DETERMINING THE MINIMAL BACKGROUND AREA FOR SPECIES DISTRIBUTION MODELS: MinBAR PACKAGE. SUPPLEMENTARY MATERIAL

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1 Introduction

This is the Supplementary Material to the article "Determining the minimal background area for MaxEnt species distribution models: MinBAR package" (https://CRAN.R-project.org/package=MinBAR)

15

16 2 Supplementary Material S1

17 *Table S1: Example of an output of MinBAR. Buffer in km. (continued below)*

Species	Buffer	BoyceIndex_part	BoyceIndex_tot	SD_part	SD_tot
Prunus spinosa	126.8	0.968	0.954	NA	NA
Prunus spinosa	228.1	0.982	0.185	NA	NA
Prunus spinosa	304.2	0.995	0.946	NA	NA
Prunus spinosa	384.3	0.989	0.992	0.01162	0.39
Prunus spinosa	476.3	0.993	0.996	0.00573 7	0.3971
Prunus spinosa	591.5	0.997	0.992	0.00341 6	0.0237 4
Prunus spinosa	746.1	1	1	0.00478 7	0.0038 3
Prunus spinosa	878.2	0.999	1	0.00309 6	0.0038 3
Prunus spinosa	1068	0.996	0.994	0.00182 6	0.0041 23
Prunus spinosa	3668	1	0.999	0.00189 3	0.0028 72

18 *Table continues below*

Execution Time	rankBI _part	rankBI _tot	rankTime	rankFinal NoTime	rankFinal WithTime
0.7504	10	8	1	9	8
0.9735	9	10	2	10	10
1.257	6	9	3	8	6
1.417	8	6	4	7	7
1.519	7	4	5	5	4
1.753	4	7	6	6	5
2.226	1	1	7	1	1
2.63	3	2	8	2	2
2.66	5	5	9	4	9
8.862	2	3	10	3	3

19

20 3 Supplementary Material S2

21 *Table S2.1: List of species used in case study 1*

Case.Study.1	Abbreviation1
Pinus sylvestris L.	pin_syl
Quercus ilex L.	que_ile
Fagus sylvatica L.	fag_syl
Fraxinus excelsior L.	fra_exc
Quercus petraea (Matt.) Liebl.	que_pet
Quercus robur L.	que_rob
Quercus pyrenaica Willd.	que_pyr
Quercus suber L.	que_sub
Abies alba Mill.	abi_alb
Acer platanoides L.	ace_pla
Alnus glutinosa (L.) Gaertn.	aln_glu

Juniperus oxycedrus L.	jun_oxy
Arbutus unedo L.	arb_une
Crataegus monogyna Jacq.	cra_mon
Prunus spinosa L.	pru_spi
Buxus sempervirens L.	bux_sem
Cotoneaster tomentosus Lindl.	cot_tom
Viola mirabilis L.	vio_mir
Diplotaxis erucoides DC.	dip_eru
Centaurea alba L.	cen_alb
Geranium lucidum L.	ger_luc
Linaria alpina Mill.	lin_alp
Pistacia terebinthus L.	pis_ter
Muscari comosum (L.) Mill.	leo_com
Lotus edulis L.	lot_edu

22

23 The occurrences were downloaded from GBIF using *PreSPickR* (Rotllan-Puig, 2018)

24

25 *Table S2.2: Citations of the data sets downloaded from GBIF and used in case study 1*

species	source	DOI	date_downloaded
ABIES ALBA MILL.	GBIF	10.15468/dl.eo0lqe	2018-03-04T17:37:26.441+0000
ACER PLATANOIDES L.	GBIF	10.15468/dl.idbrjq	2018-03-04T17:43:00.642+0000
ALNUS GLUTINOSA (L.) GAERTN.	GBIF	10.15468/dl.6stmlq	2018-03-04T17:53:48.872+0000
ARBUTUS	GBIF	10.15468/dl.mez7r0	2018-03-04T17:59:43.726+0000

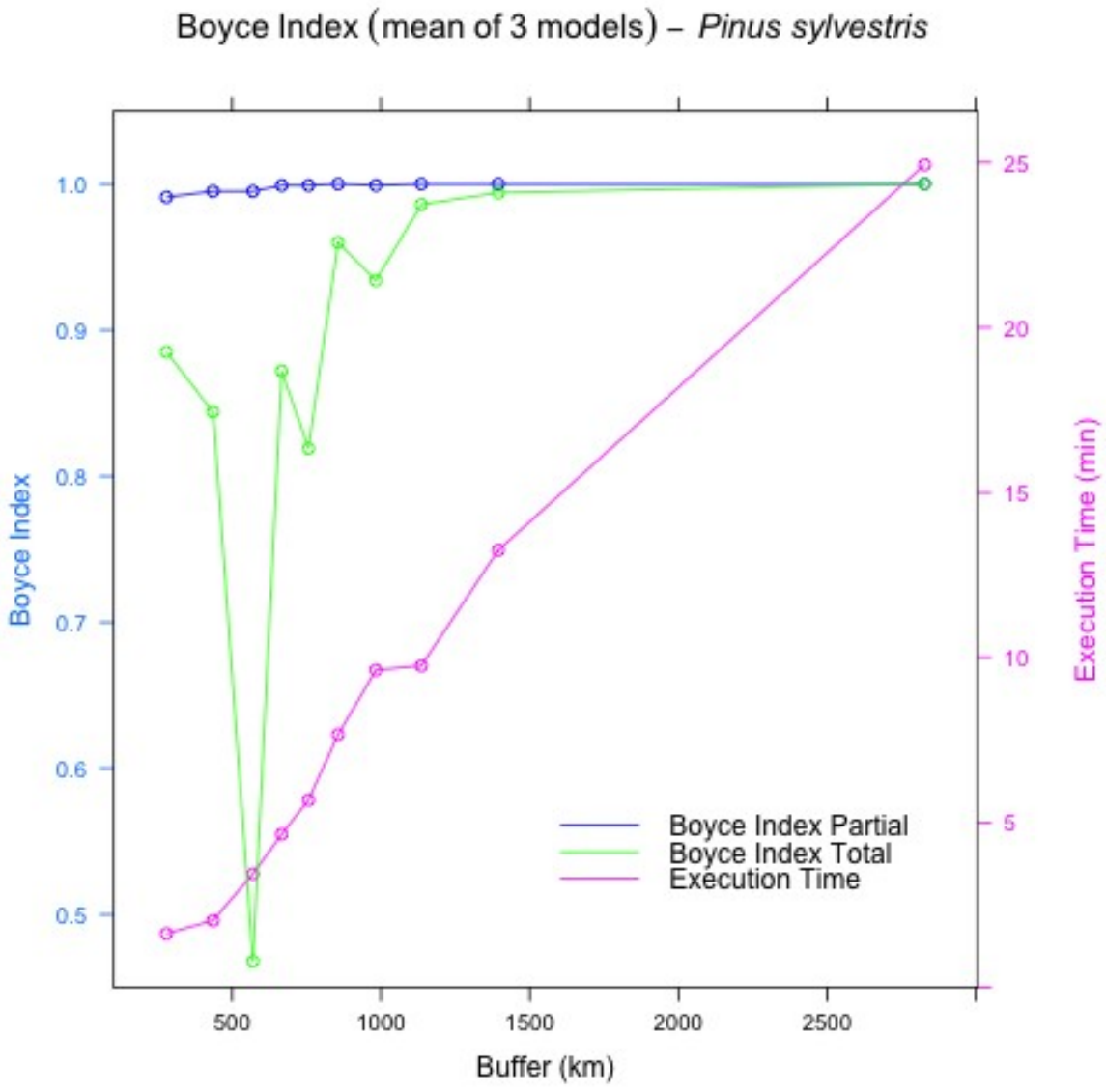
UNEDO L.			
BUXUS SEMPERVIRENS L.	GBIF	10.15468/dl.vitxba	2018-03-04T18:30:04.506+0000
CENTAUREA ALBA L.	GBIF	10.15468/dl.izlpzu	2018-03-07T22:20:10.052+0000
COTONEASTER TOMENTOSUS LINDL.	GBIF	10.15468/dl.51ud43	2018-07-12T14:53:51.438+0000
CRATAEGUS MONOGYNA JACQ.	GBIF	10.15468/dl.lshmvs	2018-03-04T18:10:29.057+0000
DIPLOTAXIS ERUCOIDES DC.	GBIF	10.15468/dl.djvzg0	2018-03-07T22:18:38.525+0000
FAGUS SYLVATICA L.	GBIF	10.15468/dl.u60ogx	2018-02-22T23:14:34.322+0000
FRAXINUS EXCELSIOR L.	GBIF	10.15468/dl.fxzzxv	2018-03-04T17:04:11.166+0000
GERANIUM LUCIDUM L.	GBIF	10.15468/dl.srgkdi	2018-03-07T22:22:17.220+0000
JUNIPERUS OXYCEDRUS	GBIF	10.15468/dl.lnykuh	2018-03-04T17:57:27.889+0000

L.			
LINARIA ALPINA MILL.	GBIF	10.15468/dl.phqgk3	2018-03-07T22:23:42.077+0000
LOTUS EDULIS L.	GBIF	10.15468/dl.gphxhp	2018-03-07T22:29:38.764+0000
MUSCARI COMOSUM (L.) MILL.	GBIF	10.15468/dl.ff8tqr	2018-03-07T22:28:23.186+0000
PINUS SYLVESTRIS L.	GBIF	10.15468/dl.lpqpm3	2018-02-22T23:00:00.299+0000
PISTACIA TEREBINTHUS L.	GBIF	10.15468/dl.g0zyyj	2018-03-07T22:25:47.461+0000
PRUNUS SPINOSA L.	GBIF	10.15468/dl.dzldah	2018-03-04T18:25:37.314+0000
QUERCUS ILEX L.	GBIF	10.15468/dl.yfpx0f	2018-02-22T23:03:47.122+0000
QUERCUS PETRAEA (MATT.) LIEBL.	GBIF	10.15468/dl.1htw8l	2018-03-04T17:15:52.716+0000
QUERCUS PYRENAICA WILLD.	GBIF	10.15468/dl.mpmnvw	2018-03-04T17:31:41.099+0000
QUERCUS	GBIF	10.15468/dl.ihampz	2018-03-04T17:28:03.035+0000

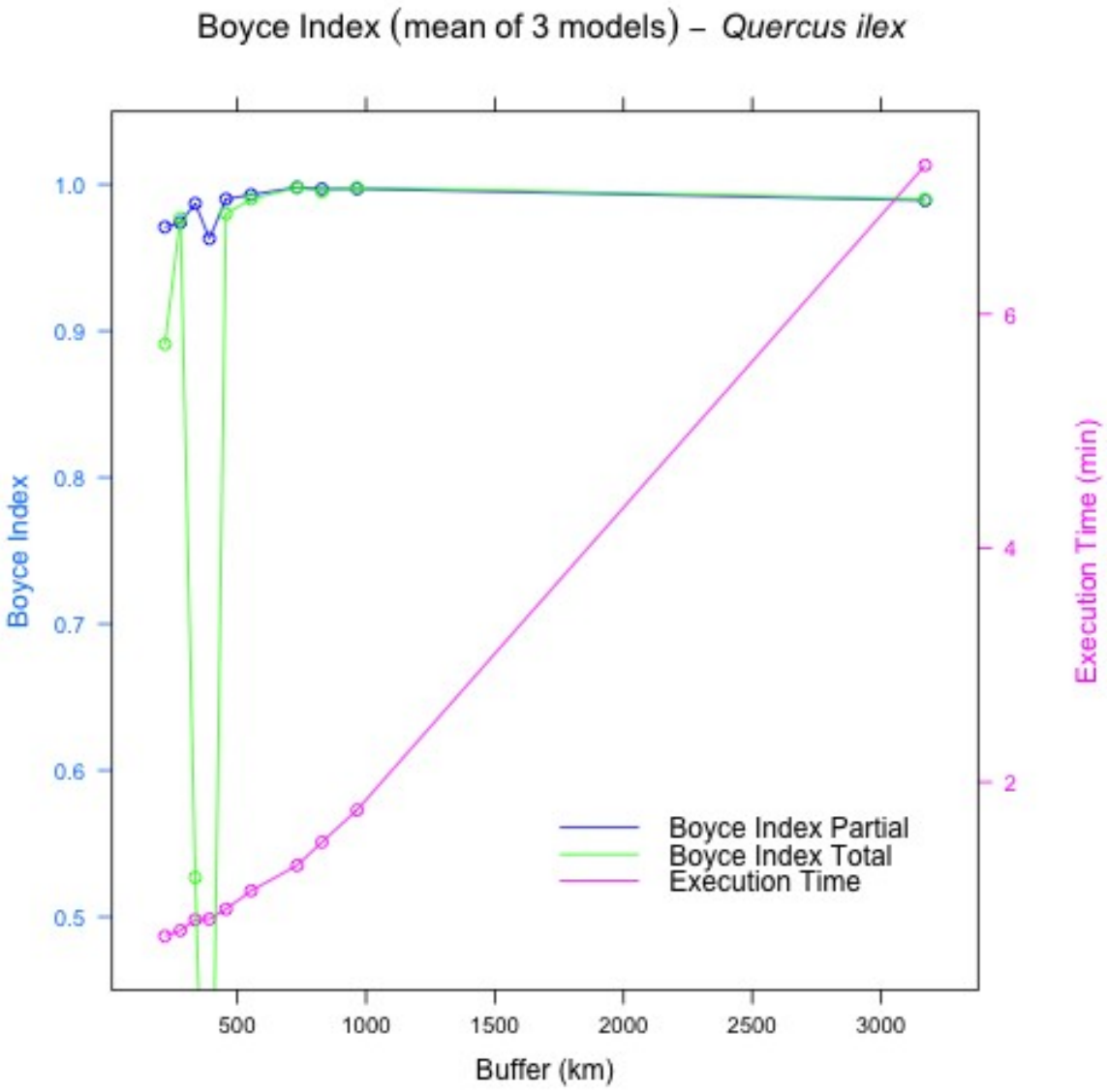
ROBUR L.			
QUERCUS SUBER L.	GBIF	10.15468/dl.uzpt1x	2018-03-04T17:33:45.764+0000
VIOLA MIRABILIS L.	GBIF	10.15468/dl.6vyew0	2018-03-07T22:16:25.766+0000

4 Supplementary Material S3

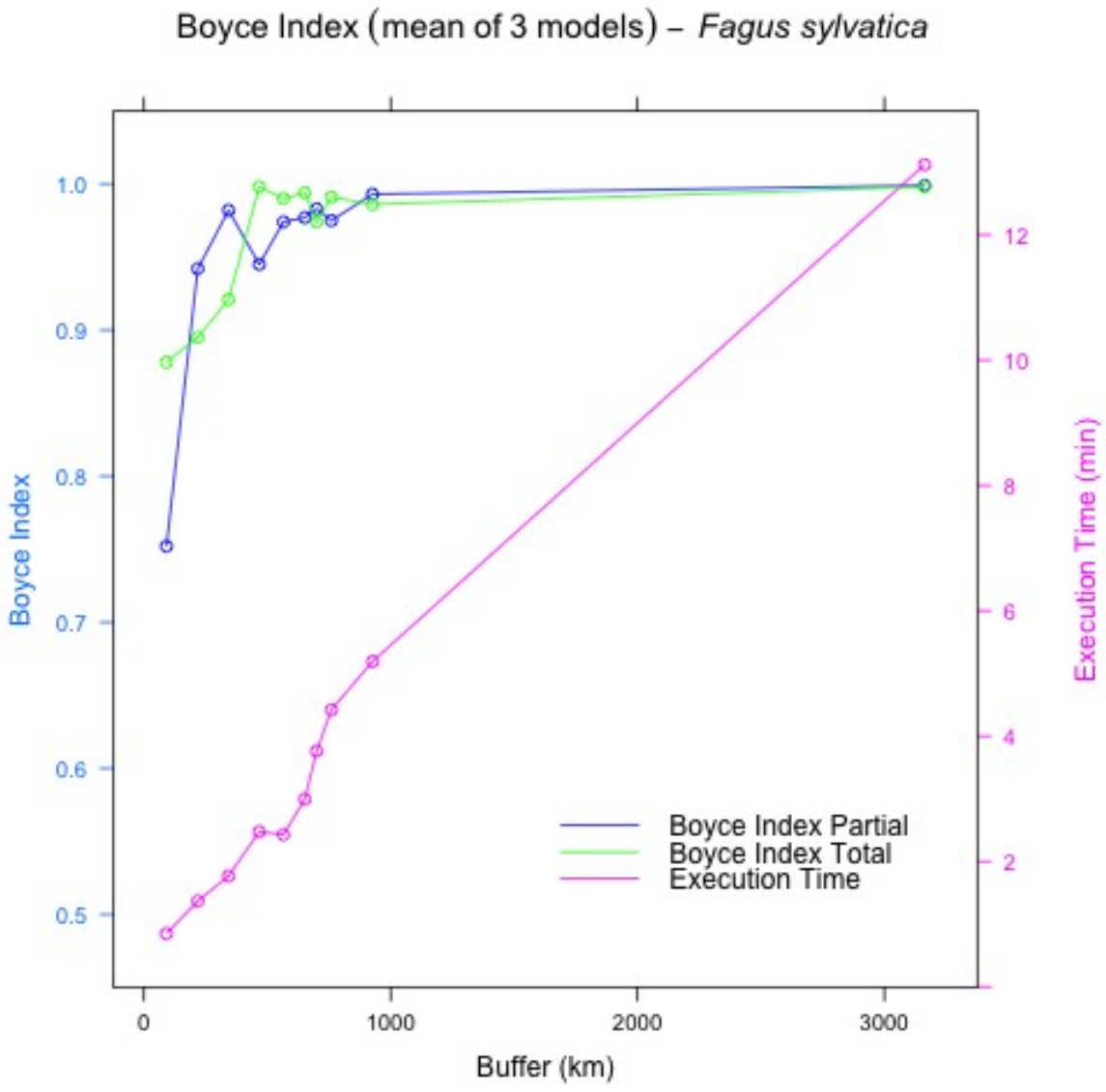
Figures S3.1 - S3.25: Evolution of Boyce Index Total (green) and Partial (blue), and the execution time in minutes (pink), for all the species in case study 1. The origin of the x-axis corresponds to the geographical centre of the species distribution (mean location for longitude/latitude coordinates dealing with angularity). The x-axis increases (in kilometres) with buffers 1 to 10, respectively the closest and the most distant to the centre of species distribution


Boyce Index (mean of 3 models) – Pinus sylvestris
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
25
20
15
10
5
500
1000
1500
2000
2500
Boyce Index Partial
Boyce Index Total
Execution Time

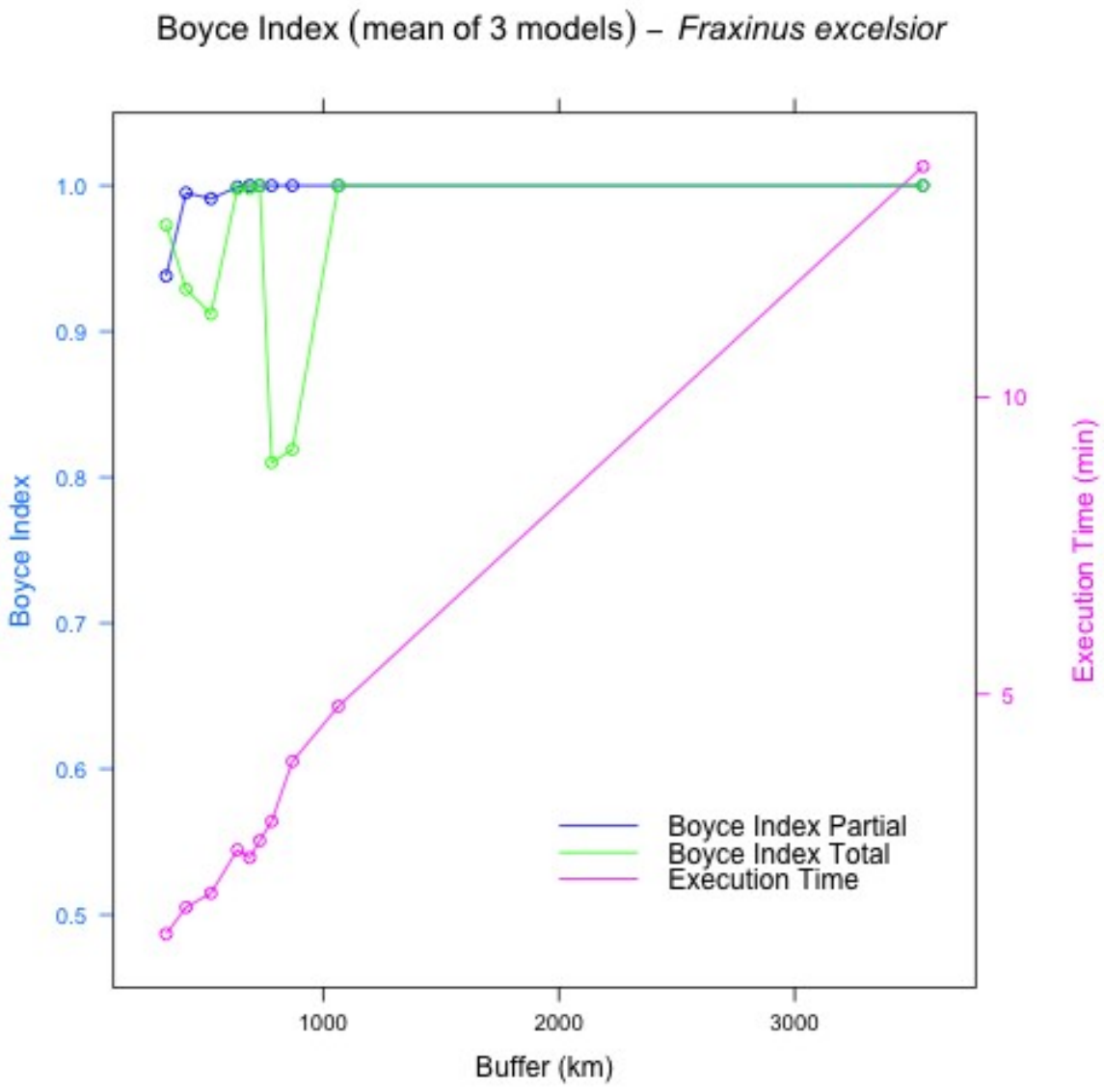
34


Boyce Index (mean of 3 models) – Quercus ilex
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
6
4
2
500
1000
1500
2000
2500
3000
Boyce Index Partial
Boyce Index Total
Execution Time

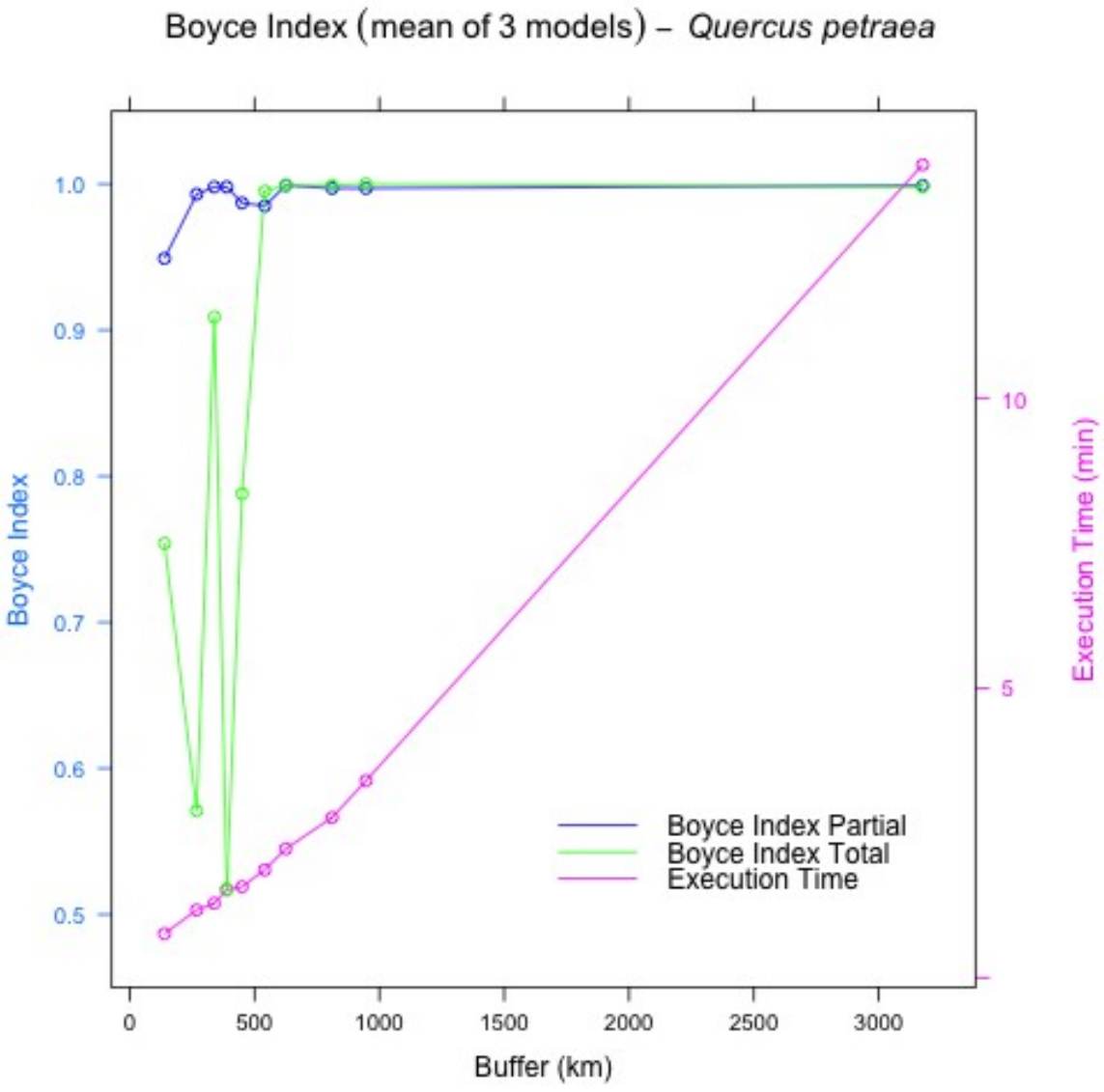
35


Boyce Index (mean of 3 models) – Fagus sylvatica
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
12
10
8
6
4
2
0
1000
2000
3000

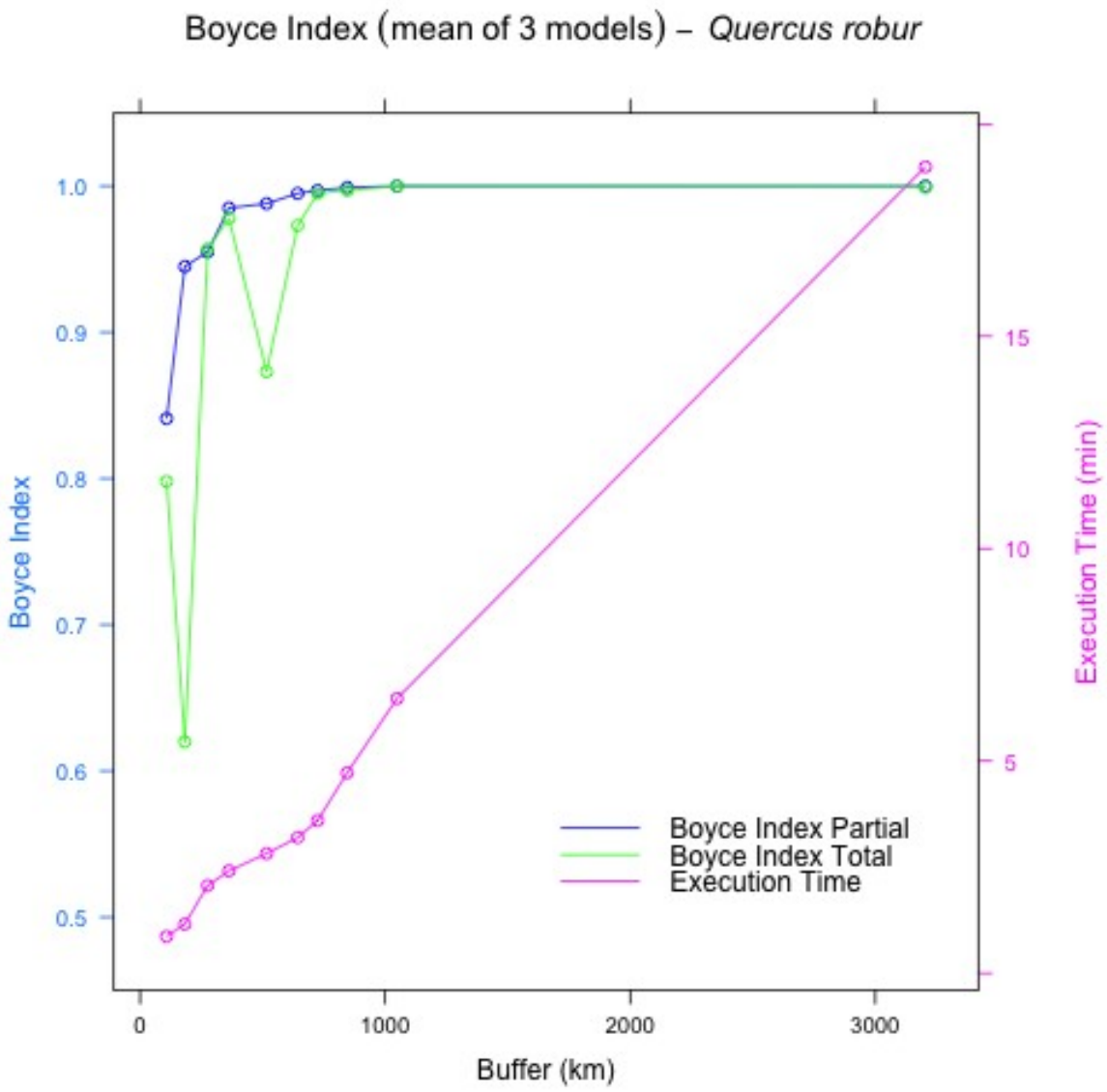
36


Boyce Index (mean of 3 models) – Fraxinus excelsior
Boyce Index
1.0
0.9
0.8
0.7
0.6
0.5
Execution Time (min)
10
5
1000
2000
3000
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time

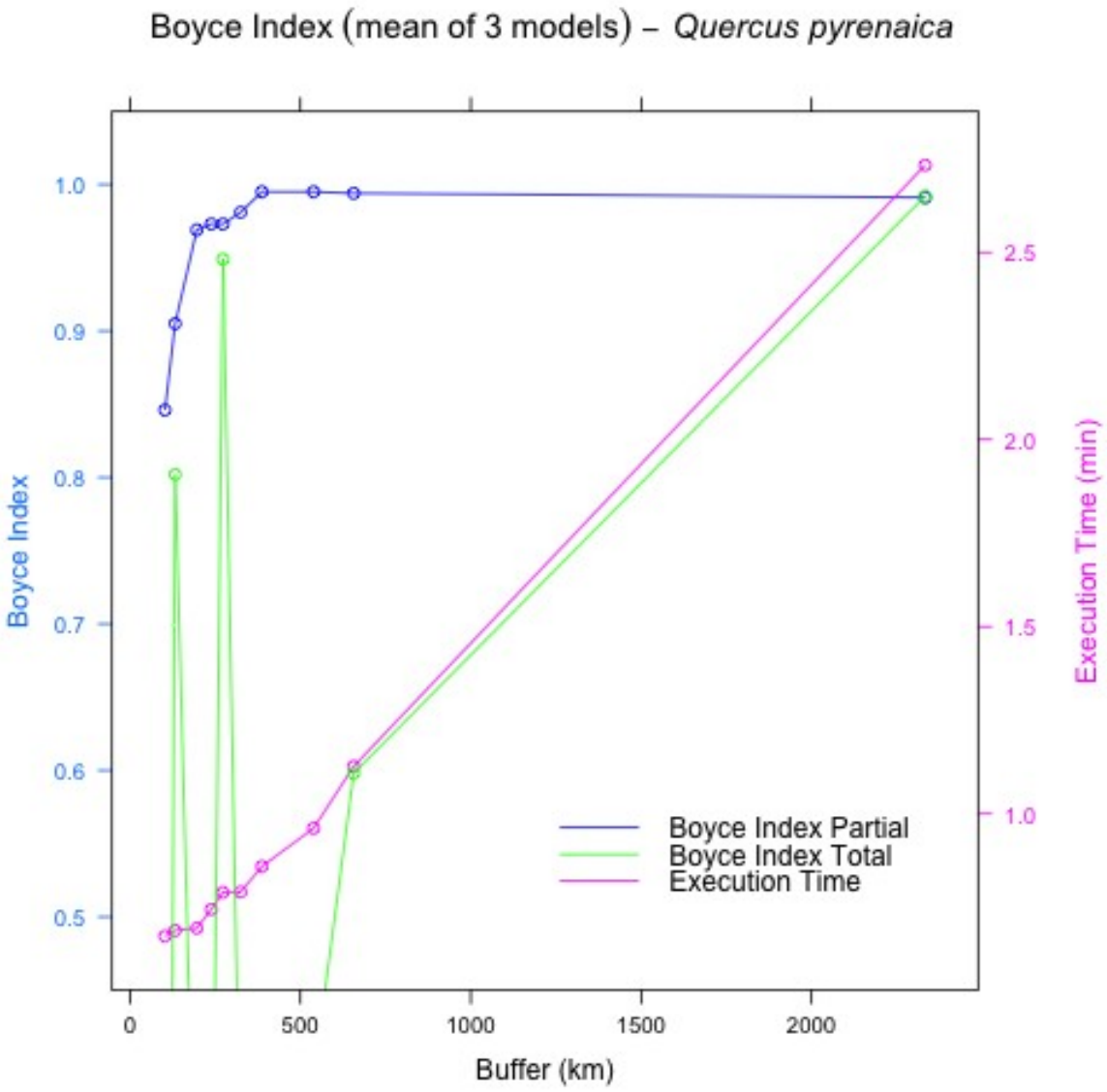
37


Boyce Index (mean of 3 models) – Quercus petraea
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
10
5
0
500
1000
1500
2000
2500
3000

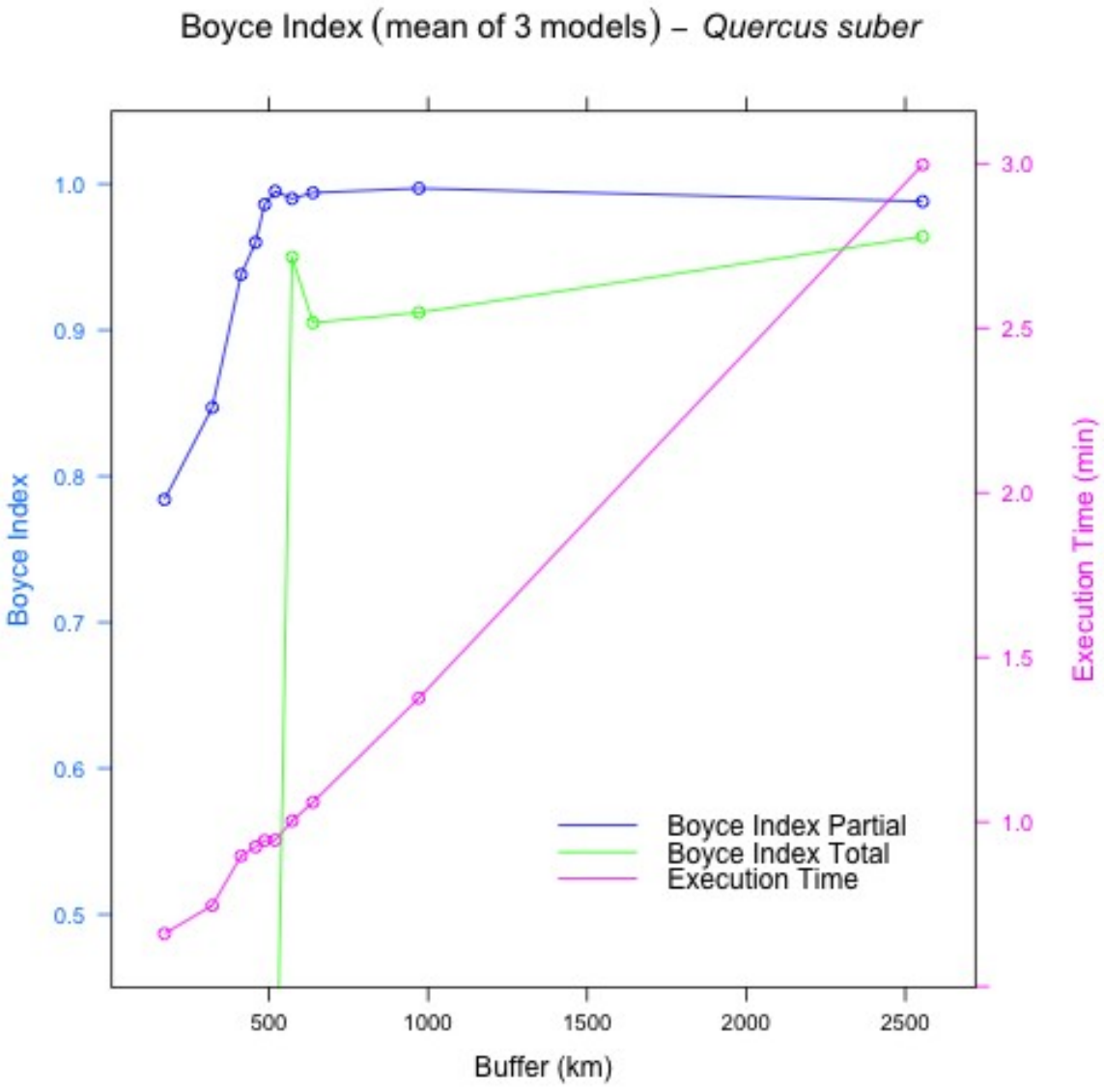
38


Boyce Index (mean of 3 models) – Quercus robur
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
15
10
5
0
1000
2000
3000
Boyce Index Partial
Boyce Index Total
Execution Time

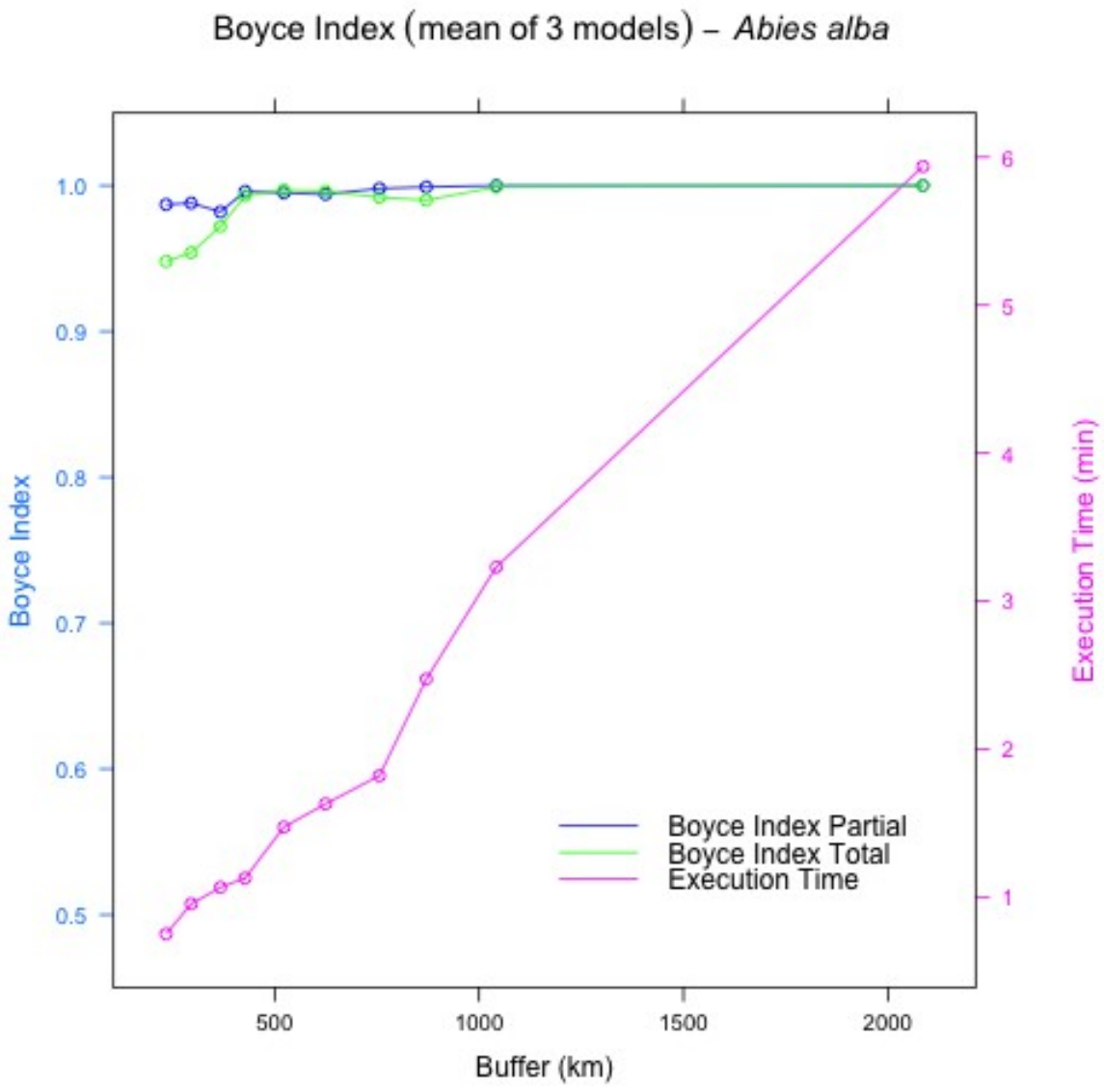
39


Boyce Index (mean of 3 models) – Quercus pyrenaica
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
2.5
2.0
1.5
1.0
0
500
1000
1500
2000

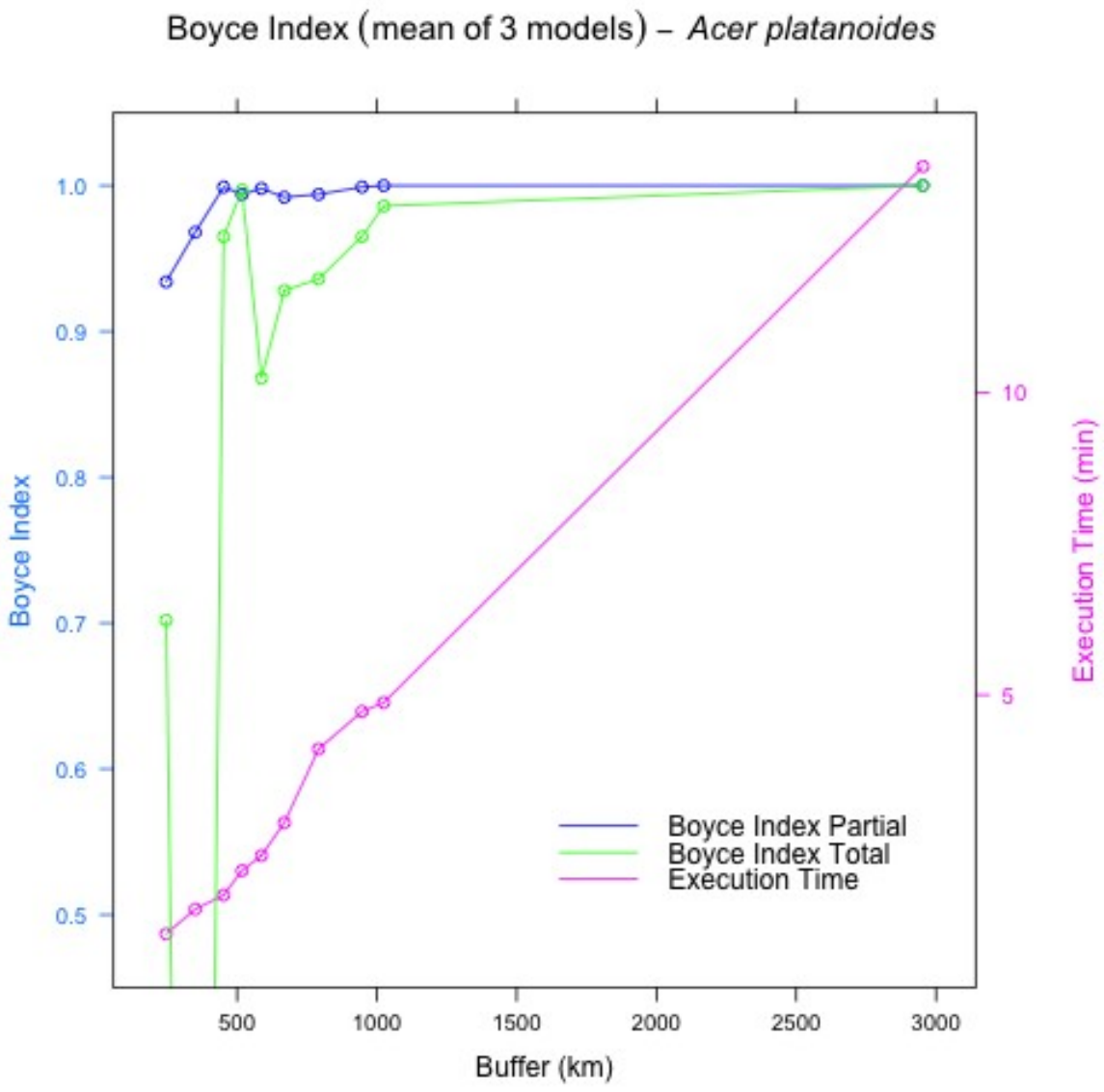
40


Boyce Index (mean of 3 models) – Quercus suber
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
3.0
2.5
2.0
1.5
1.0
500
1000
1500
2000
2500
Boyce Index Partial
Boyce Index Total
Execution Time

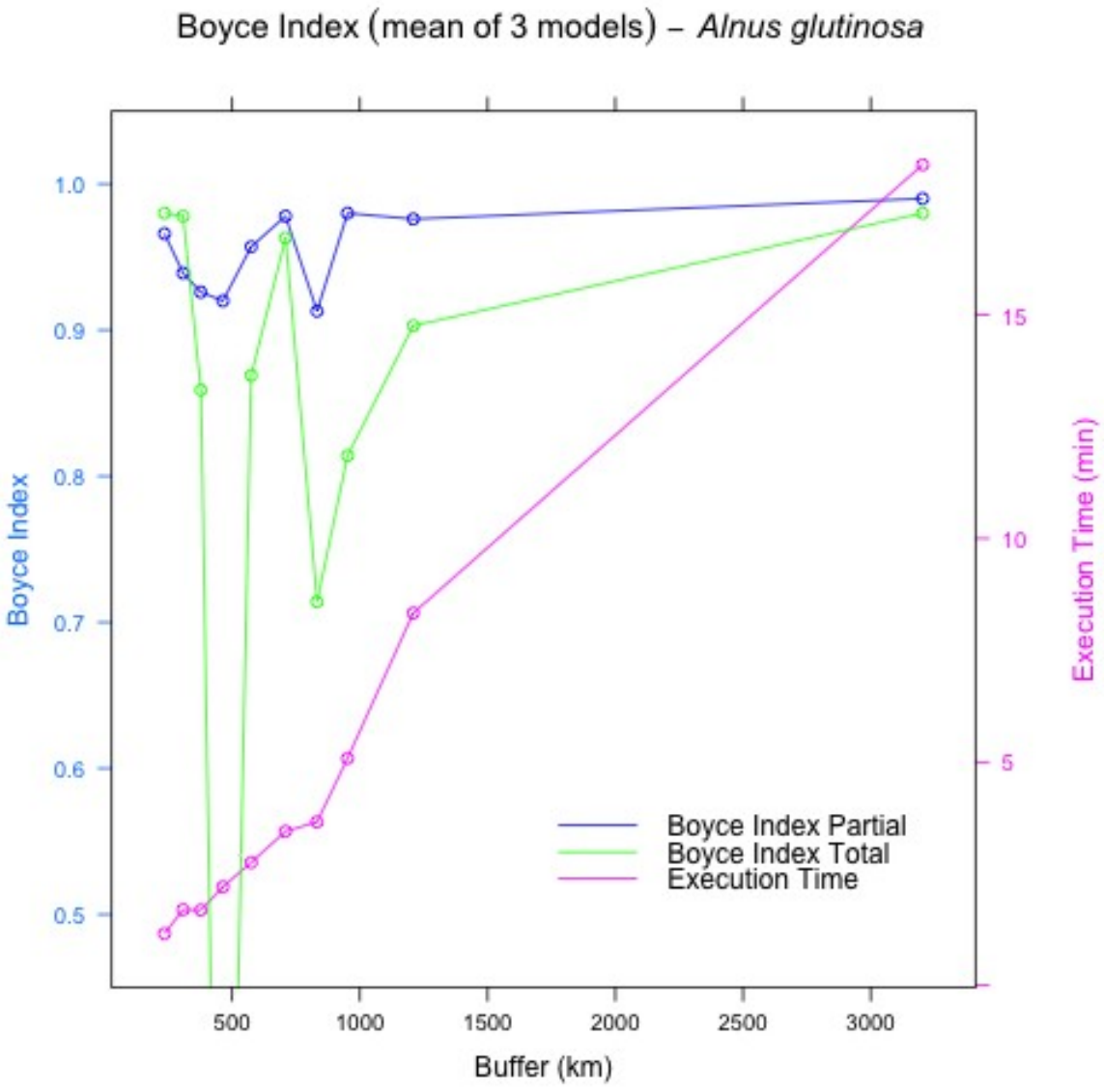
41


Boyce Index (mean of 3 models) – Abies alba
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
6
5
4
3
2
1
500
1000
1500
2000
Boyce Index Partial
Boyce Index Total
Execution Time

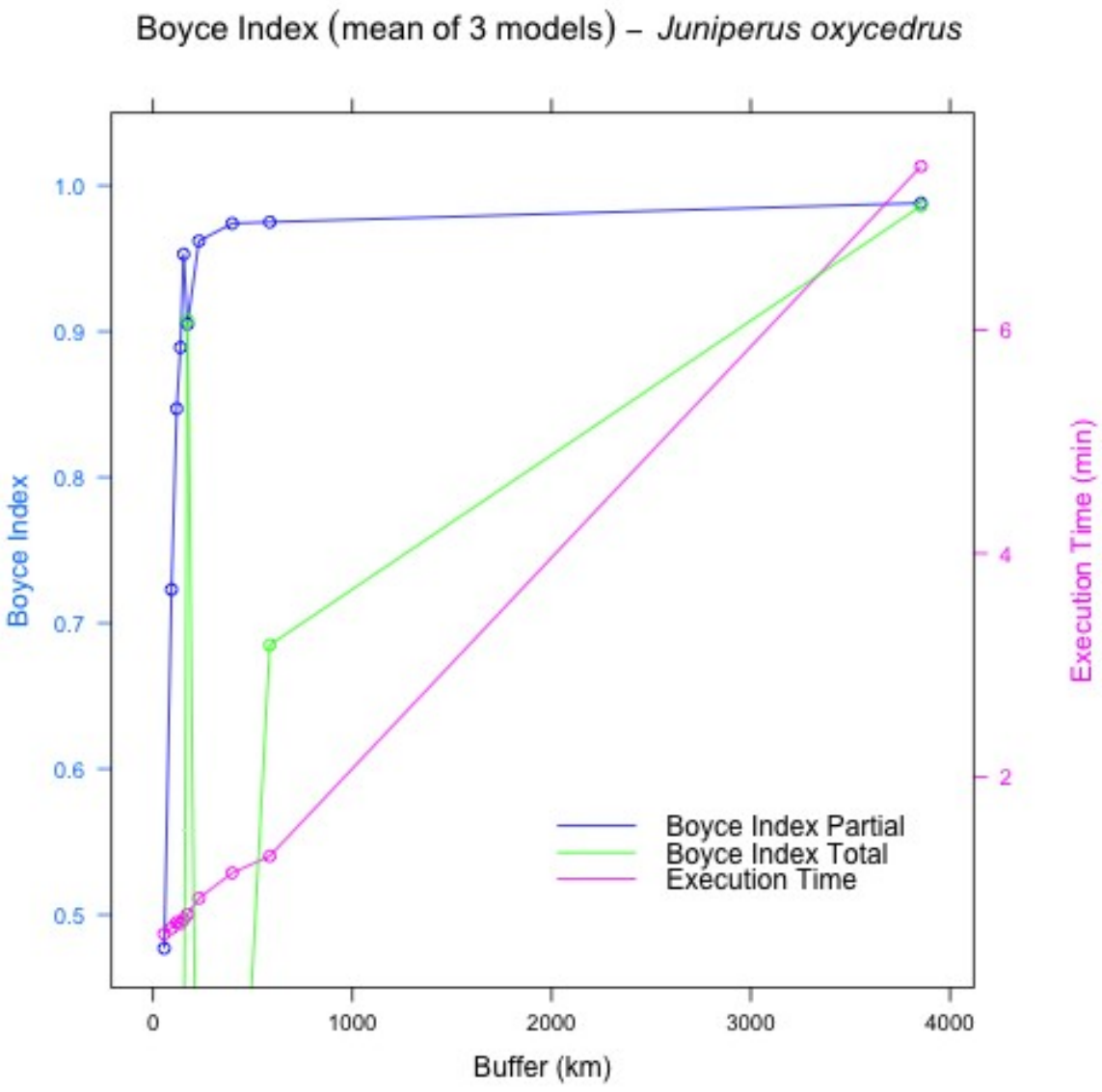
42


Boyce Index (mean of 3 models) – Acer platanoides
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
10
5
500
1000
1500
2000
2500
3000
Boyce Index Partial
Boyce Index Total
Execution Time

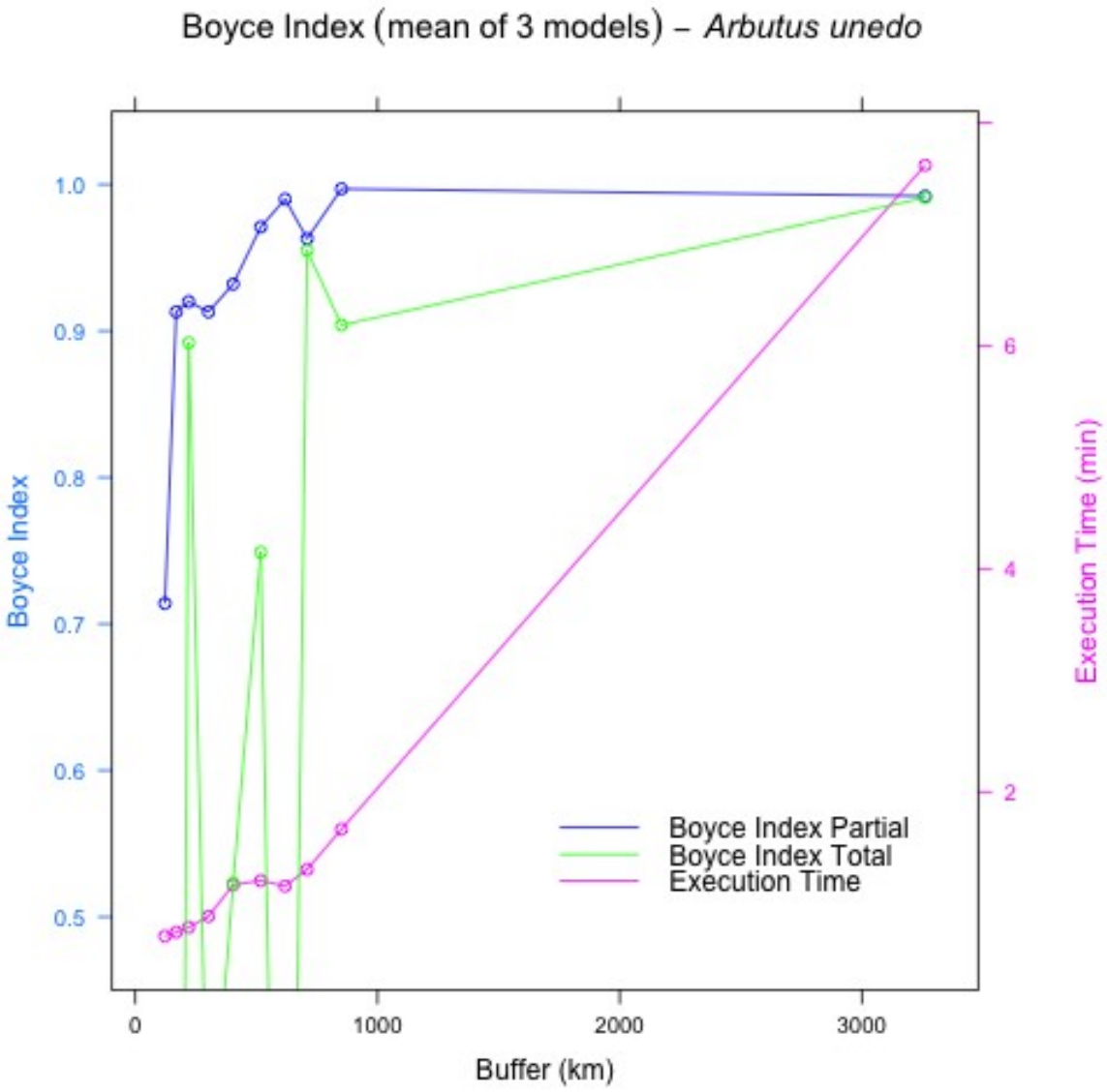
43


Boyce Index (mean of 3 models) – Alnus glutinosa
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
15
10
5
500
1000
1500
2000
2500
3000
Boyce Index Partial
Boyce Index Total
Execution Time

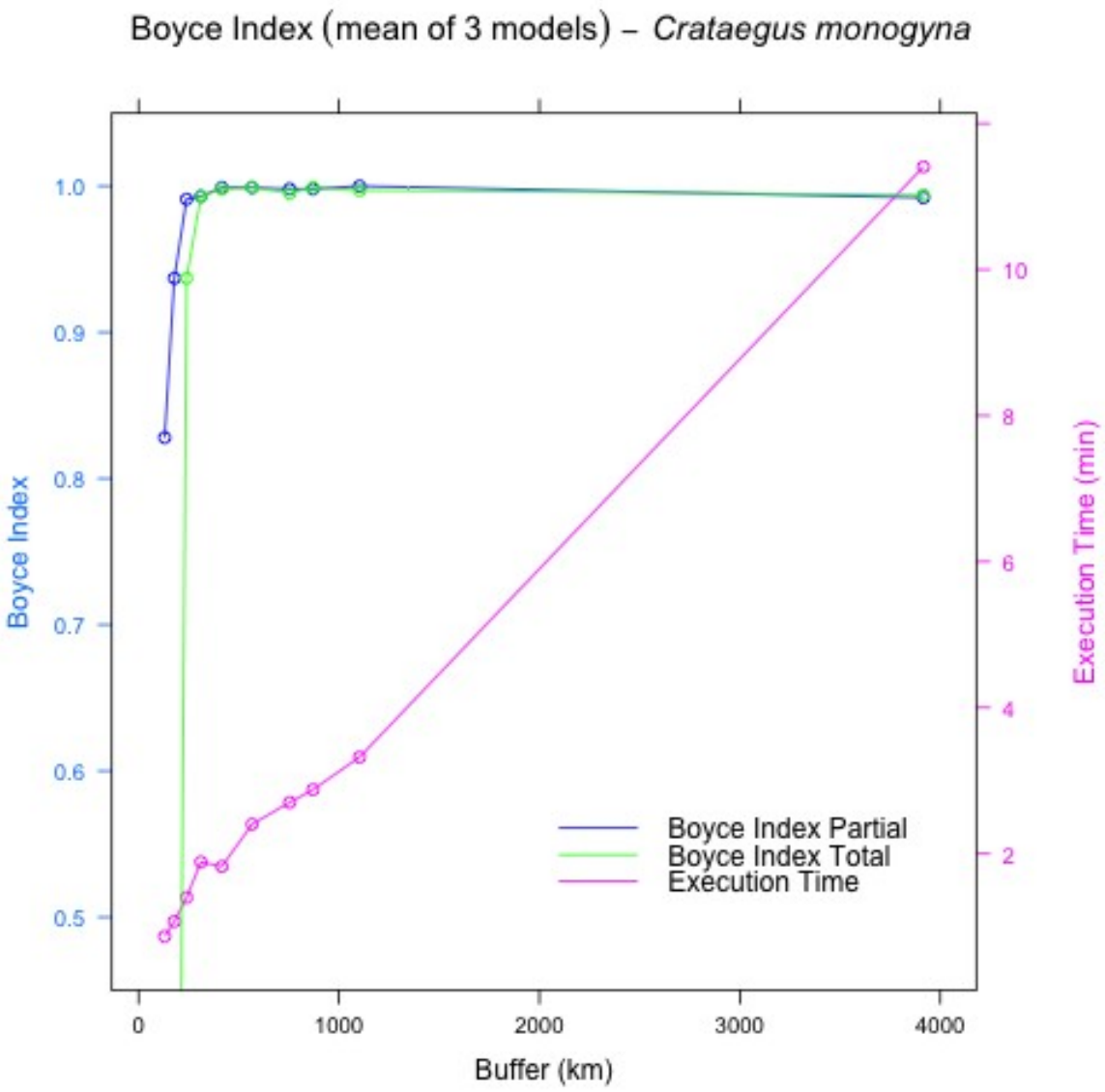
44


Boyce Index (mean of 3 models) – Juniperus oxycedrus
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
6
4
2
0
1000
2000
3000
4000
Boyce Index Partial
Boyce Index Total
Execution Time

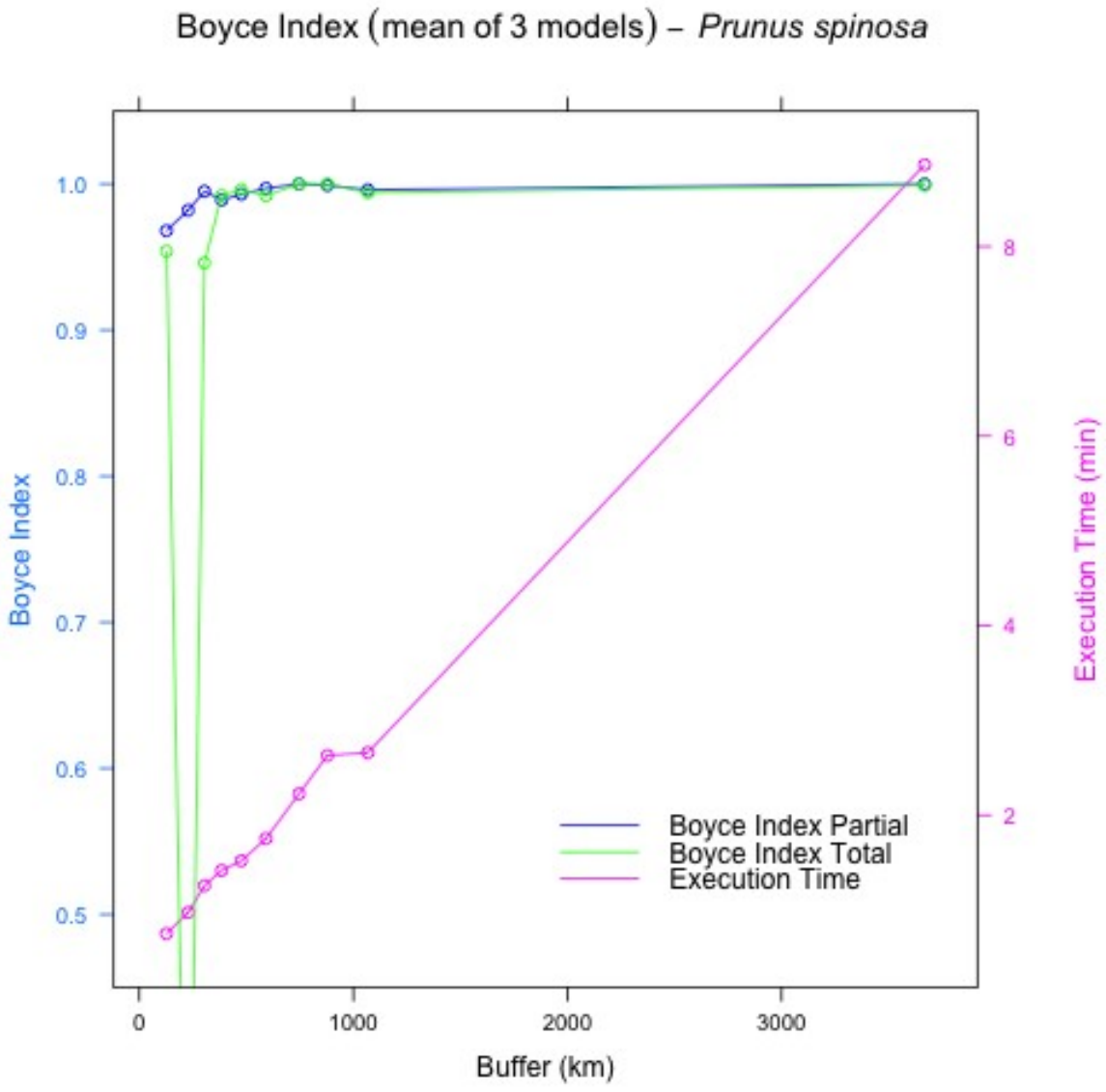
45


Boyce Index (mean of 3 models) – Arbutus unedo
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
0
1000
2000
3000
6
4
2
Boyce Index Partial
Boyce Index Total
Execution Time

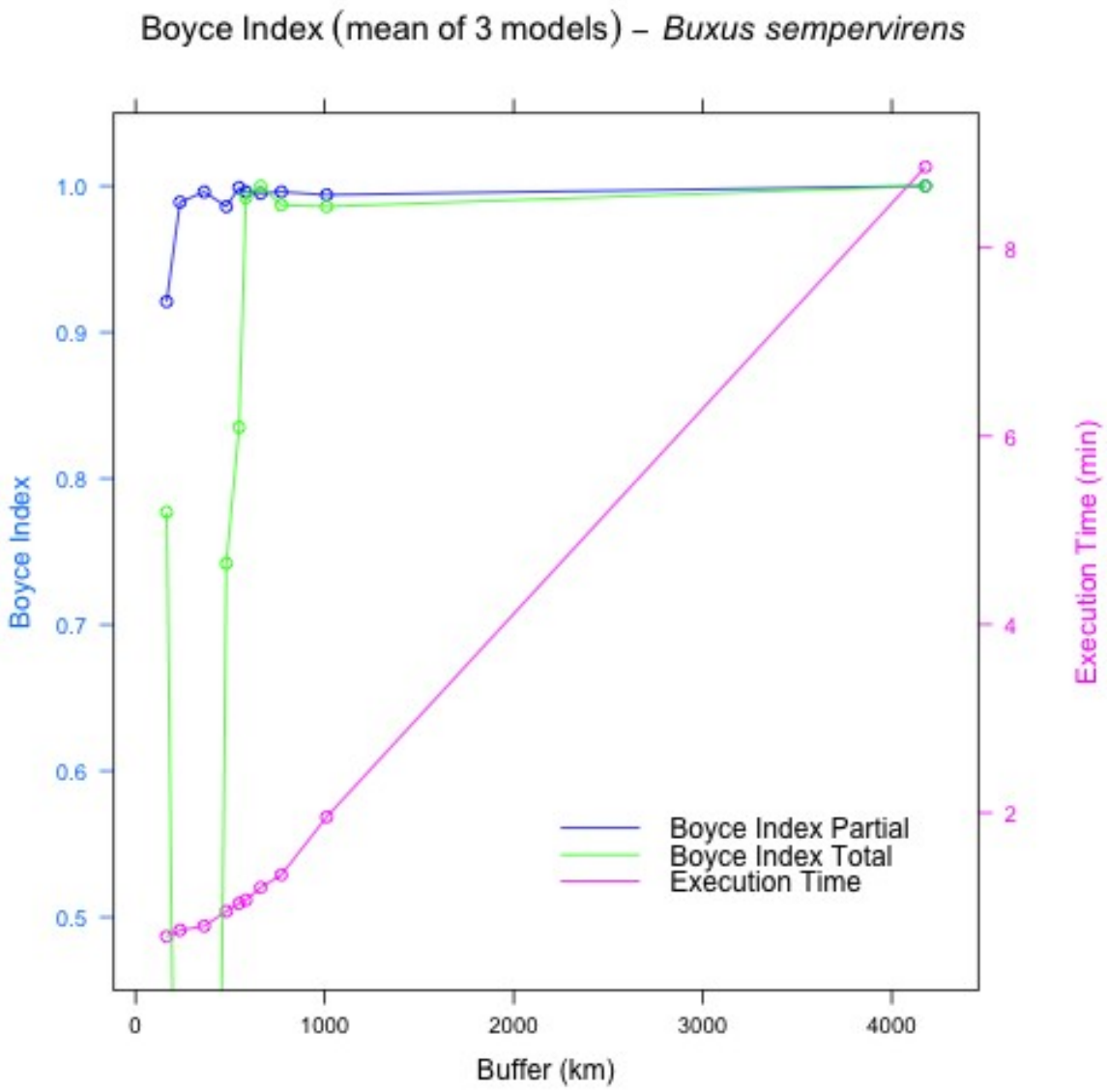
46


Boyce Index (mean of 3 models) – Crataegus monogyna
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
10
8
6
4
2
0
1000
2000
3000
4000

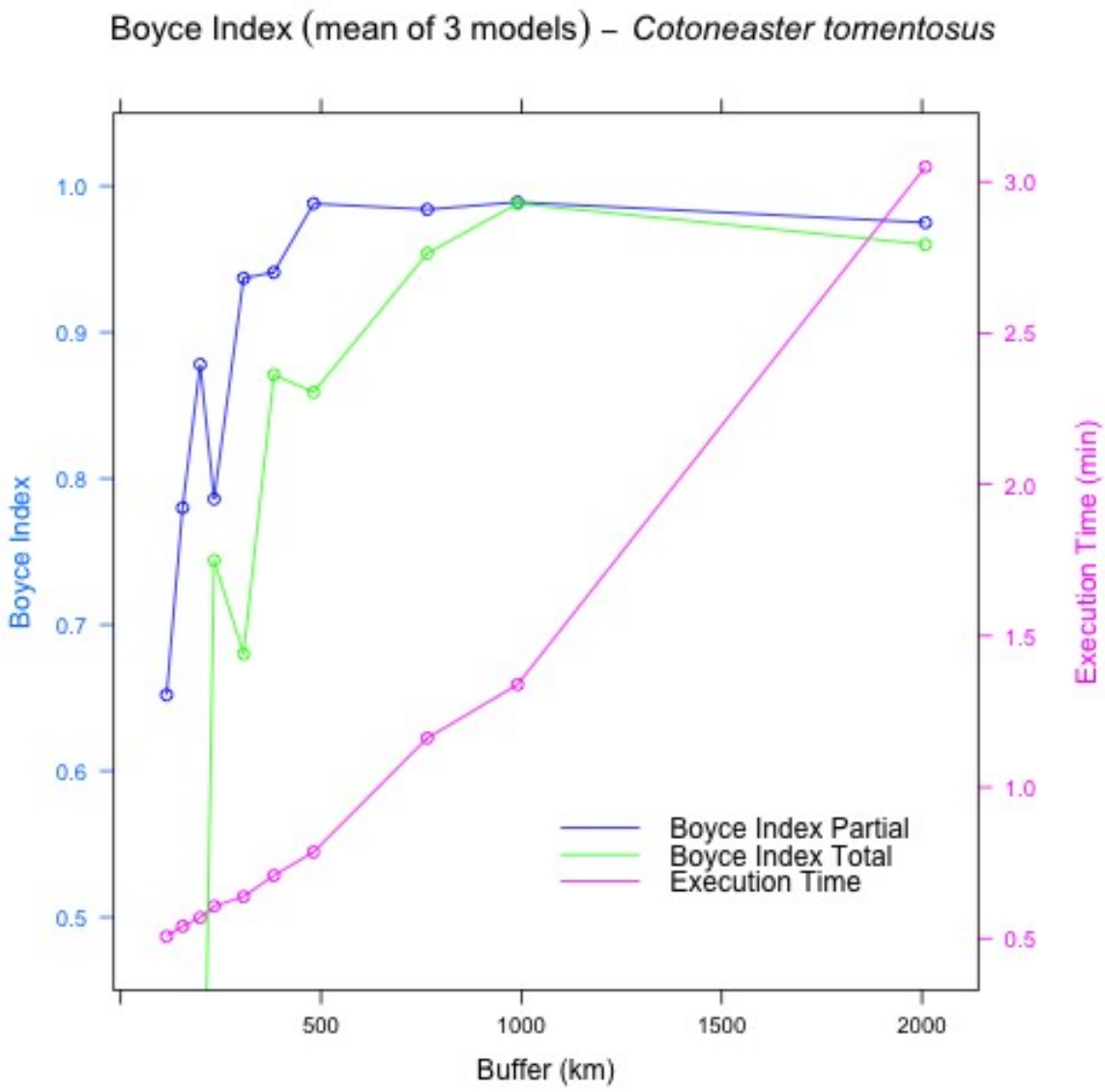
47


Boyce Index (mean of 3 models) – Prunus spinosa
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
8
6
4
2
0
1000
2000
3000

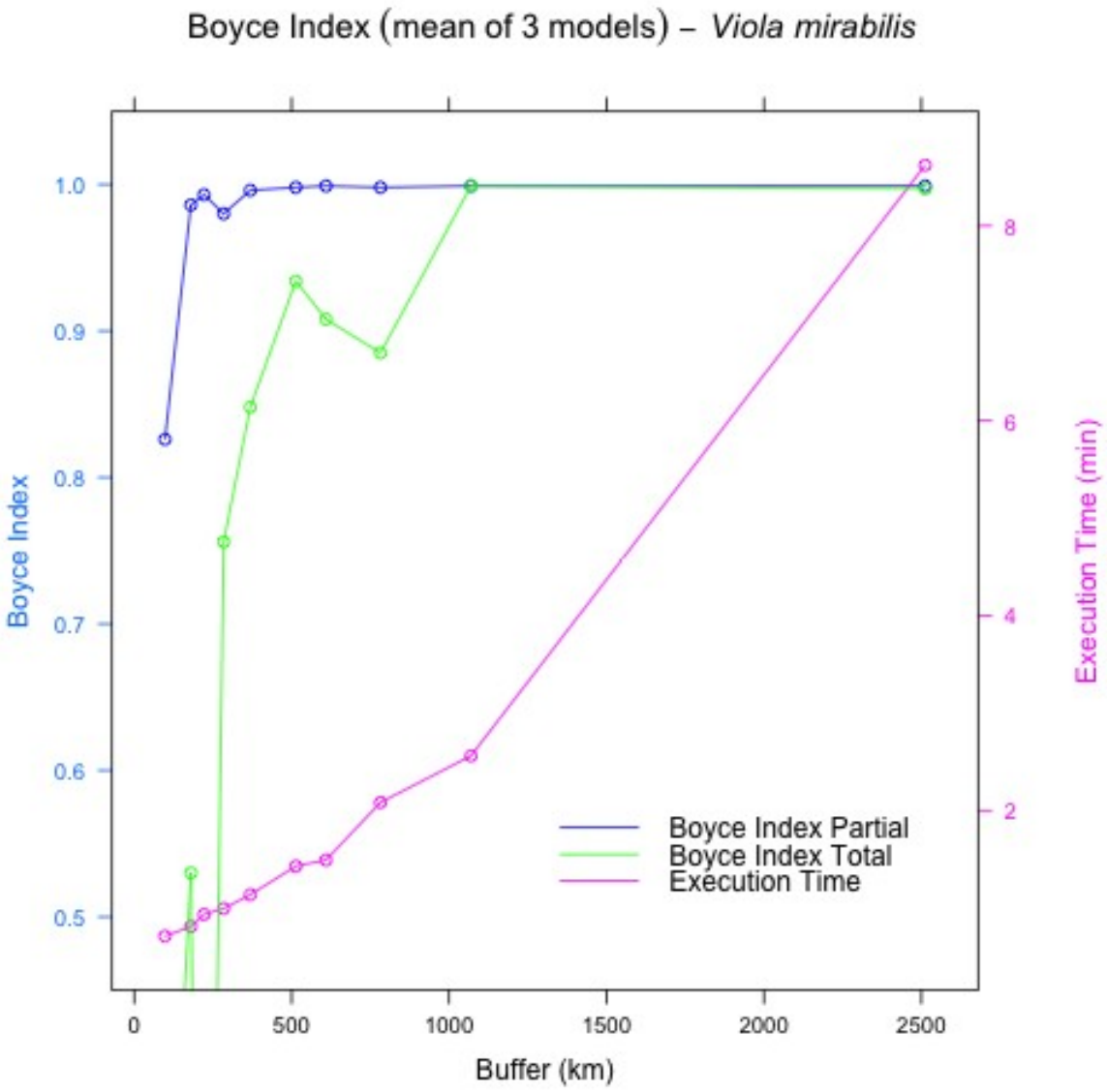
48


Boyce Index (mean of 3 models) – Buxus sempervirens
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
8
6
4
2
0
1000
2000
3000
4000
Boyce Index Partial
Boyce Index Total
Execution Time

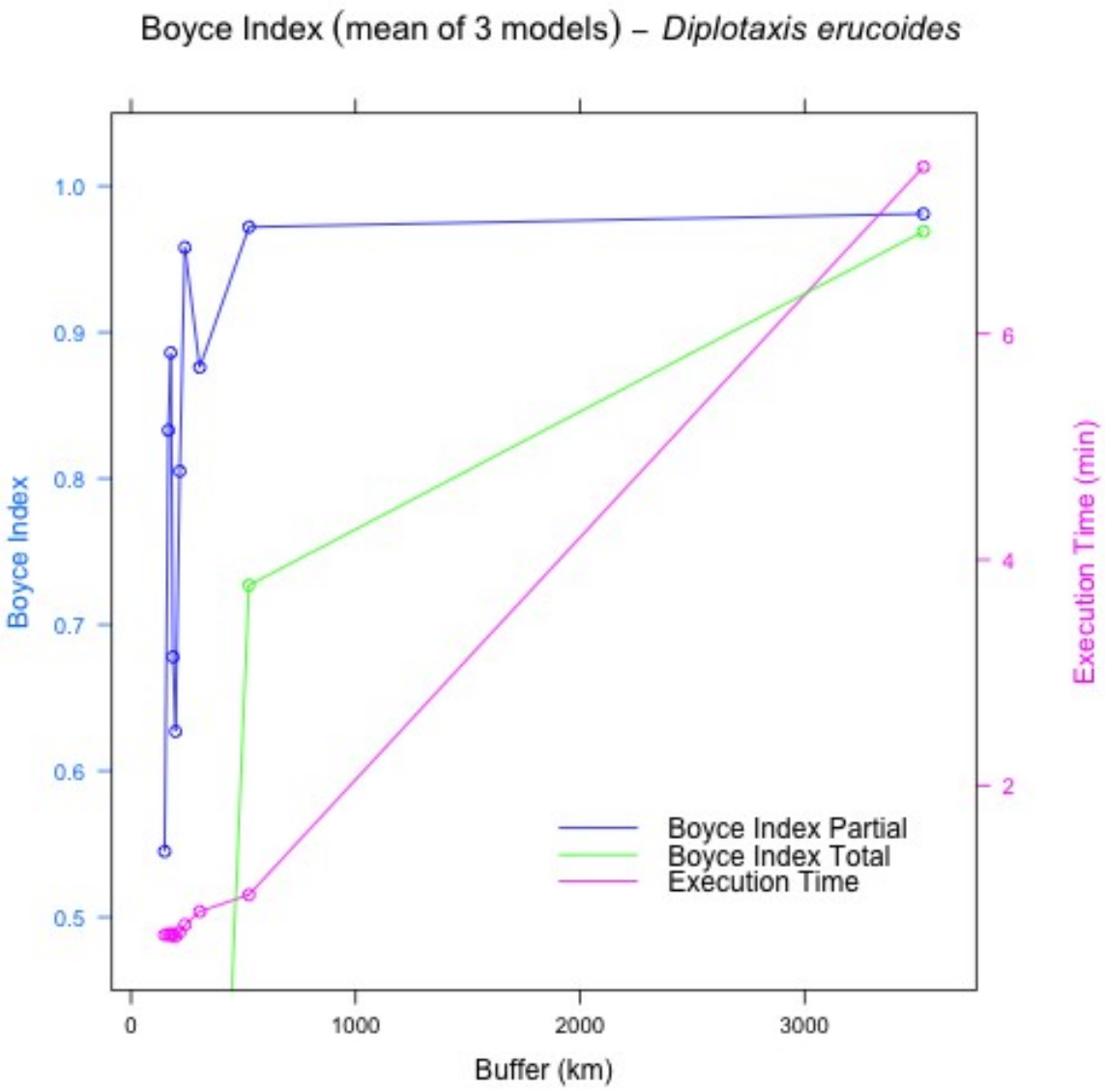
49


Boyce Index (mean of 3 models) – Cotoneaster tomentosus
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
3.0
2.5
2.0
1.5
1.0
0.5
500
1000
1500
2000

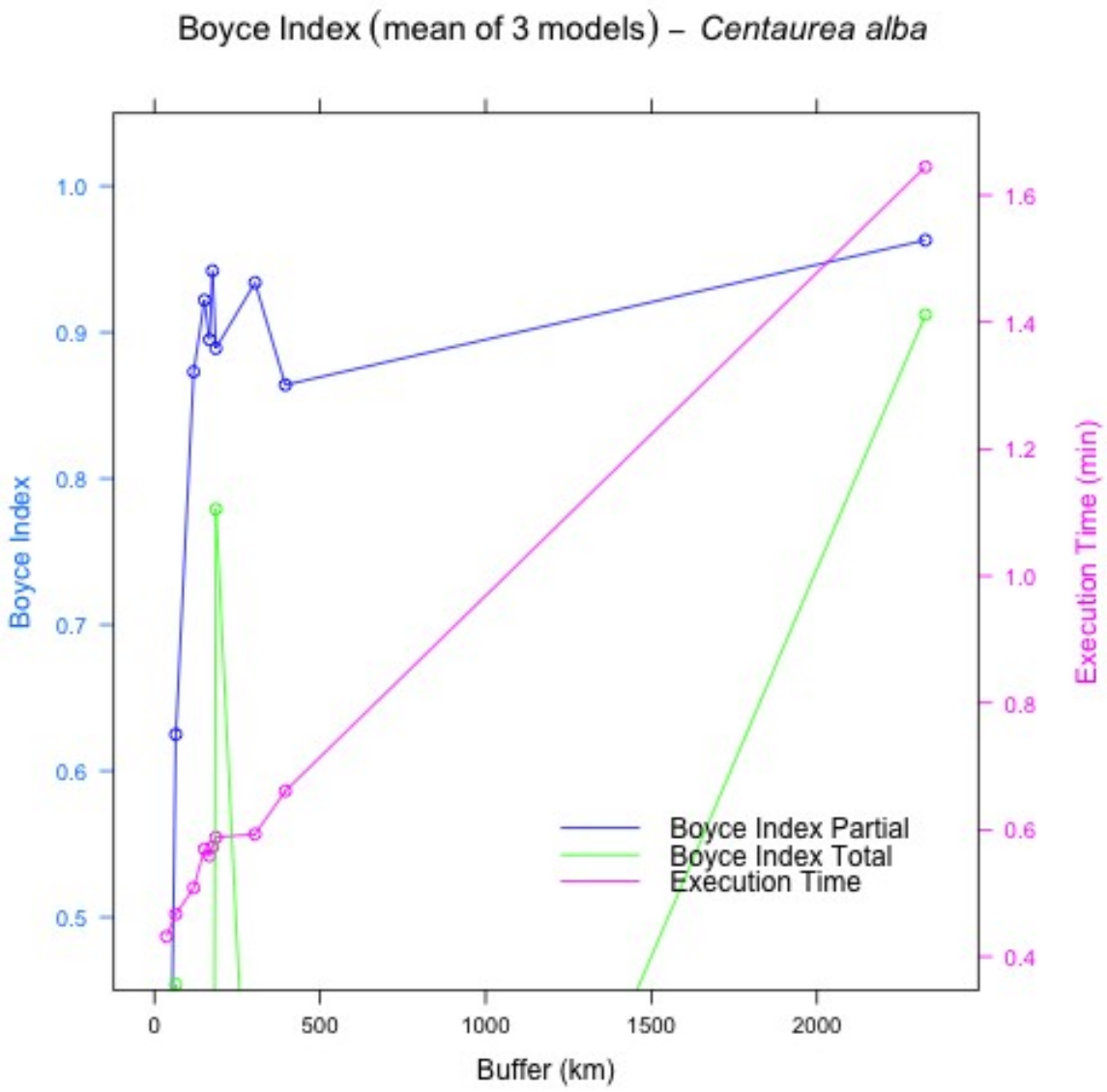
50


Boyce Index (mean of 3 models) – Viola mirabilis
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
8
6
4
2
0
500
1000
1500
2000
2500

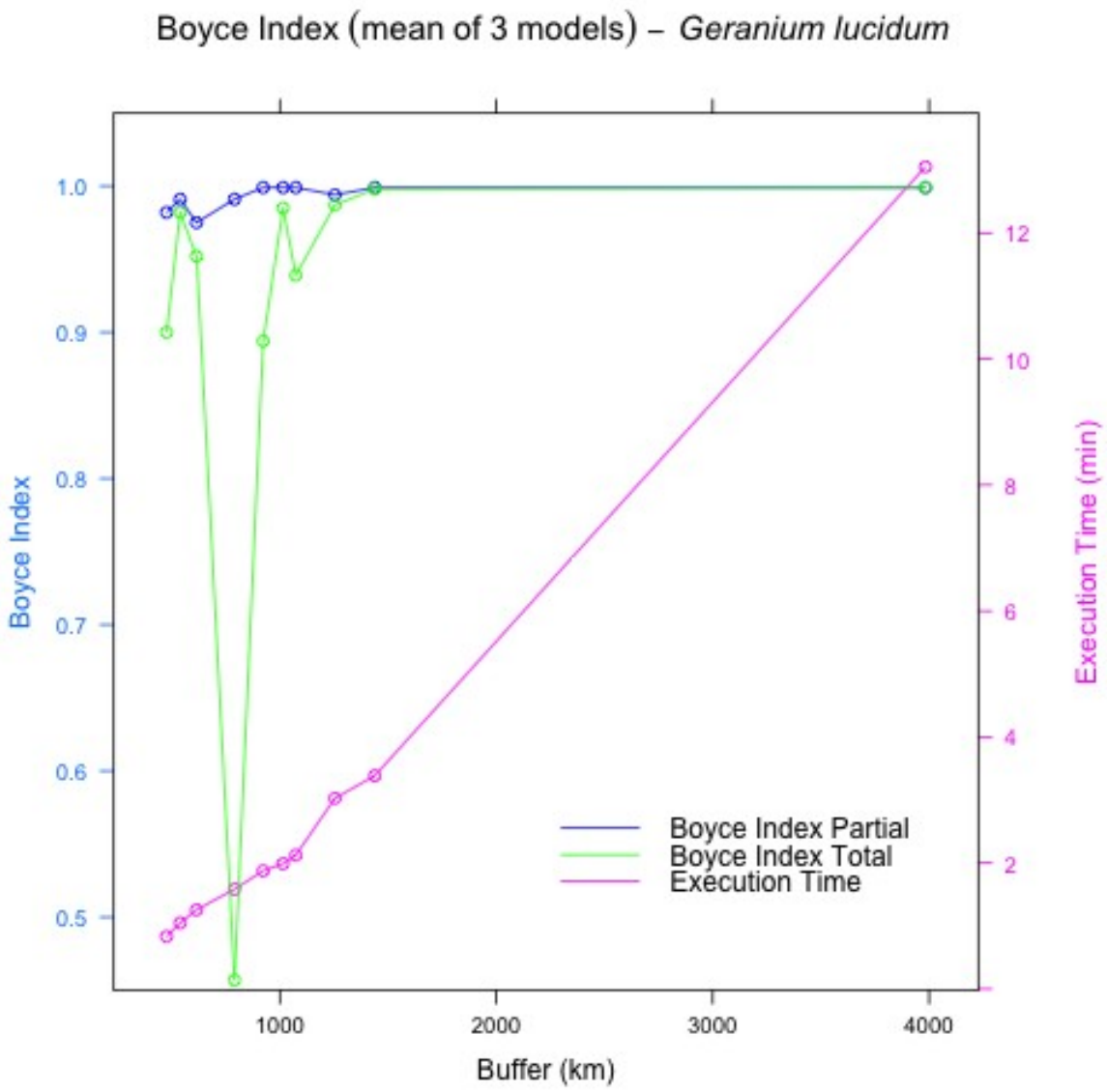
51


Boyce Index (mean of 3 models) – Diplotaxis erucoides
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
6
4
2
0
1000
2000
3000
Boyce Index Partial
Boyce Index Total
Execution Time

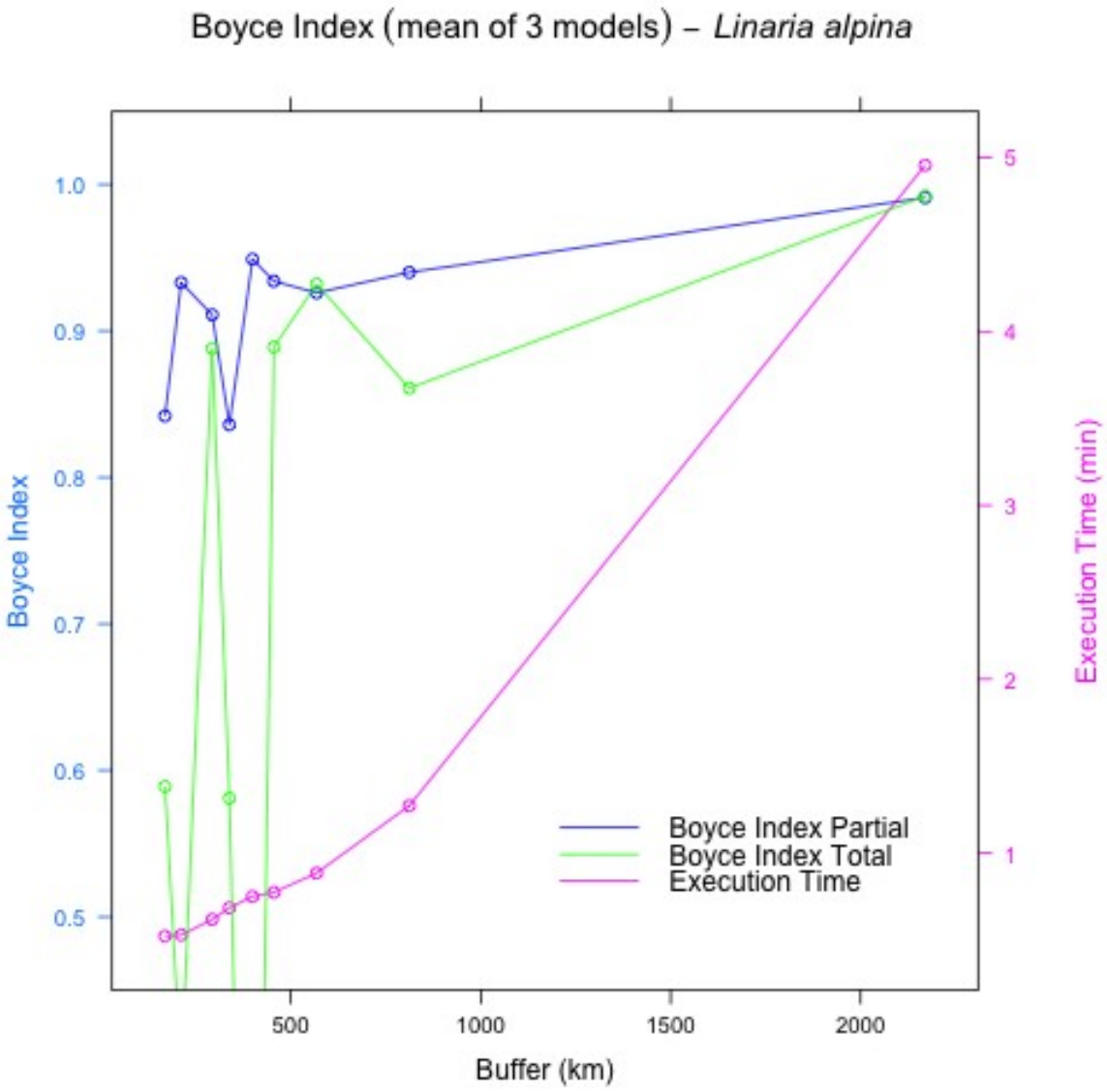
52


Boyce Index (mean of 3 models) – Centaurea alba
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0
500
1000
1500
2000

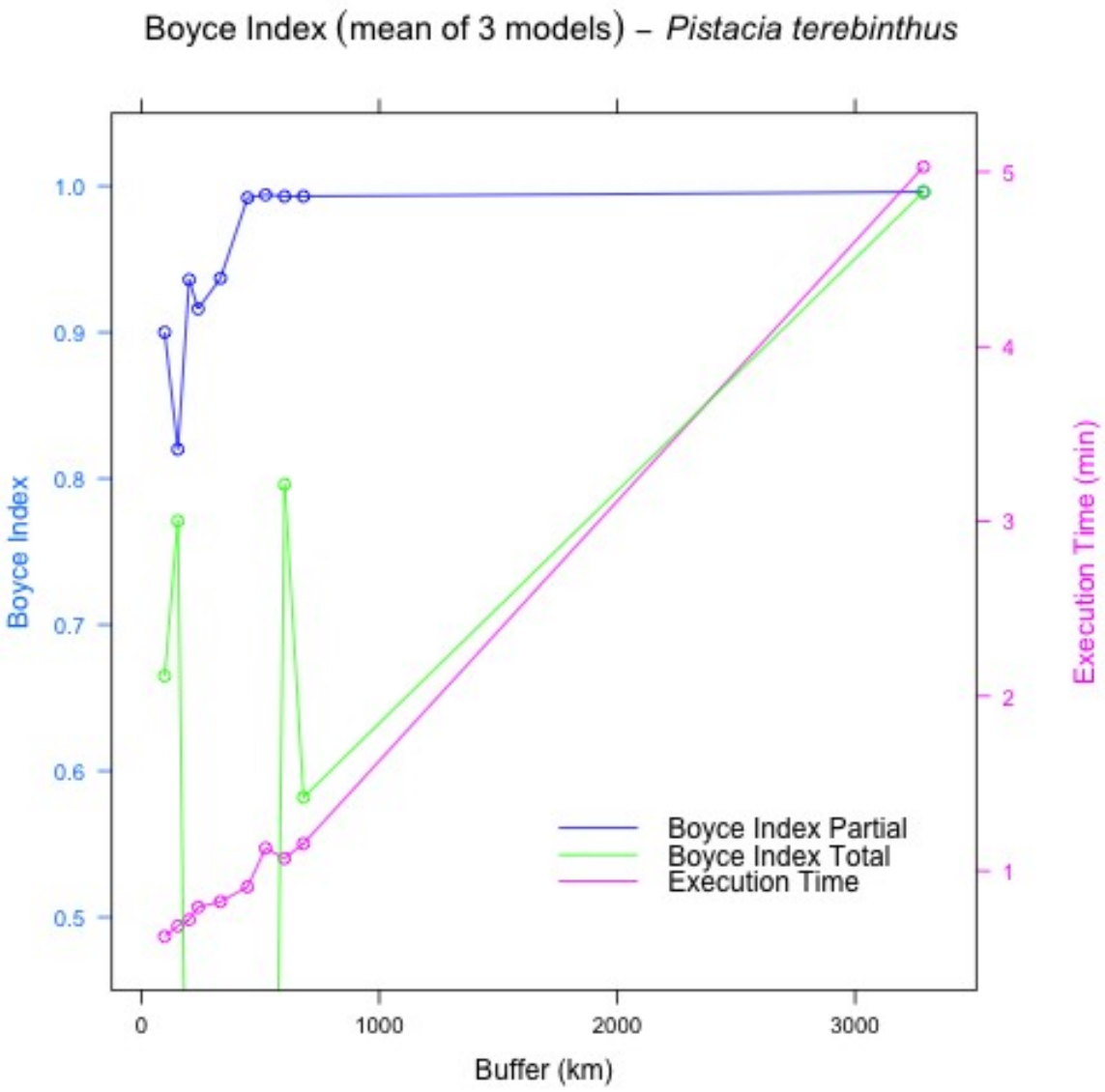
53


Boyce Index (mean of 3 models) – Geranium lucidum
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
12
10
8
6
4
2
1000
2000
3000
4000
Boyce Index Partial
Boyce Index Total
Execution Time

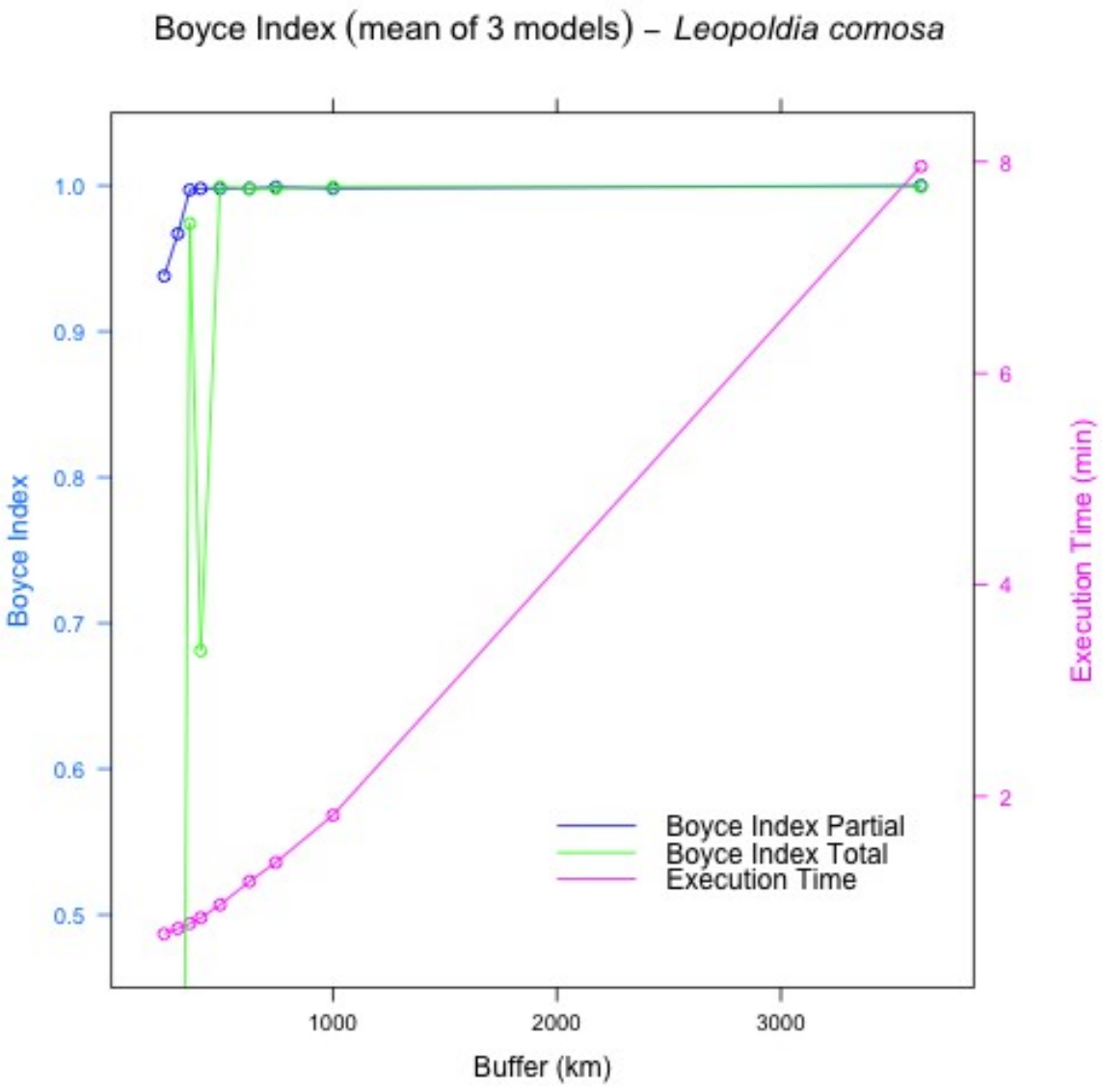
54


Boyce Index (mean of 3 models) – Linaria alpina
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
5
4
3
2
1
500
1000
1500
2000
Boyce Index Partial
Boyce Index Total
Execution Time

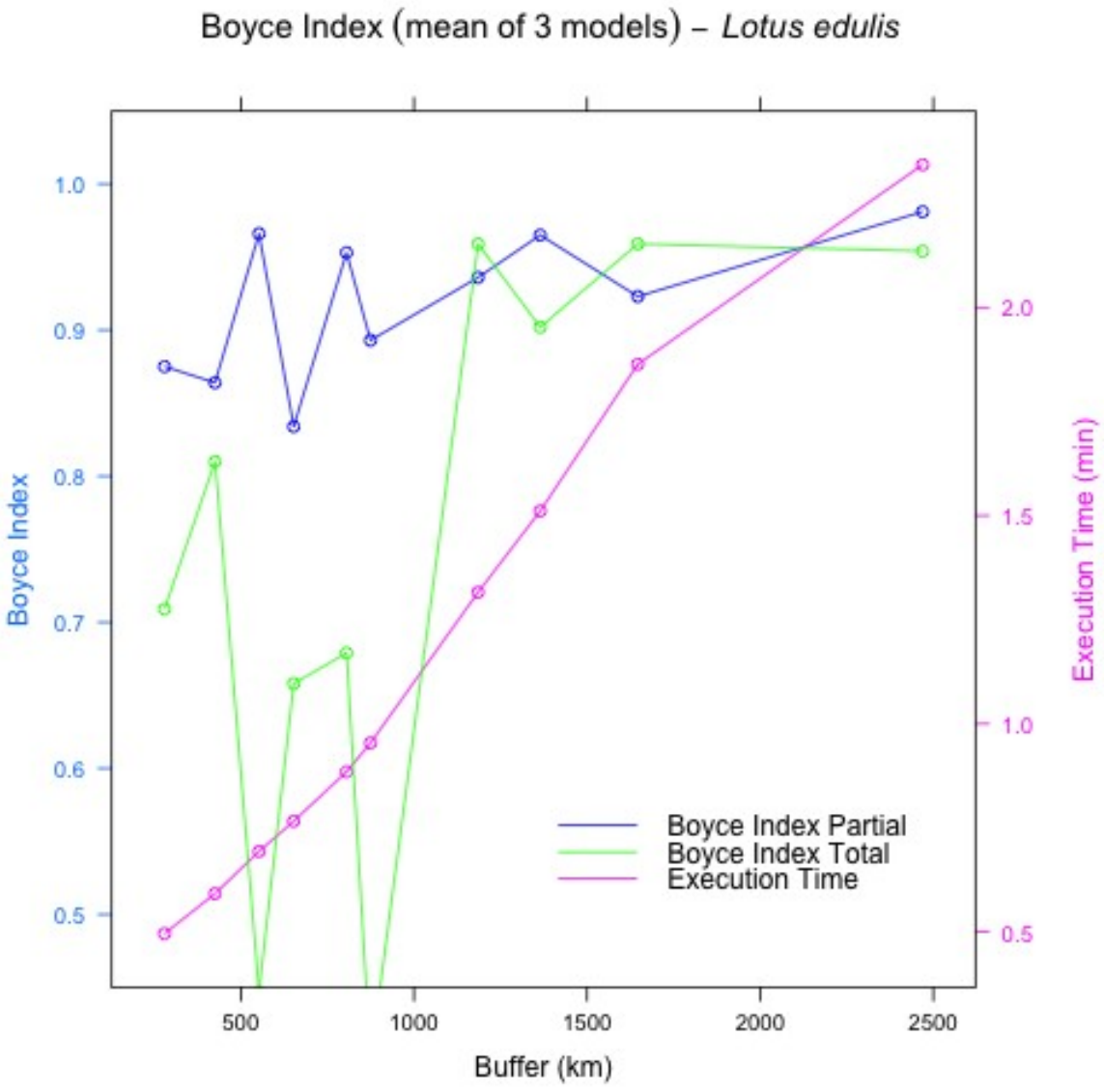
55


Boyce Index (mean of 3 models) – Pistacia terebinthus
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
5
4
3
2
1
0
1000
2000
3000

56


Boyce Index (mean of 3 models) – Leopoldia comosa
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
8
6
4
2
1000
2000
3000
Boyce Index Partial
Boyce Index Total
Execution Time

57


Boyce Index (mean of 3 models) – *Lotus edulis*
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
2.0
1.5
1.0
0.5
500
1000
1500
2000
2500
Boyce Index Partial
Boyce Index Total
Execution Time

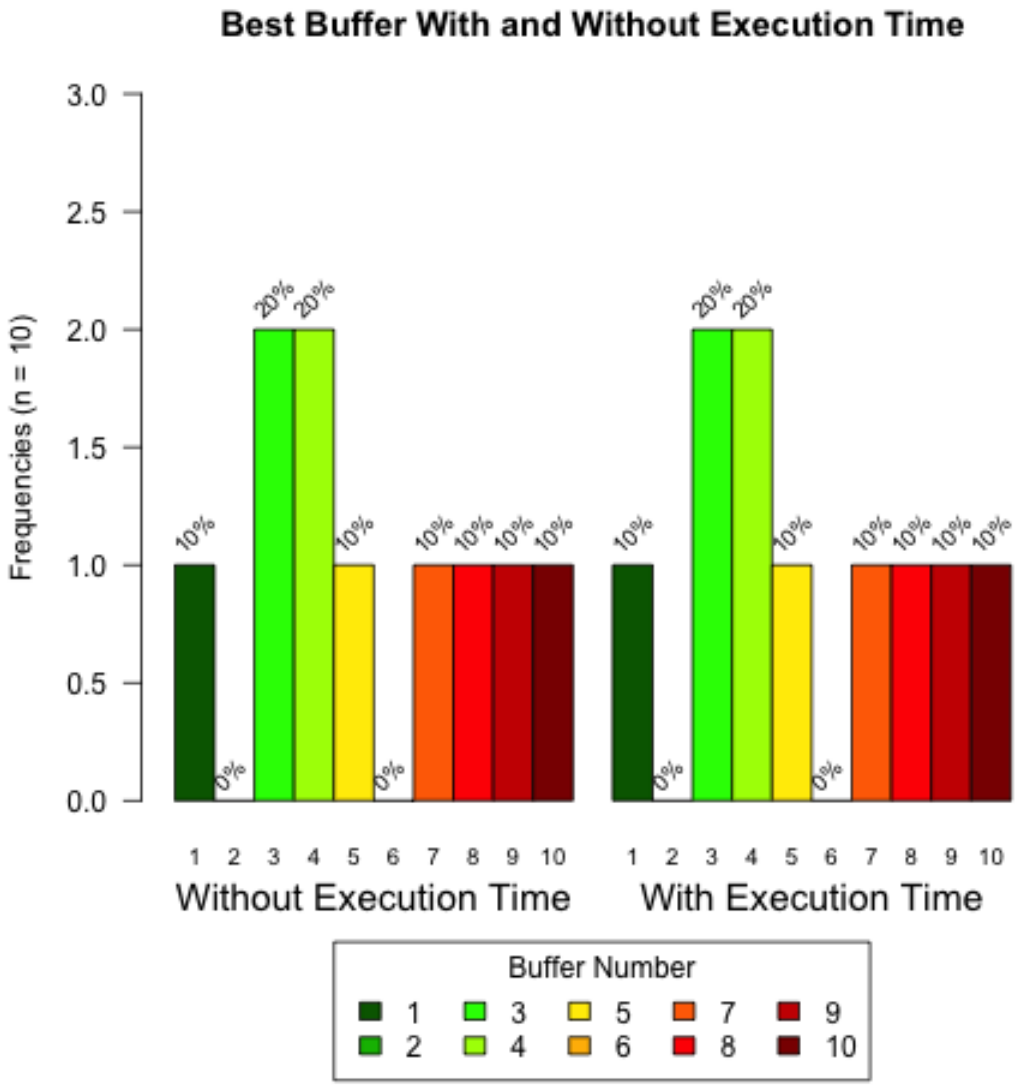
58

5 Supplementary Material S4

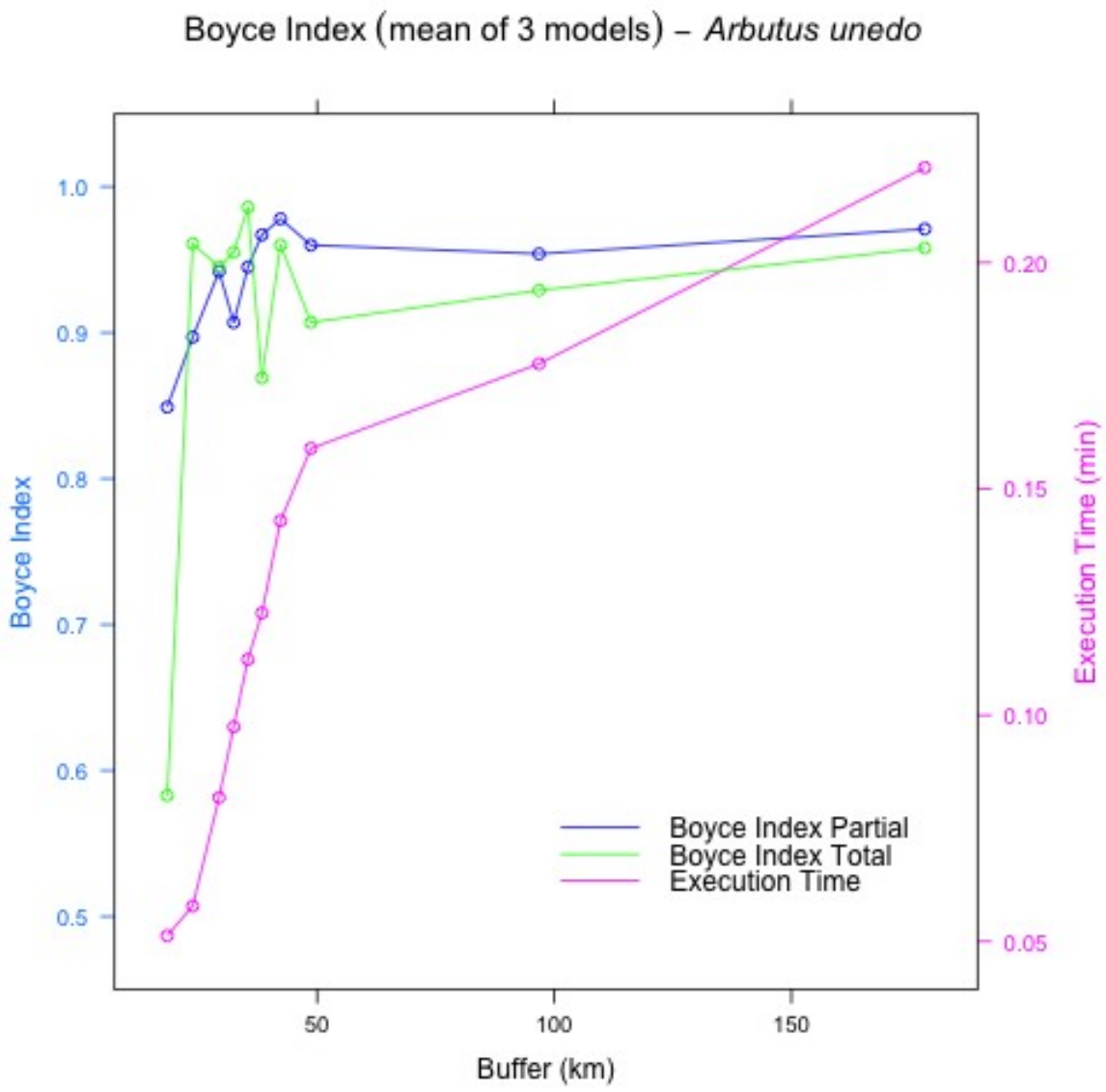
Table S4.1: List of species used in case study 3 (Balearic Islands)

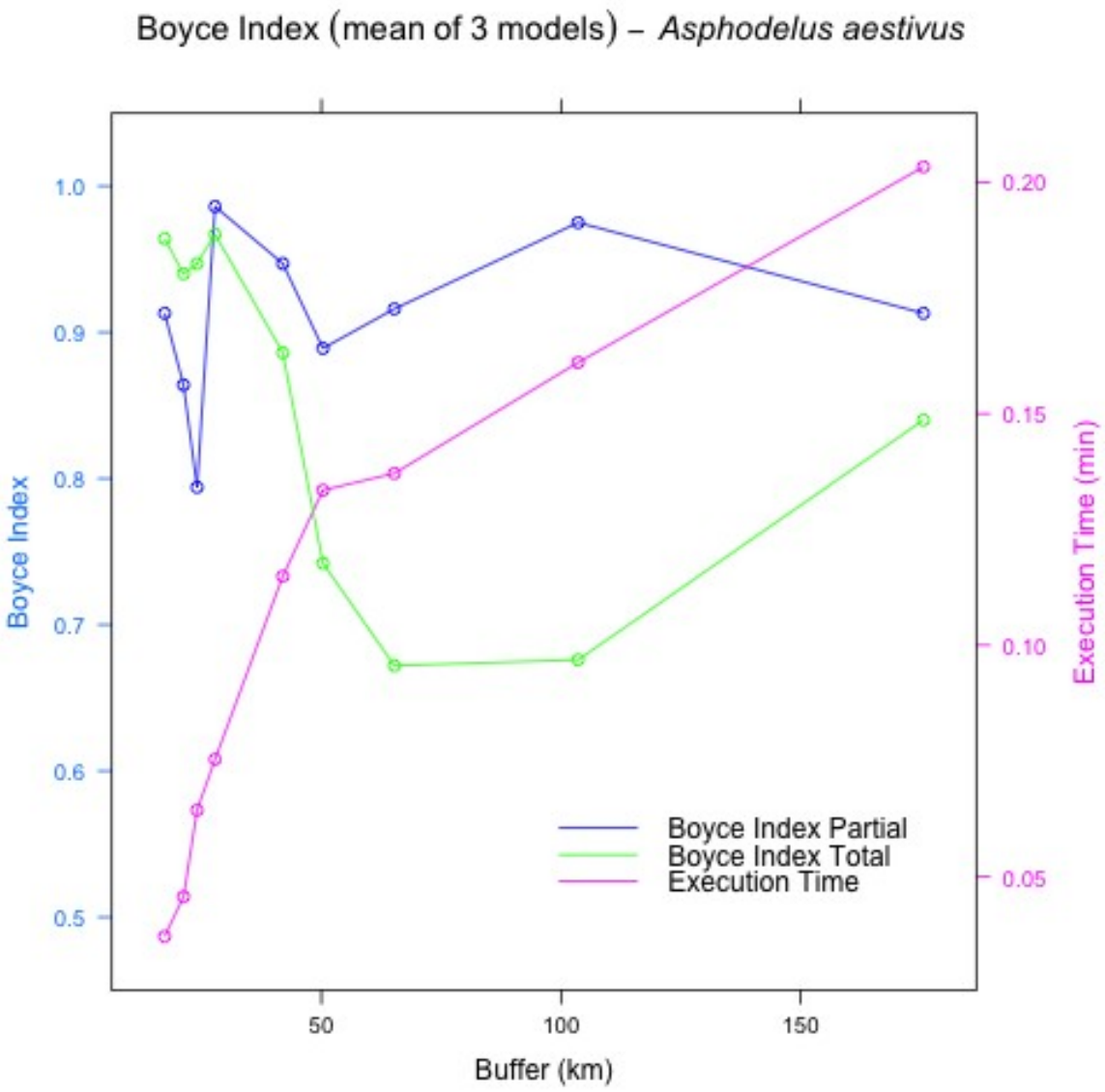
Case.Study.2	Abbreviation2
Arbutus unedo L.	arb_une
Asphodelus aestivus Rchb.	asp_aes
Chamaerops humilis L.	cha_hum
Ephedra fragilis subsp. fragilis Desf.	eph_fra
Helichrysum stoechas (L.) Moench	hel_sto
Juniperus oxycedrus subsp. oxycedrus L.	jun_oxy
Pistacia lentiscus L.	pis_len
Quercus coccifera L.	que_coc
Rhamnus alaternus L.	rha_ala
Viburnum tinus L.	vib_tin

Figure S4.1: Frequencies of best buffer with and without taking into account execution time in Case Study 3 (Balearic Islands)

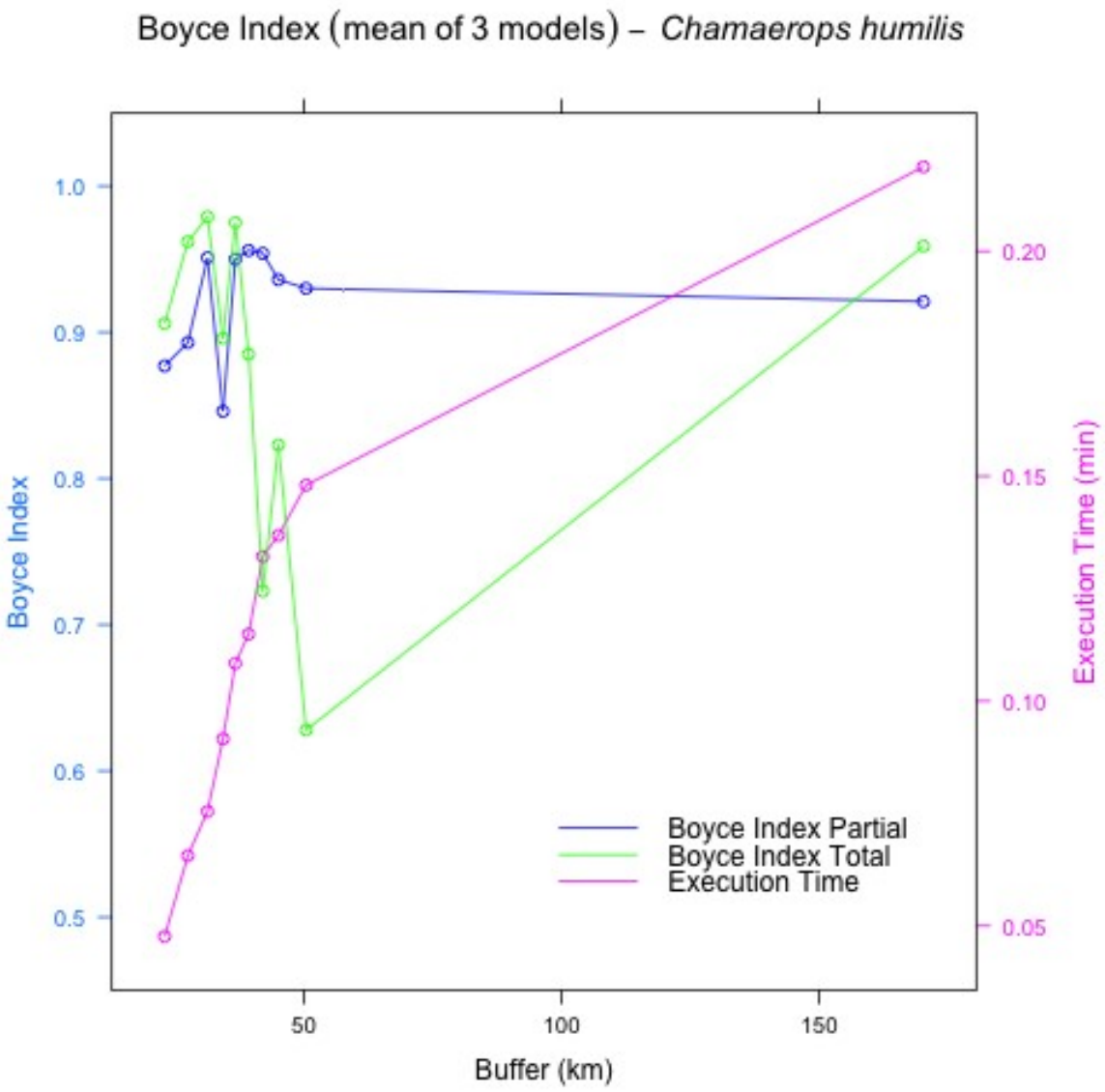


Figures S4.2 - S4.11: Evolution of Boyce Index Total (green) and Partial (blue), and the execution time in minutes (pink), for all the species in Case Study 3 (Balearic Islands). The origin of the x-axis corresponds to the geographical centre of the species distribution (mean location for longitude/latitude coordinates dealing with angularity). The x-axis increases (in kilometres) with buffers 1 to 10, respectively the closest and the most distant to the centre of species distribution

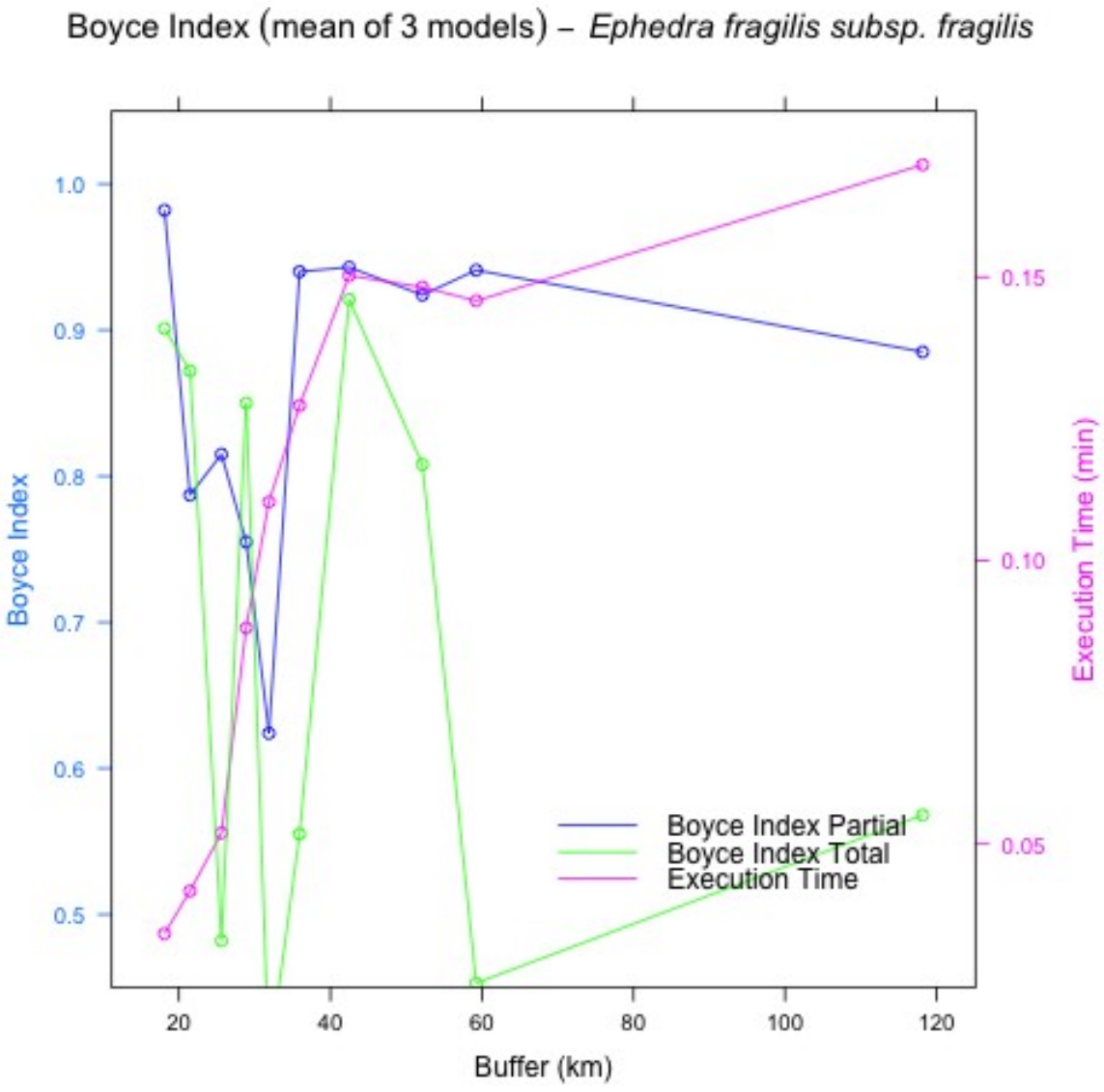



Boyce Index (mean of 3 models) – Asphodelus aestivus
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
0.20
0.15
0.10
0.05
50
100
150
Boyce Index Partial
Boyce Index Total
Execution Time

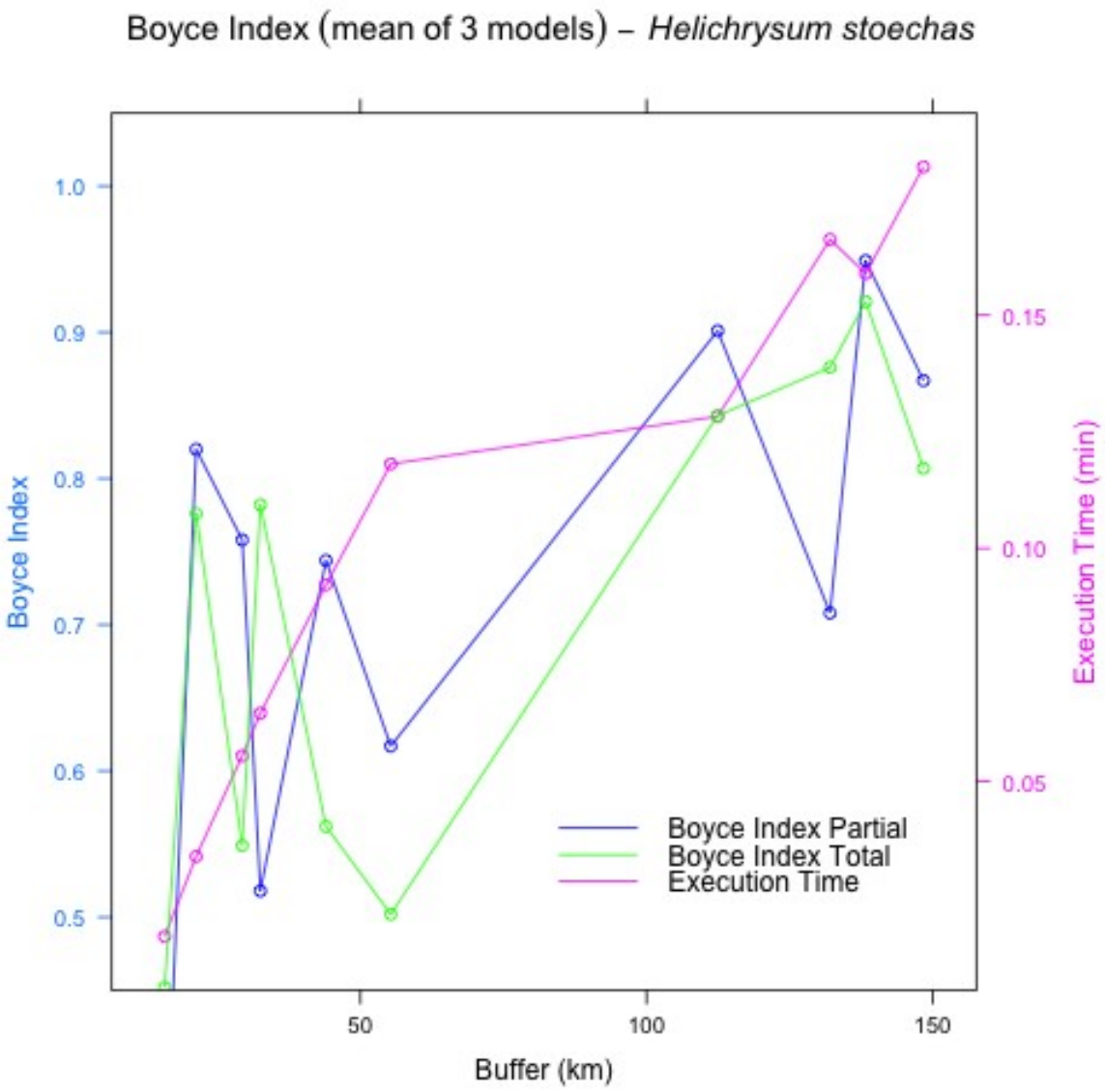
83


Boyce Index (mean of 3 models) – Chamaerops humilis
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
0.20
0.15
0.10
0.05
50
100
150
Boyce Index Partial
Boyce Index Total
Execution Time

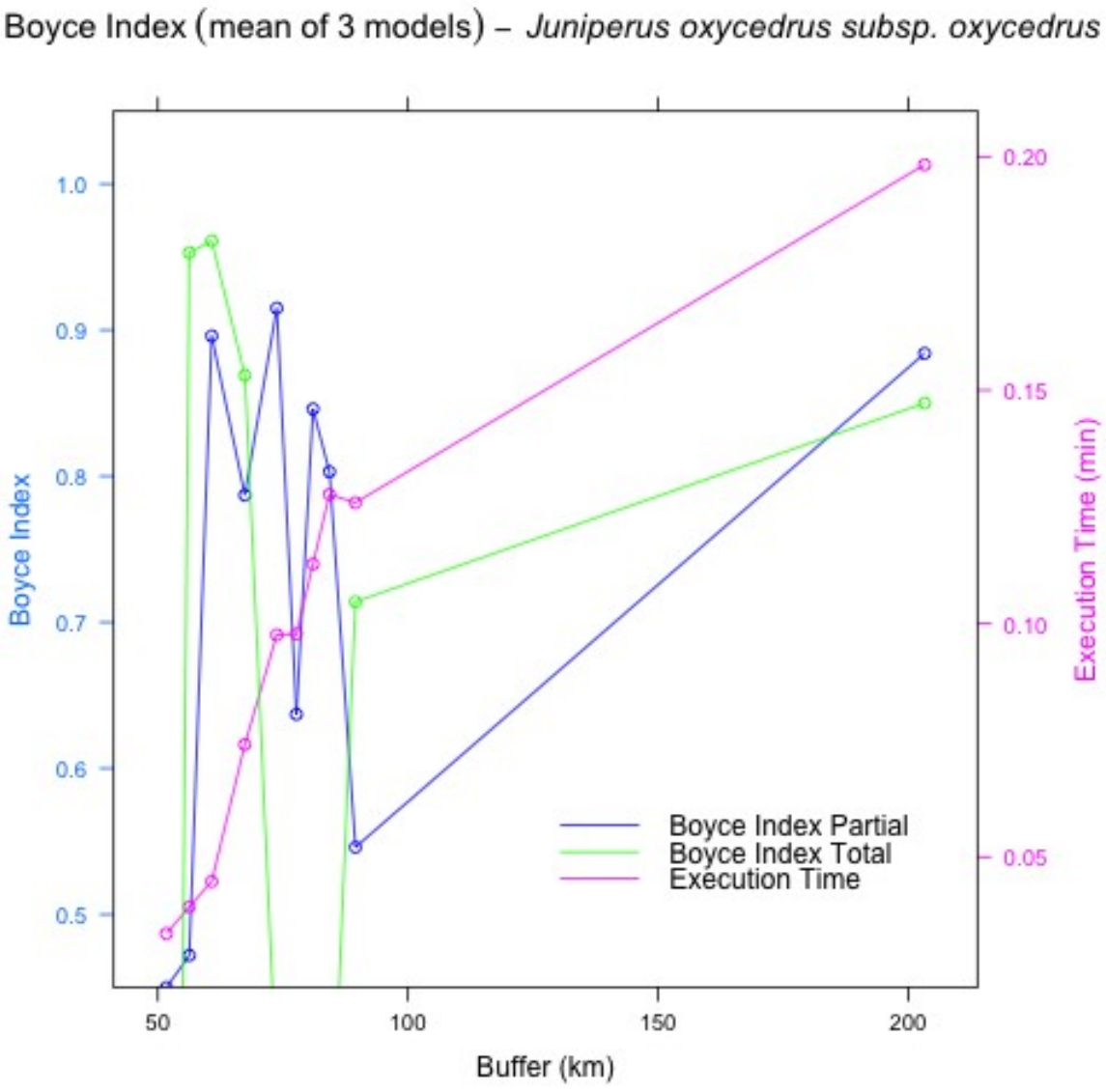
84


Boyce Index (mean of 3 models) – Ephedra fragilis subsp. fragilis
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
0.15
0.10
0.05
20
40
60
80
100
120

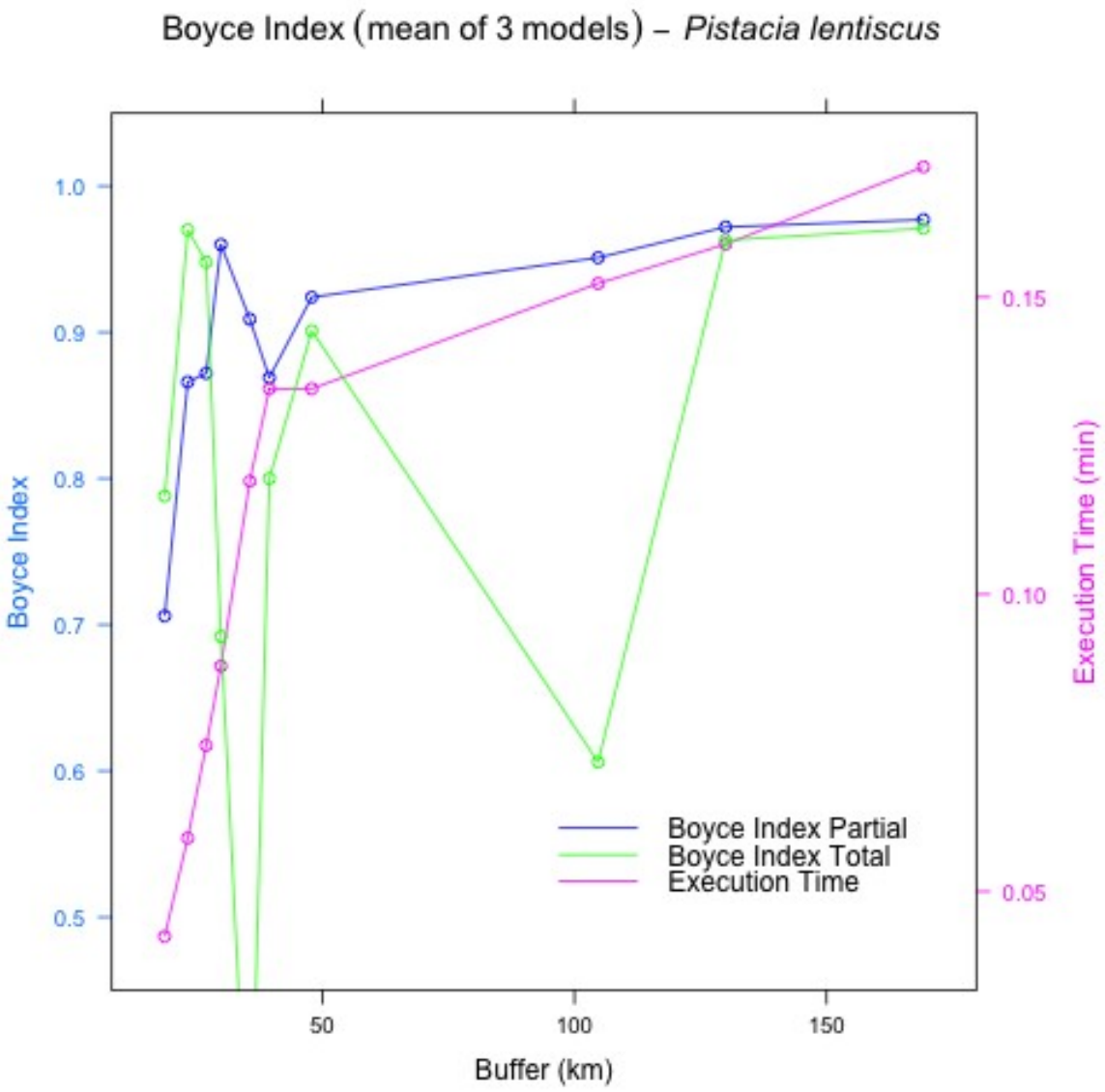
85


Boyce Index (mean of 3 models) – Helichrysum stoechas
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
0.15
0.10
0.05
50
100
150
Boyce Index Partial
Boyce Index Total
Execution Time

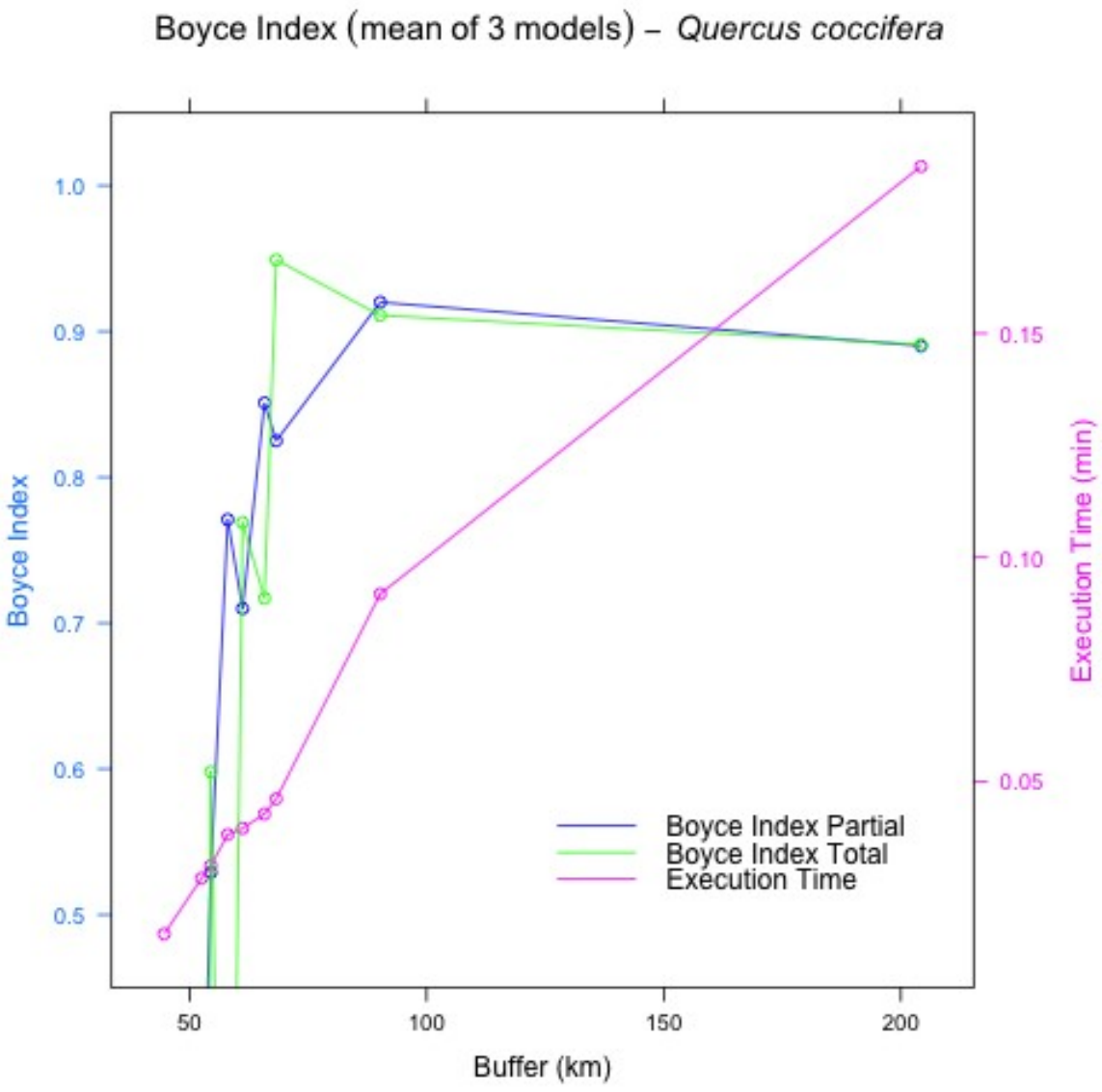
86


Boyce Index (mean of 3 models) – Juniperus oxycedrus subsp. oxycedrus
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
0.20
0.15
0.10
0.05
50
100
150
200

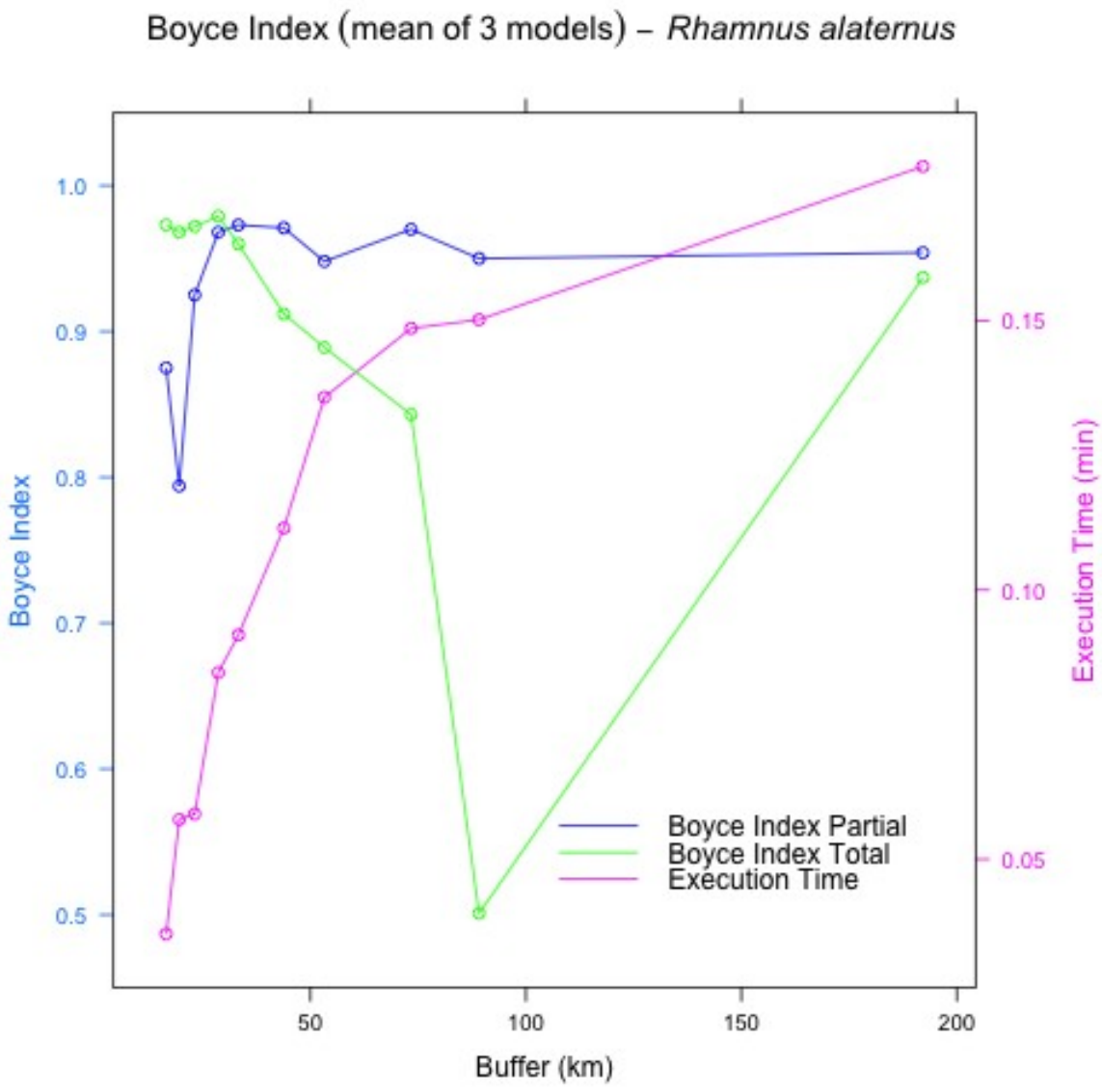
87


Boyce Index (mean of 3 models) – Pistacia lentiscus
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
0.15
0.10
0.05
50
100
150
Boyce Index Partial
Boyce Index Total
Execution Time

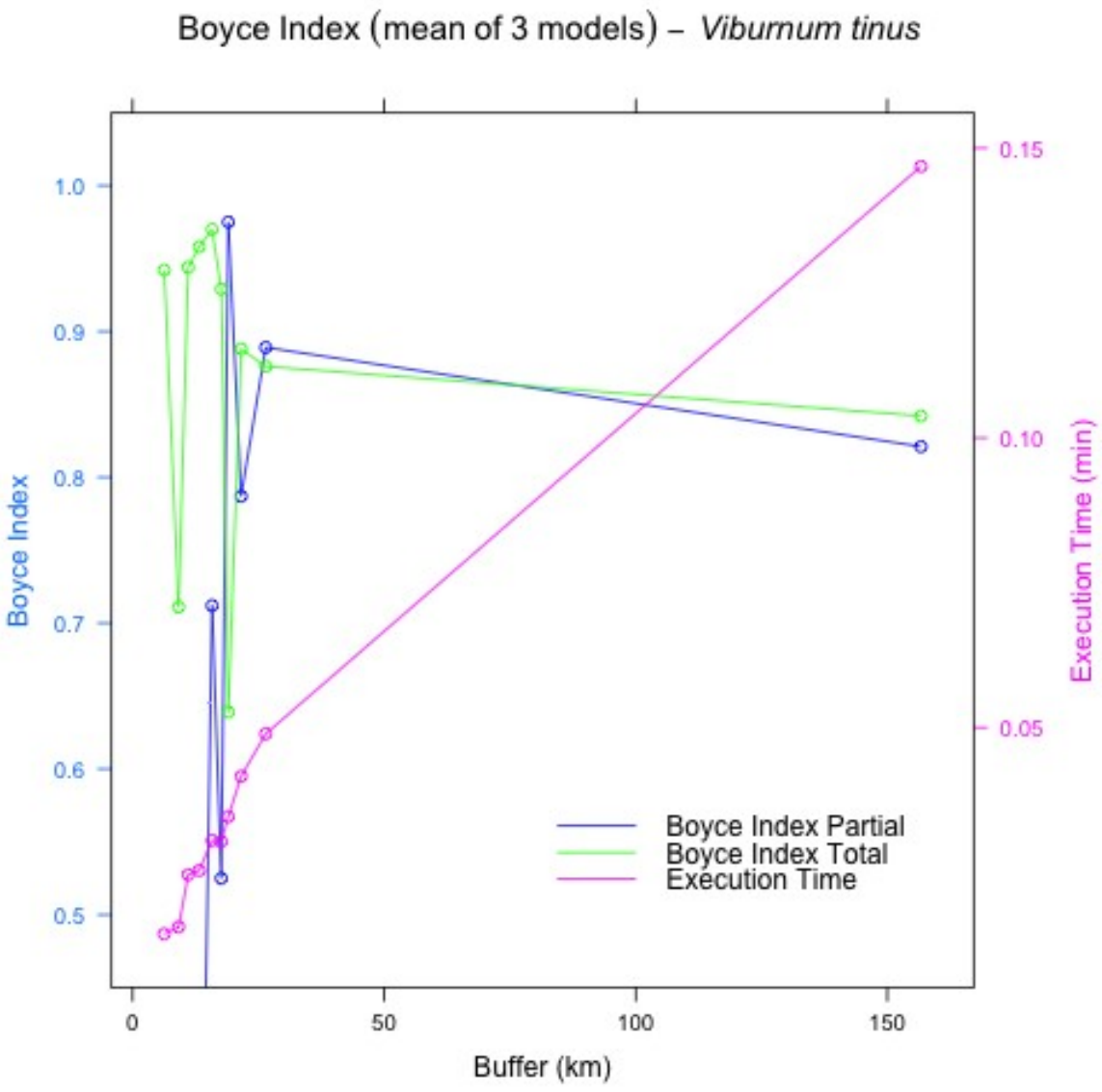
88


Boyce Index (mean of 3 models) – Quercus coccifera
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
0.15
0.10
0.05
50
100
150
200
Boyce Index Partial
Boyce Index Total
Execution Time

89


Boyce Index (mean of 3 models) – Rhamnus alaternus
Boyce Index
Execution Time (min)
Buffer (km)
1.0
0.9
0.8
0.7
0.6
0.5
0.15
0.10
0.05
50
100
150
200
Boyce Index Partial
Boyce Index Total
Execution Time

90


Boyce Index (mean of 3 models) – Viburnum tinus
Boyce Index
Execution Time (min)
Buffer (km)
Boyce Index Partial
Boyce Index Total
Execution Time
1.0
0.9
0.8
0.7
0.6
0.5
0.15
0.10
0.05
0
50
100
150

91

6 References

Rotllan-Puig, X., 2018. PreSPickR: Downloading species presences (occurrences) from public repositories. https://doi.org/10.13140/RG.2.2.10574.97607/1