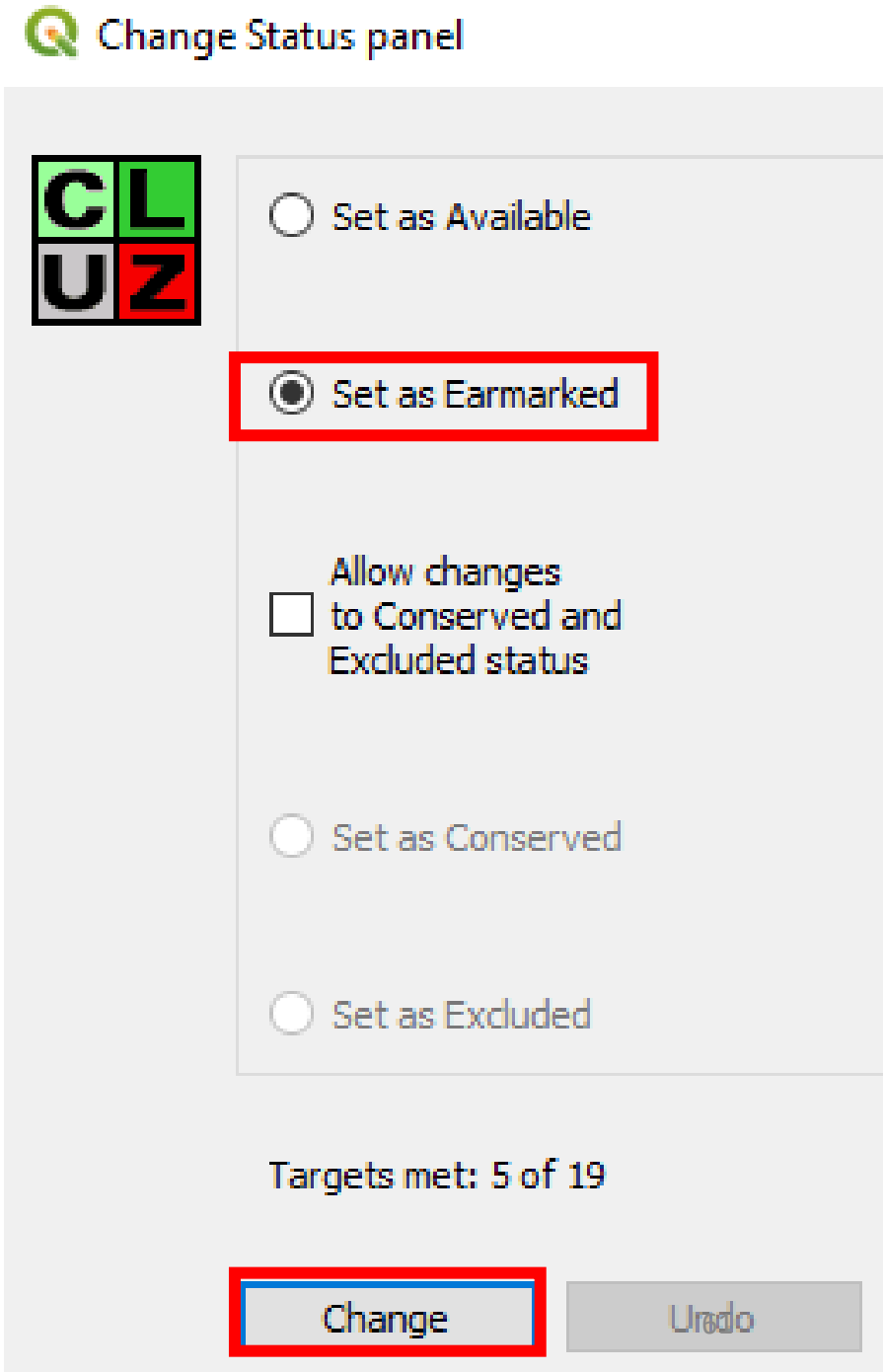
- Digitalize um polígono estendendo a área proposta de conservação a sudoeste (canto inferior esquerdo) para abranger a área de ocorrência de “A. gigantica”
- Clique com o botão direito do mouse para fechar o polígono

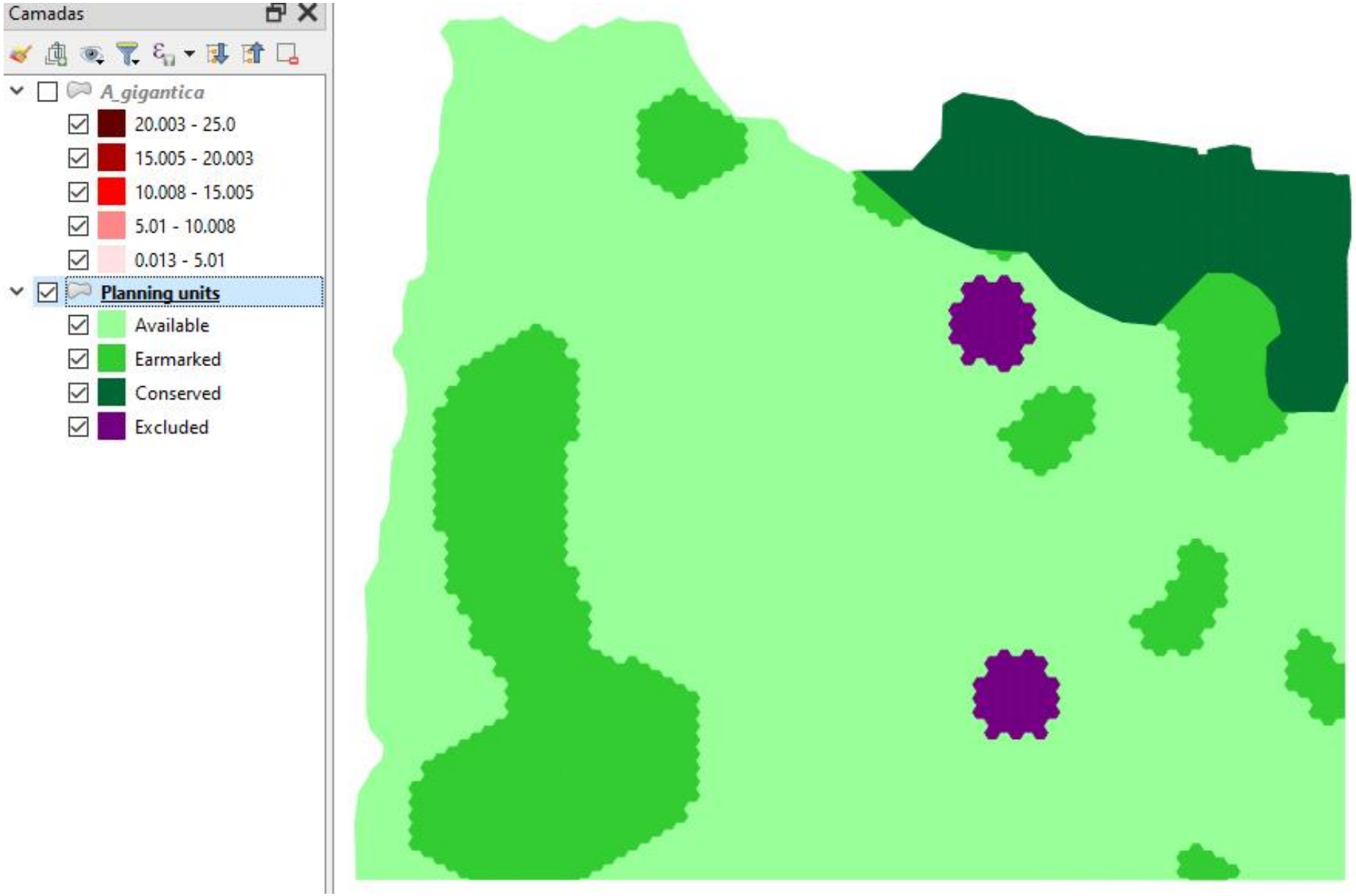


- Clique novamenteno botão
“Change unit and status”



- Escolha a opção
“Set as Earmarked”
- Observe a mudança nas metas (targets) atingidos

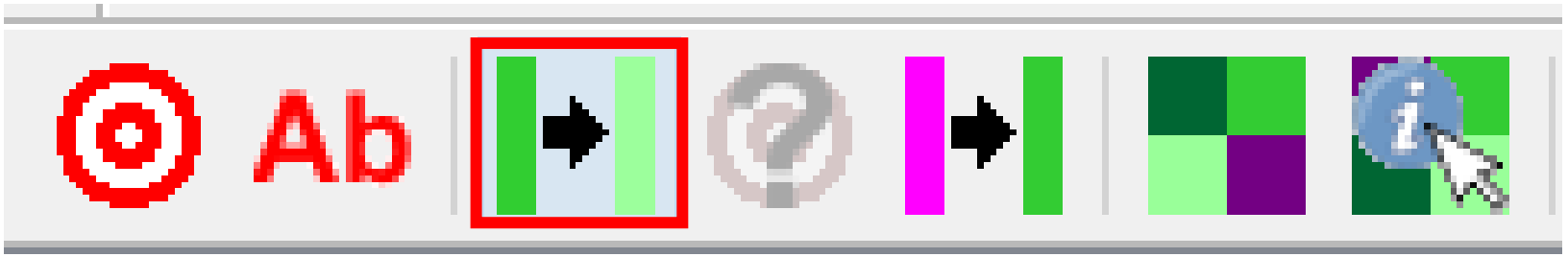


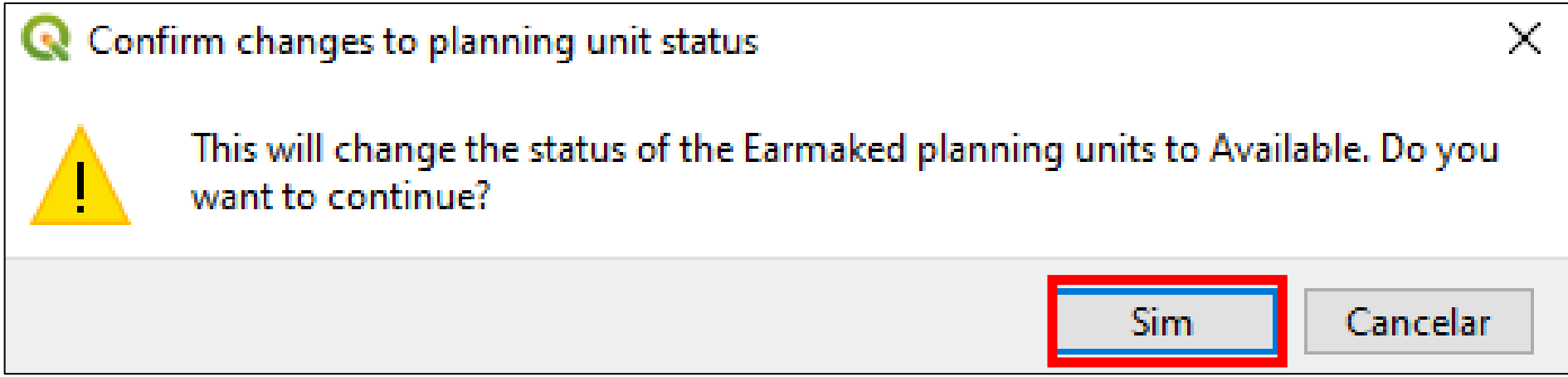

Camadas
A_gigantica
20.003 - 25.0
15.005 - 20.003
10.008 - 15.005
5.01 - 10.008
0.013 - 5.01
Planning units
Available
Earmarked
Conserved
Excluded

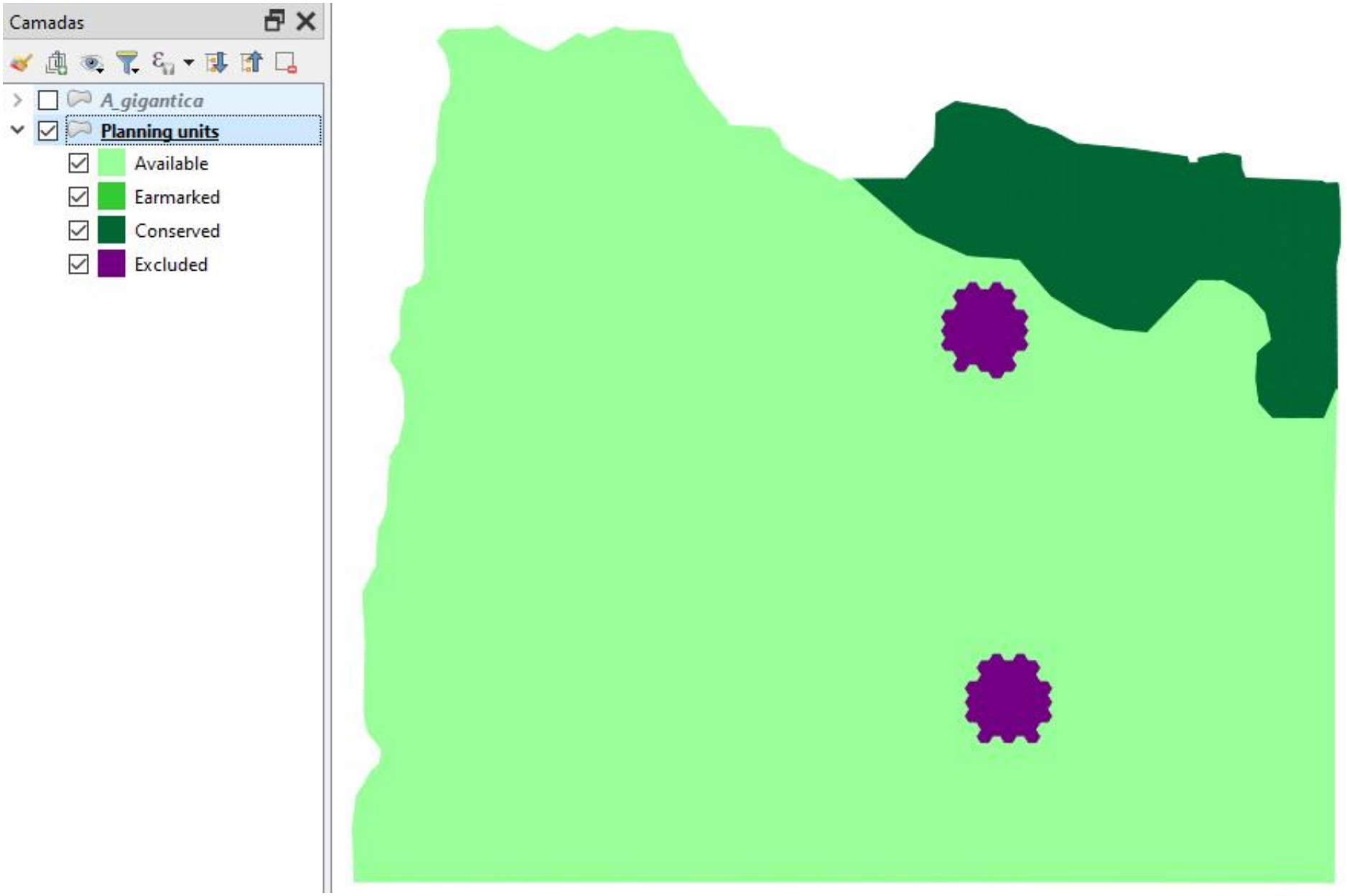
Partes

1. Análise manual
2. **Análise sistemática**

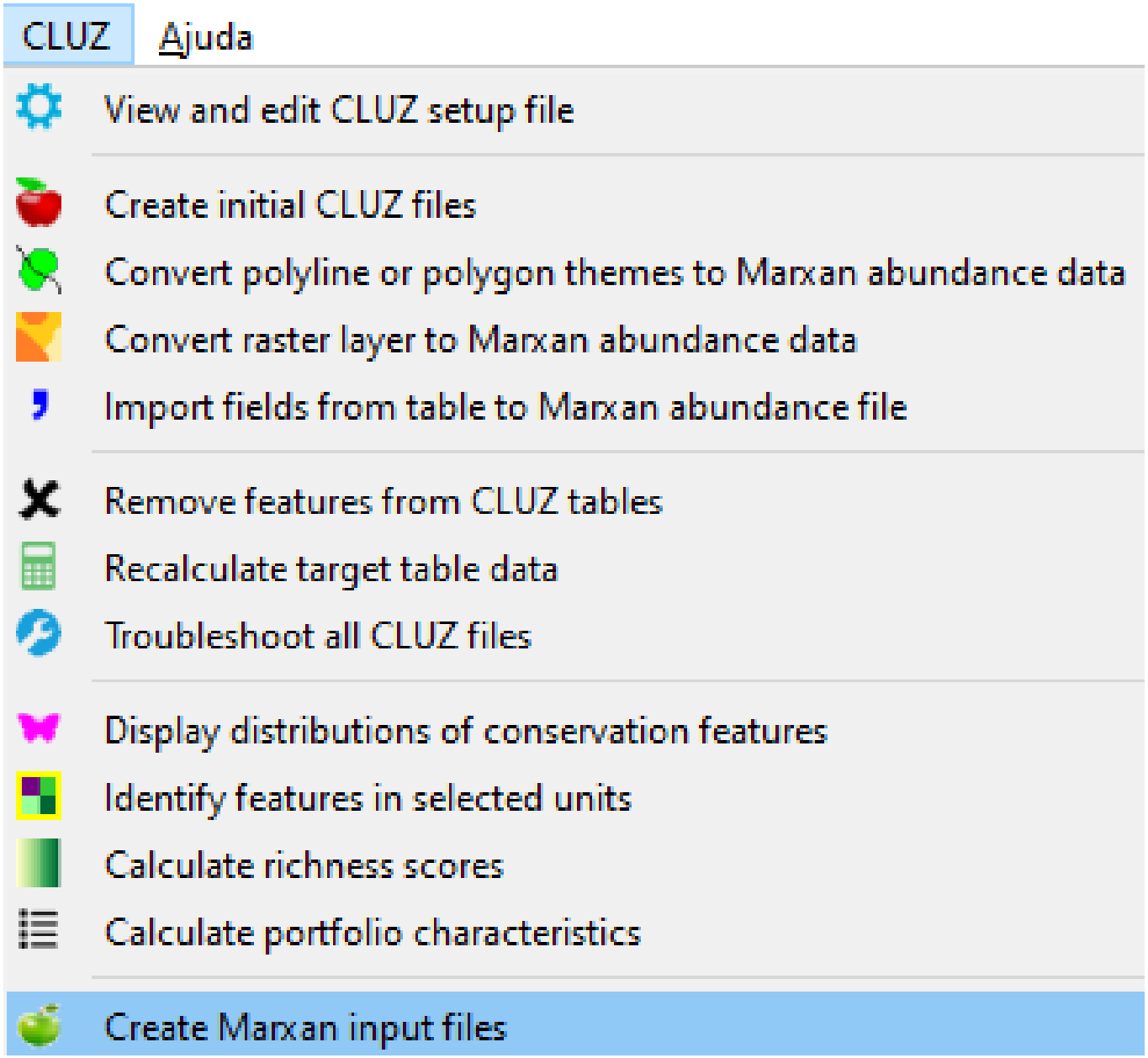
- Clique no botão “Change Earmarked units to Available”



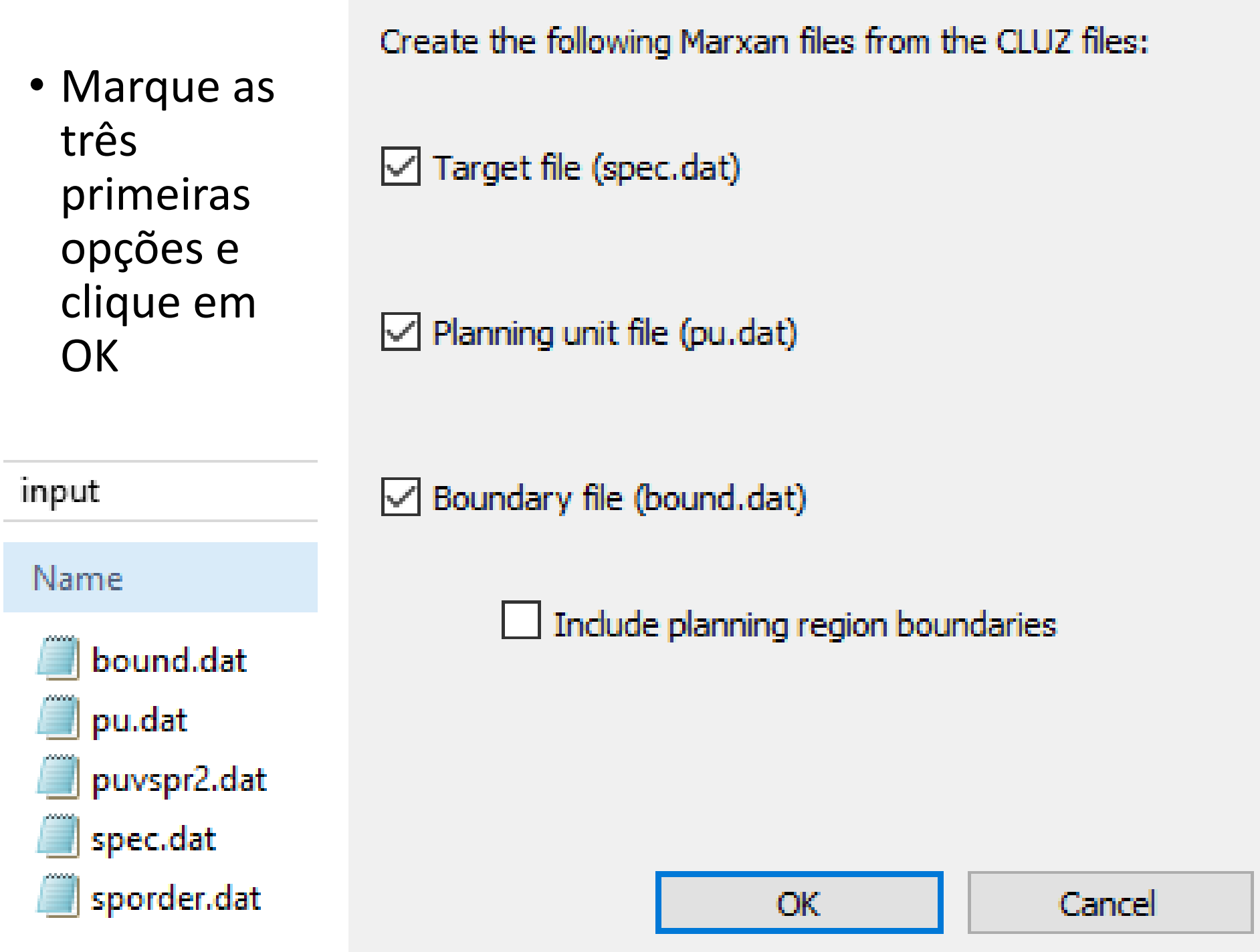



Camadas
A_gigantica
Planning units
Available
Earmarked
Conserved
Excluded

- Menu “Create Marxan input files”



- Marque as três primeiras opções e clique em OK



Metas

spec.dat - Notepad

File Edit Format View Help

```
id,name,target,spf,type
1,Montane_aquatic,244.2625,10.0,1
2,Rock_faces,158.025,10.0,1
3,Montane_grassland,136.025,10.0,2
4,Montane_woodland,4919.6125,10.0,1
5,Montane_thicket,2055.7875,10.0,1
```

Unidades de Planejamento

pu.dat - Notepad

File Edit Format View Help

```
id,cost,status,xloc,yloc
1,7.04,2,434283.679,7019734.470
2,11.67,2,435128.193,7019714.469
3,11.53,2,436055.429,7019715.649
4,1.35,2,433911.453,7020028.358
5,24.57,2,434662.891,7019860.303
```

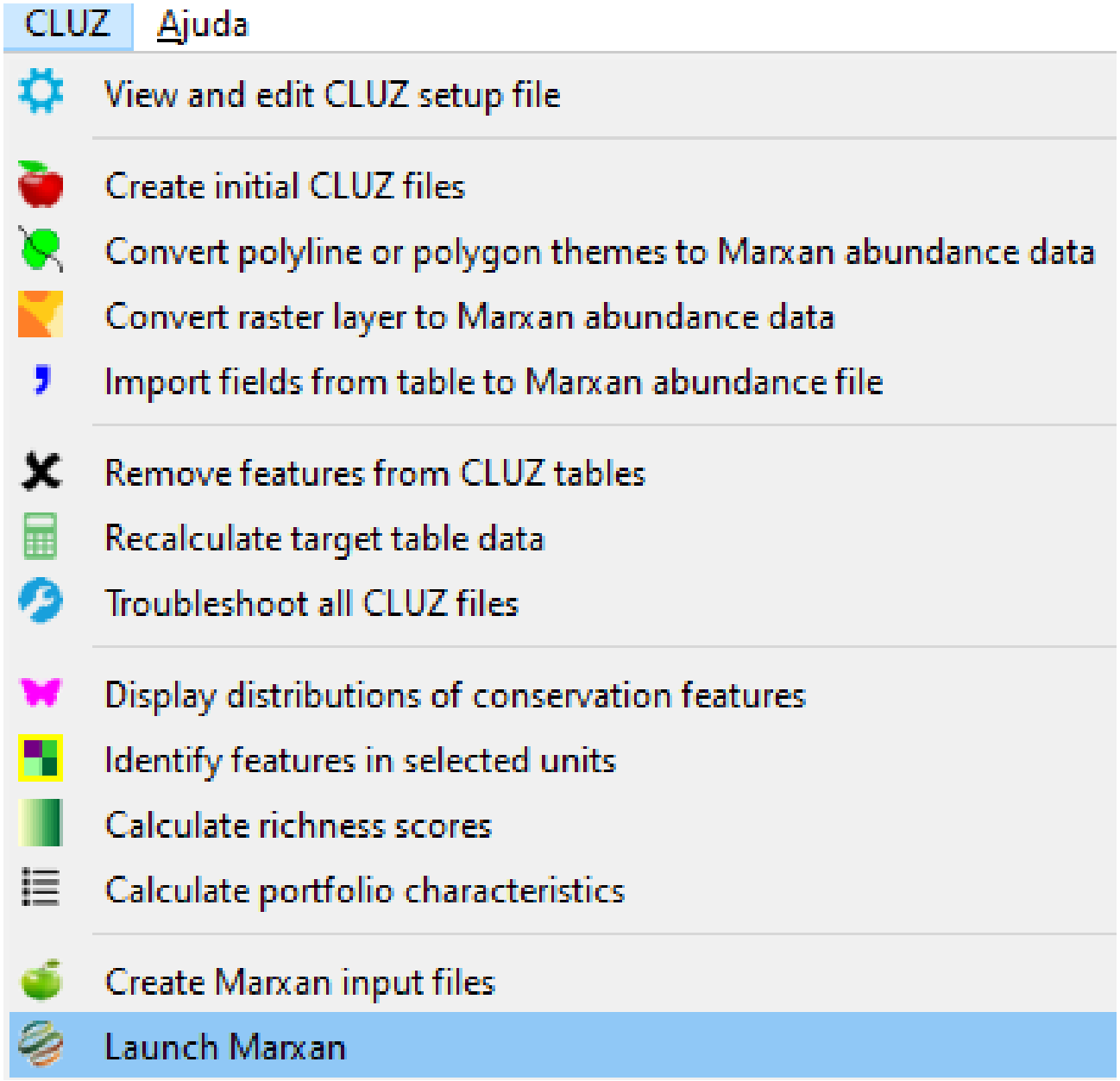
Bordas entre unidades de planejamento

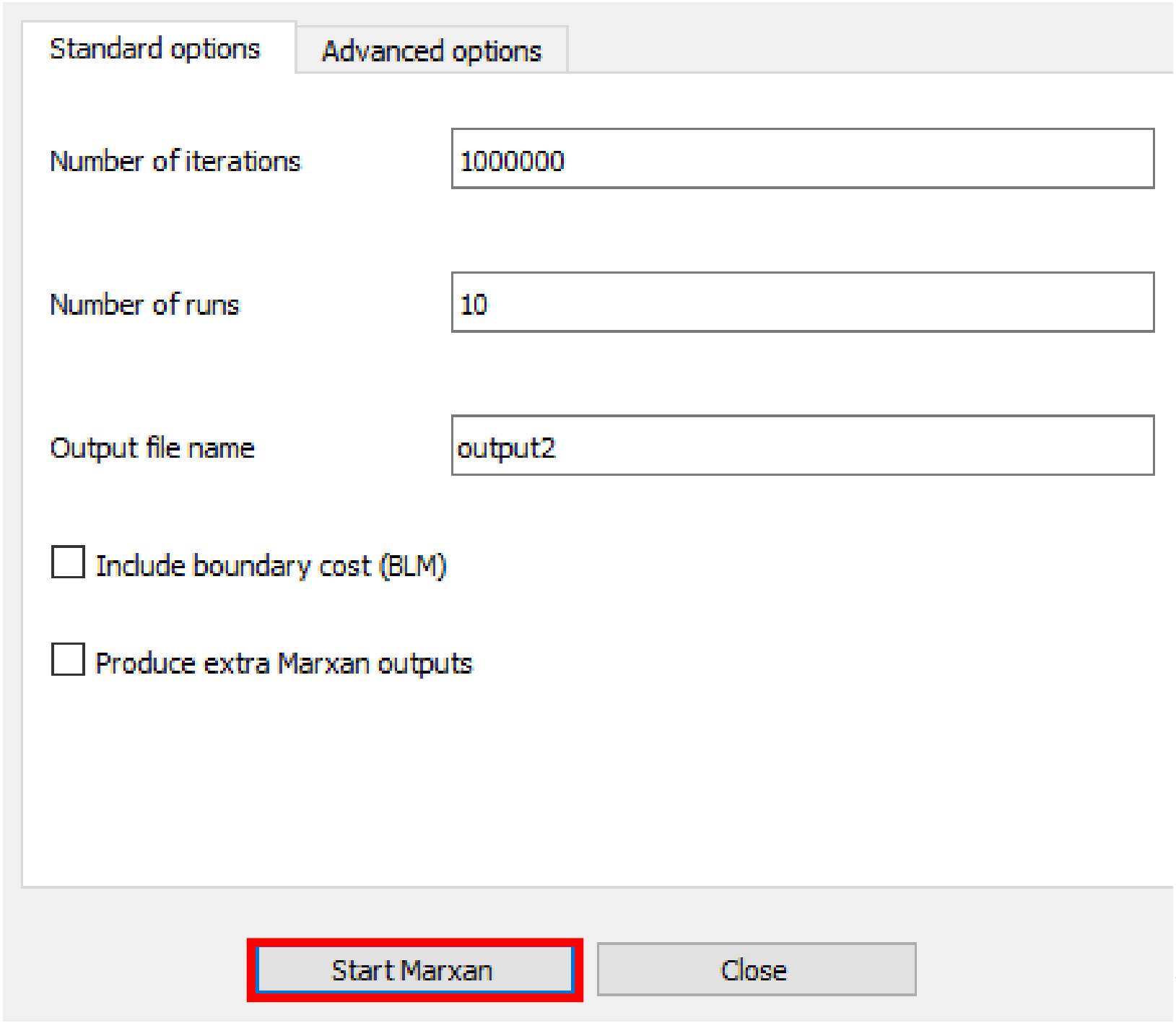
bound.dat - Notepad

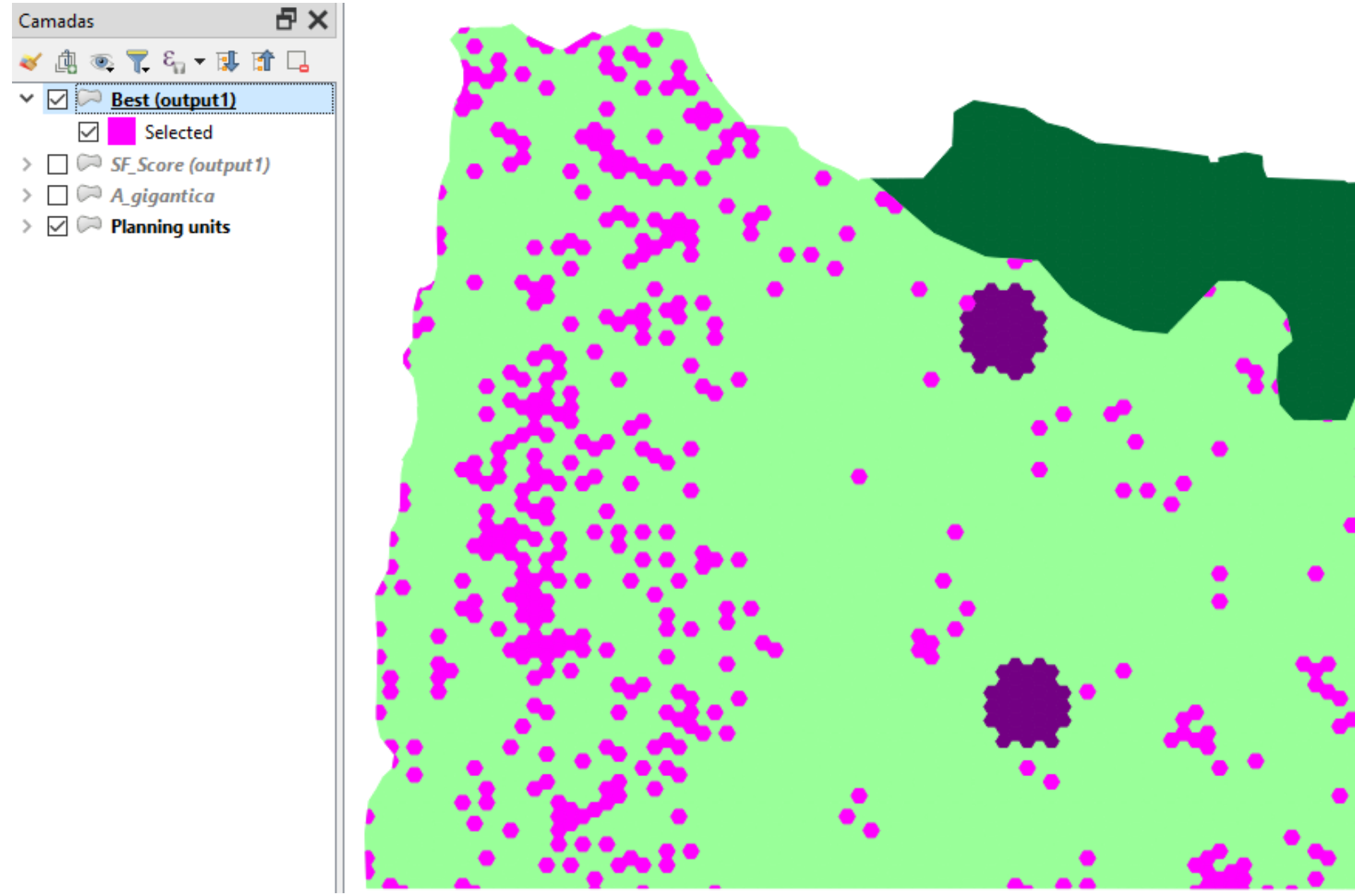
File Edit Format View

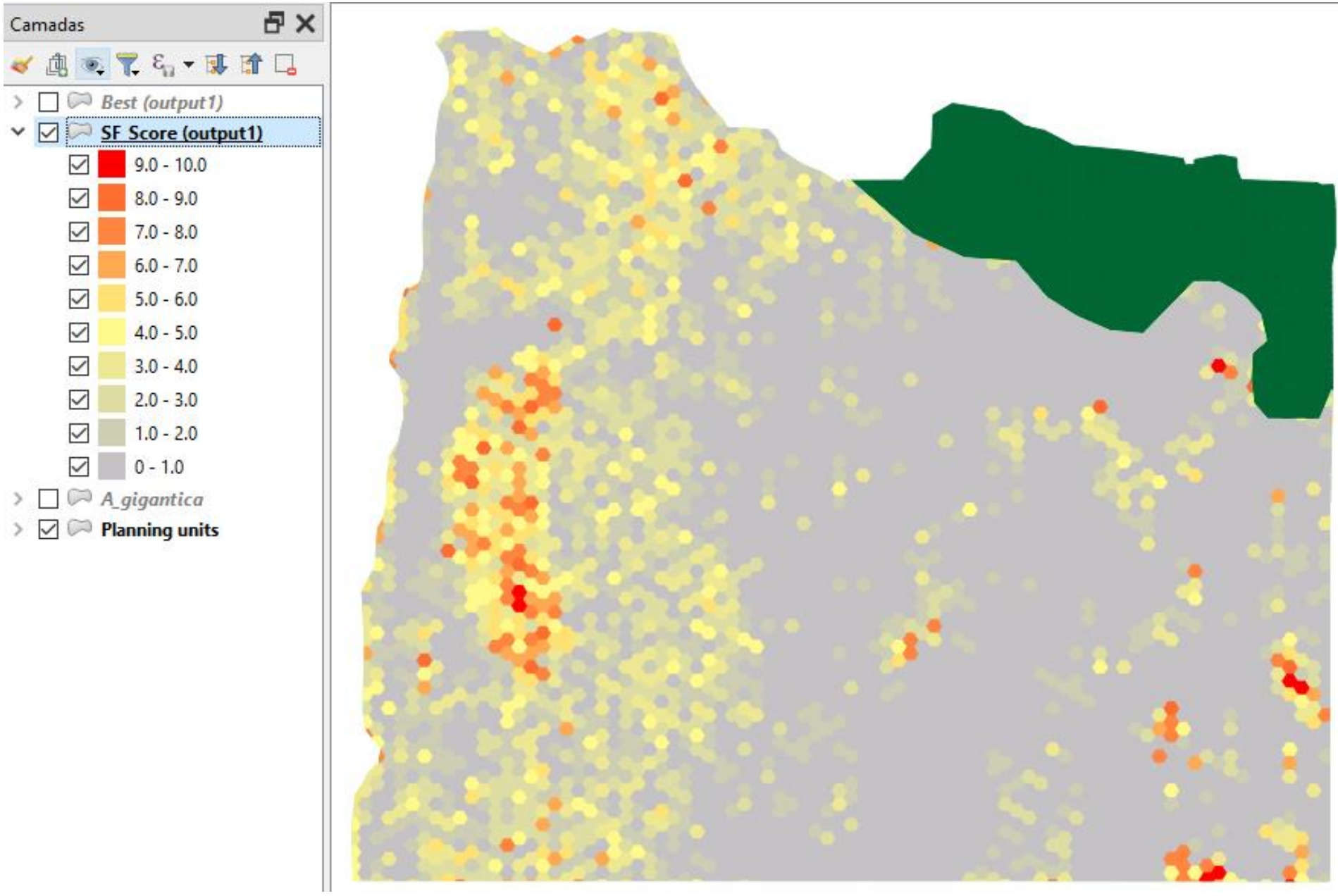
```
id1,id2,boundary
1,4,5.490
1,5,294.593
1,8,310.202
1,3343,571.749
2,5,294.593
2,6,294.593
2,9,310.202
2,3344,604.795
3,6,294.593
```

- Menu “Launch Marxan”




Standard options
Advanced options
Number of iterations
1000000
Number of runs
10
Output file name
output2
Include boundary cost (BLM)
Produce extra Marxan outputs
Start Marxan
Close

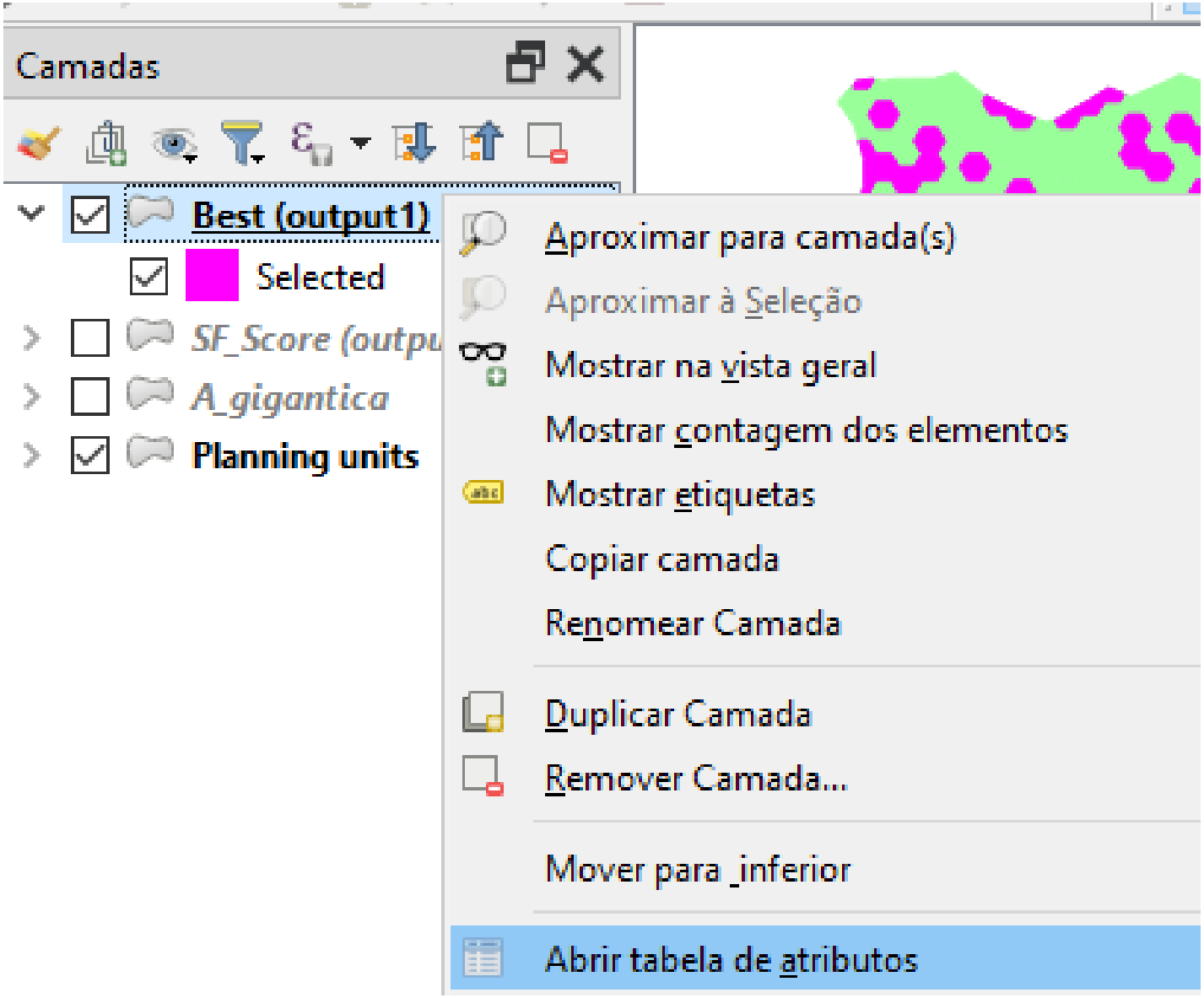

Camadas
Best (output1)
Selected
SF_Score (output1)
A_gigantica
Planning units


Camadas
Best (output1)
SF_Score (output1)
9.0 - 10.0
8.0 - 9.0
7.0 - 8.0
6.0 - 7.0
5.0 - 6.0
4.0 - 5.0
3.0 - 4.0
2.0 - 3.0
1.0 - 2.0
0 - 1.0
A_gigantica
Planning units

- Clique no botão “Open Marxan results table”

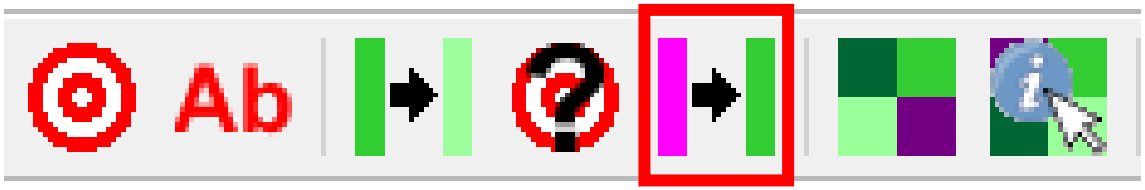
Conservation Feature	Feature Name	Target	Amount Held	Occurrence Target	Occurrences Held	Separation Target	Separation Achieved	Target Met	MPM
1	Montane_aquatic	244.262500	244.240000	0	100	0	3306597	no	0.999908
2	Rock_faces	158.025000	158.878000	0	160	0	3306597	yes	1.000000
3	Montane_grassland	136.025000	137.568000	0	41	0	3306597	yes	1.000000
4	Montane_woodland	4919.612500	4919.822000	0	348	0	3306597	yes	1.000000
5	Montane_thicket	2055.787500	2056.051000	0	286	0	3306597	yes	1.000000
6	Montane_forest	70.025000	70.063000	0	11	0	3306597	yes	1.000000
8	Acacia_woodland	1356.162500	1356.806000	0	194	0	3306597	yes	1.000000
9	Acacia_thicket	2020.125000	2923.121000	0	223	0	3306597	yes	1.000000
11	Floodplain_grassland	1752.950000	1754.565000	0	245	0	3306597	yes	1.000000
12	Reed_beds	655.700000	970.621000	0	237	0	3306597	yes	1.000000
13	Riverine_thicket	589.375000	589.628000	0	163	0	3306597	yes	1.000000
14	Riverine_forest	442.700000	856.055000	0	192	0	3306597	yes	1.000000
18	Terminalia_woodland	1957.350000	1957.373000	0	187	0	3306597	yes	1.000000
19	Woodland_on_red_sands	345.600000	415.186000	0	30	0	3306597	yes	1.000000
21	Sand_forest	388.075000	388.999000	0	43	0	3306597	yes	1.000000
30	Subsistence_agriculture	0.000000	1603.690000	0	355	0	3306597	yes	1.000000
31	Commercial_agriculture	0.000000	4.626000	0	2	0	3306597	yes	1.000000
33	Open_water	356.675000	604.562000	0	170	0	3306597	yes	1.000000
105	F_splendens	2000.000000	2073.181000	0	96	0	3306597	yes	1.000000
107	A_gigantica	2000.000000	2001.181000	0	87	0	3306597	yes	1.000000
156	Vulture_nest	20.000000	21.000000	0	18	0	3306597	yes	1.000000

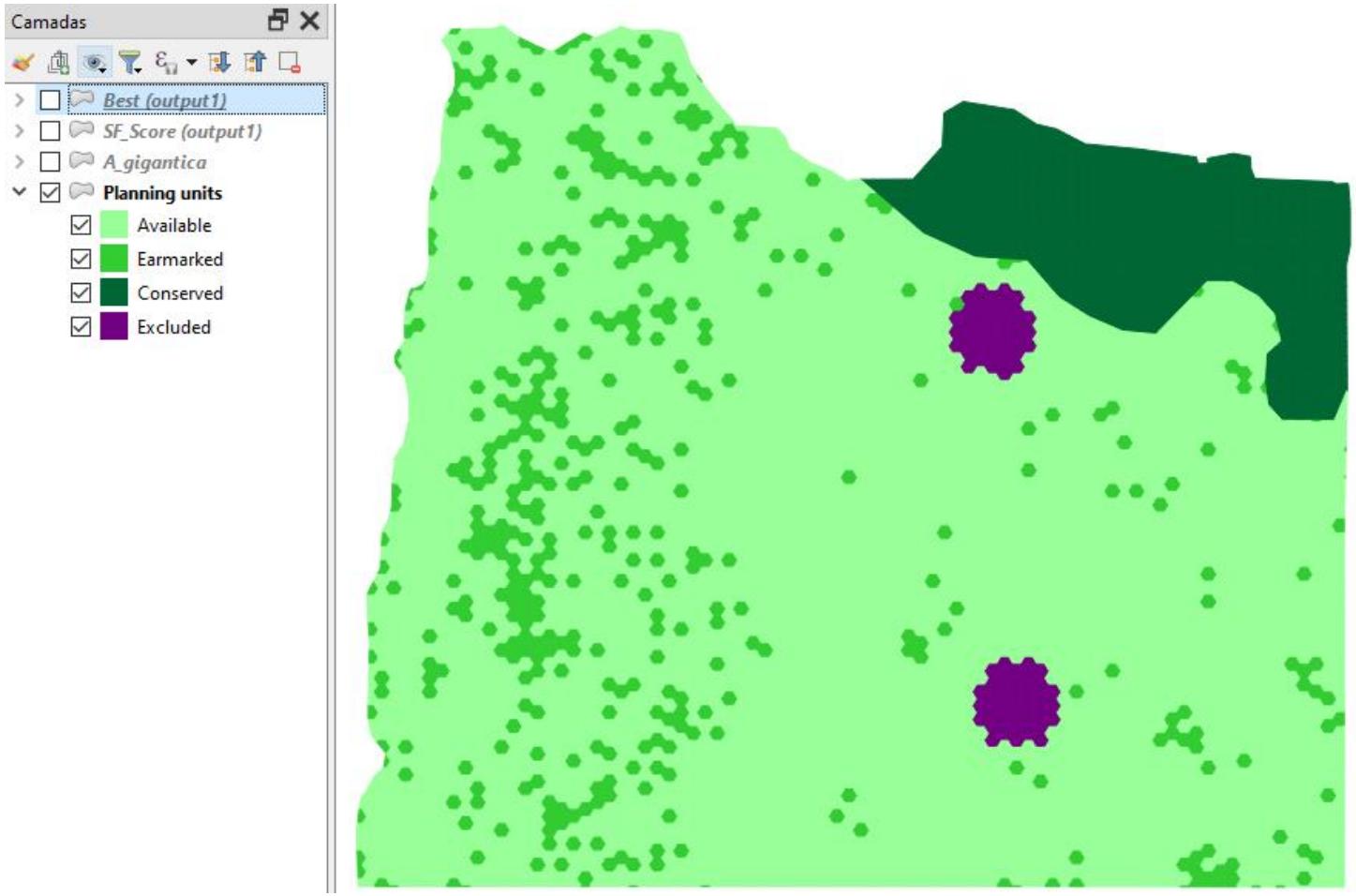
- Selecione a camada “Best”, clique com o botão direito do mouse e selecione “Abrir tabela de atributos”



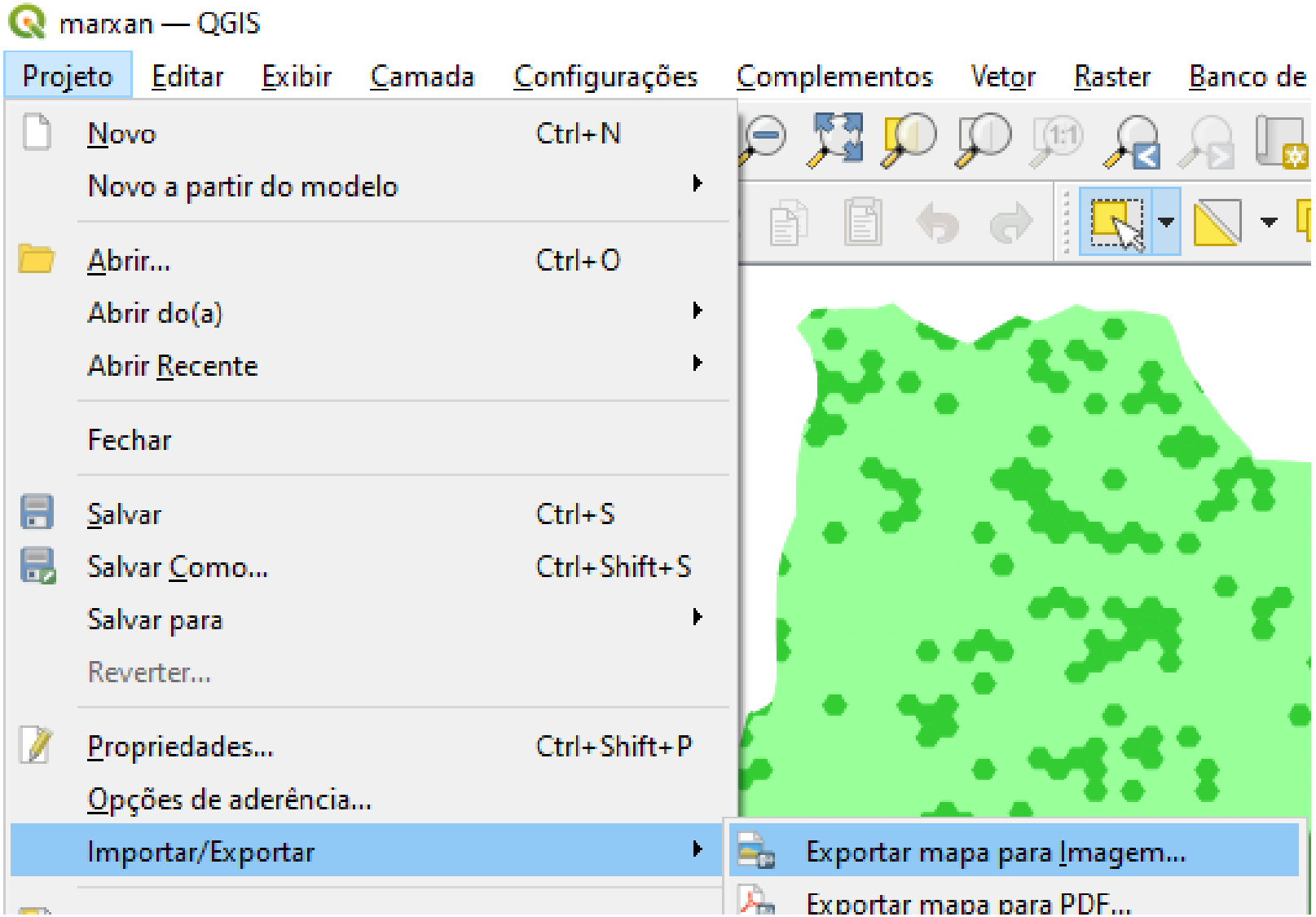
	Unit_ID	Area	Cost	Status	Previous	Best	SF_Score
1	1747	25,00	25,00	Available	1	Selected	10
2	3644	25,00	25,00	Available	1	Selected	10
3	538	3,66	3,66	Available	0	-	9
4	576	17,81	17,81	Available	1	Selected	9
5	618	25,00	25,00	Available	1	Selected	9
6	1788	25,00	25,00	Available	1	Selected	9
7	2212	25,00	25,00	Available	0	Selected	9
8	2295	25,00	25,00	Available	0	Selected	9
9	503	2,86	2,86	Available	0	Selected	8
10	528	2,97	2,97	Available	0	-	8
11	1617	25,00	25,00	Available	0	Selected	8

- Selecione o botão
  “Change the status of the Best units to Earmarked”

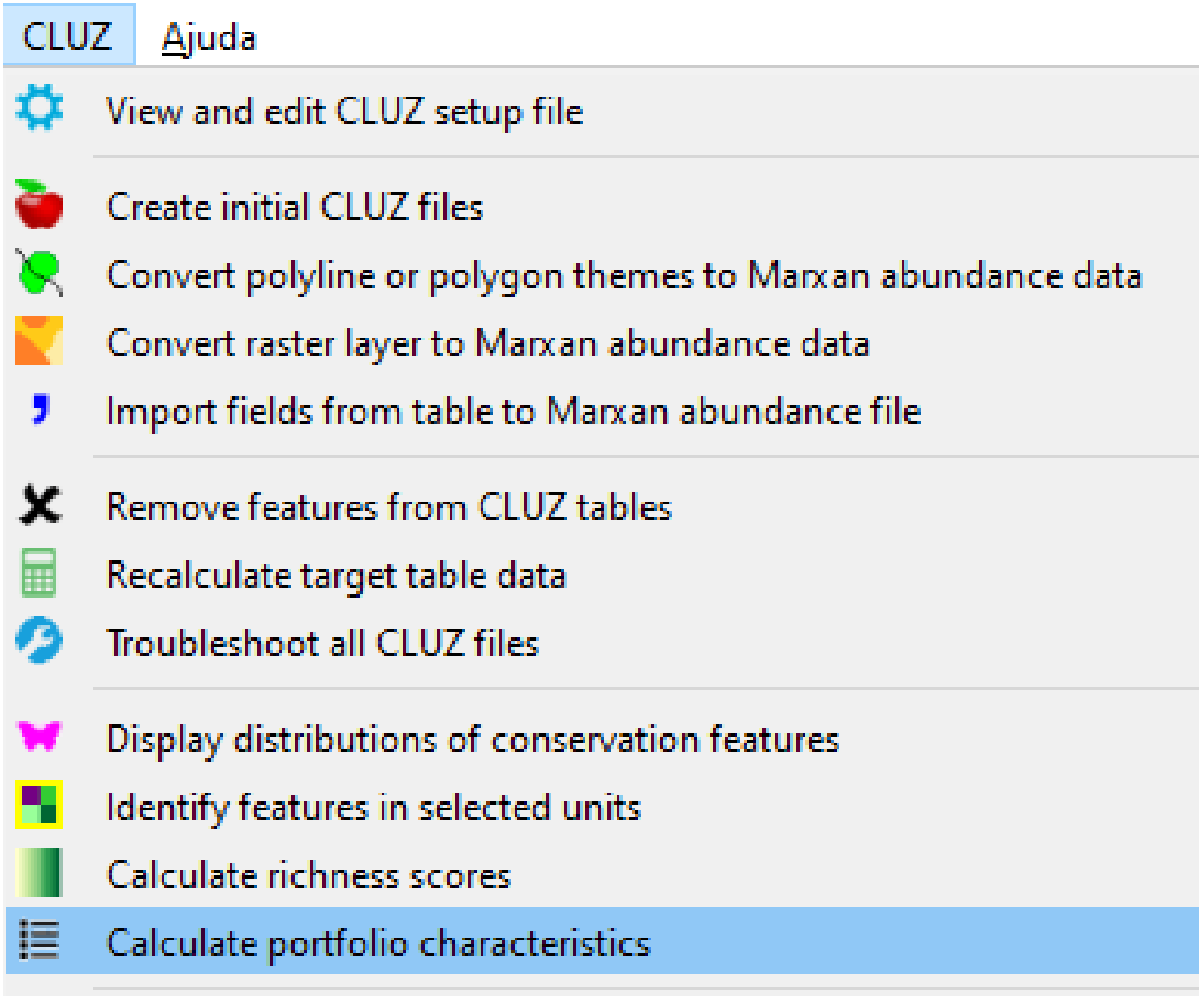


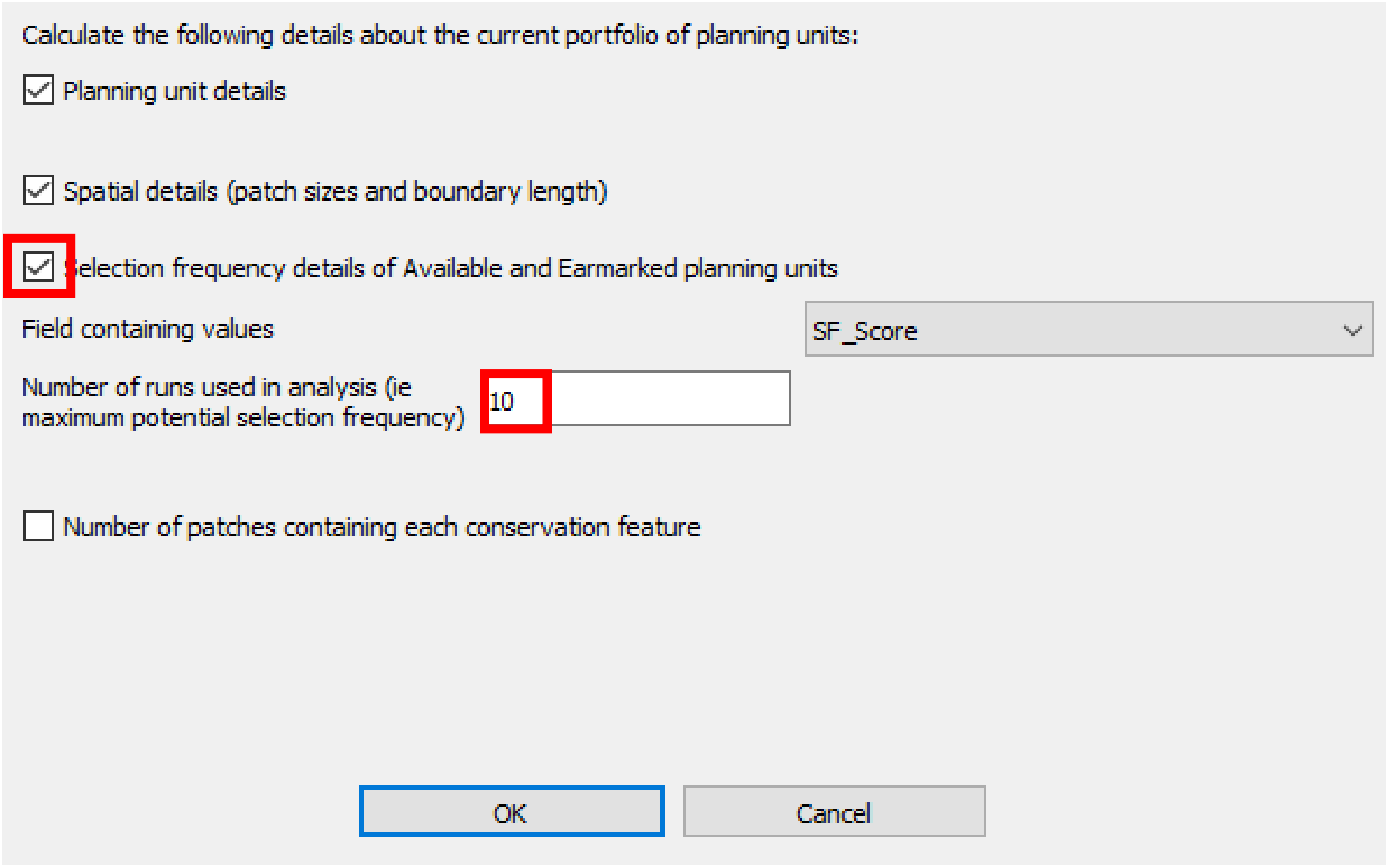


- Menu “Projeto” -> “Importar/exportar” -> “Exportar mapa para Imagem”
- Grave como “area_0.png” na pasta da atividade



- Menu “Calculate portfolio characteristics”

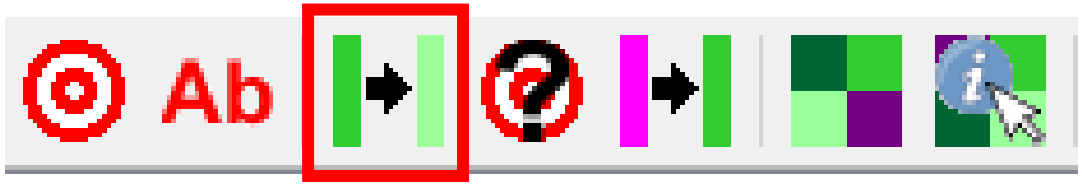


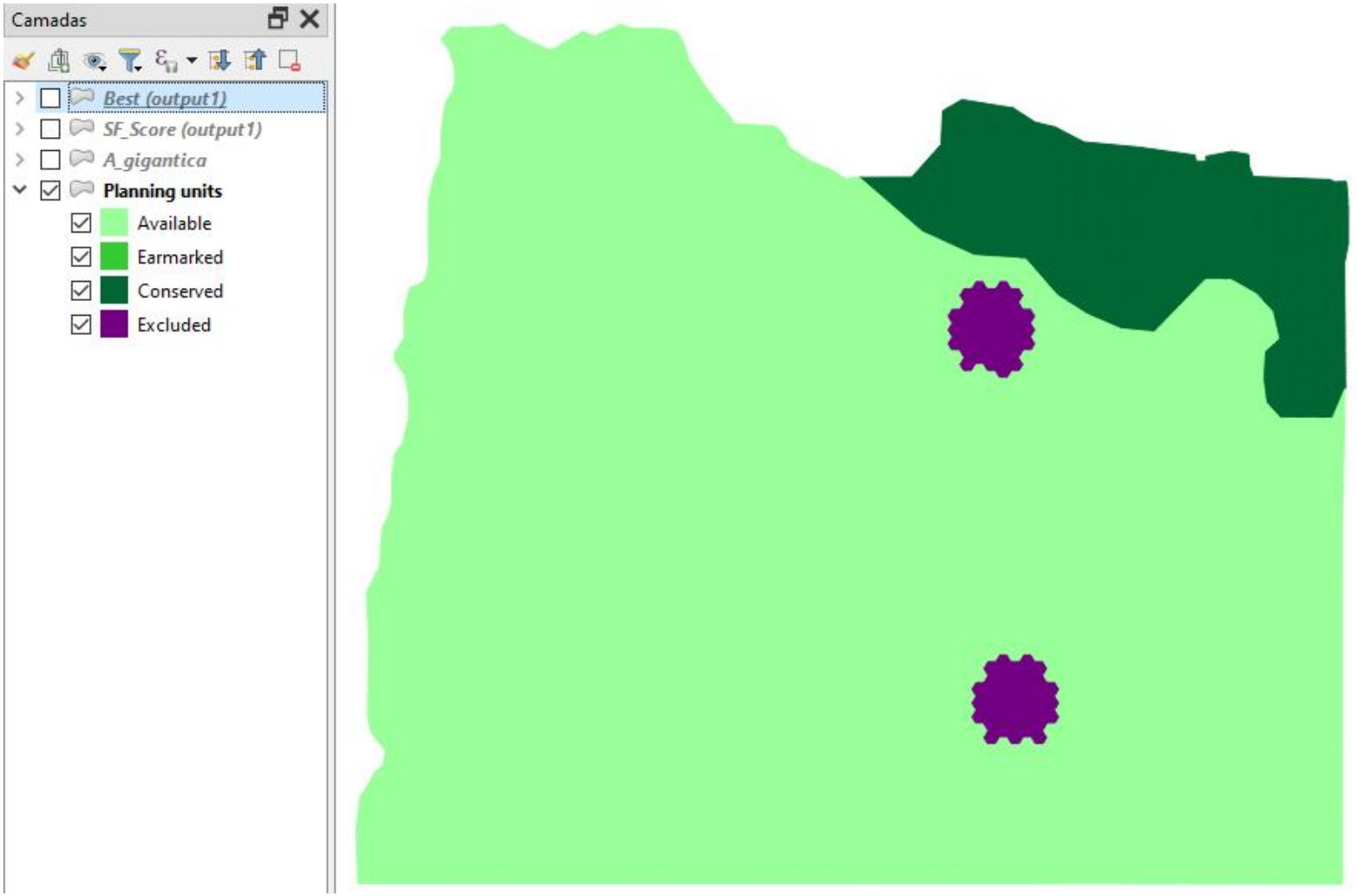

Calculate the following details about the current portfolio of planning units:
Planning unit details
Spatial details (patch sizes and boundary length)
Selection frequency details of Available and Earmarked planning units
Field containing values
SF_Score
Number of runs used in analysis (ie maximum potential selection frequency)
10
Number of patches containing each conservation feature
OK
Cancel

Status results | Spatial results | Selection frequency results

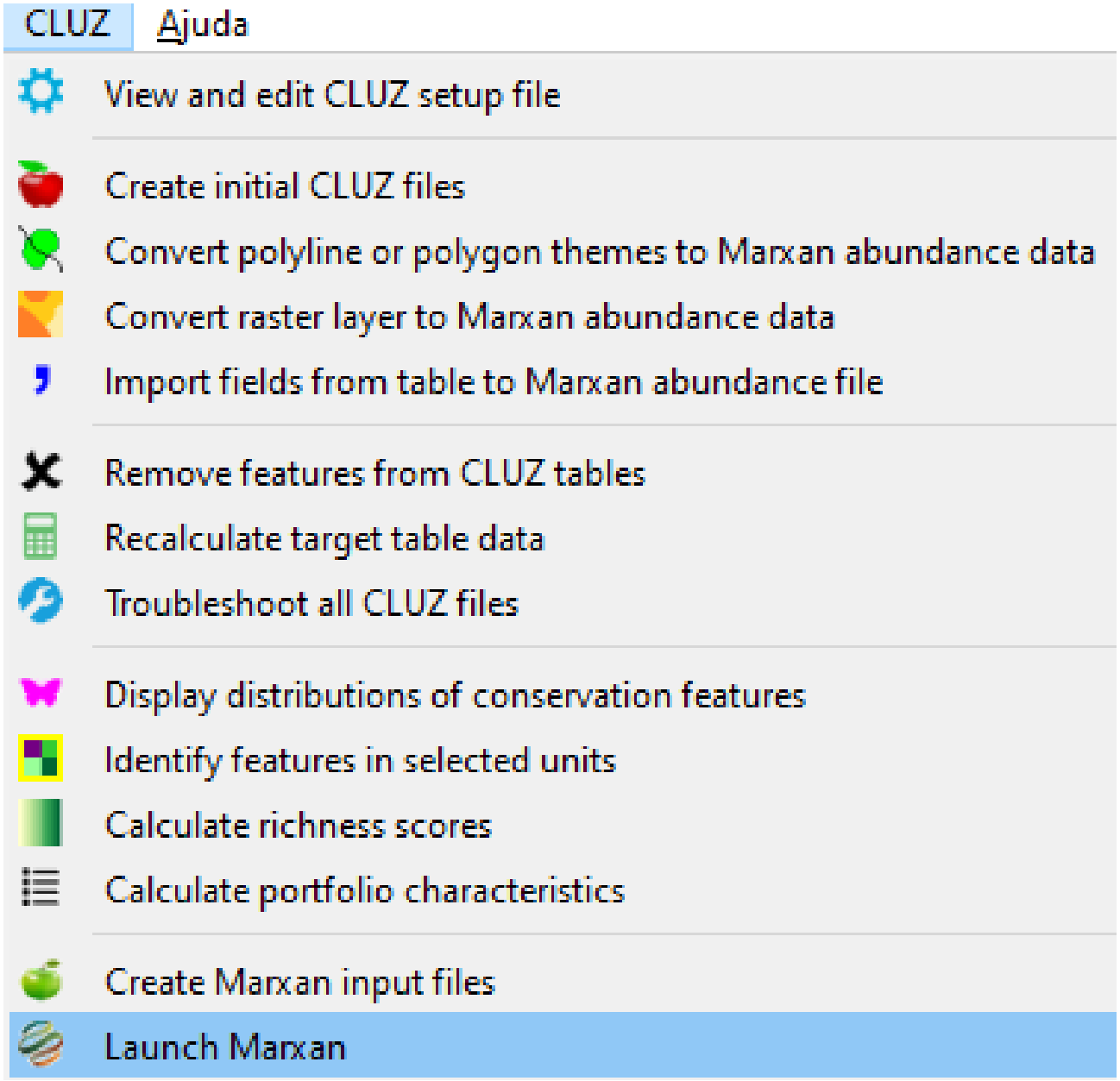
Status	Total cost	Total area	No. of planning units
Available	87676.880	87676.880	3630
Conserved	10862.570	10862.570	498
Earmarked	10143.030	10143.030	460
Excluded	1825.000	1825.000	73
Portfolio	21005.600	21005.600	958
Region	110507.480	110507.480	4661

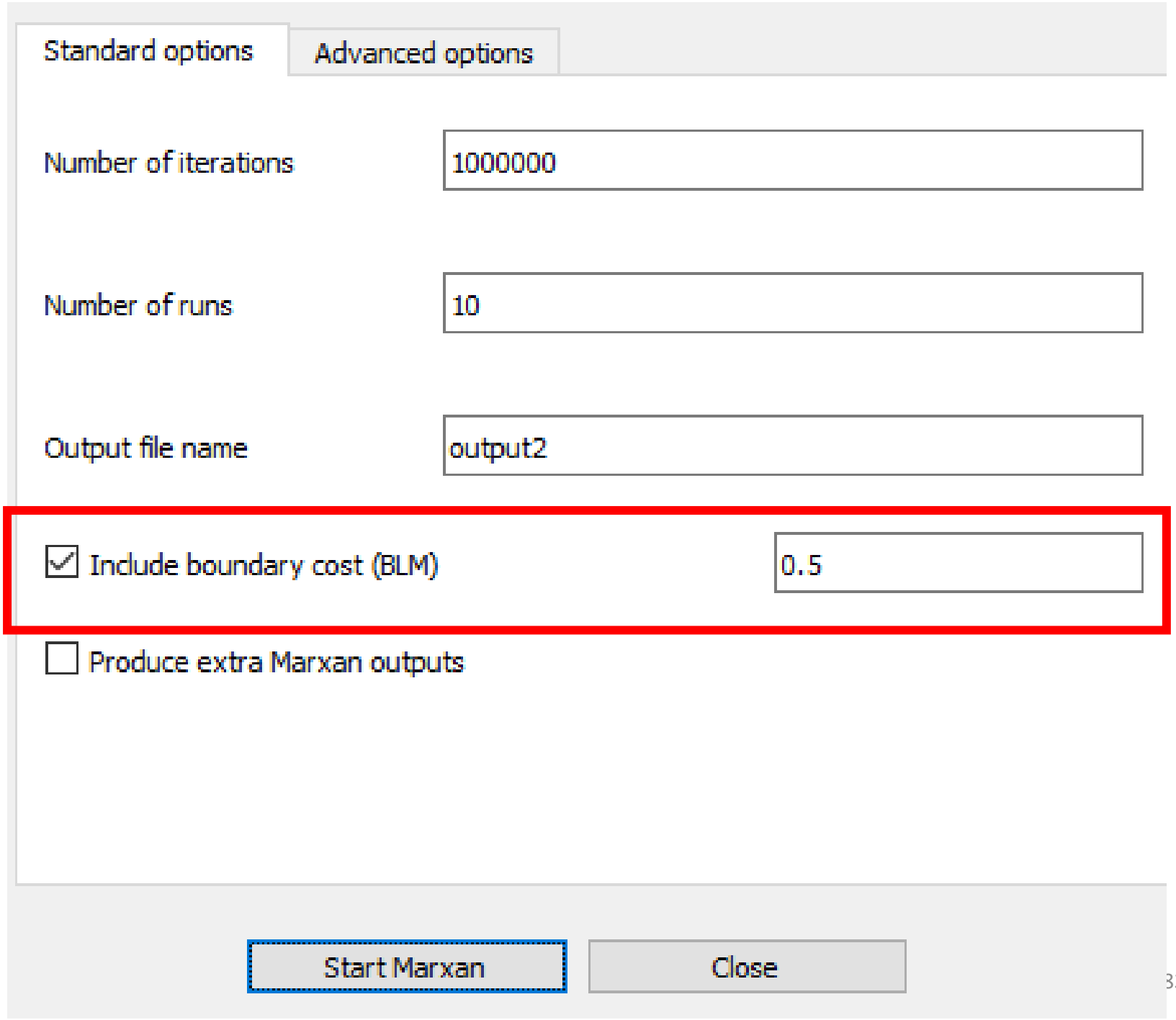
- Clique no botão “Change Earmarked units to Available”

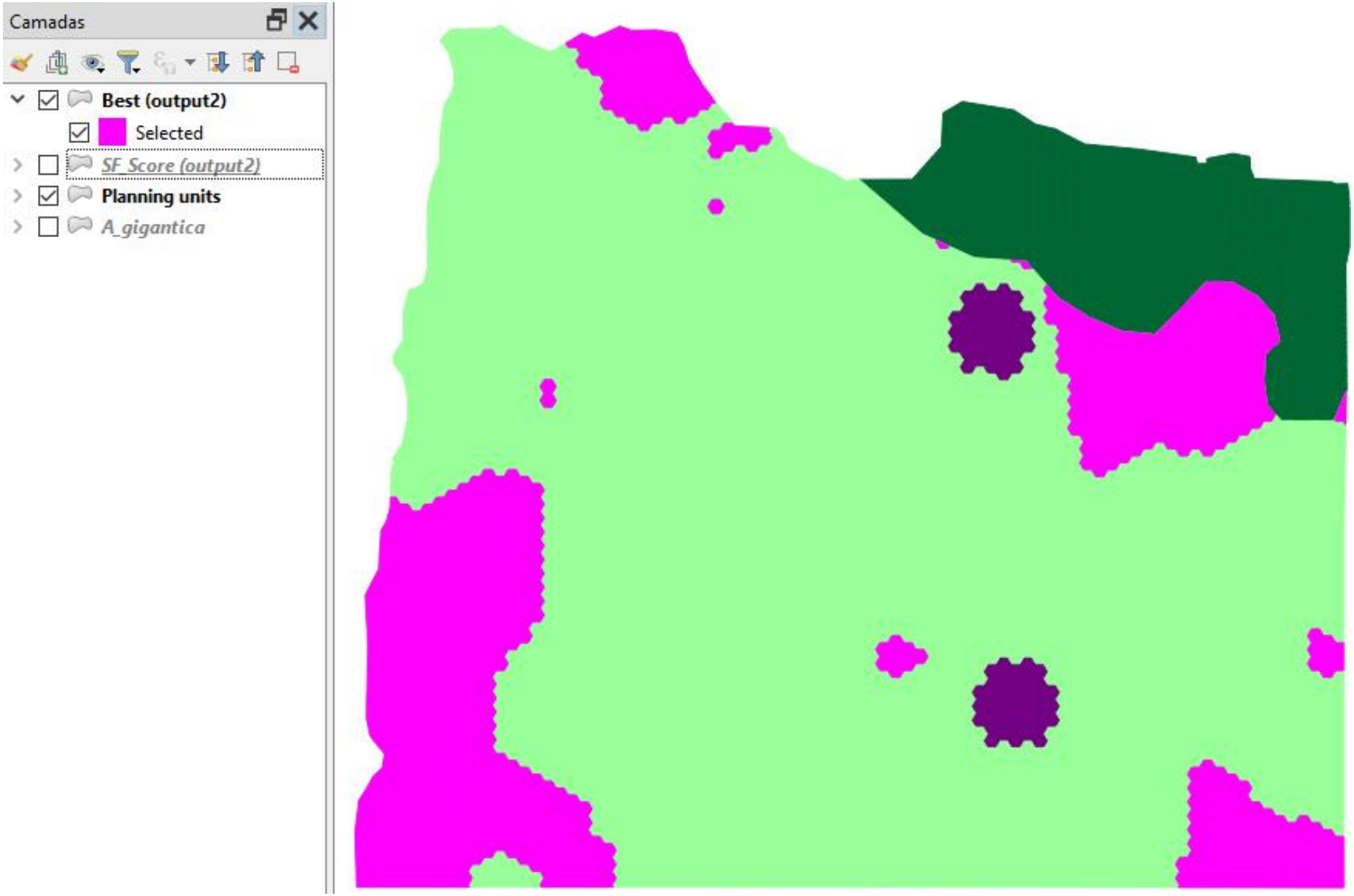


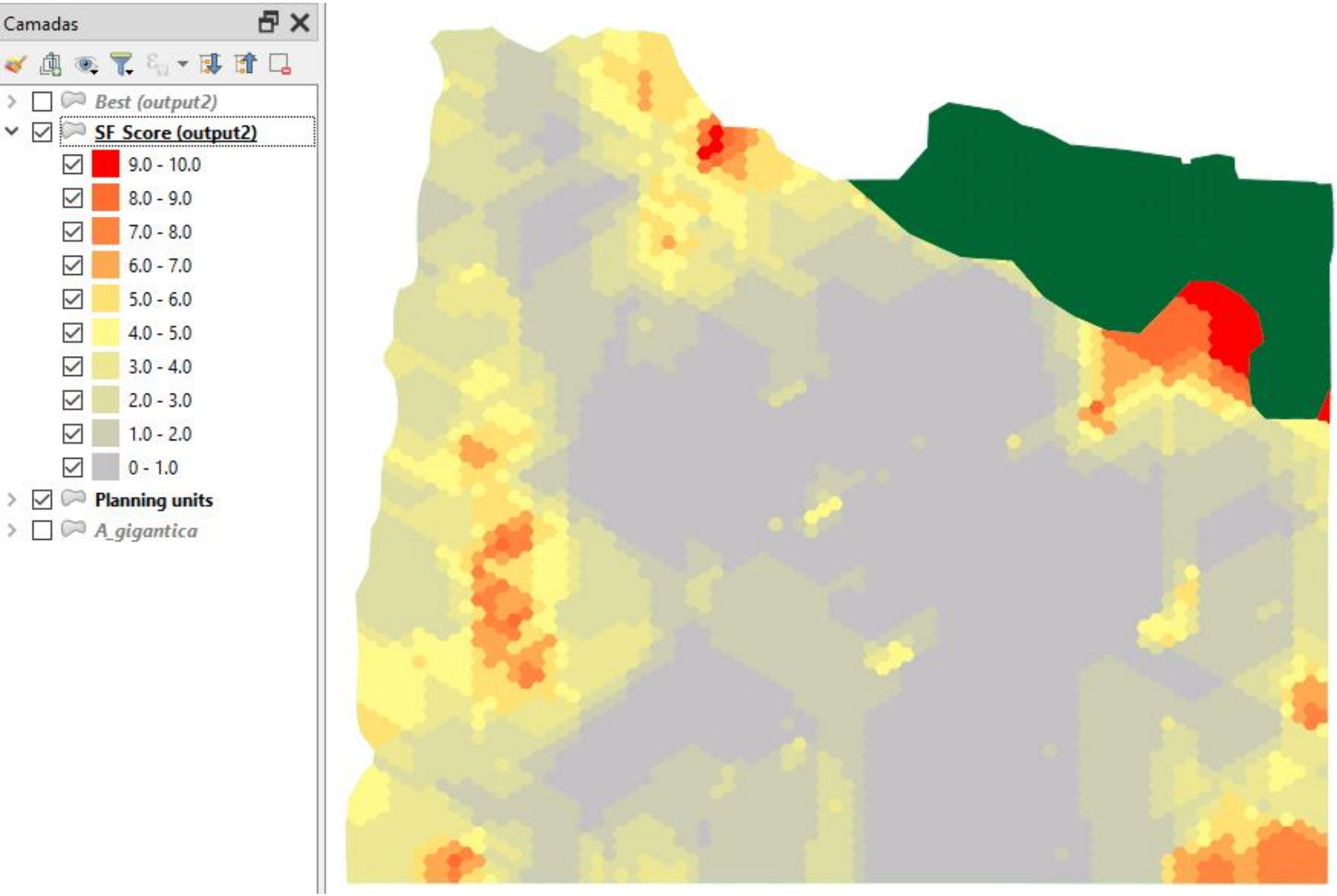


- Menu “Launch Marxan”

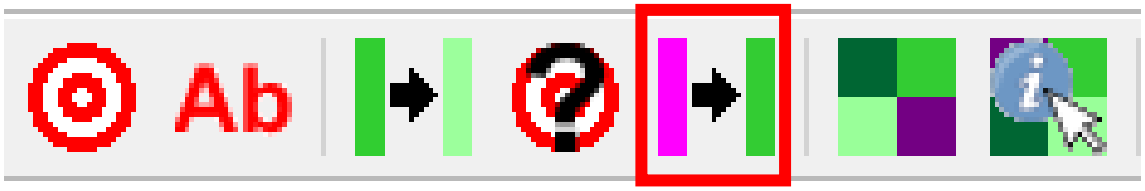


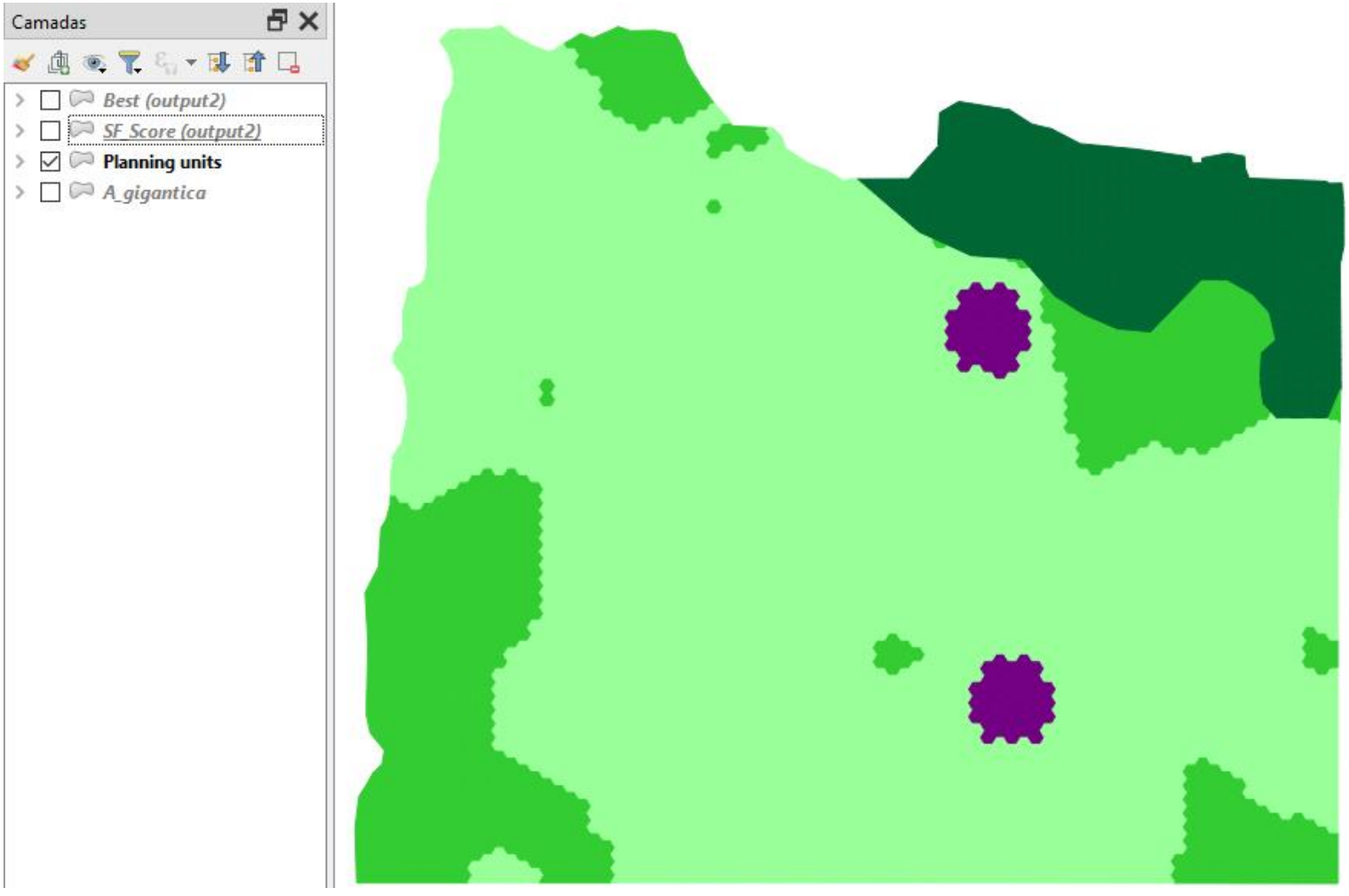

Standard options
Advanced options
Number of iterations
1000000
Number of runs
10
Output file name
output2
Include boundary cost (BLM)
0.5
Produce extra Marxan outputs
Start Marxan
Close


Camadas
Best (output2)
Selected
SF_Score (output2)
Planning units
A_gigantica

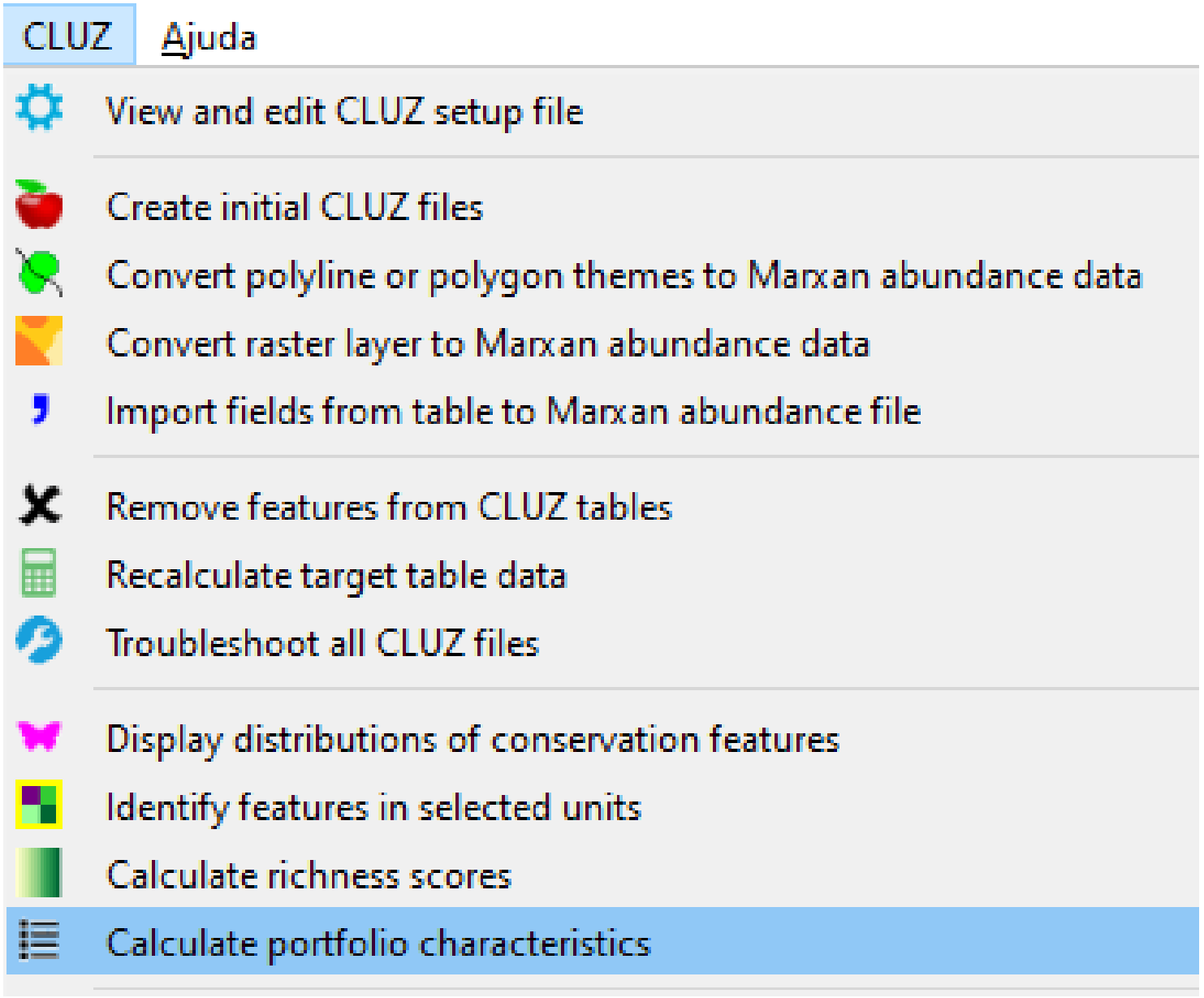

Camadas
Best (output2)
SF_Score (output2)
9.0 - 10.0
8.0 - 9.0
7.0 - 8.0
6.0 - 7.0
5.0 - 6.0
4.0 - 5.0
3.0 - 4.0
2.0 - 3.0
1.0 - 2.0
0 - 1.0
Planning units
A_gigantica

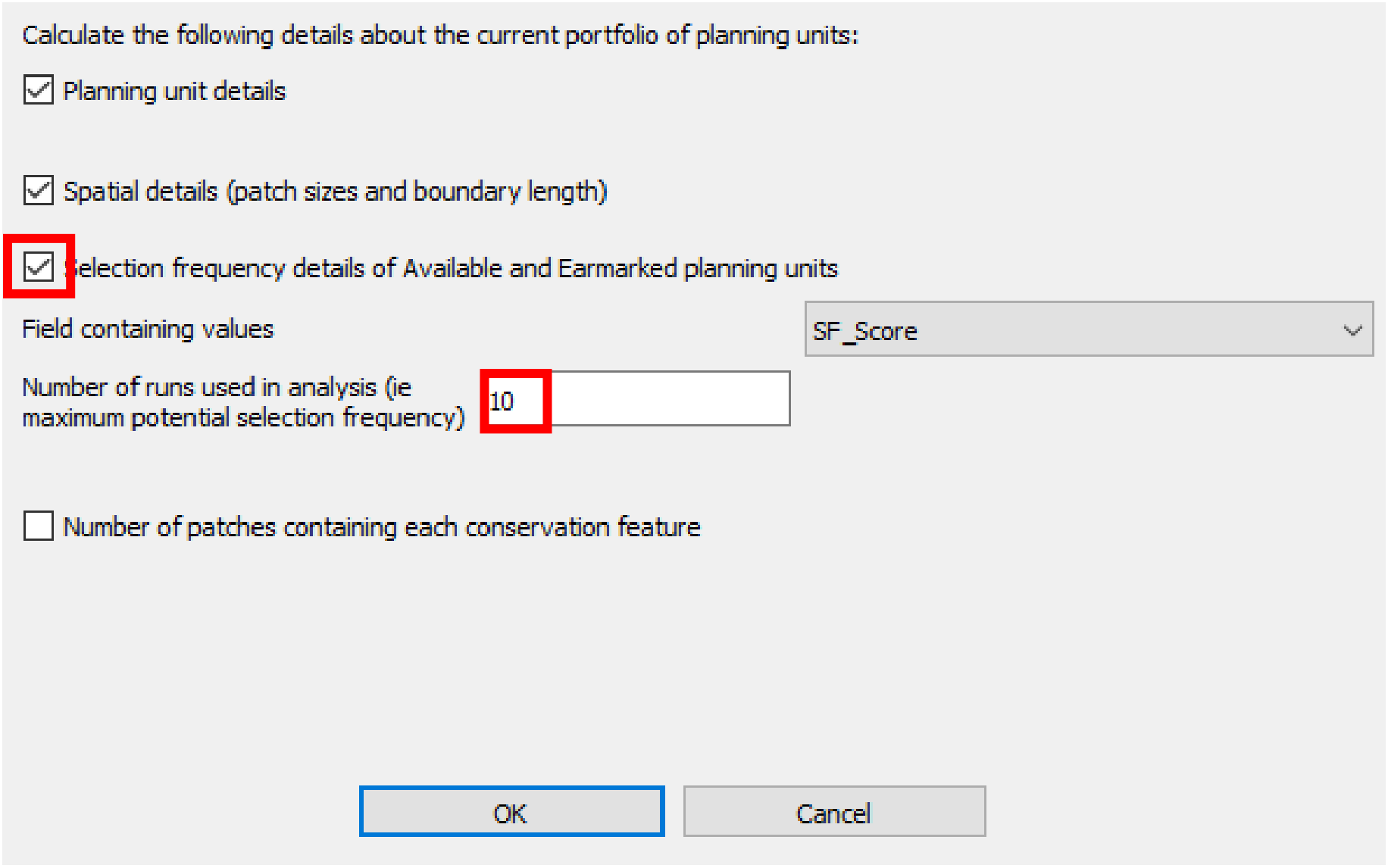
- Selecione o botão
  “Change the status of the Best units to Earmarked”





- Menu “Calculate portfolio characteristics”




Calculate the following details about the current portfolio of planning units:
Planning unit details
Spatial details (patch sizes and boundary length)
Selection frequency details of Available and Earmarked planning units
Field containing values
SF_Score
Number of runs used in analysis (ie maximum potential selection frequency)
10
Number of patches containing each conservation feature
OK
Cancel

Comparação entre os resultados

	BLM = 0	BLM = 0.5
Earmarked (area)	10143	18728
Number of patches	214	9
Portfolio boundary length	594904	111896

Obrigado!

Vitor Vieira Vasconcelos

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Academia.edu: *https://ufabc-br.academia.edu/VitorVasconcelos*

Lattes: http://*lattes*.cnpq.br/8151243279050980

Slideshare: https://pt.slideshare.net/vitor_vasconcelos