Framework for a conservation plan for the Cape Floristic Region

Appendices

December 1999

Contents

Appendix 1 Broad Habitat Units (BHUs) identified for the planning domain (including the Cape Floristic Region) (see Figure 1) and mapped at a 1:250 000 scale (Figure 2). Primary units are underlined; secondary units are numbered. Shown here are the biological and environmental characteristics (vegetation type, geology, homogeneous climate zones (HCZ) and altitude - themes in a geographical information system) that were used to delineate the BHUs. Only those features in themes, collectively covering 75% of each secondary BHU, are shown. When more than one feature is shown, those in italics cover more than 50% of the BHU. The ruggedness index (RI) of a BHU is the standard deviation of all spot heights within a digital terrain model. See text for details on the derivation of themes and explanation of sources of plant community data. M = moderate, S = strong (winter rainfall). BHUs not represented in the CFR are shown in italics

					Rainfall characteristics		Topography			Plant community data	
BHU	Vegetation type (sensu Low & Rebelo 1996)	Geology	Area (km^2) (%)	HCZ No.	Mean $mmyr^{-1}$	Season-ality	Altitudinal range (m)	Modal altitude (m)	RI	No. com-munities (no plots) [area (km^2)]	References
AZONAL											
Dune Pioneer											
1. South West	Dune Thicket	Alluvium, sand & calcrete	120 (0.1)	5	366	S winter	0 - 192	100	58.4	NA	Boucher & Le Roux (1993)
2. South	Dune Thicket	Alluvium, sand & calcrete Bredasdorp	58 (<0.1)	83 137 47	438 684 318	Non seasonal	0 – 179	100	50.9	NA	Taylor & Boucher (1993)
3. South East	Dune Thicket	Alluvium, sand & calcrete Nanaga	28 (<0.1)	139 140 136	755 647 512	Non seasonal	0 – 143	100	28.1	NA	Weisser & Cooper (1993)
FYNBOS BIOME											
Fynbos/											

Thicket Mosaic											
4. Langebaan	Dune Thicket	Alluvium, sand & calcrete Bredasdorp	783 (0.6)	24 22	230 314	S winter	0 – 256	100	39.0	24 (157) [ca 250]	Boucher (1987)
5. Cape Flats	Dune Thicket	Alluvium, sand & calcrete	267 (0.2)	6	472	S winter	0 – 73	500	16.7	11 (60) [ca 175]	Boucher (1987)
6. Agulhas	Dune Thicket	Bredasdorp Alluvium, sand & calcrete	492 (0.4)	46 43	470 528	M winter	0 – 237	100	40.8	NA	Cowling *et al*. (1988)
7. Stilbaai	Dune Thicket S & SW Coast Renosterveld	Alluvium, sand & calcrete Bredasdorp	230 (0.2)	47 84 83	318 362 438	Non seasonal	0 – 203	100	47.5	NA	Rebelo *et al*. (1991)
8. Goukamma	Dune Thicket	Alluvium, sand & calcrete	142 (0.1)	116	728	Non seasonal	0 – 273	100	62.5	NA	Van der Merwe (1976)
9. St Francis	Dune Thicket	Nanaga	259 (0.2)	137 139	684 755	Non seasonal	0 – 246	100	44.7	4 (42) [ca 220]	Cowling (1982)
Sand Plain Fynbos											
10. Leipoldt-ville	Sand Plain Fynbos Mountain Fynbos	Alluvium, sand & calcrete Graafwater & Piekenierskloof	2111 (1.7)	26 27	184 266	S winter	0 – 560	300	72.6		
11. Hopefield	Sand Plain Fynbos	Alluvium, sand & calcrete	2976 (2.4)	22 24	393 472	S winter	0 – 411	100	44.6	16 (139) [ca 345]	Boucher (1987)
12. Blackheath	Sand Plain Fynbos	Alluvium, sand & calcrete Tygerberg	796 (0.6)	7 6 5 25	605 472 366 625	S winter	0 – 594	100	57.7	6 (20) [ca 110]	Boucher (1987)
13. Springfield	Mountain Fynbos Laterite Fynbos	Peninsula Nardouw, Cedarberg & Pakhuis	440 (0.4)	43	528	M winter	2 – 485	300	88.4	3 (42) [0.15] NA	Richards *et al*. (1995) Cowling *et al*. (1988)
14. Albertinia	Limestone Fynbos S & SW Coast Renosterveld	Alluvium, sand & calcrete	448 (0.4)	84 83	362 438	Non seasonal	0 – 331	200	62.3	NA	Rebelo *et al*. (1991)
Limestone Fynbos											

Fynbos											
15. Hagelkraal	Limestone Fynbos S & SW Coast Renosterveld	Bredasdorp	440 (0.4)	46	470	M winter	0 – 330	100	55.5	2 (33) [0.15] NA	Richards *et al*. (1995) Cowling *et al* (1988)
16. De Hoop	Limestone Fynbos	Bredasdorp	776 (0.6)	47	318	M winter	0 – 277	200	61.8		
17. Canca	Limestone Fynbos Dune Thicket	Bredasdorp	852 (0.7)	83	438	Non seasonal	0 – 307	200	53.4	NA	Rebelo *et al*. (1991)
Grassy Fynbos											
18. Genaden-dal	Mountain Fynbos S & SW Coast Renosterveld	Witpoort & Weltevrede Ceres Peninsula	489 (0.4)	39 40 45	417 528 466	M winter	64 – 735	400	100.5		
19. Suurbraak	S & SW Coast Renosterveld	Bokkeveld Enon	742 (0.6)	79 81	638 528	Non seasonal	49 – 400	300	72.7	NA NA	Grobler & Marais (1967) Rebelo *et al*. (1991)
20. Keurbooms	Mountain Fynbos	Enon Peninsula Nardouw, Cedarberg & Pakhuis	141 (0.1)	119	1115	Non seasonal	0 – 329	100	74.1		
21. Humans-dorp	Grassy Fynbos Mountain Fynbos	Peninsula Nardouw, Cedarberg & Pakhuis	1987 (1.6)	137 136	684 512	Equi-noctial	0 – 962	500	162.8	6 (42) [ca 175]	Cowling (1982)
22. Algoa	S & SW Coast Renosterveld Grassy Fynbos	Peninsula Nardouw, Cedarberg & Pakhuis	297 (0.2)	140 139	647 755	Non seasonal	34 – 477	200	59.1		
23. *Zuurberg*	Xeric Succulent Thicket Central Nama Karoo Grassy Fynbos	Witpoort & Weltevrede Kommadagga & Lake Mentz	477 (0.4)	132 145	248 737	Equi-noctial	152 – 1020	800	165.8		
Fynbos / Renosterveld											

Mosaic											
24. Perdeberg	Mountain Fynbos	Cape Granite Suite	44 (<0.1)	19 31	855 647	S winter	151 – 722	600	120.8		
25. Elgin	S & SW Coast Renosterveld Mountain Fynbos	Ceres Bidouw	136 (0.1)	14	659	S winter	109 - 625	200	65.2		
26. Breede	Central Mountain Renosterveld	Alluvium, sand & calcrete	378 (0.3)	36 50	589 263	S winter	186 – 486	300	32.5		
27. Elim	Laterite Fynbos	Ceres Malmesbury	594 (0.5)	46 43	470 528	M winter	6 - 404	300	51.6	NA	Cowling *et al*. (1988)
28. Blanco	S & SW Coast Renosterveld	Cape Granite Suite Enon Kaaimans Grahamstown	1689 (1.4)	85 86	509 645	Non seasonal	0 – 472	200	78.8		
29. Langkloof	Grassy Fynbos Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Ceres	783 (0.6)	121 114 120	422 476 523	Non seasonal	304 – 1261	600	176.0		
30. Kromme	S & SW Coast Renosterveld	Ceres Enon	846 (0.7)	136 137	512 684	Equi-noctial	0 – 731	300	126.7	3 (27) [ca 375]	Cowling (1982)
Coast Renosterveld											
31. Swartland	West Coast Renosterveld	Moorreesburg Porterville Cape Granite Suite Porseleinberg	4113 (3.4)	22 27 21	314 266 393	S winter	0 – 518	100	61.7	11 (42) [ca 420]	Boucher (1987)

32. Boland	West Coast Renosterveld	Porterville Cape Granite Suite Moorreesburg Tygerberg Porseleinberg	2417 (2.0)	30 7 32 5 8 31 33 34	460 605 470 366 711 647 607 748	S winter	6 – 1288	300	101.2	16 (66) [ca 480]	Boucher (1987)
33. Overberg	S & SW Coast Renosterveld	Bokkeveld Bidouw Ceres	4297 (3.5)	48 39 47 44	384 417 318 378	M winter	0 – 515	300	81.5	3 (23) [49]	Kemper (1997)
34. Riversdale	S & SW Coast Renosterveld	Bokkeveld Bredasdorp	3163 (2.6)	47 82 84	318 454 362	Non seasonal	0 – 375	200	59.4		Rebelo *et al*. (1991)
<u>Inland Renosterveld</u>											
35. Nieuwoudt-ville	Upland Succulent Karoo	Knersvlakte Dwyka Nardouw, Cedarberg & Pakhuis	322 (0.3)	202	339	S winter	306 – 835	600	122.5		
36. Koue-bokkeveld	Central Mountain Renosterveld	Witpoort & Weltevrede Bidouw Ceres	985 (0.8)	61 56	377 650	S winter	427 – 1851	1000	210.6		
37. Waveren-Bokkeveld	Central Mountain Renosterveld	Brandwacht Ceres	803 (0.7)	56 55 54	650 378 954	S winter	91 – 1323	600	264.8		
38. Ashton	Central Mountain Renosterveld	Bokkeveld Malmesbury Witpoort & Weltevrede Ceres Nardouw, Cedarberg & Pakhuis	1267 (1.0)	49 51 50 48 52	266 322 263 384 496	M winter	79 – 1306	300	172.4		
39. Matjies	Central Mountain Renosterveld	Witpoort & Weltevrede Kommadagga & Lake Mentz	1141 (0.9)	73 74 95 96	269 183 520 165	M winter	374 – 1586	1100	179.1		

40. *Roggeveld*	Escarpment Mt. Renosterveld	Adelaide & Estcourt	1496 (1.2)	64 69	155 277	M winter	781 – 1470	1200	110.9		
41. Montagu	Central Mountain Renosterveld	Bidouw Ceres	1280 (1.0)	75 74 77	173 183 279	Non seasonal	208 – 1158	500	194.3		
42. Cannaland	Central Mountain Renosterveld	Ceres Nardouw, Cedarberg & Pakhuis	495 (0.4)	74 89 77	183 241 279	Non seasonal	76 – 704	500	106.8		
43. Kango	S & SW Coast Renosterveld	Kango Ceres Nardouw, Cedarberg & Pakhuis Witpoort & Weltevrede	1688 (1.4)	93 110 91 92	423 186 318 242	Non seasonal	239 – 1914	800	205.8	NA	Moffet & Deacon (1977)
44. Uniondale	S & SW Coast Renosterveld	Ceres Nardouw, Cedarberg & Pakhuis	1203 (1.0)	92 89 113	242 241 312	Non seasonal	393 – 1375	1100	212.6		
<u>Mountain Complex</u>											
45. Bokkeveld	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis	984 (0.8)	201 202	466 339	S winter	229 – 1012	800	135.6		
46. Gifberg	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis	2003 (1.6	62 200	220 360	S winter	50 – 1123	300	188.2		
47. Cederberg	Mountain Fynbos	Peninsula Nardouw, Cedarberg & Pakhuis	2278 (1.9)	60 59	683 207	S winter	78 – 2046	300	392.4	26 (197) [1260]	Taylor (1996) Campbell (1995)
48. Olifants River	Mountain Fynbos	Peninsula Graafwater & Piekenierskloof	1461 (1.2)	58 59	498 207	S winter	63 – 1227	600	169.3		

49. Swart-ruggens	Mountain Fynbos Lowland Succulent Karoo	Witpoort & Weltevrede Nardouw, Cedarberg & Pakhuis Ceres	1538 (1.3)	61	377	S winter	502 – 1797	1200	167.4	9 (125) [127] NA	Lechmere-Oertel (1998) Campbell (1995)
50. Piketberg	Mountain Fynbos	Peninsula Graafwater & Piekenierskloof Alluvium, sand & calcrete	516 (0.4)	29 28	838 464	S winter	53 – 1442	700	231.5		
51. Groot Winterhoek	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	866 (0.7)	56 54	650 954	S winter	75 – 1971	1200	342.5	NA	Campbell (1995)
52. Matroos-berg	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	714 (0.6)	56	650	S winter	342 – 2226	1800	377.6		
53. Hawequas	Mountain Fynbos	Peninsula Nardouw, Cedarberg & Pakhuis	1218 (1.0)	18 35 36 34	818 998 589 748	S winter	94 – 1915	1200	366.4	10 (105) [9.68] NA	Van Wilgen & Kruger (1985) Campbell (1995)
54. Fransch-hoek	Mountain Fynbos	Peninsula Cape Granite Suite Nardouw, Cedarberg & Pakhuis	551 (0.4)	9 15 10 17	1605 778 1067 1838	S winter	96 – 1545	1100	328.7	8 (44) [0.4] 5 (201) {0.4} NA	Werger *et al*. (1972) McDonald (1988) Campbell (1995)
55. Cape Peninsula	Mountain Fynbos	Peninsula Cape Granite Suite	359 (0.3)	4 2	596 1282	S winter	0 – 1080	300	203.9	3 (48) [2] NA 2 (53) [1.24] 2 (38) [1.4] 18 (78) [ca 4] 10 (87) [77]	Glyphis *et al*. (1978) Taylor (1969) Joubert & Moll (1992) Laidler *et al*. (1978) McKenzie *et al*. (1977) Privett (1998)

56. Kogelberg	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	729 (0.6)	14 13 10 11 12	659 931 1067 1258 1104	S winter	0 - 1227	500	224.0	11 (367) [1.6] 29 (250) [240] NA	Kruger (1974) Boucher (1978) Campbell (1995)
57. Klein River	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	368 (0.3)	41 40 42	493 528 637	M winter	6 – 1106	600	185.2		
58. Caledon Swartberg	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	98 (0.1)	40	528	M winter	290 – 1054	800	161.9		
59. Rivier-sonderend	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	820 (0.7)	38 49	614 266	M winter	88 – 1603	400	301.0	NA	Campbell (1995)
60. Koo Langeberg	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	737 (0.6)	52 75	496 173	Non seasonal	281 – 2054	1500	312.8		
61. Wabooms-berg	Little Succulent Karoo	Ceres Nardouw, Cedarberg & Pakhuis	280 (0.2)	53 52 63	272 496 219	M winter	742 – 1429	1200	69.7		
62. Witteberg	Central Mountain Renosterveld Little Succulent Karoo	Witpoort & Weltevrede Ceres Kommadagga & Lake Mentz	450 (0.4)	73 53 52 64	269 272 496 155	M winter	956 – 1507	1200	101.9	NA	Campbell (1995)
63. Bredas-dorp	Mountain Fynbos	Peninsula Nardouw, Cedarberg & Pakhuis	334 (0.3)	45 43	466 528	M winter	20 – 787	500	148.1		
64. Southern Langeberg	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	1506 (1.2)	78	1016	Non seasonal	47 – 1568	1200	293.4	13 (119) [142] 17 (83) [110] NA	McDonald (1993a) McDonald (1993b) Campbell (1995)
65. Potberg	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis	119 (0.1)	48 47	384 318	M winter	0 – 568	400	125.8		

66. Klein Swartberg	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	814 (0.7)	74 94 95	183 718 520	Non seasonal	296 – 2268	1300	336.7		
67. Rooiberg	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	778 (0.6)	91 90	318 192	Non seasonal	154 – 1433	1000	224.9	NA NA	Taylor & van der Meulen (1981) Campbell (1995)
68. Groot Swartberg	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	1156 (0.9)	94 92	718 242	Non seasonal	374 - 2098	1800	301.7	9 (50) [ca 100] NA	Bond (1981) Campbell (1995)
69. Outeniqua	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	1689 (1.4)	114 88 86 87	476 961 645 1030	Non seasonal	142 – 1531	800	210.4	11 (65) [ca 150] NA	Bond (1981) Campbell (1995)
70. Kama-nassie	Mountain Fynbos	Nardouw, Cedarberg & Pakhuis	550 (0.4)	113	312	Non seasonal	418 – 1832	1100	262.4	NA	Campbell (1995)
71. Tsitsi-kamma	Mountain Fynbos	Peninsula Nardouw, Cedarberg & Pakhuis	1619 (1.3)	117 119	1145 1115	Non seasonal	29 – 1597	600	262.6	NA	Campbell (1995)
72. Kouga	Mountain Fynbos Grassy Fynbos	Peninsula Nardouw, Cedarberg & Pakhuis	1749 (1.4)	121	422	Non seasonal	270 – 1721	1400	298.8	8 (75) [ca 400] NA	Euston-Brown (1995) Campbell (1995)
73. Baviaans-kloof	Grassy Fynbos Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	1683 (1.4)	122	297	Equi-noctial	136 – 1593	1100	253.8	6 (38) [ca 200] NA	Euston-Brown (1995) Campbell (1995)
74. Cocks-comb	Grassy Fynbos Mountain Fynbos	Nardouw, Cedarberg & Pakhuis Peninsula	1465 (1.2)	135 139	609 755	Non seasonal	76 - 1606	600	218.5	5 (28) [ca 50] NA	Cowling (1982) Campbell (1995)

SUCCULENT KAROO BIOME

Vygieveld

75. *Western Mountain*	Upland Succulent Karoo	Dwyka Ceres Adelaide & Estcourt Prince Albert Koedoesberg Karoo dolerite	3025 (2.5)	203 64 62	233 155 220	S winter	170 – 1258	900	147.7
76. Klawer	Lowland Succulent Karoo	Gifberg Peninsula Alluvium, sand & calcrete	878 (0.7)	199 27 59	147 266 207	S winter	2 - 524	300	90.1
77. *Knersvlakte*	Lowland Succulent Karoo	Alluvium, sand & calcrete Knersvlakte Gifberg	4650 (3.8)	199 198 191	147 104 102	S winter	0 – 796	200	84.4
78. Tanqua	Lowland Succulent Karoo Central Mountain Renosterveld Upland Succulent Karoo	Dwyka Witpoort & Weltevrede Ceres Tierberg Bidouw Skoorsteenberg Whitehill & Prince Albert	6194 (5.1)	62	220	M winter	157 - 1439	900	197.0
79. *Laingsburg*	Lowland Succulent Karoo	Adelaide & Estcourt Laingsburg, Whitehill & Prince Albert Fort Brown Dwyka	1340 (1.1)	72 97 64	114 118 155	Non seasonal	397 – 1150	900	147.0
80. *Moordenaars*	Great Nama Karoo	Adelaide & Estcourt	953 (0.8)	71 64	135 155	Non seasonal	662 – 1280	400	114.4
81. Touws	Little Succulent Karoo Central Mountain Renosterveld	Witpoort & Weltevrede Ceres Bidouw Alluvium, sand & calcrete	1419 (1.2)	63	219	M winter	695 – 1290	1000	108.9

Strandveld											
82. *Namaqua-land*	Strandveld Succulent Karoo	Alluvium, sand & calcrete	433 (0.4)	191 199	102 147	S winter	0 – 184	100	48.4		
83. Lamberts Bay	Strandveld Succulent Karoo	Alluvium, sand & calcrete Peninsula	963 (0.8)	26	184	S winter	0 – 310	200	62.8		
Broken Veld											
84. *Garies*	Upland Succulent Karoo Lowland Succulent Karoo	Little Namaqualand Suite Spektakel Suite	98 (0.1)	197	154	S winter	284 – 454	400	30.3		
85. *Loeries-fontein*	Upland Succulent Karoo	Knersvlakte Dwyka	517 (0.4)	204	117	M winter	320 – 792	500	96.4		
86. Witrantjies	Little Succulent Karoo	Laingsburg, Whitehill & Prince Albert Dwyka Kommadagga & Lake Mentz Ceres Fort Brown	971 (0.8)	64 73 96 52 75	155 269 165 496 173	M winter	332 – 1339	1000	143.7		
87. Robertson	Little Succulent Karoo	Ceres Alluvium, sand & calcrete Laingsburg, Whitehill & Prince Albert Dwyka Bidouw Witpoort & Weltevrede	1277 (1.0)	50 49	263 266	M winter	83 – 721	300	102.8	NA NA	Olivier (1966)
88. Little Karoo	Little Succulent Karoo	Ceres Bidouw	4457 (3.6)	74 76	183 129	Non seasonal	68 – 1638	400	205.8		

89. Oudts-hoorn	Little Succulent Karoo	Alluvium, sand & calcrete Enon Traka	1352 (1.1)	92 90	318 192	Non seasonal l	185 – 1128	400	230.7	
90. *Prince Albert*	Great Nama Karoo	Laingsburg, Whitehill & Prince Albert Fort Brown Witpoort & Weltevrede Dwyka Traka	2931 (2.4)	110 111 112	118 186 130	Equi-noctial	367 – 1261	900	129.8	
NAMA KAROO BIOME										
91. *Gamka Broken Veld*	Great Nama Karoo	Adelaide & Escourt Fort Brown Laingsburg, Whitehill & Prince Albert	3118 (2.5)	97 109	118 183	Equi-noctial	381 – 1073	900	184.7	
92. *Steytlerville Broken Veld*	Central Nama Karoo	Traka Witpoort & Weltevrede Ceres	3475 (2.8)	123	237	Equi-noctial	308 – 1134	600	163.8	
THICKET BIOME										
Mesic Succulent Thicket										
93. Gouritz	S & SW Coast Renosterveld	Bokkeveld Enon	183 (0.1)	84	362	Non seasonal	7 – 200	100	33.7	Rebelo *et al*. (1991)

94. Gamtoos	Valley Thicket Mesic Succulent Thicket S & SW Coast Renosterveld	Gamtoos Alluvium, sand & calcrete Nardouw, Cedarberg & Pakhuis	322 (0.3)	136	512	Non seasonal	0 – 754	100	144.0	3 (18) [ca 100]	Cowling (1982)
95. *Sundays*	Mesic Succulent Thicket Xeric Succulent Thicket	Kirkwood Alexandra Alluvium, sand & calcrete Sundays River Ceres Traka	1513 (1.2)	142 141 134 132	585 492 467 248	Non seasonal	0 – 1035	500	217.9		
96. Aloes	*Dune Thicket* S & SW Coast Renosterveld	Enon Nanaga	26 (<0.1)	136 137	512 684	Non seasonal	0 – 69	50?	15.1	1 (5) [ca 20]	Cowling (1982)
Xeric Succulent Thicket											
97. Spekboom	Spekboom Succulent Thicket	Ceres Enon Kango	2443 (2.0)	92 74 89 91	242 183 241 318	Non seasonal	115 – 1366	500	137.8		
98. *Willow-more*	Spekboom Succulent Thicket S & SW Coast Renosterveld	Witpoort & Weltevrede Ceres Dwyka Kommadagga & Lake Mentz -	1949 (1.6)	123 96	237 165	Equi-noctial	296 – 1529	1000	197.3		
99. *Addo*	Xeric Succulent Thicket	Kirkwood Enon Traka Alluvium, sand & calcrete Sundays River Witpoort & Weltevrede	1799 (1.5)	143 133	326 251	Equi-octial	6 – 904	500	154.8	NA	Archibald (1955)

FOREST BIOME											
Afromontane Forest											
100. Knysna	Afromontane Forest	Nardouw, Cedarberg & Pakhuis Peninsula Cape Granite Suite Kaaimans	2079 (1.7)	119 115 118 118 138 86	1115 880 880 856 951 645	Non seasonal	0 - 1346	200	162.9		Phillips (1931)
101. Swellen-dam	Afromontane Forest	Nardouw, Cedarberg & Pakhuis Enon	18 (<0.1)	79	638	Non seasonal	182 – 478	300	70.5	3 (94) [ca 1] 9 (103) [ca. 50 – fragmen-ted]	Campbell & Moll (1977) McKenzie (1978)
Indian Ocean Forest											
102. Alex-andria	S & SW Coast Renosterveld Valley Thicket Mesic Succulent Thicket Dune Thicket	Nanaga Gamtoos	357 (0.3)	139	755	Non seasonal	0 - 534	200	85.6	1 (5) [ca 2]	Cowling (1982)

Appendix 2 Categorization of Broad Habitat Units according to agricultural potential. Codes (numbers) are those in Appendix 1. L= low potential, M = medium, H = high.

1L	2L	3L	4L	5L	6L	7L	8L	9L	10M	11M	12M	13M	14M	15M	16M	17M	18H	19H	20H	21L	22H	23L	24H	25H	26H
27H	28H	29H	30H	31H	32H	33H	34H	35H	36M	37M	38M	39L	40M	41M	42M	43M	44M	45L	46L	47L	48L	49L	50L		
51L	52L	53L	54L	55L	56L	57L	58L	59L	60L	61L	62L	63M	64L	65M	66L	67L	68L	69L	70L	71L	72L	73L	74L	75L	76L
77L	78L	79L	80L	81L	82L	83L	84L	85L	86L	87L	88L	89L	90L	91L	92L	93H	94M	95M	96L	97L	98L	99L	100H	101H	
102H																									

Appendix 3 Rationale and method for setting baseline targets

Methods

Plant species-level patterns

Here we addressed the question: is regional plant richness distributed uniformly across the CFR? If so, then the same reservation targets can be applied to all BHUs; if not, then targets must be adjusted to accommodate for this variation.

We compiled plant species-area data derived from sources cited in Cowling *et al.* (1992) and Cowling *et al.* (1997), as well from Taylor (1996) for the Cederberg (Appendix 3.1). A total of 30 data sets were thus compiled, covering a wide range of richness and area values, and encompassing 32 BHUs distributed across the CFR (Appendix 3.1). Since there is a well-documented pattern of higher regional-scale richness in the western, winter-rainfall than the eastern, summer-rainfall parts of the CFR (Levyns 1964, Oliver et al 1983, Cowling et al. 1992, Cowling and Heijnis subm.), we divided the data into western and eastern categories), thereby introducing a geography effect. There is also some indication that montane regions support more species than lowland ones, at least in the western CFR (Linder 1991). Therefore, we also categorised data as lowland and montane , thereby introducing a topography effect.

The species-area data were fitted to log-log regression ($\log S = z \log A + \log c$) since this relationship is theoretically appropriate and provides the best fit for large areas within relatively homogeneous biogeographical zones (Rosenzweig 1995, see also Cowling et al. 1988, 1992, 1997). We investigated the geography and topography effects in a number of ways. Using *F* tests, we determined whether there were significant differences in the slopes (*z* values) and intercepts (*c* values) between the following data sets:

- western (n = 17) vs. eastern (n = 13);
- montane (n = 16) vs. lowland (n = 14);
- western, montane (n = 10) vs. western, lowland (n = 7);
- eastern, montane (n = 6) vs. eastern, lowland (n = 7).

Although we would not expect significant differences in *z* values between our different (mainland) data sets, differences in *c* values are very important for comparing diversity patterns. In arithmetic form of the power curve ($S = cA^z$), *c* is an important slope parameter that profoundly affects *S:* species richness rises faster in curves with higher *c* values (Rosenzweig 1995).

We also used analysis of covariance – with area as the covariate - to investigate a geography (western vs. eastern) and topography (montane vs. lowland) effect for the full data set (n = 30).

Community-level patterns

The overall approach adopted for the community level analysis was similar to that for the species-level analysis. Thus, we asked the question: is biodiversity at the community level uniformly distributed across the CFR? Again, we categorised sites as montane, lowland, western and eastern.

We compiled data from the many plant community survey studies undertaken in the CFR (Appendix 3.2). Only studies that used formal phytosociological methods for data collection and analysis were used. We analysed the data in a number of steps. Firstly, we established bivariate relationships between community number and sampling area for the study , as well as between this variable and sampling intensity (or number of plots sampled). Intuitively, these variables are likely to be good predictors of community-level richness. We then modelled community richness as a function of these two variables, using

multiple regression. Being satisfied that these two variables are good predictors of community richness, we used analysis of covariance – with area and plot number as covariates - to investigate a geography (western vs. eastern) and topography (montane vs. lowland) effect on this measure of biodiversity.

Results

Plant species-level patterns

Species-area regressions for all data sets were significant except for the eastern, montane one where results were marginally non-significant (Fig. 3.1, Table 3.1). The intercept of the regression for western CFR sites was significantly higher than that for the eastern sites. Since the slopes of the two relationships were homogeneous, it was acceptable to compute the *c* ratio, or the ratio of the values of the intercepts in arithmetic space (Gould 1979). This ratio provides a measure of relative species densities when logA = 0 (i.e. 1 km^2). With increasing area, the curves diverge in arithmetic space as species accumulate at a faster for rate for the curve with the higher value of *c*. The *c* ratio for these two data sets was 2.11, indicating that western sites have slightly more than double the number of species than at small area sizes. However, species accumulate faster with increasing area in western than eastern sites (Fig 3.1). Therefore, larger areas (approximately double) are required to encompass the full complement of species in western than eastern landscapes.

There was a slight topography effect on these patterns. For both montane and lowland sites, the slopes of the regressions for western and eastern data were homogeneous (F = 0.278, P = 0.607 and F = 2.659, P = 0.134, respectively) and the intercepts were significantly different (F = 18.583, P = <0.0001 and F = 7.622, P = 0.018, respectively). The *c* ratio values derived form these regressions were 2.43 for the montane data and 1.80 for the lowland data. Therefore, the west-east richness differential was 1.4 times higher in montane than in lowland areas. Again, owing to the contribution of the higher *c* values to the slope of the species-area curve in arithmetic space, species saturation occurs at much higher area sizes in western than eastern montane landscapes, and somewhat higher area sizes in corresponding lowland sites.

The slope of species-area relationship for the montane sites was significantly lower than that for the lowland sites (Fig. 3.1, Table 3.1). Therefore, it was not feasible to compute the *c* ratios for these curves. Montane patterns were strongly influenced by the comparatively low richness of large-sized eastern sites (Fig 3.1a). As determined from the *c* ratio (slopes were homogeneous), western, montane sites of small size had 1.65 times as many species as comparable western, lowland sites. Again, this implies saturation at larger area size in montane landscapes. Neither the slopes nor the intercepts of the eastern montane and lowland regressions were significantly different. The fact that the regression for the montane data set was marginally non-significant is unlikely to have influenced this relationship. The conclusion is that montane and lowland sites in the east support similar numbers of species over all area sizes.

The ANCOVA results showed a highly significant geography effect and a non-significant topography effect (Table 3.2). There was, however, a weakly significant interaction, a result of the fact that while western montane sites were richer than corresponding lowland sites, there was no difference between the richness of lowland and montane sites in the east.

In summary, montane sites in the east are no richer than eastern lowland sites. However, larger areas of montane, western landscapes – in proportion to the ratio of *c* values – will be required to encompass the full species complement than lowland landscapes in the west, and all eastern landscapes.

Community-level patterns

The best-fit relationships were achieved with the response variable (community richness) untransformed, and area log-transformed and plot number untransformed. Both bivariate relationships were significant, although only a moderate proportion of the variance was explained. The multiple regression model was thus:

Community richness = 1.137 + 0.054 plot number + 1.193 log area; R^2 (adjusted) = 0.489

Sixty one per cent of the variance explained was attributed to plot number.

Given that the two explanatory variables were reasonable predictors of community richness, their use as covariates in the ANCOVA was justified. There was, however, neither a significant geography, nor a significant topography effect on community richness (Table 3.3). The conclusion is that, unlike species richness, community richness shows no appreciable variation across the CFR.

Discussion

The species-area patterns presented in this study suggest that considerably larger areas are required to encompass the same proportion of the total species complement in western versus eastern landscapes and, at least for the west, in montane versus lowland landscapes. The same patterns were not evident for community richness. Therefore, the differences in species richness in relation to geography and topography are not a function of differences in community diversity. Rather, they are most likely a result of differences in the compositional turnover between communities (beta diversity) and within communities along geographical gradients (gamma diversity). Consistent with these patterns are data that indicate, at least for lowland areas, two-fold higher values of beta and gamma diversity along comparable gradients in western and eastern landscapes (Cowling et al. 1992).

These higher values are largely the result of a much higher incidence of beta and gamma rares in the west (Linder 1985, Cowling 1990, Cowling et al 1992, Cowling and McDonald 1998). These species are often clustered in small populations covering small ranges (Cowling and Holmes 1992, McDonald and Cowling 1995, Simmons and Cowling 1996, Trinder-Smith et al 1996a, 1996b) – hence their limited impact on determining community patterns.

Should the target of conservation planning in the CFR be the representation of community-level richness within each of the BHUs, then targets need not differ in relation to geography and topography. However, should the aim be the representation of species, especially those that contribute to the higher *c* values (the range-restricted, habitat specialist component), then larger reserves are required in western than eastern BHUs, and in western montane than western lowland BHUs.

There is no consensus on reservation targets for conservation planning; in terms of area targets for land classes, value appear arbitrary. Van Jaarsveld & Chown (1996) recommend the adoption in South Africa of the Caracas Action Plan target (IUCN 1993), namely to represent 10% of each vegetation type (or other land class) in the reserve system (see also Rebelo 1997). Higher targets have been mooted, for example the Brundtland Commission recommended 12% (Brundtland 1987) whereas 15% is the agreed target for Australian forests (Pressey *et al*. 1997); Noss & Cooperrider (1994) suggest between 25 and 75% for certain ecosystems. A major problem with uniform targets is the implicit assumption that all land classes have the same conservation value. However, as shown in this study, this is not the case even within a relatively homogeneous biogeographical zone such as the CFR.

Nonetheless, targets must be set (Vane-Wright 1996). Using 10% of each BHU as a baseline, we have adjusted targets upwards on the basis of differences in *c* values of the species-area curves for the different categories of landscape (geographical and topographical) that we identified for the CFR. Hence, we recommend a reservation target of 10% for all BHUs in the east; about 1.5 times higher (i.e. 15%) in western lowland landscapes; and about 2.5 times higher (25%) in western montane landscapes.

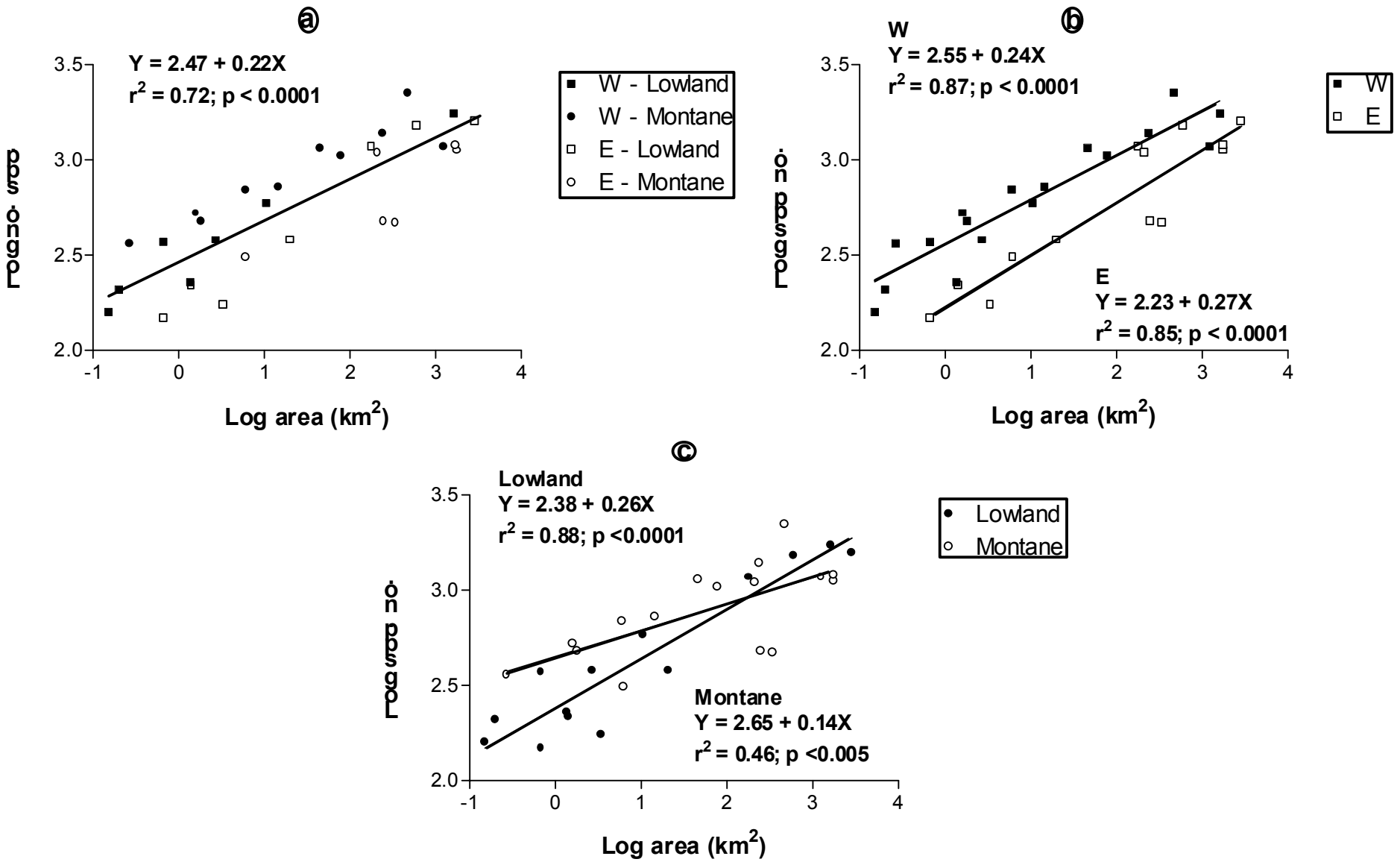

Figure 3.1 Species-area relations for different categories of BHUs in the CFR.

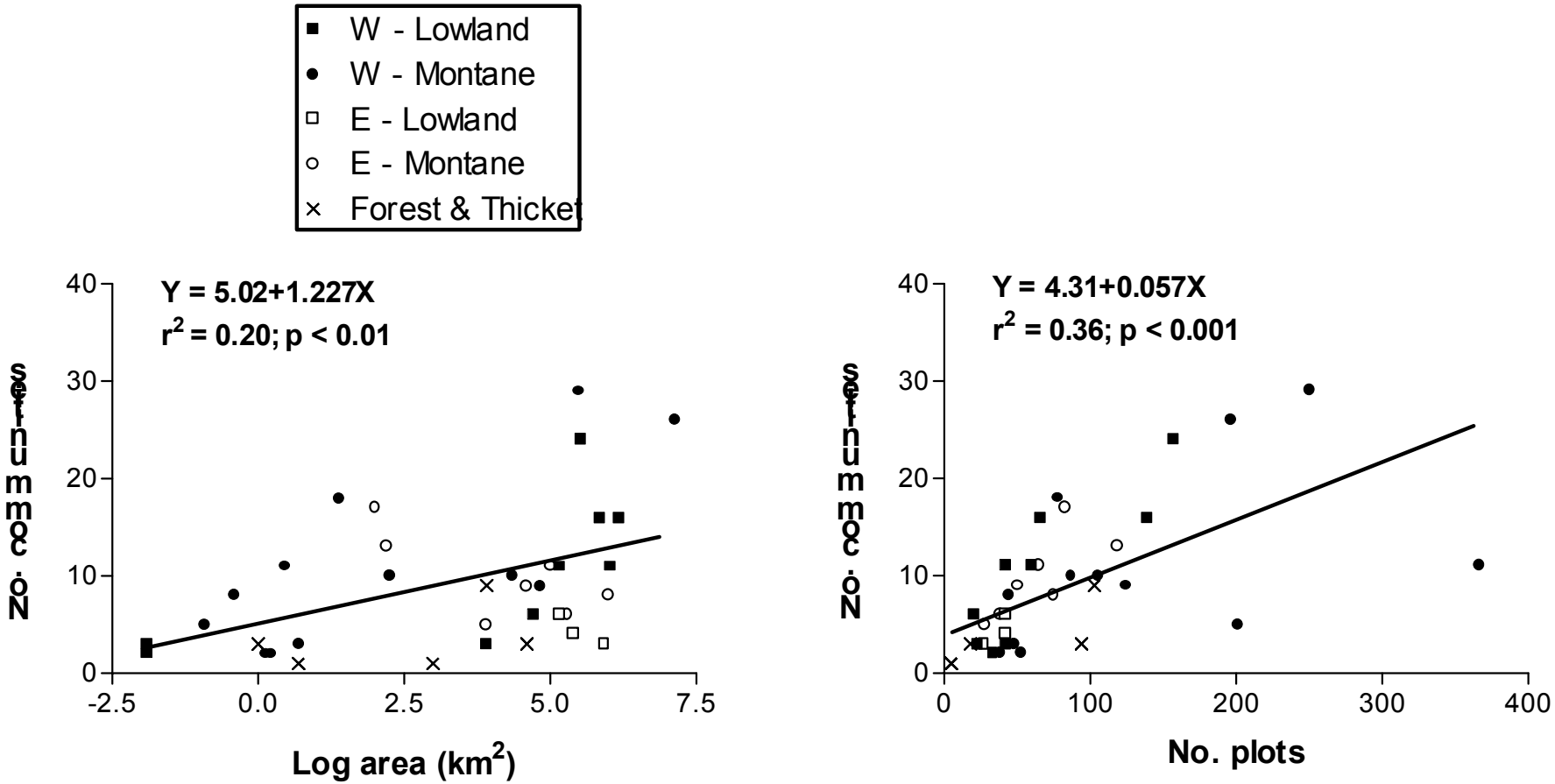

Figure 3.2 Community diversity-sampling intensity relations for different categories of BHUs in the CFR.

Table 3.1. Results of species-area (log-log) regressions and comparisons of slopes and intercepts (F tests) for different categories of data. Categories were identified to test for a geography (western vs. eastern), and a topography (montane vs. lowland) effect across the Cape Floristic Region. Sig. = significance, se = standard error.

Category	n	r^2 (sig.)	Slope (se)	F-ratio (sig.)	Intercept (se)	F-ratio (sig.)
Western	17	0.867 (<0.0001	0.236 (0.024)		2.554 (0.038)	
Eastern	13	0.846 (<0.0001)	0.274 (0.035)	0.853 (0.364)	2.230 (0.079)	24.411 (<0.0001)
Montane	16	0.462 (<0.005)	0.138 (0.040)		2.652 (0.084)	
Lowland	14	0.876 (<0.0001)	0.258 (0.028)	6.046 (0.021)	2.383 (0.047)	NA
Western, montane	7	0.857 (<0.0005)	0.187 (0.022)		2.678 (0.048)	
Western, lowland	10	0.9332 (<0.0005)	0.245 (0.040)	2.167 (0.165)	2.468 (0.040)	8.785 (0.010)
Eastern, montane	6	0.640 (0.056)	0.225 (0.084)		2.291 (0.215)	
Eastern, lowland	7	0.945 (<0.001)	0.319 (0.034)	1.312 (0.282)	2.213 (0.067)	2.092 (0.179)

Table 3.2. Results of an analysis of covariance, with log area as the covariate, and plant species richness as the response variable. Treatment variables define a geography effect (western and eastern), and a topography effect (montane and lowland).

Source of variation	Sum of squares	df	Mean square	*F* ratio	Significance
Covariates					
Log area	2.41	1	2.41	145.02	<0.0001
Main effects					
(1) Geogr.	0.38	1	0.38	23.13	<0.0005
(2) Topogr.	0.01	1	0.01	0.22	0.646
Interactions					
(1) X (2)	0.08	1	0.08	4.81	0.038
Residual	0.42	25	0.02		
Total (corrected)	3.42	29			

Table 3.3. Results of an analysis of covariance, with log area of the sampling domain and number of plots (or sampling intensity) as the covariates, and community richness as the response variable. Treatment variables define a geography effect (western and eastern), and a topography effect (montane and lowland). The analysis excludes data from forest and thicket habitats.

Source of variation	Sum of squares	df	Mean square	*F* ratio	Significance
Covariates					
Log area	354.57	1	354.57	13.56	<0.005
No. plots	262.27	1	262.27	10.03	<0.005
Main effects					
(1) Geogr.	75.61	1	75.61	3.03	0.094
(2) Topogr.	44.75	1	44.75	1.79	0.190
Interactions					
(1) X (2)	56.07	1	56.07	2.25	0.150
Residual	623.62	25	24.95		
Total (corrected)	1542.71	30			

Appendix 3.1 Species-area data for Broad Habitat Units (BHUs) used in the target-setting analyses

Broad Habitat Unit	Area (km^2)	No. spp
Lowland, winter rainfall		
Hagelkraal	0.15	157
Cape Flats	0.20	210
Boland	0.68	373
Cape Flats	1.37	229
Blackheath	2.70	379
Boland	10.40	585
De Hoop, Potberg, Agulhas	180.0	1 179
De Hoop, Potberg, Agulhas	600.0	1 506
Elim, Springfield, Hagelkraal, Agulhas	1 609.25	1 751
Lowland, non seasonal rainfall		
Knysna	0.67	150
Aloes	1.41	217
Goukamma	20.55	380
Suurbraak	27.86	446
Riversdale, Canca, Albertinia, Stilbaai, Gouritz, Blanco	2 860.0	1 580
Montane, winter rainfall		
Franschhoek	0.27	364
Kogelberg	1.53	533
Franschhoek	1.82	483
Klein River	6.02	697
Klein River	14.46	773
Franschhoek	45.30	1 142
Cape Peninsula	77.50	1 036
Kogelberg	240.0	1 383
Cape Peninsula	471	2 256
Cederberg	1 259	1 175
Montane, non-seasonal rainfall		
Outeniqua	6.17	313
Zuurberg	207.8	1 100
Rooiberg	250.0	481
Klein Swartberg, Little Karoo	340.0	473

Appendix 3.1 cont

Southern Langeberg	1 737.8	1 203
Kouga, Baviaanskloof	1 778.2	1 122

[1]Primary sources are given in this reference

Appendix 3.2. Plant community data for Broad Habitat Units (BHU) (see Cowling and Heijnis, submitted) in the Cape Floristic Region. All data were collected using methods of the Zurich-Montpellier School (Werger 1974).

Broad Habitat Unit	Area sampled (km^2)	No. relevés	Sampling intensity (relevés/km^2)	No. commu-nities	Data source
Lowland, winter rainfall					
Langebaan	250	157	0.628	24	Boucher (1987)
Cape Flats	175	60	0.343	11	Boucher (1987)
Hopefield	345	139	0.403	16	Boucher (1987)
Blackheath	110	20	0.182	6	Boucher (1987)
Springfield	0.15	42	280	3	Richards et al. (1995)
Hagelkraal	0.15	33	220	2	Richards et al. (1995)
Swartland	420	42	0.100	11	Boucher (1987)
Boland	480	66	0.137	16	Boucher (1987)
Overberg	49	23	0.467	3	Kemper (1997)
Lowland, non-seasonal rainfall					
St Francis	220	42	0.191	4	Cowling (1982)
Humansdorp	175	42	0.240	6	Cowling (1982)
Kromme	375	27	0.072	3	Cowling (1982)
Montane, winter rainfall					
Cederberg	1260	197	0.156	26	Taylor (1996)
Swartruggens	127	125	0.984	9	Lechmere-Oertel (1998)
Hawequas	9.7	105	10.85	10	Van Wilgen and Kruger (1985)
Franschhoek	0.4	201	502.5	5	McDonald (1988)
Cape Peninsula	2	48	24	3	Glyphis et al. (1978)
	1.24	53	42.74	2	Joubert and Moll (1982)
	1.4	38	27.14	2	Laidler et al. (1978)
	4	78	19.5	18	McKenzie et al. (1977)
	77	87	1.13	10	Privett (1998)
Kogelberg	1.6	367	229.4	11	Kruger (1974)
	240	250	1.04	29	Boucher (1978)
Montane, non-seasonal rainfall					
Southern Langeberg	1748	299	0.171	46	McDonald et al. (1996)
Groot Swartberg	100	50	0.5	9	Bond (1981)
Outeniqua	150	65	0.433	11	Bond (1981)
Kouga	400	75	0.1875	8	Euston Brown (1995)

Appendix 3.2 cont

Baviaanskloof	200	38	0.190	6	Euston Brown (1995)
Cockscomb	50	28	0.56	5	Cowling (1992)
Non-fynbos biome					
Gamtoos	100	0.18	18	3	Cowling (1982)
Aloes	20	0.25	5	1	Cowling (1982)
Swellendam	1	94	94	3	Campbell and Moll (1977)
	50	2.06	103	9	McKenzie (1978)
Alexandria	2	2.5	5	1	Cowling (1982)

Appendix 4 Variables used to compute baseline (*B*) and retention (*R*) targets for BHUs. Pre-European area of BHU = *e;* biodiversity weighting = *b'*; threat weighting = *h'*; transformation weighting = *t';* total target = *T*. Colour coding for *T* as a % extant (non-transformed) habitat = 100%, 75-99.9%, 50-74.9%, <50%. See text in Targets section for derivation of targets

BHU	BHU code	*e* (ha)	*b'* (%)	*B* (ha)	*h'* (%)	*t'*	*r'* (%)	*R* (ha)	*T* (ha)	*T* (% extant)
Dune Pioneer										
South West	1	11964.95	15	1794.74	30	1.226	36.8	3406.31	5201.05	**56.2**
South	2	5797.55	10	579.76	30	1.138	34.1	1706.37	2286.13	**45.7**
South	3	2781.18	10	278.12	30	1.400	42.0	700.55	978.67	**58.7**
Fynbos / Thicket Mosaic										
Langebaan	4	160339.3	15	24050.89	15	1.465	22.0	18840.72	42891.61	**50.0**
Cape Flats	5	26729.1	15	4009.37	30	1.761	52.8	3374.95	7384.32	**100.0**
Agulhas	6	49232.43	15	7384.86	30	1.205	36.2	14147.87	21532.73	**55.0**
Stilbaai	7	23009.19	10	2300.92	30	1.186	35.6	6664.50	8965.42	**47.9**
Goukamma	8	14223.71	10	1422.37	30	1.318	39.5	3836.95	5259.32	**54.2**
St Francis	9	25923.59	10	2592.36	30	1.638	49.1	4615.37	7207.73	**76.7**
Sand Plain Fynbos										
Leipoldtville	10	211084.6	15	31662.68	15	1.440	21.6	25532.34	57195.02	**48.4**
Hopefield	11	297628.8	15	44644.33	15	1.466	22.0	34946.72	79591.04	**50.1**
Blackheath	12	79600.53	15	11940.08	30	1.800	54.0	8613.32	20553.40	**100.0**
Springfield	13	44041.42	15	6606.21	30	1.209	36.3	12636.36	19242.58	**55.2**
Albertinia	14	44753.93	10	4475.39	15	1.480	22.2	5164.54	9639.94	**41.4**
Limestone Fynbos										
Hagelkraal	15	44003.06	15	6600.46	15	1.406	21.1	5513.37	12113.83	**46.3**
De Hoop	16	77588.88	15	11638.33	30	1.231	36.9	22029.90	33668.23	**56.5**
Canca	17	85232.67	10	8523.27	15	1.039	15.6	12765.36	21288.63	**26.0**
Genadendal	18	48897.06	15	7334.56	30	1.423	42.7	12047.33	19381.89	**68.7**
Suurbraak	19	74191.48	10	7419.15	30	1.610	48.3	13973.37	21392.52	**73.9**

Keurbooms	20	14078.04	10	1407.80	30	1.171	35.1	4100.57	5508.37	**47.2**
Humansdorp	21	198725.5	10	19872.55	15	1.208	18.1	28513.44	48385.99	**30.8**
Algoa	22	29675.22	10	2967.52	30	1.422	42.7	7315.46	10282.98	**60.0**
Zuurberg	23	47709.74	10	4770.97	0	1.003	0.0	0.00	4770.97	**10.0**
Fynbos / Renosterveld										
Mosaic										
Perdeberg	24	4449.83	15	667.47	30	1.110	33.3	1318.81	1986.29	**50.2**
Elgin	25	13610.23	15	2041.53	30	1.880	56.4	920.71	2962.24	**100.0**
Breede	26	37817.54	15	5672.63	30	1.629	48.9	6860.66	12533.29	**89.3**
Elim	27	59407.45	15	8911.12	30	1.602	48.0	11371.63	20282.75	**85.7**
Blanco	28	74975.6	10	7497.56	30	1.370	41.1	19417.85	26915.41	**57.0**
Langkloof	29	78345.54	10	7834.55	30	1.326	39.8	21011.73	28846.28	**54.6**
Kromme	30	84570.77	10	8457.08	30	1.385	41.5	21615.15	30072.23	**57.8**
Coast Renosterveld										
Swartland	31	411302	15	61695.31	30	1.892	56.8	25219.14	86914.45	**100.0**
Boland	32	241692.1	15	36253.82	30	1.768	53.0	29727.86	65981.68	**100.0**
Overberg	33	429687.7	15	64453.15	30	1.892	56.7	26449.55	90902.70	**100.0**
Riversdale	34	316301.6	10	31630.16	30	1.694	50.8	49223.80	80853.96	**83.5**
Inland Renosterveld										
Niewoudtville	35	32204.24	25	8051.06	30	1.189	35.7	9317.84	17368.90	**66.5**
Kouebokkeveld	36	98544.82	25	24636.21	15	1.097	16.5	14641.66	39277.87	**44.2**
Waveren-Bokkeveld	37	80272.35	15	12040.85	15	1.530	23.0	8656.76	20697.61	**54.9**
Ashton	38	126740.2	25	31685.04	15	1.369	20.5	16428.82	48113.86	**60.1**
Matjies	39	114136.2	10	11413.62	0	1.006	0.0	0.00	11413.62	**10.1**
Roggeveld	40	149582.6	15	22437.39	15	1.000	15.0	22437.39	44874.78	**30.0**
Montagu	41	128045.1	10	12804.51	15	1.052	15.8	19154.87	31959.38	**26.3**
Cannaland	42	49468.95	10	4946.90	15	1.162	17.4	7225.35	12172.25	**29.4**
Kango	43	168756.2	10	16875.62	15	1.052	15.8	25245.83	42121.45	**26.3**
Uniondale	44	120306.1	10	12030.61	15	1.265	19.0	16783.24	28813.85	**32.6**
Mountain Complex										
Bokkeveld	45	98355.62	25	24588.91	0	1.060	0.0	0.00	24588.91	**26.6**
Gifberg	46	200285.5	25	50071.37	0	1.218	0.0	0.00	50071.37	**32.0**

Cederberg	47	227821.3	25	56955.33	0	1.078	0.0	0.00	56955.33	**27.1**
Olifants River	48	146071.3	25	36517.82	0	1.227	0.0	0.00	36517.82	**32.3**
Swartruggens	49	158200.9	25	39550.22	0	1.082	0.0	0.00	39550.22	**27.2**
Piketberg	50	51581.41	25	12895.35	15	1.169	17.5	7515.95	20411.31	**47.6**
Groot Winterhoek	51	86565.29	25	21641.32	0	1.037	0.0	0.00	21641.32	**25.9**
Matroosberg	52	71418.64	25	17854.66	0	1.007	0.0	0.00	17854.66	**25.2**
Hawequas	53	121769.2	25	30442.29	15	1.072	16.1	18170.70	48612.99	**43.0**
Franschhoek	54	55101.88	25	13775.47	15	1.179	17.7	8001.70	21777.17	**48.1**
Cape Peninsula	55	35936.35	25	8984.09	30	1.263	37.9	10034.66	19018.75	**71.8**
Kogelberg	56	72851.88	25	18212.97	15	1.195	17.9	10513.95	28726.92	**49.0**
Klein River	57	36822.8	25	9205.70	30	1.218	36.5	10523.12	19728.82	**68.5**
Caledon Swartberg	58	9826.63	25	2456.66	30	1.204	36.1	2825.10	5281.76	**67.5**
Riviersonderend	59	82005.59	25	20501.40	0	1.043	0.0	0.00	20501.40	**26.1**
Koo Langeberg	60	73666.42	10	7366.64	0	1.017	0.0	0.00	7366.64	**10.2**
Waboomsberg	61	27997.87	25	6999.47	0	1.208	0.0	0.00	6999.47	**31.6**
Witteberg	62	45020.71	25	11255.18	0	1.003	0.0	0.00	11255.18	**25.1**
Bredasdorp	63	33372.67	25	8343.17	30	1.214	36.4	9552.23	17895.39	**68.2**
Southern Langeberg	64	150597.7	10	15059.77	0	1.081	0.0	0.00	15059.77	**10.9**
Potberg	65	11937.35	25	2984.34	30	1.050	31.5	3572.07	6556.41	**57.8**
Klein Swartberg	66	81393.3	10	8139.33	0	1.003	0.0	0.00	8139.33	**10.0**
Rooiberg	67	77786.18	10	7778.62	0	1.002	0.0	0.00	7778.62	**10.0**
Groot Swartberg	68	115571.9	10	11557.19	0	1.002	0.0	0.00	11557.19	**10.0**
Outeniqua	69	168928.5	10	16892.85	15	1.163	17.4	24666.91	41559.75	**29.4**
Kamanassie	70	54974.75	10	5497.48	0	1.021	0.0	0.00	5497.48	**10.2**
Tsitsikamma	71	161941	10	16194.10	0	1.046	0.0	0.00	16194.10	**10.5**
Kouga	72	174911.4	10	17491.14	0	1.029	0.0	0.00	17491.14	**10.3**
Baviaanskloof	73	168340.1	10	16834.01	0	1.010	0.0	0.00	16834.01	**10.1**
Cockscomb	74	146476.2	10	14647.62	0	1.103	0.0	0.00	14647.62	**11.2**
Vygieveld										
Western Mountain	75	302457	15	45368.56	0	1.025	0.0	0.00	45368.56	**15.4**
Klawer	76	87819.79	15	13172.97	0	1.384	0.0	0.00	13172.97	**24.4**
Knersvlakte	77	464960.6	15	69744.09	0	1.033	0.0	0.00	69744.09	**15.5**

Tanqua	78	619389.6	15	92908.44	0	1.007	0.0	0.00	92908.44	**15.1**
Laingsburg	79	133951.5	15	20092.72	0	1.003	0.0	0.00	20092.72	**15.0**
Moordenaars	80	95289.67	15	14293.45	0	1.000	0.0	0.00	14293.45	**15.0**
Touws	81	141908.3	15	21286.24	0	1.070	0.0	0.00	21286.24	**16.1**
Strandveld										
Namaqualand	82	43340.64	15	6501.10	0	1.007	0.0	0.00	6501.10	**15.1**
Lamberts Bay	83	96275.5	15	14441.33	0	1.225	0.0	0.00	14441.33	**19.4**
Broken Veld										
Garies	84	9767.54	15	1465.13	0	1.000	0.0	0.00	1465.13	**15.0**
Loeriesfontein	85	51659.98	15	7749.00	0	1.042	0.0	0.00	7749.00	**15.7**
Witrantjies	86	97126.98	10	9712.70	0	1.052	0.0	0.00	9712.70	**10.6**
Robertson	87	127658.9	15	19148.83	0	1.364	0.0	0.00	19148.83	**23.6**
Little Karoo	88	445654.7	10	44565.47	0	1.013	0.0	0.00	44565.47	**10.1**
Oudtshoorn	89	135197.2	10	13519.72	0	1.137	0.0	0.00	13519.72	**11.6**
Prince Albert	90	293142.3	10	29314.23	0	1.006	0.0	0.00	29314.23	**10.1**
Gamka	91	311818	10	31181.80	0	1.000	0.0	0.00	31181.80	**10.0**
Steytlerville	92	347465.7	10	34746.57	0	1.011	0.0	0.00	34746.57	**10.1**
Mesic Succulent Thicket										
Gouritz	93	18280.18	10	1828.02	30	1.293	38.8	5013.91	6841.93	**52.9**
Gamtoos	94	32222.83	10	3222.28	15	1.310	19.6	4368.96	7591.25	**34.1**
Sundays	95	151266.6	10	15126.66	15	1.177	17.6	21982.69	37109.34	**29.8**
Aloes	96	2611.01	10	261.10	30	1.608	48.2	493.80	754.90	**73.7**
Xeric Succulent Thicket										
Spekboom	97	244306.8	10	24430.68	0	1.037	0.0	0.00	24430.68	**10.4**
Willowmore	98	194937.9	10	19493.79	0	1.005	0.0	0.00	19493.79	**10.0**
Addo	99	179864.3	10	17986.43	0	1.067	0.0	0.00	17986.43	**10.7**
Afromontane Forest										
Knysna	100	207872.9	10	20787.29	30	1.411	42.3	51821.81	72609.10	**59.3**
Swellendam	101	1808.88	10	180.89	30	1.242	37.2	510.97	691.86	**50.4**
Indian Ocean Forest										
Alexandria	102	35738.44	10	3573.84	30	1.267	38.0	9956.74	13530.58	**51.7**

Appendix 5 Areas of Cateogory 1 conservation system in Broad Habitat Units of the Cape Floristic Region

	South African National Parks		Dept. Water Affairs		Provincial		Total	
	%	km^2	%	km^2	%	km^2	%	km^2
BHU								
Dune Pioneer								
1. South West					22.34	26.73	22.34	26.73
2. South					25.47	14.77	25.47	14.77
3. South East							0	0
Total	0	0	0	0	20.2	41.5	20.2	41.5
Fynbos / Thicket Mosaic								
4. Langebaan	12.21	195.82			1.11	17.81	13.32	213.63
5. Cape Flats					1.66	4.45	1.66	4.45
6. Agulhas					19.5	96.01	19.5	96.01
7. Stilbaai					2.39	5.51	2.39	5.51
8. Goukamma	8.54	12.15			14.07	20.02	22.61	32.17
9. St Francis					0.55	1.43	0.55	1.43
Total	6.94	207.97	0	0	4.85	145.23	11.79	353.2
Sand Plain Fynbos								
10. Leipoldtville					0.01	0.15	0.01	0.15
11. Hopefield	2.15	64			0.39	11.66	2.54	75.66
12. Blackheath	0.19	1.53					0.19	1.53
13. Springfield					0.04	0.17	0.04	0.17
14. Albertinia							0	0
Total	0.97	65.53	0	0	0.18	11.98	1.14	77.51
Limestone Fynbos								
15. Hagelkraal					1.17	5.13	1.17	5.13
16. De Hoop					25.14	195.08	25.14	195.08
17. Canca					0.65	5.56	0.65	5.56
Total	0	0	0	0	9.95	205.77	9.95	205.77
Grassy Fynbos								

18. Genadendal					1.82	8.93	1.82	8.93
19. Suurbraak	3.04	22.58			0.32	2.37	3.36	24.95
20. Keurbooms					0.06	0.08	0.06	0.08
21. Humansdorp					3.73	74.19	3.73	74.19
22. Algoa							0	0
Total	0.62	22.58	0	0	2.34	85.57	2.96	108.15
Fynbos/Renosterveld Mosaic								
24. Perdeberg							0	0
25. Elgin					2.29	3.11	2.29	3.11
26. Breede							0	0
27. Elim					0.19	1.11	0.19	1.11
28. Blanco							0	0
29. Langkloof					3.47	27.21	3.47	27.21
30. Kromme					1.18	9.95	1.18	9.95
Total	0	0	0	0	1.17	41.38	1.17	41.38
Coast Renosterveld								
31. Swartland					0.01	0.29	0.01	0.29
32. Boland					0.98	23.77	0.98	23.77
33. Overberg	0.13	5.77			0.76	32.63	0.89	38.4
34. Riversdale					0	0.09	0	0.09
Total	0.04	5.77	0	0	0.41	56.78	0.45	62.55
Inland Renosterveld								
35. Nieuwoudtville							0	0
36. Kouebokkeveld					1.84	18.18	1.84	18.18
37. Waveren-Bokkeveld					1.24	9.98	1.24	9.98
38. Ashton					1.51	19.14	1.51	19.14
39. Matjies					11.2	127.82	11.2	127.82
41. Montagu					0.07	0.86	0.07	0.86
42. Cannaland					0.81	4.01	0.81	4.01
43. Kango					9.02	152.19	9.02	152.19
44. Uniondale					1.32	15.92	1.32	15.92
Total	0	0	0	0	3.79	348.1	3.79	348.1
Mountain Complex								
45. Bokkeveld					5.8	57.04	5.8	57.04
46. Gifberg					0.41	8.22	0.41	8.22

47. Cederberg						28.31	644.9	28.31	644.9
48. Olifants River								0	0
49. Swartruggens						6.15	97.27	6.15	97.27
50. Piketberg								0	0
51. Groot Winterhoek						33.45	289.6	33.45	289.6
52. Matroosberg						22.73	162.34	22.73	162.34
53. Hawequas						47.84	582.49	47.84	582.49
54. Franschhoek						57.77	318.34	57.77	318.34
55. Cape Peninsula		45.86	164.81					45.86	164.81
56. Kogelberg						39.83	290.18	39.83	290.18
57. Klein River						4.23	15.58	4.23	15.58
58. Caledon Swartberg								0	0
59. Riviersonderend						29.17	239.24	29.17	239.24
60. Koo Langeberg						0.66	4.86	0.66	4.86
61. Waboomsberg								0	0
62. Witteberg						11.74	52.86	11.74	52.86
63. Bredasdorp						2.18	7.29	2.18	7.29
64. Southern Langeberg						28.25	425.41	28.25	425.41
65. Potberg						48.37	57.74	48.37	57.74
66. Klein Swartberg						37.53	305.47	37.53	305.47
67. Rooiberg						29.84	232.08	29.84	232.08
68. Groot Swartberg						73.64	851.12	73.64	851.12
69. Outeniqua						22.68	383.15	22.68	383.15
70. Kamanassie						48.09	264.39	48.09	264.39
71. Tsitsikamma				1.05	17.04	18.53	300.04	19.58	317.08
72. Kouga						32.88	575.19	32.88	575.19
73. Baviaanskloof						54.67	920.33	54.67	920.33
74. Cockscomb						31.47	460.91	31.47	460.91
	Total	0.56	164.81	0.06	17.04	25.6	7546.04	26.22	7727.89
Vygieveld									
76. Klawer						0.21	1.85	0.21	1.85
78. Tanqua						0.53	32.68	0.53	32.68
81. Touws						0.57	8.07	0.57	8.07
	Total	0	0	0	0	1.83	42.6	1.83	42.6
Strandveld									
83. Lamberts						0.64	6.13	0.64	6.13

Broken Veld									
86. Witrantjies								0	0
87. Robertson						0.48	6.1	0.48	6.1
88. Little Karoo						4.64	206.84	4.64	206.84
89. Oudtshoorn						0.29	3.95	0.29	3.95
	Total	0	0	0	0	2.97	216.89	2.97	216.89
Mesic Succulent Thicket									
93. Gouritz								0	0
94. Gamtoos						26.25	84.6	26.25	84.6
96. Aloes						6.89	1.8	6.89	1.8
	Total	0	0	0	0	16.27	86.4	16.27	86.4
Xeric Succulent Thicket									
97. Spekboom						1.71	41.77	1.71	41.77
Afromontane Forest									
100. Knysna		2.61	54.24	4.85	100.82	2.37	49.18	9.83	204.24
101. Swellendam						36.26	6.56	36.26	6.56
	Total	2.59	54.24	4.81	100.82	2.66	55.74	10.05	210.8
Indian Ocean Forest									
102. Alexandria						5.97	21.35	5.97	21.35

Appendix 6. Areas of Category 2 conservation system in Broad Habitat Units of the Cape Floristic Region

	Conservancy		DWAF Demarcated Forest		Private Demarcated Forest		Local Authority Reserve		Mountain Catchment Area		Natural Heritage Site		Protected Natural Environment		Private Nature Reserve		Total	
BHU	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%	km^2
Dune Pioneer																		
1. South West	0.18	0.21															0.29	0.35
2. South													0.11	0.14			0.00	0.00
3. South East							35.60	9.90									35.60	9.90
Total	0.10	0.21	0.00	0.00	0.00	0.00	4.82	9.90	0.00	0.00	0.00	0.00	0.07	0.14	0.00	0.00	4.99	10.25
Fynbos / Thicket Mosaic																		
4. Langebaan	10.00	160.48					0.16	2.57					0.25	3.94	0.77	12.27	11.18	179.26
5. Cape Flats							0.91	2.43	0.00	0.01	0.09	0.25	0.09	0.24			1.10	2.93
6. Agulhas	2.67	13.15					0.21	1.04			4.93	24.27					7.81	38.46
7. Stilbaai	0.28	0.65					0.16	0.38									0.45	1.03
8. Goukamma											0.34	0.49					0.34	0.49
9. St Francis							1.65	4.29			0.27	0.70					1.92	4.99
Total	5.82	174.28	0.00	0.00	0.00	0.00	0.27	8.14	0.00	0.01	0.86	25.71	0.14	4.18	0.41	12.27	7.59	227.16
Sand Plain Fynbos																		
10. Leipoldtville	1.36	28.68					0.03	0.66	0.15	3.26							1.54	32.60
11. Hopefield	20.17	589.92									0.00	0.07			0.35	10.47	20.17	600.45
12. Blackheath							0.28	2.19			0.74	5.87	1.92	15.30			2.94	23.37
13. Springfield	1.74	7.66									1.77	7.78					3.50	15.44
14. Albertinia																	0.00	0.00
Total	9.25	626.26	0.00	0.00	0.00	0.00	0.04	2.85	0.05	3.26	0.20	13.72	0.23	15.30	0.15	10.47	9.92	671.86
Limestone Fynbos																		
15. Hagelkraal	0.17	0.75									1.50	6.61					1.67	7.37
16. De Hoop	0.10	0.80															0.10	0.80
17. Canca							0.17	1.42									0.17	1.42
Total	0.07	1.55	0.00	0.00	0.00	0.00	0.07	1.42	0.00	0.00	0.32	6.61	0.00	0.00	0.00	0.00	0.46	9.59
Grassy Fynbos																		
18. Genadendal							1.44	7.05	5.52	26.98							6.96	34.03

19. Suurbraak	10.88	80.71							0.80	5.93							11.68	86.64
20. Keurbooms			1.27	1.79													1.27	1.79
21. Humansdorp							0.39	7.71			0.85	16.84					1.24	24.55
22. Algoa																	0.00	0.00
Total	2.21	80.71	0.05	1.79	0.00	0.00	0.40	14.76	0.85	32.91	0.46	16.84	0.00	0.00	0.00	0.00	4.02	147.01
Fynbos/Renosterveld																		
Mosaic																		
24. Perdeberg							44.23	19.68			36.08	16.05					80.31	35.73
25. Elgin									7.85	10.68	0.63	0.85					8.48	11.54
26. Breede									0.35	1.31							0.35	1.31
27. Elim																	0.00	0.00
28. Blanco							0.02	0.12									0.02	0.12
29. Langkloof																	0.00	0.00
30. Kromme											0.02	0.13					0.02	0.13
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.56	19.80	0.34	11.99	0.48	17.03	0.00	0.00	0.00	0.00	1.38	48.83
Coast Renosterveld																		
31. Swartland	3.23	132.76					0.01	0.37			0.79	32.54			0.03	1.30	4.06	166.97
32. Boland	2.37	57.39					0.33	7.96	1.15	27.75	2.78	67.30	0.53	12.91			7.17	173.30
33. Overberg	0.03	1.35					0.05	2.03	0.23	9.75	0.06	2.46					0.36	15.58
34. Riversdale	7.00	221.47					0.06	2.04									7.07	223.50
Total	2.95	412.97	0.00	0.00	0.00	0.00	0.09	12.40	0.27	37.50	0.73	102.30	0.09	12.91	0.01	1.30	4.14	579.35
Inland Renosterveld																		
35. Nieuwoudtville																	0.00	0.00
36. Kouebokkeveld	28.81	273.47							5.68	56.01							33.44	329.49
37. Waveren-Bokkeveld	0.10	0.81					0.04	0.29	3.44	27.57	0.07	0.59			0.37	3.00	4.02	32.26
38. Ashton							0.35	4.38	10.66	135.08							11.00	139.46
39. Matjies									2.23	25.51							2.23	25.51
41. Montagu							0.31	3.93	3.16	40.52					0.56	7.20	4.03	51.64
42. Cannaland	0.07	0.32							0.02	0.10							0.09	0.42
43. Kango	0.18	3.10							1.90	32.02							2.08	35.12
44. Uniondale							0.10	1.14	1.60	19.25							1.70	20.39
Total	3.14	288.18	0.00	0.00	0.00	0.00	0.11	9.74	3.66	336.06	0.01	0.59	0.00	0.00	0.11	10.20	6.91	634.29
Mountain Complex																		
45. Bokkeveld																	0.00	0.00
46. Gifberg	13.61	272.68							1.29	25.79							14.90	298.47
47. Cederberg	7.00	159.42							44.83	1021.33	0.01	0.21			0.04	0.82	51.87	1181.78

48. Olifants River	0.38	5.51							10.19	148.84					0.58	8.51	11.15	162.86
49. Swartruggens	36.03	569.98							21.54	340.74	0.26	4.13					57.83	914.85
50. Piketberg											2.08	10.75			0.56	2.86	2.64	13.61
51. Groot Winterhoek							3.28	28.41	49.57	429.11	0.23	2.03			0.02	0.17	53.11	459.73
52. Matroosberg							5.56	39.72	62.51	446.47							68.08	486.19
53. Hawequas	1.45	17.72					1.72	21.00	37.12	451.98	0.09	1.05					40.38	491.75
54. Franschhoek	0.88	4.83					0.49	2.70	10.41	57.38			5.52	30.39			17.29	95.30
55. Cape Peninsula											0.02	0.07	30.46	109.45			30.48	109.52
56. Kogelberg							1.18	8.57	23.83	173.59	0.23	1.65					25.23	183.81
57. Klein River							2.95	10.86	31.20	253.98	1.65	6.06					4.60	16.92
58. Caledon Swartberg							2.59	2.54									2.59	2.54
59. Riviersonderend	0.01	0.08					2.28	18.66	41.56	340.83							43.85	359.58
60. Koo Langeberg							0.98	7.20	69.89	514.86							70.87	522.06
61. Waboomsberg									14.76	41.31							14.76	41.31
62. Witteberg																	0.00	0.00
63. Bredasdorp							0.62	2.08									0.62	2.08
64. Southern Langeberg	0.91	13.67					0.27	4.07	35.61	536.26							36.79	554.00
65. Potberg	50.82	60.67															50.82	60.67
66. Klein Swartberg									30.98	252.13	1.58	12.85					32.55	264.97
67. Rooiberg	13.00	101.09							15.95	124.11							28.95	225.19
68. Groot Swartberg									14.78	170.85							14.78	170.85
69. Outeniqua			0.11	1.80			0.00	0.02									0.11	1.82
70. Kamanassie									39.05	214.68							39.05	214.68
71. Tsitsikamma			0.65	10.61							0.12	1.97					0.78	12.57
72. Kouga																	0.00	0.00
73. Baviaanskloof																	0.00	0.00
74. Cockscomb							0.27	3.89									0.27	3.89
Total	5.35	1575.73	0.04	12.41	0.00	0.00	0.51	149.72	18.81	5544.24	0.14	40.77	0.47	139.84	0.04	12.36	23.24	6851.00
Vygieveld																		
76. Klawer																	0.00	0.00
78. Tanqua	6.19	383.58															6.19	383.57
81. Touws							1.21	17.14	0.40	5.68							1.61	22.82
Total	16.46	383.58	0.00	0.00	0.00	0.00	0.74	17.14	0.24	5.68	0.00	0.00	0.00	0.00	0.00	0.00	17.44	406.39
Strandveld																		
83. Lamberts	0.34	3.26															0.34	3.26
Broken Veld																		

86. Witrantjies									11.34	23.58							11.34	23.58
87. Robertson									2.00	25.58							2.00	25.58
88. Little Karoo	0.57	25.57					0.08	3.35	0.47	20.79	0.00	0.15			0.81	36.12	1.93	85.98
89. Oudtshoorn									0.01	0.13							0.01	0.13
Total	0.35	25.57	0.00	0.00	0.00	0.00	0.05	3.35	0.96	70.08	0.00	0.15	0.00	0.00	0.50	36.12	1.85	135.27
Mesic Succulent Thicket																		
93. Gouritz									0.32	0.58							0.32	0.58
94. Gamtoos							0.06	0.19									0.06	0.19
96. Aloes							7.22	1.89									7.22	1.89
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.39	2.08	0.11	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.50	2.66
Xeric Succulent Thicket																		
97. Spekboom	3.91	95.45	0.00	0.00	0.00	0.00	1.00	24.37	0.55	13.41	0.11	2.59	0.00	0.00	0.00	0.00	5.56	135.81
Afromontane Forest																		
100. Knysna			11.20	232.72	1.62	33.58	0.05	1.05			0.02	0.36					12.88	267.71
101. Swellendam	63.72	11.53															63.72	11.53
Total	0.55	11.53	11.10	232.72	1.60	33.58	0.05	1.05	0.00	0.00	0.02	0.36	0.00	0.00	0.00	0.00	13.32	279.24
Indian Ocean Forest																		
102. Alexandria	0.00	0.00	0.00	0.00	0.00	0.00	1.36	4.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.36	4.87

Appendix 7 Achievement of pattern targets for different reserve design strategies. All analyses include Category 1 and Category 2 reserves as mandatory. Pattern targets achieved using the Minset function in C-Plan (Anon 1999); process targets achieved by design.

Broad Habitat Unit		% of initial achievable target		
Code	Name	Pattern	Process	Pattern and process
	Dune Pioneer			
1	South West	112.5	139.41	157.80
2	South	167.33	165.43	188.11
3	South East	106.84	130.87	170.32
	Fynbos / Thicket Mosaic			
4	Langebaan	100.73	102.64	102.72
5	Cape Flats	100.00	0.00	100.00
6	Agulhas	100.87	148.04	154.68
7	Stilbaai	101.91	157.43	167.74
8	Goukamma	108.36	50.61	108.36
9	St Francis	102.45	0.53	102.34
	Sand Plain Fynbos			
10	Leipoldtville	100.07	63.09	100.15
11	Hopefield	123.28	90.53	131.25
12	Blackheath	100.00	12.33	100.00
13	Springfield	100.74	72.32	113.03
14	Albertinia	102.47	131.2	170.63
	Limestone Fynbos			
15	Hagelkraal	103.04	134.47	140.57
16	De Hoop	100.99	67.51	115.30
17	Canca	103.23	238.92	297.78

	Grassy Fynbos			
18	Genadendal	142.19	91.99	142.19
19	Suurbraak	101.32	47.00	100.22
20	Keurbooms	101.76	96.08	101.76
21	Humansdorp	101.22	22.62	103.08
22	Algoa	100.55	0.01	111.78
	Fynbos / Renosterveld Mosaic			
24	Perdeberg	199.42	95.56	199.42
25	Elgin	100.00	87.95	100.00
26	Breede	102.32	6.30	102.32
27	Elim	100.58	30.99	103.16
28	Blanco	100.39	16.84	100.00
29	Langkloof	100.57	56.57	102.76
30	Kromme	100.66	16.83	104.27
	Coast Renosterveld			
31	Swartland	100.00	15.91	100.00
32	Boland	100.00	46.58	100.00
33	Overberg	100.00	26.59	100.00
34	Riversdale	100.01	45.13	100.61
	Inland Renosterveld			
35	Niewoudtville	101.50	0.00	101.50
36	Kouebokkeveld	100.42	130.06	130.06
37	Waveren-Bokkeveld	104.33	87.93	104.33
38	Ashton	100.89	74.36	102.99
39	Matjies	115.84	381.75	381.75
41	Montagu	101.92	57.31	107.53
42	Cannaland	100.64	120.87	120.87
43	Kango	100.95	222.19	222.19
44	Uniondale	102.33	131.89	135.13
	Mountain Complex			
45	Bokkeveld	101.84	62.21	111.03
46	Gifberg	100.67	183.48	186.13
47	Cederberg	321.00	339.8	339.80
48	Olifants River	100.07	100.34	112.73
49	Swartruggens	234.59	304.00	304.00

50	Piketberg	104.48	0.00	112.63
51	Groot Winterhoek	332.55	332.55	332.55
52	Matroosberg	329.57	328.25	330.93
53	Hawequas	218.39	207.61	218.39
54	Franschhoek	198.88	165.05	198.88
55	Cape Peninsula	136.84	131.04	136.81
56	Kogelberg	183.37	146.46	183.37
57	Klein River	118.18	13.91	124.39
58	Caledon Swartberg	148.06	0.00	148.06
59	Riviersonderend	269.56	256.56	277.02
60	Koo Langeberg	701.69	789.4	789.40
61	Waboomsberg	104.71	22.16	127.24
62	Witteberg	103.52	220.31	220.31
63	Bredasdorp	102.19	5.93	101.13
64	Southern Langeberg	656.83	719.3	731.54
65	Potberg	172.89	163.43	172.89
66	Klein Swartberg	472.04	500.25	500.25
67	Rooiberg	577.86	909.75	909.75
68	Groot Swartberg	609.94	882.94	882.94
69	Outeniqua	102.81	159.83	160.63
70	Kamanassie	842.46	873.97	873.97
71	Tsitsikamma	225.69	446.79	495.72
72	Kouga	632.09	698.16	722.01
73	Baviaanskloof	500.54	956.16	956.16
74	Cockscomb	281.10	493.26	512.09
	Vygieveld			
76	Klawer	100.87	28.03	104.86
78	Tanqua	100.34	255.00	255.00
81	Touws	104.71	56.43	110.92
	Strandveld			
83	Lamberts Bay	100.48	279.07	281.10
	Broken Veld			
86	Witrantjies	107.84	197.51	197.65
87	Robertson	105.25	48.79	103.17
88	Little Karoo	100.21	286.42	286.42

89	Oudtshoorn	100.01	293.45	293.45
	Mesic Succulent Thicket			
93	Gouritz	107.60	168.17	169.27
94	Gamtoos	124.23	119.60	139.15
96	Aloes	104.47	104.47	104.47
	Xeric Succulent Thicket			
97	Spekboom	101.47	572.41	572.41
	Afromontane Forest			
100	Knysna	100.21	66.17	102.38
101	Swellendam	198.23	192.25	198.23
	Indian Ocean Forest			
102	Alexandria	100.59	54.39	110.93

Appendix 8 Stages in planning for process. Shown is the rationale for choice of planning units and number of units selected. See Table 4 for method of identification and targets for the spatial components dealt with at each planning stage.

When options were available for achieving process targets, planning units with the highest site irreplaceability values were chosen.

Stage 1: Juxtaposed Edaphically Different Habitats

1. West Coast
Planning units that are not heavily fragmented (agriculture, urbanisation and dense aliens) and comprise substantive contact between Langebaan BHU (limestone alkaline) and Hopefield and Blackheath BHUs (acidic).
Note: 11 planning units are mandatory (Category 1 and Category 2) reserves; 13 additional planning units were selected.

2. Agulhas Plain
Planning units that are not heavily fragmented (agriculture, urbanisation and dense aliens) and comprise substantive contact between Hagelkraal BHU (limestone alkaline), and Springfield and Elim BHUs (acidic).
Note: 1 planning unit is a mandatory reserve; 14 additional planning units were selected.

3. De Hoop
Planning units that are not heavily fragmented (agriculture, urbanisation and dense aliens) and comprise substantive contact between De Hoop BHU (limestone alkaline) and Potberg BHUs (acidic).
Note: 5l planning units are mandatory reserves; 0 additional planning units were selected.

4. Riversdale Plain
Planning units that are not heavily fragmented (agriculture, urbanisation and dense aliens) and comprise contact between Canca BHU (alkaline) and Albertinia BHU (acidic).
Note: No planning units are mandatory reserves; 3 planning units were selected.

Stage 2: Entire Sand Movement Corridors

Only those dune fields were chosen where sediment – source and – sink dynamics could be maintained. Dune fields covered in dense alien plants and where the sediment sink (or downwind) zone was not available for conservation management, were rejected.

1.South West Coast
Walker Bay dune field selected.
Note: 2 planning units are mandatory reserves; 2 additional planning units were selected.

2.South Coast
De Hoop dune field and a second dune field chosen on Stilbaai coast were selected.
Note: 3 planning units are mandatory reserves; 6 additional planning units were selected.

3. South East Coast
Gamtoos dune field selected.
Note: No mandatory reserves; 5 planning units were selected.

Stage 3: Whole Riverine Corridors

1. Olifants - Doring System
Olifants rejected owing to agricultural transformation; Doring selected.
Note: 1 planning unit is a mandatory reserve; 40 additional planning units were selected.

2. Berg System
Unavailable owing to transformation by agriculture and urbanisation.

3. Breede River
Only lower reaches (below the junction with the Riviersonderend River) available owing to agricultural transformation.
Note: 11 planning units are mandatory reserves; 7 additional planning units were selected.

4. Gouritz - Gamka - Olifants System
Olifants unavailable owing to agricultural transformation. Entire Gouritz - Gamka System available.
Note: 4 planning units are mandatory reserves; 34 additional planning units were selected.
This System also links coastal plain to Great Karoo (see Upland-Lowland Gradients below).

5. Gamtoos - Baviaanskloof - Groot System
Lower reaches of Gamtoos unavailable owing to agricultural transformation. Baviaanskloof and Groot Rivers available.
Note: 11 planning units are mandatory reserves; 29 additional planning units were selected.

Stage 4: Upland Lowland Gradients

1. Strong Winter Climate Zone
Transformation by agriculture is a constraint on the coastal plain; uplands largely conserved already; potential to extend eastwards to the Tanqua Karoo National Park. Geographical considerations enabled combining all gradients in one transect.
Note: 8 planning units are mandatory reserves; 15 additional planning units were selected.

2. Moderate Winter Climate Zone
Owing to geographic considerations (i.e. absence of suitable gradients within this climatic zone) and extensive transformation of the coastal lowlands, this transect is not feasible.

3. Non-Seasonal Climate Zone
The Gouritz – Gamka System (see Whole Riverine Corridors above) provides the necessary units for all environment combinations.

4. Non-Seasonal - Equinoctial Climate Zone
All environment combinations included in one transect; shortest route via Storm's River and Langkloof to Baviaanskloof and Springbokvlakte.
Note: 4 planning units are mandatory reserves; 7 additional planning units were selected.

Stage 5: Macroclimatic Gradients

1. Western CFR (North - South)
Lowlands
Only feasible in extreme north and south (see Juxtaposed Edaphically Different Habitats above) and along the coastal margin; remaining area extensively transformed.
Note: no planning units are mandatory reserves; 18 additional planning units were selected.

Mountains
Well covered by existing reserves (see note below); crucial linkages in Doring River Valley, Gouda and Sir Lowry's Pass areas have been added.
Note: 41 planning units are mandatory reserves; 17 additional planning units were selected.

2. Southern and Eastern CFR
Lowlands
Suitable habitat is confined to the area between Stanford and Gouritzmond on the coastal margin; other areas have been transformed by agriculture and urbanisation.
Note: 16 planning units are mandatory reserves; 42 additional planning units were selected.

Coastal Mountains
Selected minimum number of units in montane habitats to link existing reserves and create an unbroken conservation system; includes the Hawequas - Riviersonderend gradient and the Matroosberg - Tsitsikamma gradient.
Note: 44 planning units are mandatory reserves; 45 additional planning units were selected.

Inland Mountains
Selected minimum number of units in montane habitats to link existing reserves and create an unbroken conservation system; comprises the Matroosberg - Cockscomb gradient.
Note: 40 planning units are mandatory reserves; 64 additional planning units were selected.

Interior Basin
Planning units selected to maximise representation of and transitions between Little Karoo BHU's, as well as to link up with existing reserves.
Note: 7 planning units are mandatory reserves; 65 additional planning units were selected.

Stage 6: Megawilderness Areas

1. Northwest (Cederberg)
Area larger than 500 000ha and encompassing a biome transition (Fynbos-Succulent Karoo) as well as riverine corridor (Doring).
Note: 85 planning units are mandatory reserves; 59 additional planning units were selected

2. Southeast (Baviaanskloof)
Area larger than ca 400 000ha and encompassing biome transitions (Fynbos-Nama Karoo-Thicket) as well as
riverine corridor (Baviaanskloof).
Note: 42 planning units are mandatory reserves; 61 additional planning units were selected.

3. South (Little Karoo)
Area larger than 500 000ha and encompassing biome transitions (Fynbos-Nama Karoo-Thicket-Succulent Karoo) as well as riverine corridor (Gouritz).
Note: 52 planning units are mandatory reserves; 71 additional planning units were selected.

Stage 7: Transitions between primary BHU's and biomes

A "mopping up" exercise to select planning units of high irreplaceability that are adjacent to existing mandatory reserves and/or units selected for process targets, and that also encompass sufficient untransformed habitat of transitions between primary BHU's and/or biomes.
Note: by definition planning units are mandatory reserves; 56 planning units were selected.

Figures for GEF report:

Figure #	Description	Filename (apr)	Status	Appendices	Status
1	Planning domain	gefrepfigg1_8			
2	Planning units	gefrepfigg1_8			
3	BHU's	gefrepfig1_8			
4	Trashed	gefrepfigg1_8			
5	Agric. Threats	gefrepfigg1_8			
6	Urbanisation Threats	gefrepfigg1_8			
7	Alien Threats	gefrepfig_8			
8	Reserves (cat.1 & 2)	gefrepfig1_8			
9	Graph				
10	Irreplaceability with NO reserves	gefrepfig10			
11	Irreplaceability with CAT. 1 reserves	gefrepfig11			
12	Irreplaceability with CAT. 1 & 2 reserves	gefrepfig12			
13	Min. set for pattern	gefrepfig13			
14	Stage 1 for processes:. Jux. Edaphically Diff. Habitats (4 substages)			Features to targets Appendix 8	
15	Stage 2 for processes:. Entire Sand Movement Corridors (3 substages)			Features to targets Appendix 8	
16	Stage 3 for processes:. Whole Riverine corridors (5 substages)			Features to targets Appendix 8	
17	Stage 4 for processes: Upland Lowland Gradients (4 substages)			Features to targets Appendix 8	
18	Stage 5 for processes:. Mesoclimatic Gradients (2 substages)			Features to targets Appendix 8	
19	Stage 6 for process6. Megawilderness Areas (3 stages) plus gradient "mopping up"			Features to targets Appendix 8	
20	Stage 7 Mopping up				
21	Min. set for pattern & process	Gefrepfig20			
22	Planning detail: – Cedarberg Megawilderness Areas Mega				
23	Planning detail: – Little Karoo				

	Megawilderness Area				
24	Planning detail: – Baviaanskloof Megawilderness Area				
25	Planning detail: – West coast renosterveld				
26	Planning detail: – Agulhas Plain				
27	Planning detail: – Garden Route				
28	IV maps – agriculture				
29	IV maps – urbanisation				
30	IV maps - - aliens				