Reserve Design Activity

Delivered by: **Trevor Wiens**

Materials provided by:

PacMARA

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Pacific Marine Analysis & Research Association

Based on materials developed by:

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Applied Environmental Decision Analysis
Commonwealth Environmental Research Facility

The University of Queensland Australia

Exercise 1

Objectives:

- Represent target amount for feature 1, 2, 3
- Minimize cost
- Consider spatial configuration: Try to ensure that most of the selected planning units are adjacent to at least one other planning unit

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Planning Unit ID and its cost: PUID_COST

1_347	2_52	3_985	4_207	5_276	6_821	7_122	8_404	9_300	10_681
11_813	12_537	13_931	14_653	15_919	16_826	17_455	18_983	19_731	20_875
21_247	22_462	23_287	24_988	25_85	26_736	27_681	28_479	29_459	30_615
31_378	32_986	33_887	34_392	35_526	36_783	37_224	38_149	39_268	40_90
41_977	42_74	43_53	44_390	45_619	46_773	47_952	48_738	49_897	50_580
51_969	52_76	53_147	54_870	55_350	56_543	57_607	58_375	59_903	60_790
61_729	62_492	63_303	64_289	65_490	66_599	67_407	68_651	69_709	70_365
71_571	72_931	73_353	74_64	75_955	76_950	77_855	78_886	79_840	80_598
81_422	82_252	83_941	84_152	85_353	86_123	87_716	88_587	89_346	90_318
	92_891	93_815	94_818	95_726	96_372	97_197	98_89	99_417	100_975

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Area occupied by each biogeoclimatic zone in each square: BZ1_BZ2_BZ3

		0_0_1		89_0_12	30_48_0	69_4_9			0_0_91
				71_43_12	99_0_1		17_0_0	0_0_35	31_0_0
	55_40_0		0_2_27	70_0_0	37_0_56		0_0_33	0_41_0	54_0_0
	80_8_0	0_47_0		0_78_0	0_0_87	66_0_38			0_91_0
	0_0_73	0_60_0	25_79_0		11_0_8				0_0_53
76_34_0	0_90_0	0_84_0	0_0_82	0_72_26		0_0_21	58_0_0		0_54_59
75_0_60						91_0_0	0_0_57	0_42_97	0_0_7
	0_37_0						0_23_0	0_41_0	81_0_37
0_0_12			0_53_24	0_72_0	93_0_0		0_23_59		
	11_0_0	0_14_50		0_0_88			48_0_0		0_76_0

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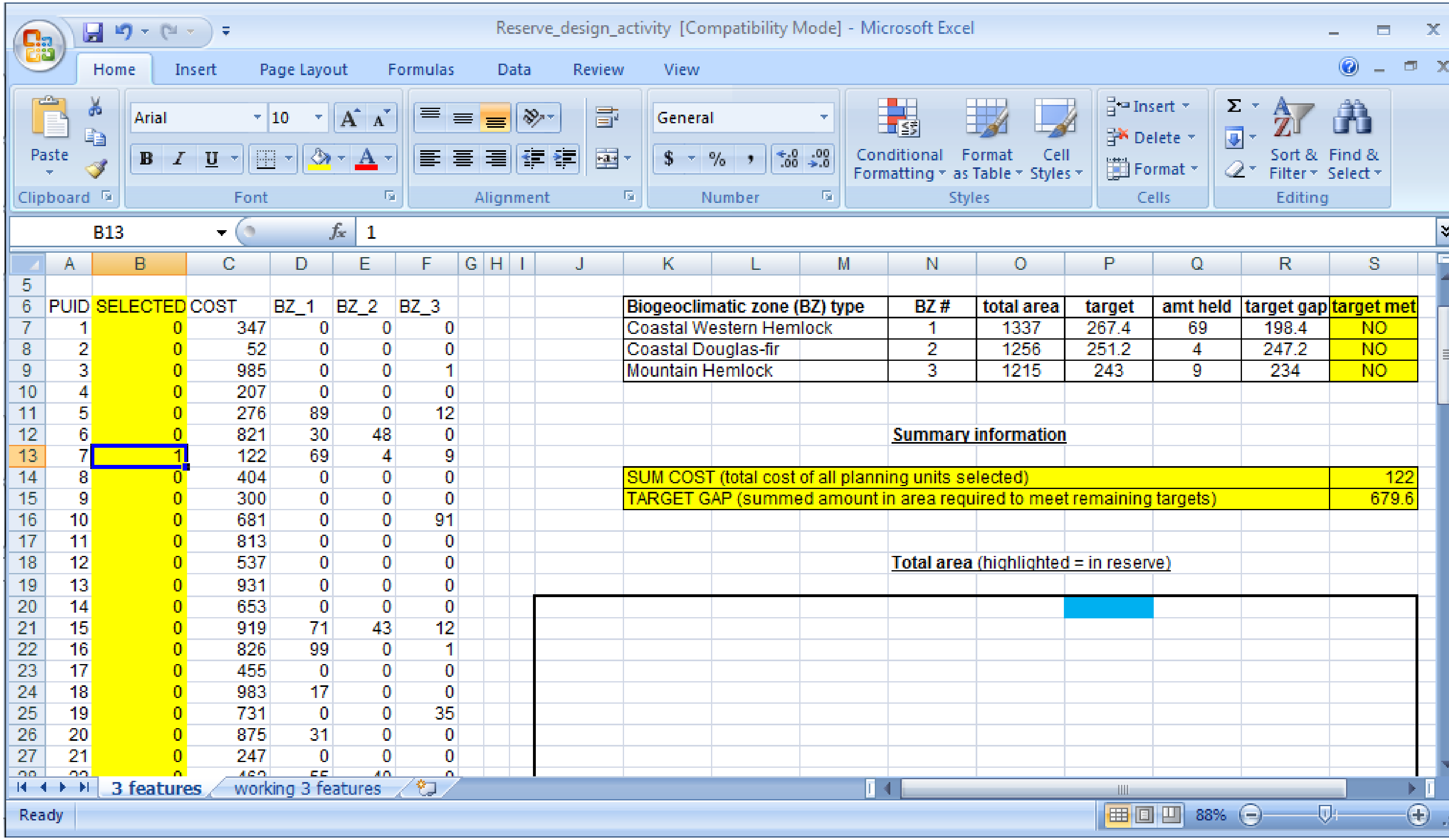
Spreadsheet computes "target gap" and "cost"



Reserve_design_activity [Compatibility Mode] - Microsoft Excel

B13 = 1

PUID	SELECTED	COST	BZ_1	BZ_2	BZ_3
1	0	347	0	0	0
2	0	52	0	0	0
3	0	985	0	0	1
4	0	207	0	0	0
5	0	276	89	0	12
6	0	821	30	48	0
7	1	122	69	4	9
8	0	404	0	0	0
9	0	300	0	0	0
10	0	681	0	0	91
11	0	813	0	0	0
12	0	537	0	0	0
13	0	931	0	0	0
14	0	653	0	0	0
15	0	919	71	43	12
16	0	826	99	0	1
17	0	455	0	0	0
18	0	983	17	0	0
19	0	731	0	0	35
20	0	875	31	0	0
21	0	247	0	0	0

Biogeoclimatic zone (BZ) type	BZ #	total area	target	amt held	target gap	target met
Coastal Western Hemlock	1	1337	267.4	69	198.4	NO
Coastal Douglas-fir	2	1256	251.2	4	247.2	NO
Mountain Hemlock	3	1215	243	9	234	NO

Summary information

SUM COST (total cost of all planning units selected)	122
TARGET GAP (summed amount in area required to meet remaining targets)	679.6

Total area (highlighted = in reserve)

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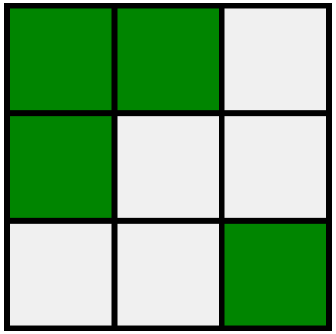
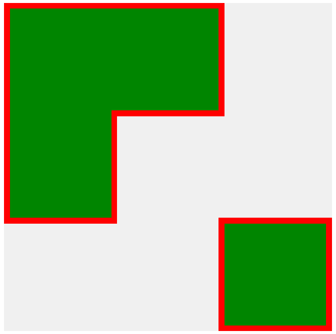
Consider clumping

- Count the number of outside edges
- Each edge counts * 100

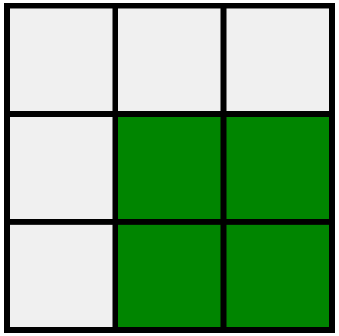
Portfolio A

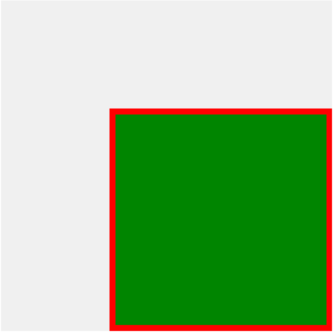




12 edges * 100 = 1200

Portfolio B





8 edges * 100 = 800

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Begin Reserve Design Activity

Follow the instructions on the worksheet, using the spreadsheet and the maps:

- Worksheet: Reserve Design Activity Maps.doc or .pdf
- Spreadsheet: Reserve_design_activity.xls
- "Maps": on page 7 of the course manual

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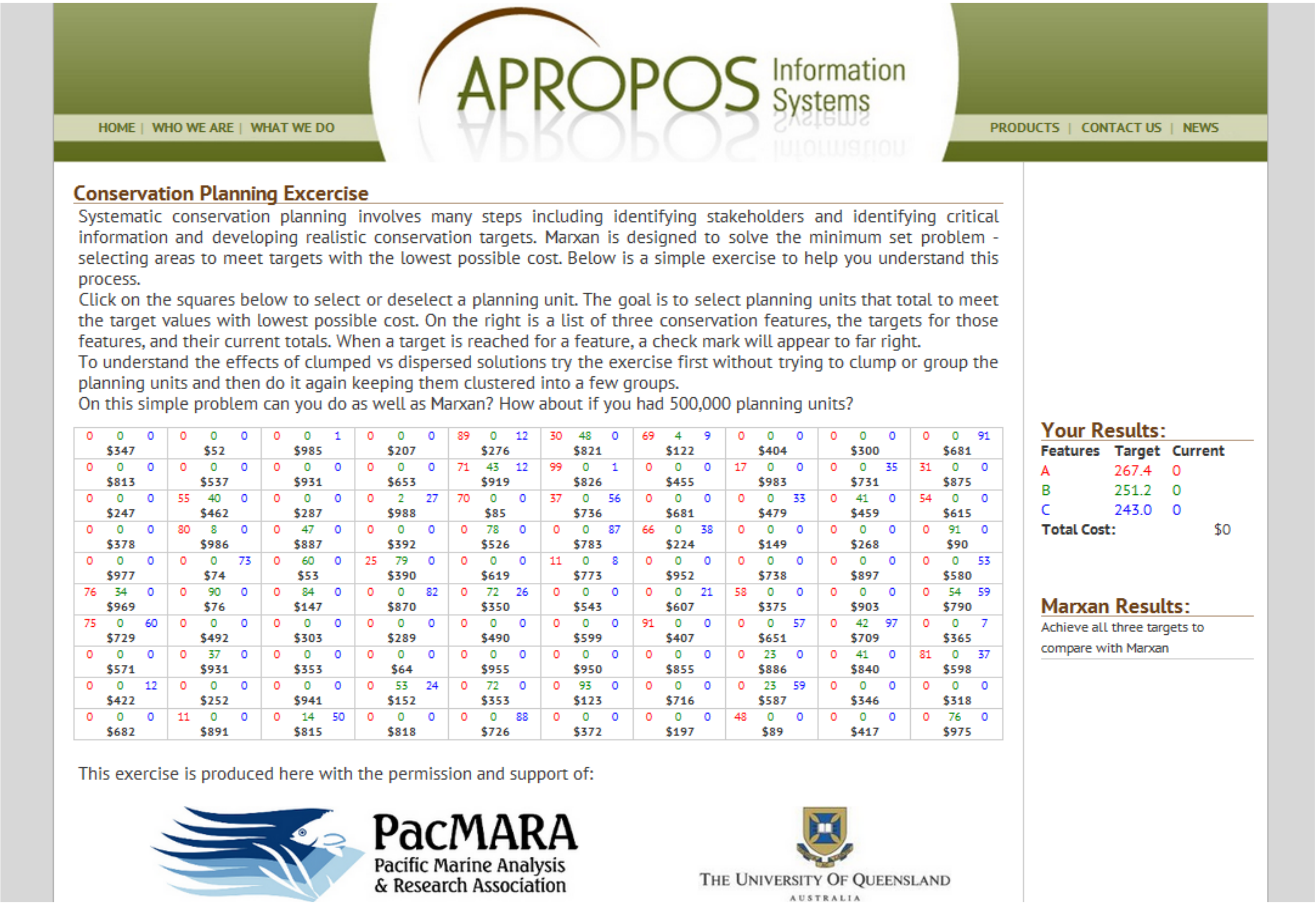
Online Reserve Design Exercise



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Conservation Planning Excercise

Systematic conservation planning involves many steps including identifying stakeholders and identifying critical information and developing realistic conservation targets. Marxan is designed to solve the minimum set problem - selecting areas to meet targets with the lowest possible cost. Below is a simple exercise to help you understand this process.

Click on the squares below to select or deselect a planning unit. The goal is to select planning units that total to meet the target values with lowest possible cost. On the right is a list of three conservation features, the targets for those features, and their current totals. When a target is reached for a feature, a check mark will appear to far right.

To understand the effects of clumped vs dispersed solutions try the exercise first without trying to clump or group the planning units and then do it again keeping them clustered into a few groups.

On this simple problem can you do as well as Marxan? How about if you had 500,000 planning units?

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

Your Results:

Features	Target	Current
A	267.4	0
B	251.2	0
C	243.0	0
Total Cost:		$0

Marxan Results:

Achieve all three targets to compare with Marxan

This exercise is produced here with the permission and support of:

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The University Of Queensland AUSTRALIA

http://aproposinfosystems.com/media/marxan-demo.html

You can start now.
You have 15 min to find the best solution.
Good luck !!

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SUM COST

+

TARGET GAB

+

BOUNDARY COST

(number of free edges * 100)

=

Marxan Score

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NAME	SUMCOST	TARGET GAB	BOUNDARY COST	MARXAN SCORE
Daniel F	4502	0	2400	6902
Daniel M	5401	0	3600	9101
Vasiliki	5518	0	3200	8718
Niel	5507	0	2200	7707
Benjamin	2912	0	4000	6912
Jongseo	4513	0	7200	11713
Rebecca	6570	2	2200	8772
Keunhyung	5823	119	2000	7942
Elodie				

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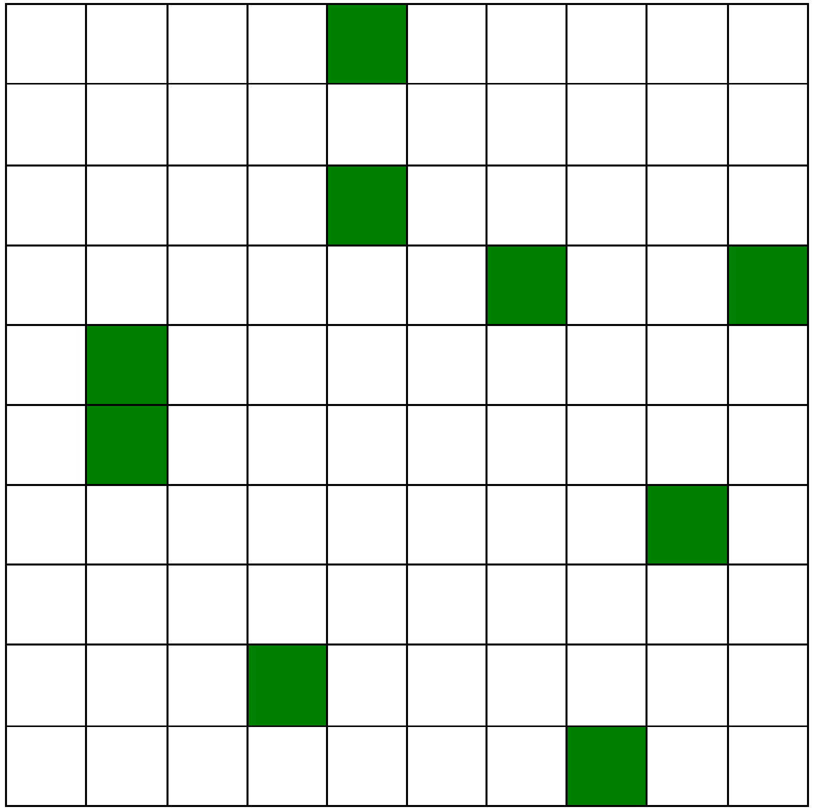
Results of Marxan



Lowest cost solution = **1775**

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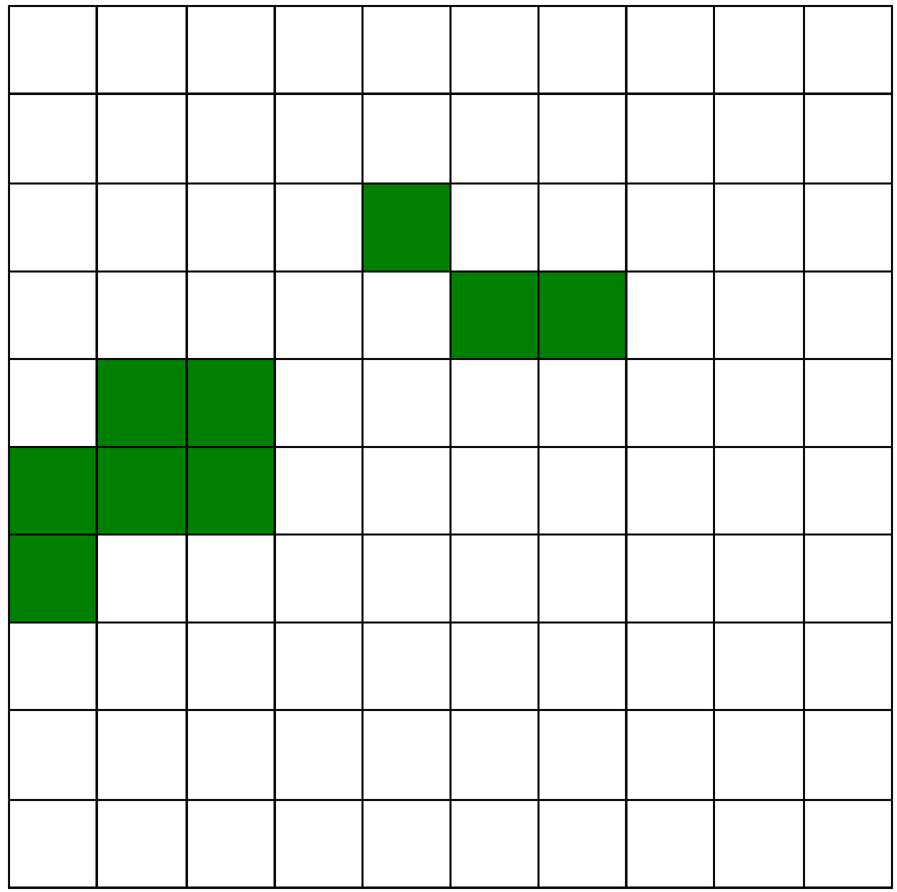
Results of Marxan



Lowest cost clumped solution

Cost= 3140

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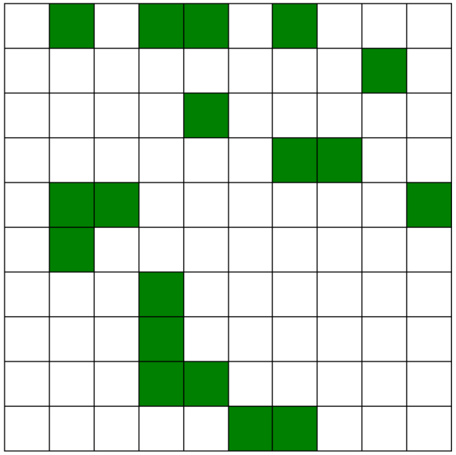
Now consider…

- More features (a few hundred?)
- More spatial constraints
- The problem gets so large that it is impossible to find a good solution in reasonable amount of time



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