Evaluating the adequacy of reserves in the Tembe–Tshanini Complex: a case study in Maputaland, South Africa

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Appendix 1.1 Steps 2–7 (Fig. 1) for determining the minimum viable conservation area for Sand Forest using the method adapted from Burgman et al. (2001) for the complete grid of 42 square disturbance regions (Fig. 2) in the Tembe Elephant Park and–Tshanini Conservation Area complex, northern Maputaland, KwaZulu-Natal province, South Africa.

Grid square	Grid square area (ha)	% potential habitat	Area of potential habitat (ha)	Step 2, Disturbance level	Step 3, Potential Sand Forest per square (P_{hS})		Step 4, Potential habitat surveyed (Hi)	Step 5, Density of adult trees per ha (D)		*Adjusted F*		Step 6, A_0 = *Adjusted F/D*		% of land that remains in 50 years after annual disturbance		Step 7, $A_1 = A_0 / S$	
					(%)	(ha)		*C. schlechteri*	*N. hildebrandtii*	*C. schlechteri*	*N. hildebrandtii*	*C. schlechteri* (ha)	*N. hildebrandtii* (ha)	Disturbed (Sd)	Remaining (S)	*C. schlechteri* (ha)	*N. hildebrandtii* (ha)
A1	3,600	100	3,600	Sustainable	43	1,548	33,600	94.5	34.2	678	260	7.17	7.60	8	92	7.80	8.26
A2	3,600	100	3,600	Sustainable	43	1,548	33,600	94.5	34.2	678	260	7.17	7.60	8	92	7.80	8.26
A3	3,600	100	3,600	Sustainable	43	1,548	33,600	94.5	34.2	678	260	7.17	7.60	8	92	7.80	8.26
A4	3,600	100	3,600	Heavy	43	1,548	33,600	94.5	34.2	678	260	7.17	7.60	8	92	7.80	8.26
A5	3,600	100	3,600	Heavy	43	1,548	33,600	94.5	34.2	678	260	7.17	7.60	18	82	8.75	9.27
A6	3,600	100	3,600	Sustainable	43	1,548	33,600	94.5	34.2	678	260	7.17	7.60	5	95	7.55	8.00
A7	3,600	100	3,600	Sustainable	43	1,548	33,600	94.5	34.2	678	260	7.17	7.60	5	95	7.55	8.00
B1	3,600	100	3,600	Light	43	1,548	33,600	101.0	35.0	678	260	6.71	7.43	9	91	7.38	8.16
B2	3,600	100	3,600	Light	43	1,548	33,600	101.0	35.0	678	260	6.71	7.43	9	91	7.38	8.16
B3	3,600	100	3,600	Light	43	1,548	33,600	101.0	35.0	678	260	6.71	7.43	9	91	7.38	8.16
B4	3,600	100	3,600	Heavy	43	1,548	33,600	101.0	35.0	678	260	6.71	7.43	14	86	7.81	8.64
B5	3,600	100	3,600	Heavy	43	1,548	33,600	101.0	35.0	678	260	6.71	7.43	25	75	8.95	9.90
B6	3,600	100	3,600	Sustainable	43	1,548	33,600	133.0	80.0	678	260	5.10	3.25	6	94	5.42	3.46
B7	3,600	100	3,600	Sustainable	43	1,548	33,600	94.5	34.2	678	260	7.17	7.60	6	94	7.63	8.09
C1	3,600	100	3,600	Sustainable	43	1,548	33,600	101.0	35.0	678	260	6.71	7.43	6	94	7.14	7.90
C2	3,600	100	3,600	Sustainable	43	1,548	33,600	101.0	35.0	678	260	6.71	7.43	6	94	7.14	7.90
C3	3,600	100	3,600	Sustainable	15	540	33,600	101.0	35.0	678	260	6.71	7.43	6	94	7.14	7.90
C4	3,600	75	2,700	Sustainable	15	405	33,600	101.0	35.0	678	260	6.71	7.43	6	94	7.14	7.90
C5	3,600	50	1,800	Heavy	43	774	33,600	101.0	35.0	678	260	6.71	7.43	35	65	10.33	11.43
C6	3,600	75	2,700	Heavy	43	1161	33,600	94.5	34.2	678	260	7.17	7.60	35	65	11.04	11.70
C7	3,600	75	2,700	Heavy	43	1161	33,600	94.5	34.2	678	260	7.17	7.60	25	75	9.57	10.14
D1	3,600	100	3,600	Sustainable	43	1,548	33,600	101.0	35.0	678	260	6.71	7.43	6	94	7.14	7.90
D2	3,600	60	2,160	Sustainable	15	324	33,600	101.0	35.0	678	260	6.71	7.43	6	94	7.14	7.90
D3	3,600	40	1440	Sustainable	15	216	33,600	101.0	35.0	678	260	6.71	7.43	6	94	7.14	7.90
D4	3,600	60	2,160	Light	15	324	33,600	101.0	35.0	678	260	6.71	7.43	10	90	7.46	8.25
D5	3,600	60	2,160	Heavy	15	324	33,600	94.5	34.2	678	260	7.17	7.60	58	42	17.08	18.10
D6	3,600	50	1,800	Light	43	774	33,600	94.5	34.2	678	260	7.17	7.60	15	85	8.44	8.94

Appendix 1.1 (Continued)

Grid square	Grid square area (ha)	% potential habitat	Area of potential habitat (ha)	Step 2, Disturbance level	Step 3, Potential Sand Forest per square (P_{hS})		Step 4, Potential habitat surveyed (*Hi*)	Step 5, Density of adult trees per ha (*D*)		*Adjusted F*		Step 6, A_0 = *Adjusted F/D*		% of land that remains in 50 years after annual disturbance		Step 7, $A_1 = A_0 / S$	
					(%)	(ha)		*C. schlechteri*	*N. hildebrandtii*	*C. schlechteri*	*N. hildebrandtii*	*C. schlechteri* (ha)	*N. hildebrandtii* (ha)	Disturbed (*Sd*)	Remaining (*S*)	*C. schlechteri* (ha)	*N. hildebrandtii* (ha)
D7	3,600	50	1,800	Light	15	270	33,600	94.5	34.2	678	260	7.17	7.60	9	91	7.88	8.35
E1	3,600	50	1,800	Sustainable	15	270	33,600	101.0	35.0	678	260	6.71	7.43	9	91	7.38	8.16
E2	3,600	30	1,080	Sustainable	15	162	33,600	101.0	35.0	678	260	6.71	7.43	6	94	7.14	7.90
E3	3,600	50	1,800	Light	15	270	33,600	101.0	35.0	678	260	6.71	7.43	10	90	7.46	8.25
E4	3,600	30	1,080	Light	15	162	33,600	94.5	34.2	678	260	7.17	7.60	10	90	7.97	8.45
E5	3,600	0	0	Light	0	0	33,600	94.5	34.2	678	260	7.17	7.60	10	90	7.97	8.45
E6	3,600	0	0	Heavy	0	0	33,600	94.5	34.2	678	260	7.17	7.60	20	80	8.97	9.50
E7	3,600	30	1,080	Light	20	216	33,600	94.5	34.2	678	260	7.17	7.60	10	90	7.97	8.45
F1	3,600	30	1,080	Light	20	216	33,600	101.0	35.0	678	260	6.71	7.43	10	90	7.46	8.25
F2	3,600	30	1,080	Light	20	216	33,600	101.0	35.0	678	260	6.71	7.43	10	90	7.46	8.25
F3	3,600	50	1,800	Light	20	360	33,600	94.5	34.2	678	260	7.17	7.60	10	90	7.97	8.45
F4	3,600	60	2,160	Light	15	324	33,600	94.5	34.2	678	260	7.17	7.60	10	90	7.97	8.45
F5	3,600	60	2,160	Light	15	324	33,600	94.5	34.2	678	260	7.17	7.60	10	90	7.97	8.45
F6	3,600	70	2,520	Heavy	15	378	33,600	94.5	34.2	678	260	7.17	7.60	20	80	8.97	9.50
F7	3,600	50	1,800	Light	15	270	33,600	94.5	34.2	678	260	7.17	7.60	10	90	7.97	8.45

Appendix 1.2 Steps 8–12 (Fig. 1) for determining the minimum viable conservation area for Sand Forest using the method adapted from Burgman et al. (2001) for the complete grid of 42 square disturbance regions (Fig. 2) in the Tembe Elephant Park-and-Tshanini Conservation Area complex, northern Maputaland, KwaZulu-Natal province, South Africa.

	% of expected total habitat loss in 50 yrs		Step 8, $A_2 = A_1 / (1- ci)$		% of remaining habitat after density-reducing processes				Step 9, $A_3 = A_2 / ri$			Conservation value of the disturbance region per species			Step 12, Ratio of available to required habitat $I_h = P_{hS} / A_3$	
Grid square	Loss (*ci*)	Remaining (1 - *ci*)	*C. schlechteri* (ha)	*N. hildebrandtii* (ha)	Grazing (*G*)	Building (*B*)	Weather (*W*)	Product of the density-reducing processes (G x B x $W = ri$, %)	*C. schlechteri* (ha)	*N. hildebrandtii* (ha)	Step 10, Catastrophic disturbance expected	*C. schlechteri*	*N. hildebrandtii*	Step 11	*C. schlechteri*	*N. hildebrandtii*
A1	60	40	19.5	20.7	92	90	90	74.52	26.16	27.72	None	High	High	Not applicable	59.17	55.84
A2	30	70	11.1	11.8	92	90	90	74.52	14.95	15.84	None	High	High	Not applicable	103.55	97.72
A3	25	75	10.4	11.0	92	90	90	74.52	13.95	14.79	None	Medium	Medium	Not applicable	110.94	104.70
A4	90	10	78.0	82.6	92	75	90	62.10	125.58	133.07	None	Low	Low	Not applicable	12.33	11.63
A5	45	55	15.9	16.9	92	75	90	62.10	25.62	27.14	None	Low	Low	Not applicable	60.43	57.03
A6	20	80	9.4	10.0	92	85	90	70.38	13.41	14.21	None	High	High	Not applicable	115.41	108.91
A7	25	75	10.1	10.7	92	90	90	74.52	13.51	14.32	None	High	High	Not applicable	114.56	108.11
B1	50	50	14.8	16.3	88	85	90	67.32	21.92	24.25	None	High	High	Not applicable	70.63	63.83
B2	35	65	11.3	12.6	84	85	90	64.26	17.66	19.54	None	High	High	Not applicable	87.65	79.21
B3	30	70	10.5	11.7	84	85	90	64.26	16.40	18.15	None	High	High	Not applicable	94.39	85.30
B4	25	75	10.4	11.5	84	80	90	60.48	17.21	19.04	None	High	High	Not applicable	89.96	81.29
B5	75	25	35.8	39.6	90	60	90	48.60	73.67	81.52	None	Low	Low	Not applicable	21.01	18.99
B6	6	94	5.8	3.7	92	90	90	74.52	7.74	4.94	None	High	High	Not applicable	199.95	313.63
B7	9	91	8.4	8.9	92	90	90	74.52	11.26	11.93	None	High	High	Not applicable	137.54	129.80
C1	20	80	8.9	9.9	84	90	90	68.04	13.12	14.52	None	High	High	Not applicable	117.99	106.62
C2	6	94	7.6	8.4	84	90	90	68.04	11.17	12.36	None	High	High	Not applicable	138.64	125.28
C3	6	94	7.6	8.4	84	90	90	68.04	11.17	12.36	None	High	High	Not applicable	48.36	43.70
C4	6	94	7.6	8.4	84	90	90	68.04	11.17	12.36	None	High	High	Not applicable	36.27	32.78
C5	75	25	41.3	45.7	88	55	90	43.56	94.83	104.95	None	Low	Low	Not applicable	8.16	7.38
C6	75	25	44.2	46.8	90	45	90	36.45	121.13	128.35	None	Low	Low	Not applicable	9.58	9.05
C7	65	35	27.3	29.0	90	55	90	44.55	61.35	65.01	None	Low	Low	Not applicable	18.92	17.86
D1	20	80	8.9	9.9	88	90	90	71.28	12.52	13.86	None	High	High	Not applicable	123.61	111.70
D2	6	94	7.6	8.4	84	90	90	68.04	11.17	12.36	None	High	High	Not applicable	29.02	26.22
D3	6	94	7.6	8.4	84	90	90	68.04	11.17	12.36	None	High	High	Not applicable	19.34	17.48
D4	25	75	9.9	11.0	84	85	90	64.26	15.48	17.13	None	High	High	Not applicable	20.94	18.92
D5	95	5	341.6	362.0	89	25	90	20.03	1706.11	1807.82	None	Low	Low	Not applicable	0.19	0.18
D6	40	60	14.1	14.9	89	65	90	52.07	27.02	28.63	None	Low	Low	Not applicable	28.65	27.03
D7	6	94	8.4	8.9	89	85	90	68.09	12.32	13.05	None	Medium	Medium	Not applicable	21.92	20.68
E1	20	80	9.2	10.2	88	90	90	71.28	12.94	14.32	None	High	High	Not applicable	20.87	18.86
E2	9	91	7.8	8.7	86	90	90	69.66	11.27	12.47	None	High	High	Not applicable	14.38	12.99
E3	60	40	18.6	20.6	86	85	90	65.79	28.34	31.36	None	High	High	Not applicable	9.53	8.61
E4	65	35	22.8	24.1	90	80	90	64.80	35.15	37.24	None	Low	Low	Not applicable	4.61	4.35
E5	70	30	26.6	28.2	89	65	90	52.07	51.04	54.08	None	Low	Low	Not applicable	0.00	0.00
E6	70	30	29.9	31.7	89	65	90	52.07	57.42	60.84	None	Low	Low	Not applicable	0.00	0.00
E7	12	88	9.1	9.6	90	85	90	68.85	13.16	13.94	None	Medium	Medium	Not applicable	16.42	15.49
F1	40	60	12.4	13.8	88	85	90	67.32	18.47	20.43	None	High	High	Not applicable	11.70	10.57
F2	90	10	74.6	82.5	84	65	90	49.14	151.79	167.97	None	High	High	Not applicable	1.42	1.29

Appendix 1.2 (Continued)

Grid square	% of expected total habitat loss in 50 yrs		Step 8, $A_2 = A_1 / (1- ci)$		% of remaining habitat after density-reducing processes			Product of the density-reducing processes (G x B x $W = ri$, %)	Step 9, $A_3 = A_2 / ri$		Step 10, Catastrophic disturbance expected	Conservation value of the disturbance region per species		Step 11	Step 12, Ratio of available to required habitat $I_h = P_{hS} / A_3$	
	Loss (ci)	Remaining ($1 - ci$)	*C. schlechteri* (ha)	*N. hildebrandtii* (ha)	Grazing (G)	Building (B)	Weather (W)		*C. schlechteri* (ha)	*N. hildebrandtii* (ha)		*C. schlechteri*	*N. hildebrandtii*		*C. schlechteri*	*N. hildebrandtii*
F3	60	40	19.9	21.1	85	70	90	53.55	37.22	39.44	None	Medium	Medium	Not applicable	9.67	9.13
F5	20	80	10.0	10.6	85	85	90	65.03	15.32	16.24	None	Low	Low	Not applicable	21.14	19.95
F6	90	10	89.7	95.0	85	55	90	42.08	213.15	225.86	None	Low	Low	Not applicable	1.77	1.67
F7	20	80	10.0	10.6	85	85	90	65.03	15.32	16.24	None	Low	Low	Not applicable	17.62	16.63

Appendix 2.1 Steps 2–4 (Fig. 1) for determining the minimum viable conservation area for woodlands using the method adapted from Burgman et al. (2001) for the complete grid of 42 square disturbance regions (Fig. 2) in the Tembe Elephant Park–Tshanini Conservation Area complex, northern Maputaland, KwaZulu-Natal province, South Africa.

Grid square	Grid square area (ha)	% potential habitat	Area of potential habitat (ha)	Step 2, Disturbance level	Step 3, Potential woodland per square (P_{hS})		Repartition of woodland habitat			Step 4, Potential habitat surveyed (*Hi*)
					(%)	(ha)	Closed, 34% (ha)	Open, 20% (ha)	Sparse, 46% (ha)	
A1	3,600	100	3,600	Sustainable	57	2,052	697.68	410.40	943.92	33,600
A2	3,600	100	3,600	Sustainable	57	2,052	697.68	410.40	943.92	33,600
A3	3,600	100	3,600	Sustainable	57	2,052	697.68	410.40	943.92	33,600
A4	3,600	100	3,600	Heavy	57	2,052	697.68	410.40	943.92	33,600
A5	3,600	100	3,600	Heavy	57	2,052	697.68	410.40	943.92	33,600
A6	3,600	100	3,600	Sustainable	57	2,052	697.68	410.40	943.92	33,600
A7	3,600	100	3,600	Sustainable	57	2,052	697.68	410.40	943.92	33,600
B1	3,600	100	3,600	Light	57	2,052	697.68	410.40	943.92	33,600
B2	3,600	100	3,600	Light	57	2,052	697.68	410.40	943.92	33,600
B3	3,600	100	3,600	Light	57	2,052	697.68	410.40	943.92	33,600
B4	3,600	100	3,600	Heavy	57	2,052	697.68	410.40	943.92	33,600
B5	3,600	100	3,600	Heavy	57	2,052	697.68	410.40	943.92	33,600
B6	3,600	100	3,600	Sustainable	57	2,052	697.68	410.40	943.92	33,600
B7	3,600	100	3,600	Sustainable	57	2,052	697.68	410.40	943.92	33,600
C1	3,600	100	3,600	Sustainable	57	2,052	697.68	410.40	943.92	33,600
C2	3,600	100	3,600	Sustainable	57	2,052	697.68	410.40	943.92	33,600
C3	3,600	100	3,600	Sustainable	85	3,060	1,040.40	612.00	1,407.60	33,600
C4	3,600	75	2,700	Sustainable	85	2,295	780.30	459.00	1,055.70	33,600
C5	3,600	50	1,800	Heavy	57	1,026	348.84	205.20	471.96	33,600
C6	3,600	75	2,700	Heavy	57	1,539	523.26	307.80	707.94	33,600
C7	3,600	75	2,700	Heavy	57	1,539	523.26	307.80	707.94	33,600
D1	3,600	100	3,600	Sustainable	57	2,052	697.68	410.40	943.92	33,600
D2	3,600	60	2,160	Sustainable	85	1,836	624.24	367.20	844.56	33,600
D3	3,600	40	1,440	Sustainable	85	1,224	416.16	244.80	563.04	33,600
D4	3,600	60	2,160	Light	85	1,836	624.24	367.20	844.56	33,600
D5	3,600	60	2,160	Heavy	50	1,080	367.20	216.00	496.80	33,600
D6	3,600	50	1,800	Light	57	1,026	348.84	205.20	471.96	33,600
D7	3,600	50	1,800	Light	57	1,026	348.84	205.20	471.96	33,600
E1	3,600	50	1,800	Sustainable	75	1,350	459.00	270.00	621.00	33,600
E2	3,600	30	1,080	Sustainable	75	810	275.40	162.00	372.60	33,600
E3	3,600	50	1,800	Light	50	900	306.00	180.00	414.00	33,600
E4	3,600	30	1,080	Light	50	540	183.60	108.00	248.40	33,600
E5	3,600	20	720	Light	50	360	122.40	72.00	165.60	33,600
E6	3,600	20	720	Heavy	50	360	122.40	72.00	165.60	33,600
E7	3,600	30	1,080	Light	50	540	183.60	108.00	248.40	33,600
F1	3,600	30	1,080	Light	60	648	220.32	129.60	298.08	33,600
F2	3,600	30	1,080	Light	40	432	146.88	86.40	198.72	33,600
F3	3,600	50	1,800	Light	40	720	244.80	144.00	331.20	33,600
F4	3,600	60	2,160	Light	40	864	293.76	172.80	397.44	33,600
F5	3,600	60	2,160	Light	40	864	293.76	172.80	397.44	33,600
F6	3,600	70	2,520	Heavy	60	1,512	514.08	302.40	695.52	33,600
F7	3,600	50	1,800	Light	40	720	244.80	144.00	331.20	33,600

Appendix 2.2 Steps 5–6 (Fig. 1) for determining the minimum viable conservation area for woodlands using the method adapted from Burgman et al. (2001) for the complete grid of 42 square disturbance regions (Fig. 2) in the Tembe Elephant Park–Tshanini Conservation Area complex, northern Maputaland, KwaZulu-Natal province, South Africa.

Grid square	Step 5, Density of adult trees per ha (*D*)					*Adjusted F*		Step 6, A_0 = *Adjusted F / D*					% of land that remains in 50 years after annual disturbance	
	H. ulmoides			*S. birrea*				*H. ulmoides*			*S. birrea*			
	Closed	Open	Sparse	Closed	Open	*H. ulmoides*	*S. birrea*	Closed (ha)	Open (ha)	Sparse (ha)	Closed (ha)	Open (ha)	Disturbed (*Sd*)	Remaining (*S*)
A1	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	8	92
A2	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	8	92
A3	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	8	92
A4	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	8	92
A5	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	18	82
A6	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	5	95
A7	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	5	95
B1	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	9	91
B2	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	9	91
B3	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	9	91
B4	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	14	86
B5	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	25	75
B6	125	411	64	75	26	1,218	471	9.7	3.0	19.0	6.3	18.1	6	94
B7	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	6	94
C1	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	6	94
C2	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	6	94
C3	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	6	94
C4	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	6	94
C5	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	35	65
C6	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	35	65
C7	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	25	75
D1	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	6	94
D2	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	6	94
D3	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	6	94
D4	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	10	90
D5	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	58	42
D6	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	15	85
D7	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	9	91
E1	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	9	91
E2	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	6	94
E3	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	10	90
E4	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	10	90
E5	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	10	90
E6	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	20	80
E7	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	10	90

Appendix 2.2 (Continued)

Grid square	Step 5, Density of adult trees per ha (*D*)					*Adjusted F*		Step 6, A_0 = *Adjusted F / D*					% of land that remains in 50 years after annual disturbance	
	H. ulmoides			*S. birrea*				*H. ulmoides*			*S. birrea*			
	Closed	Open	Sparse	Closed	Open	*H. ulmoides*	*S. birrea*	Closed (ha)	Open (ha)	Sparse (ha)	Closed (ha)	Open (ha)	Disturbed (*Sd*)	Remaining (*S*)
F1	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	10	90
F2	71	13	2	20	22	1,218	471	17.2	93.7	609.0	23.6	21.4	10	90
F3	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	10	90
F4	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	10	90
F5	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	10	90
F6	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	20	80
F7	67	30	5	21	20	1,218	471	18.3	41.0	270.7	22.8	23.8	10	90

Appendix 2.3 Steps 7–8 (Fig. 1) for determining the minimum viable conservation area for woodlands using the method adapted from Burgman et al. (2001) for the complete grid of 42 square disturbance regions (Fig. 2) in the Tembe Elephant Park–Tshanini Conservation Area complex, northern Maputaland, KwaZulu-Natal province, South Africa.

	Step 7, $A_1 = A_0 / S$					% of expected total habitat loss in 50 years		Step 8, $A_2 = A_1 / (1 - ci)$					% of remaining habitat after density-reducing processes		
	H. ulmoides			*S. birrea*				*H. ulmoides*			*S. birrea*				
Grid square	Closed (ha)	Open (ha)	Sparse (ha)	Closed (ha)	Open (ha)	Loss (*ci*)	Remaining (1 - *ci*)	Closed (ha)	Open (ha)	Sparse (ha)	Closed (ha)	Open (ha	Grazing (*G*)	Building (*B*)	Weather (*W*)
A1	19.9	44.6	294.2	24.7	25.9	60	40	49.7	111.4	735.5	61.8	64.6	92	90	90
A2	19.9	44.6	294.2	24.7	25.9	30	70	28.4	63.7	420.3	35.3	36.9	92	90	90
A3	19.9	44.6	294.2	24.7	25.9	25	75	26.5	59.4	392.3	33.0	34.5	92	90	90
A4	19.9	44.6	294.2	24.7	25.9	90	10	198.8	445.8	2,942.0	247.3	258.6	92	75	90
A5	22.3	50.0	330.1	27.7	29.0	45	55	40.6	90.9	600.1	50.5	52.7	92	75	90
A6	19.3	43.2	284.9	24.0	25.0	20	80	24.1	54.0	356.1	29.9	31.3	92	85	90
A7	19.3	43.2	284.9	24.0	25.0	25	75	25.7	57.6	379.9	31.9	33.4	92	90	90
B1	18.9	103.0	669.2	25.9	23.5	50	50	37.7	205.9	1,338.5	51.8	47.1	88	85	90
B2	18.9	103.0	669.2	25.9	23.5	35	65	29.0	158.4	1,029.6	39.8	36.2	84	85	90
B3	18.9	103.0	669.2	25.9	23.5	30	70	26.9	147.1	956.0	37.0	33.6	84	85	90
B4	19.9	108.9	708.1	27.4	24.9	25	75	26.6	145.3	944.2	36.5	33.2	84	80	90
B5	22.9	124.9	812.0	31.4	28.5	75	25	91.5	499.7	3,248.0	125.6	114.2	90	60	90
B6	10.4	3.2	20.2	6.7	19.3	6	94	11.0	3.4	21.5	7.1	20.5	92	90	90
B7	19.5	43.6	287.9	24.2	25.3	9	91	21.4	47.9	316.4	26.6	27.8	92	90	90
C1	18.2	99.7	647.9	25.1	22.8	20	80	22.8	124.6	809.8	31.3	28.5	84	90	90
C2	18.2	99.7	647.9	25.1	22.8	6	94	19.4	106.0	689.2	26.7	24.2	84	90	90
C3	18.2	99.7	647.9	25.1	22.8	6	94	19.4	106.0	689.2	26.7	24.2	84	90	90
C4	18.2	99.7	647.9	25.1	22.8	6	94	19.4	106.0	689.2	26.7	24.2	84	90	90
C5	26.4	144.1	936.9	36.2	32.9	75	25	105.6	576.6	3,747.7	144.9	131.7	88	55	90
C6	28.1	63.1	416.4	35.0	36.6	75	25	112.5	252.4	1,665.6	140.0	146.4	90	45	90
C7	24.4	54.7	360.9	30.3	31.7	65	35	69.7	156.2	1,031.1	86.7	90.6	90	55	90
D1	18.2	99.7	647.9	25.1	22.8	20	80	22.8	124.6	809.8	31.3	28.5	88	90	90
D2	18.2	99.7	647.9	25.1	22.8	6	94	19.4	106.0	689.2	26.7	24.2	84	90	90
D3	18.2	99.7	647.9	25.1	22.8	6	94	19.4	106.0	689.2	26.7	24.2	84	90	90
D4	19.1	104.1	676.7	26.2	23.8	25	75	25.4	138.8	902.2	34.9	31.7	84	85	90
D5	43.5	97.6	644.4	54.2	56.6	95	5	870.9	1,952.9	12,888.9	1,083.5	1,132.8	89	25	90
D6	21.5	48.2	318.4	26.8	28.0	40	60	35.9	80.4	530.7	44.6	46.6	89	65	90
D7	20.1	45.1	297.4	25.0	26.1	6	94	21.4	47.9	316.4	26.6	27.8	89	85	90
E1	18.9	103.0	669.2	25.9	23.5	20	80	23.6	128.7	836.5	32.3	29.4	88	90	90
E2	18.2	99.7	647.9	25.1	22.8	9	91	20.1	109.5	711.9	27.5	25.0	86	90	90
E3	19.1	104.1	676.7	26.2	23.8	60	40	47.7	260.3	1,691.7	65.4	59.5	86	85	90
E4	20.3	45.6	300.7	25.3	26.4	65	35	58.1	130.2	859.3	72.2	75.5	90	80	90
E5	20.3	45.6	300.7	25.3	26.4	70	30	67.7	151.9	1,002.5	84.3	88.1	89	65	90
E6	22.9	51.3	338.3	28.4	29.7	70	30	76.2	170.9	1,127.8	94.8	99.1	89	65	90
E7	20.3	45.6	300.7	25.3	26.4	12	88	23.1	51.8	341.8	28.7	30.0	90	85	90
F1	19.1	104.1	676.7	26.2	23.8	40	60	31.8	173.5	1,127.8	43.6	39.6	88	85	90
F2	19.1	104.1	676.7	26.2	23.8	90	10	190.6	1,041.0	6,766.7	261.7	237.9	84	65	90
F3	20.3	45.6	300.7	25.3	26.4	60	40	50.8	113.9	751.9	63.2	66.1	85	70	90
F4	20.3	45.6	300.7	25.3	26.4	15	85	23.9	53.6	353.8	29.7	31.1	85	85	90
F5	20.3	45.6	300.7	25.3	26.4	20	80	25.4	57.0	375.9	31.6	33.0	85	85	90
F6	22.9	51.3	338.3	28.4	29.7	90	10	228.6	512.6	3,383.3	284.4	297.3	85	55	90
F7	20.3	45.6	300.7	25.3	26.4	20	80	25.4	57.0	375.9	31.6	33.0	85	85	90

Appendix 2.4 Steps 9–12 (Fig. 1) for determining the minimum viable conservation area for woodlands using the method adapted from Burgman et al. (2001) for the complete grid of 42 square disturbance regions (Fig. 2) in the Tembe Elephant Park–Tshanini Conservation Area complex, northern Maputaland, KwaZulu-Natal province, South Africa.

Grid square	Product of the density reducing processes (G x B x W = ri, %)	Step 9, $A_3 = A_2 / ri$					Step 10, Catastrophic disturbance expected	Conservation value of the disturbance region per species		Step 11	Step 12, Ratio of available to required habitat, $I_h = P_{hS} / A_3$				
		H. ulmoides			*S. birrea*						*H. ulmoides*			*S. birrea*	
		Closed (ha)	Open (ha)	Sparse (ha)	Closed (ha)	Open (ha)		*H. ulmoides*	*S. birrea*		Closed	Open	Sparse	Closed	Open
A1	75	66.7	149.5	987.0	83.0	86.7	None	High	High	Not applicable	30.8	13.7	2.1	24.7	23.7
A2	75	38.1	85.5	564.0	47.4	49.6	None	High	High	Not applicable	53.8	24.0	3.6	43.3	41.4
A3	75	35.6	79.8	526.4	44.3	46.3	None	Medium	Medium	Not applicable	57.7	25.7	3.9	46.4	44.4
A4	62	320.1	717.8	4,737.6	398.3	416.4	None	Low	Low	Not applicable	6.4	2.9	0.4	5.2	4.9
A5	62	65.3	146.4	966.4	81.2	84.9	None	Low	Low	Not applicable	31.4	14.0	2.1	25.3	24.2
A6	70	34.2	76.7	506.0	42.5	44.5	None	High	High	Not applicable	60.0	26.8	4.1	48.2	46.1
A7	75	34.4	77.2	509.8	42.9	44.8	None	High	High	Not applicable	59.6	26.6	4.0	47.9	45.8
B1	67	56.0	305.9	1,988.2	76.9	69.9	None	High	High	Not applicable	36.6	6.7	1.0	26.7	29.4
B2	64	45.1	246.5	1,602.2	62.0	56.3	None	High	High	Not applicable	45.5	8.3	1.3	33.1	36.4
B3	64	41.9	228.9	1,487.8	57.5	52.3	None	High	High	Not applicable	49.0	9.0	1.4	35.7	39.2
B4	60	44.0	240.2	1,561.2	60.4	54.9	None	High	High	Not applicable	46.7	8.5	1.3	34.0	37.4
B5	49	188.3	1,028.2	6,683.1	258.4	234.9	None	Low	Low	Not applicable	10.9	2.0	0.3	7.9	8.7
B6	75	14.8	4.5	28.9	9.5	27.5	None	High	High	Not applicable	138.7	455.9	71.0	215.2	74.6
B7	75	28.7	64.3	424.6	35.7	37.3	None	High	High	Not applicable	71.5	31.9	4.8	57.5	55.0
C1	68	33.5	183.1	1,190.2	46.0	41.8	None	High	High	Not applicable	61.2	11.2	1.7	44.6	49.0
C2	68	28.5	155.8	1,013.0	39.2	35.6	None	High	High	Not applicable	71.9	13.2	2.0	52.4	57.6
C3	68	28.5	155.8	1,013.0	39.2	35.6	None	High	High	Not applicable	107.2	19.6	3.0	78.1	85.9
C4	68	28.5	155.8	1,013.0	39.2	35.6	None	High	High	Not applicable	80.4	14.7	2.3	58.6	64.4
C5	44	242.4	1,323.6	8,603.5	332.7	302.5	None	Low	Low	Not applicable	4.2	0.8	0.1	3.1	3.4
C6	36	308.8	692.4	4,569.7	384.1	401.6	None	Low	Low	Not applicable	5.0	2.2	0.3	4.0	3.8
C7	45	156.4	350.7	2,314.5	194.6	203.4	None	Low	Low	Not applicable	9.8	4.4	0.7	7.9	7.6
D1	71	32.0	174.8	1,136.1	43.9	39.9	None	High	High	Not applicable	64.1	11.7	1.8	46.7	51.4
D2	68	28.5	155.8	1,013.0	39.2	35.6	None	High	High	Not applicable	64.3	11.8	1.8	46.9	51.6
D3	68	28.5	155.8	1,013.0	39.2	35.6	None	High	High	Not applicable	42.9	7.9	1.2	31.2	34.4
D4	64	39.5	216.0	1,404.0	54.3	49.4	None	High	High	Not applicable	46.4	8.5	1.3	33.8	37.2
D5	20	4,348.9	9,752.1	64,364.0	5,410.8	5,656.7	None	Low	Low	Not applicable	0.2	0.1	0.0	0.2	0.2
D6	52	68.9	154.4	1,019.3	85.7	89.6	None	Low	Low	Not applicable	14.9	6.6	1.0	12.0	11.5
D7	68	31.4	70.4	464.7	39.1	40.8	None	Medium	Medium	Not applicable	32.7	14.6	2.2	26.3	25.1
E1	71	33.1	180.6	1,173.6	45.4	41.3	None	High	High	Not applicable	40.8	7.5	1.2	29.7	32.7
E2	70	28.8	157.2	1,022.0	39.5	35.9	None	High	High	Not applicable	28.1	5.2	0.8	20.5	22.5
E3	66	72.4	395.6	2,571.3	99.4	90.4	None	High	High	Not applicable	12.4	2.3	0.4	9.1	10.0
E4	65	89.6	200.9	1,326.0	111.5	116.5	None	Low	Low	Not applicable	6.0	2.7	0.4	4.8	4.6
E5	52	130.1	291.7	1,925.4	161.9	169.2	None	Low	Low	Not applicable	2.8	1.2	0.2	2.2	2.1
E6	52	146.4	328.2	2,166.1	182.1	190.4	None	Low	Low	Not applicable	2.5	1.1	0.2	2.0	1.9
E7	69	33.5	75.2	496.4	41.7	43.6	None	Medium	Medium	Not applicable	16.1	7.2	1.1	12.9	12.4
F1	67	47.2	257.7	1,675.2	64.8	58.9	None	High	High	Not applicable	13.7	2.5	0.4	10.0	11.0
F2	49	387.9	2,118.5	13,770.2	532.5	484.1	None	High	High	Not applicable	1.1	0.2	0.0	0.8	0.9
F3	54	94.9	212.7	1,404.0	118.0	123.4	None	Medium	Medium	Not applicable	7.6	3.4	0.5	6.1	5.8

Appendix 2.4 (Continued)

Grid square	Product of the density reducing processes (G x B x W = ri, %)	Step 9, $A_3 = A_2 / ri$					Step 10, Catastrophic disturbance expected	Conservation value of the disturbance region per species		Step 11	Step 12, Ratio of available to required habitat, $I_h = P_{hS} / A_3$				
		H. ulmoides			*S. birrea*						*H. ulmoides*			*S. birrea*	
		Closed (ha)	Open (ha)	Sparse (ha)	Closed (ha)	Open (ha)		*H. ulmoides*	*S. birrea*		Closed	Open	Sparse	Closed	Open
F4	65	36.8	82.4	544.1	45.7	47.8	None	Medium	Medium	Not applicable	23.5	10.5	1.6	18.9	18.1
F5	65	39.1	87.6	578.1	48.6	50.8	None	Low	Low	Not applicable	22.1	9.9	1.5	17.8	17.0
F6	42	543.3	1,218.4	8,041.2	676.0	706.7	None	Low	Low	Not applicable	2.8	1.2	0.2	2.2	2.1
F7	65	39.1	87.6	578.1	48.6	50.8	None	Low	Low	Not applicable	18.4	8.2	1.2	14.8	14.2