



One approach to generating wilderness zones in protected areas

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E Z E M V E L O
K Z N W I L D L I F E

Conservation, Partnerships & Ecotourism

Background

- Current Wilderness zonation in the Ukhahlamba Drakensberg Park World Heritage Site (UDP WHS) is based on the Recreational Opportunity Spectrum zonation system
- Project initiated originally in 2006 with Kirsten Oliver leading. On third iteration.
- Seven zones are allocated according to their proximity and impact of external human disturbances.
- This zonation truthing exercise comprised a desktop analysis.



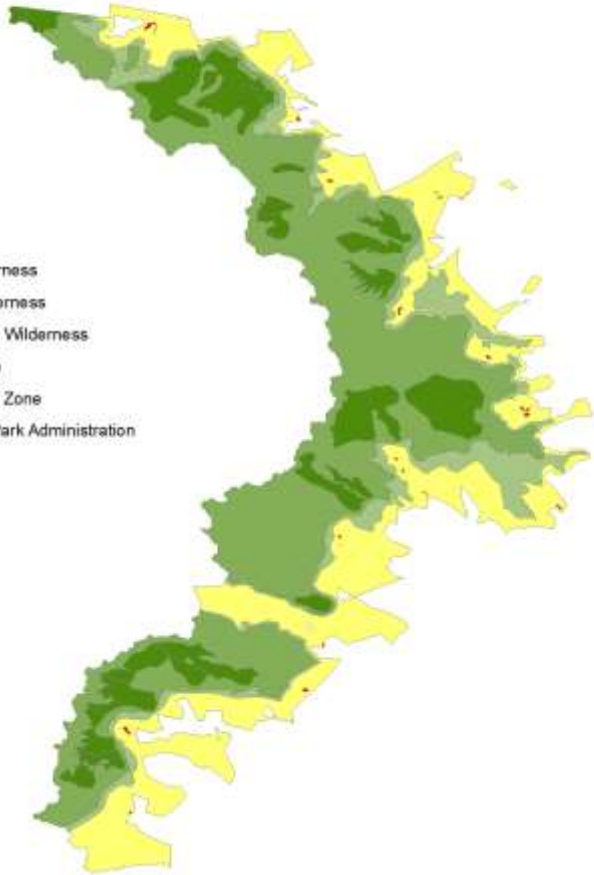
Recreational Opportunity Spectrum

- Pristine Wilderness
- Primitive Wilderness
- Semi-Primitive Wilderness
- Semi-Primitive Non-Motorised Zone
- Semi-Primitive Motorised
- Roaded Natural
- Rural

Surrogate Wilderness Areas and Wilderness Areas



- Legend**
- zonation**
- Pristine Wilderness
 - Primitive Wilderness
 - Semi-primitive Wilderness
 - Low Use Zone
 - Moderate Use Zone
 - Tourism and Park Administration



Basic Principles

- Use Viewsheds for a multitude of categories, each customised with regards to their visual thresholds (assumed 1.5m std human height)
- Ran using the 20m DEM w29
- Considered Aspect
- Considered Impact Factors per Land-use feature.
- Customised visual heights
- Consider distance modifiers



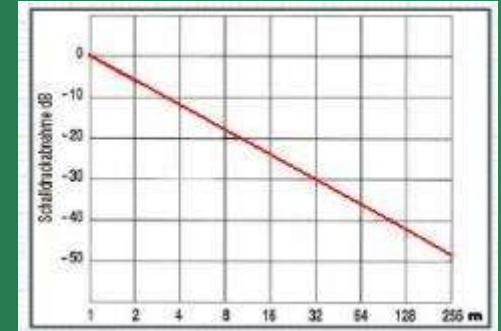
Land Cover Group	Land use Type
	Hiking Trails
Hiking Infrastructure	Bush Lodge Caravan and Camps Trail Huts
Road Infrastructure	Road Network
Railway Infrastructure	Railway Lines Railway Bridges Railway Stations
Air Travel Infrastructure	Airfields Airports Sub-Stations High voltage Sub-stations Power Stations Switching Stations Traction Stations
Eskom Infrastructure	Utility Buildings MV Power lines HV Power lines VHV Power lines
Tourism Infrastructure	Small Tourism Facilities Large Tourism Facilities Restaurant Facilities Proposed Cable Way Archaeological Sites Battlefields Cemeteries Temples and Churches
Cultural Heritage Infrastructure	Forts Missions Monuments Museums Significant Cultural Sites
Households	Households
Industrial Site Infrastructure	Industrial Sites
Education Infrastructure	Pre-school, Primary and Secondary Schools
Justice Infrastructure	Institutes Border Posts Magisterial Courts Police Stations Prisons Traditional Courts
Large Built Infrastructure	Dams
Health Infrastructure	Clinics Large Hospitals
	Dryland Cropping Irrigated Cropping Dryland Orchards Irrigated Orchards Sugarcane
Large-scale visual land-use impacts	Subsistence Agriculture Golf Courses Plantations Hotels Mines and Quarries

- Wide variety of data sources considered
- Each converted to point features
 - Points
 - Lines
 - Polygons
- Thinning of the datasets occurred
- Quantity vs questionable quality – Sledge Hammer



Impact Factors

- Noise pollution
 - Effected 1 km sensitive zone
- Light pollution
 - Ignore Sky Glow
- Activity (in situ: duration, degree; associated movement)
- Scale of land-use
- These were used to inform proximity weighting classes as well as inter-class weightings



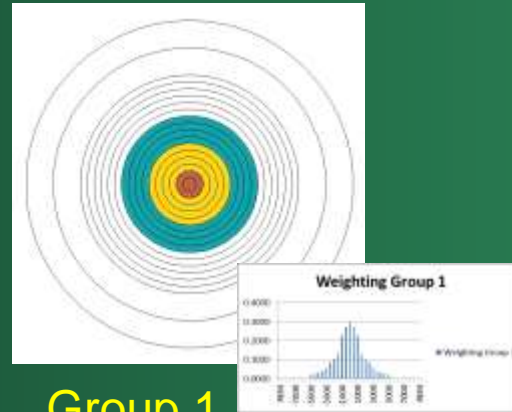
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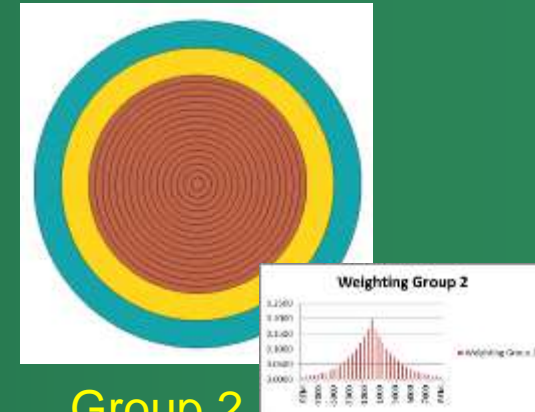
Land Cover Group	Feature type (point, linear polygon)	Land use Type	Sub-Cat. Relative Wt.	Sub. Cat. Score	Degree of Visual Impact (Factor of density and scale)	Scale of Developmental Footprint (Portion of Erf, Landscape Scale)	Generic dB value (Max Value assumed) (see Figure 2)* 35/80 means usually 35, but can go up to 80 dB on occasion	Sound Impact	Period of Activity (Sporadic Yearly, Sporadic Daily/Weekly, Working Day, All Day)	Level of Associated Activity (Low, Moderate, High)	Level of Associated Movement (Low, Moderate, High)	Level of Associated Pollution (Low, Moderate, High)	Level of Associated Odour (Low, Moderate, High)	Buffer Modifier: Distance Threshold for complete sound level reduction (see Figure 1)
Hiking Infrastructure	Linear	Hiking Trails	0.16	0.98	Low	Portion of Erf	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Point	Bush Lodge	0.29	1.78	Low	Portion of Erf	45	Low	All Day	Low	Low	Low	Low	500
	Point	Caravan and Camps	0.4	2.44	Low	Portion of Erf	45	Low	All Day	Moderate	Moderate	Moderate	Low	500
	Point	Trail Huts	0.16	0.98	Low	Portion of Erf	45	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
Road Infrastructure	Linear	Road Network	1	5.11	Moderate	Landscape Scale	70	Moderate	All Day	High	High	Moderate	Low	1000
Railway Infrastructure	Linear	Railway Lines	0.37	2.31	Moderate	Landscape Scale	35/80	Moderate	Sporadic Daily/Weekly	Low	Low	Low	Low	1000
	Point	Railway Bridges	0.23	1.42	Moderate	Portion of Erf	35/80	Moderate	Sporadic Daily/Weekly	Low	Low	Low	Low	1000
Air Travel Infrastructure	Point	Railway Stations	0.4	2.53	Moderate	Portion of Erf	60	Moderate	Sporadic Daily/Weekly	High	Low	Moderate	Low	1000
	Linear	Airfields	0.41	2.09	Low	Portion of Erf	115	High	Sporadic Daily/Weekly	Low	Moderate	Low	Low	1000
Eskom Infrastructure	Point	Airports	0.59	2.98	Low	Portion of Erf	115	High	Sporadic Daily/Weekly	High	Moderate	Low	Low	1000
	Point	Sub-Stations	0.06	0.98	Low	Portion of Erf	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Point	High voltage Sub-stations	0.07	1.20	Moderate	Portion of Erf	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Polygon	Power Stations	0.22	3.56	High	Entire Erf	80	Moderate	All Day	Moderate	Moderate	Low	Low	1000
	Point	Switching Stations	0.06	0.98	Low	Portion of Erf	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Point	Traction Stations	0.06	0.98	Low	Portion of Erf	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
Tourism Infrastructure	Point	Utility Buildings	0.11	1.78	Low	Portion of Erf	45	Low	All Day	Low	Low	Low	Low	500
	Linear	MV Power lines	0.12	1.87	Low	Landscape Scale	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Linear	HV Power lines	0.13	2.09	Moderate	Landscape Scale	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Linear	VHV Power lines	0.17	2.76	High	Landscape Scale	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Point	Small Tourism Facilities	0.13	1.38	Low	Portion of Erf	45	Low	Working Day	Low	Low	Low	Low	500
	Point	Large Tourism Facilities	0.27	2.89	Moderate	Portion of Erf	60	Moderate	All Day	Moderate	Moderate	Moderate	Low	1000
Cultural Heritage Infrastructure	Point	Restaurant Facilities	0.27	2.89	Moderate	Portion of Erf	60	Moderate	All Day	Moderate	Moderate	Moderate	Low	1000
	Linear	Proposed Cable Way	0.33	3.60	High	Landscape Scale	45	Low	Working Day	Moderate	Moderate	Low	Low	500
	Point	Archaeological Sites	0.08	0.98	Low	Portion of Erf	45	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Polygon	Battlefields	0.13	1.60	Low	Entire Erf	45	Low	Working Day	Low	Low	Low	Low	500
	Polygon	Cemeteries	0.1	1.20	Moderate	Portion of Erf	45	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Point	Temples and Churches	0.18	2.31	Moderate	Portion of Erf	45	Low	Sporadic Daily/Weekly	High	Moderate	Low	Low	500
Households	Point	Forts	0.11	1.38	Low	Portion of Erf	45	Low	Working Day	Low	Low	Low	Low	500
	Point	Missions	0.14	1.82	Moderate	Portion of Erf	45	Low	Working Day	Moderate	Low	Low	Low	500
	Point	Monuments	0.08	0.98	Low	Portion of Erf	45	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Point	Museums	0.11	1.38	Low	Portion of Erf	45	Low	Working Day	Low	Low	Low	Low	500
	Point	Significant Cultural Sites	0.08	0.98	Low	Portion of Erf	45	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
Industrial Site Infrastructure	Point	Households	1	3.33	Moderate	Portion of Erf	45	Low	All Day	High	Moderate	Moderate	Low	500
Education Infrastructure	Point	Industrial Sites	1	4.44	Moderate	Portion of Erf	90	High	All Day	High	Moderate	Moderate	Moderate	1000
Justice Infrastructure	Point	Pre-school, Primary and Secondary Schools	0.5	2.93	Moderate	Portion of Erf	45	Low	Working Day	High	Moderate	Moderate	Low	500
	Point	Institutes	0.5	2.93	Moderate	Portion of Erf	45	Low	Working Day	High	Moderate	Moderate	Low	500
Large Built Infrastructure	Point	Border Posts	0.16	1.78	Low	Portion of Erf	45	Low	All Day	Low	Low	Low	Low	500
	Point	Magisterial Courts	0.18	2.04	Moderate	Portion of Erf	45	Low	Working Day	Moderate	Moderate	Low	Low	500
	Point	Police Stations	0.22	2.44	Moderate	Portion of Erf	45	Low	All Day	Moderate	Moderate	Low	Low	500
	Point	Prisons	0.26	2.89	Moderate	Portion of Erf	45	Low	All Day	High	Low	Low	Low	500
	Point	Traditional Courts	0.18	2.04	Moderate	Portion of Erf	45	Low	Working Day	Moderate	Moderate	Low	Low	500
	Polygon	Dams	1	2.76	High	Landscape Scale	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
Large-scale visual land-use impacts	Point	Clinics	0.42	3.11	Low	Portion of Erf	55	Moderate	All Day	High	Moderate	Low	Low	500
	Polygon	Large Hospitals	0.58	4.22	High	Entire Erf	45	Low	All Day	High	Moderate	Moderate	Low	500
	Polygon	Dryland Cropping	0.09	2.09	High	Entire Erf	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Polygon	Irrigated Cropping	0.1	2.31	High	Entire Erf	45	Low	Sporadic Daily/Weekly	Low	Moderate	Low	Low	500
	Polygon	Dryland Orchards	0.09	2.09	High	Entire Erf	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Polygon	Irrigated Orchards	0.1	2.31	High	Entire Erf	45	Low	Sporadic Daily/Weekly	Low	Moderate	Low	Low	500
Health Infrastructure	Polygon	Sugarcane	0.09	2.09	High	Entire Erf	35	Low	Sporadic Daily/Weekly	Low	Low	Low	Low	500
	Polygon	Subsistence Agriculture	0.11	2.49	Moderate	Landscape Scale	35	Low	Working Day	Low	Low	Low	Low	500
	Polygon	Golf Courses	0.11	2.49	High	Entire Erf	35	Low	Working Day	Low	Low	Low	Low	500
	Polygon	Plantations	0.11	2.62	High	Landscape Scale	35/85	Low	Sporadic Yearly	Low	Low	Low	Low	1000
	Polygon	Hotels	0.12	2.89	Moderate	Entire Erf	45	Low	All Day	Moderate	Moderate	Moderate	Low	500
Polygon	Mines and Quarries	0.1	2.31	High	Entire Erf	35/80	Moderate	Sporadic Daily/Weekly	Low	Low	Low	Low	1000	



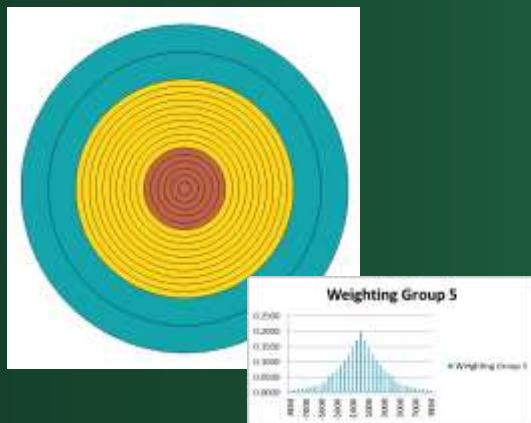
Different Impact sensitivities with increasing distance



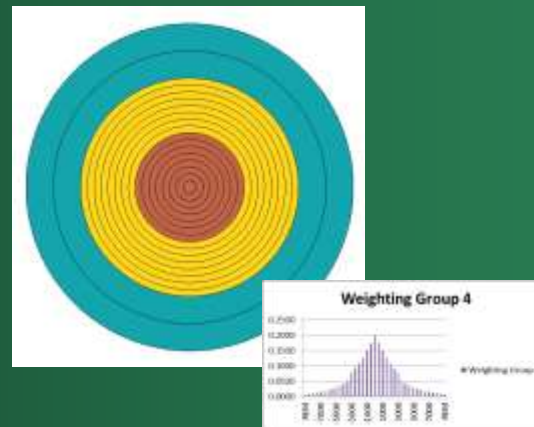
Group 1



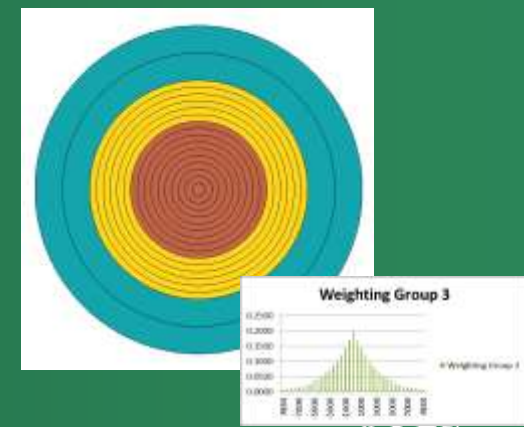
Group 2



Group 5



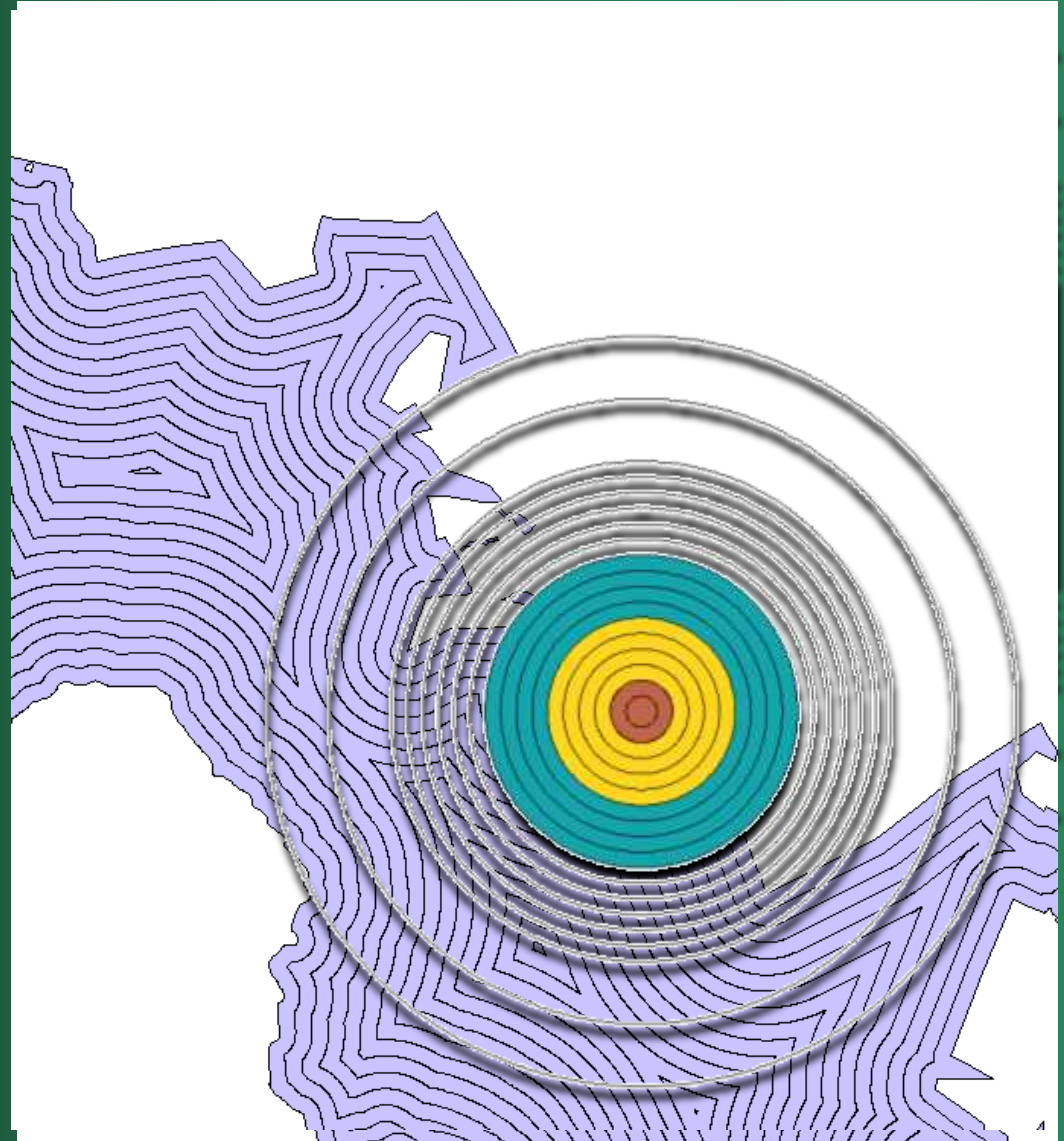
Group 4



Group 3

Proximal Considerations

- Must take proximity of land-use feature into account



Proximal Considerations

- E.G. Weight Group 1
- This only considers external impacts





Road influence

Road influence Fr

Combined Road influence within WHS

Weighted Sum

With Respect to Buildings

Tourism has slight importance over Air Infrastructure

Air Infrastructure | 9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9 | Tourism

Inconsistency Ratio = 0.042

	A	B	C	D	E	F	G	H	I	J	K	Wei...
A. Air Infrast...	1.0	5.0	3.0	2.0	3.0	1/6	1/7	1/2	1/4	1.0	1/3	0.048
B. Hiking Inf...	1/5	1.0	1/2	1/3	1/2	1/8	1/9	1/6	1/7	1/5	1/5	0.015
C. Railway I...	1/3	2.0	1.0	1/2	1.0	1/7	1/8	1/5	1/5	1/4	1/4	0.022
D. Eskom B...	1/2	3.0	2.0	1.0	2.0	1/6	1/7	1/4	1/4	1/2	1/4	0.032
E. Cultural ...	1/3	2.0	1.0	1/2	1.0	1/7	1/8	1/5	1/5	1/4	1/4	0.022
F. Househo...	6.0	8.0	7.0	6.0	7.0	1.0	1/2	5.0	3.0	6.0	3.0	0.232
G. Industrial...	7.0	9.0	8.0	7.0	8.0	2.0	1.0	3.0	3.0	7.0	4.0	0.271
H. Tourism	2.0	6.0	5.0	4.0	5.0	1/5	1/3	1.0	1/2	2.0	2.0	0.095
I. Education...	4.0	7.0	5.0	4.0	5.0	1/3	1/3	2.0	1.0	3.0	2.0	0.125
J. Justice S...	1.0	5.0	4.0	2.0	4.0	1/6	1/7	1/2	1/3	1.0	1/3	0.052
K. Health Sy...	3.0	5.0	4.0	4.0	4.0	1/3	1/4	1/2	1/2	3.0	1.0	0.088

Final Output

- Coming next week- Apologies

Where to....

- A second part of the exercise involved the ground-truthing of some areas to confirm the accuracy of the desk-top study.
- Inform external Land-use schemes – recommended areas receiving no developmental footprint – still to initiate this process



Identify No development zones for Rural schemes

