NATIONAL INVASIVE ALIEN PLANT SURVEY

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Project Details

- Department of Water Affairs – Working for Water Programme
- A map of major IAP species infestation
- South Africa, Lesotho and Swaziland (127 million ha)
- At least to a quaternary catchment level

  (1 947)

Approach

- Complete inventory – cost, time and expertise limitations
- Current mapping costs: R0.30-R2.30/ha = R38 million and R292 million
- Random sampling per quaternary catchment, 200 sample points per catchment (95% confidence interval): R154 – R265/point = R60 million and R103 million
- Fieldworker can survey approximately 20 sampling points per day if accessible by road. One person requires 88 years to sample 20 points per day if a year consists of 220 workdays or 88 alien experts to work for one year fulltime.
- Statistically sound, cost effective, objective monitoring system.

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Association between species occurrence and the natural environment

- Which environmental variables contribute the most to IAP species' occurrence at a total study area level
- Rationale: sampling orientated along an environmental variable gradient would detect the maximum variation in an area and result in sample point optimization
- Rainfall, soil depth and percentage clay in the B-horizon classified into 3 even area classes and terrain into 2 classes

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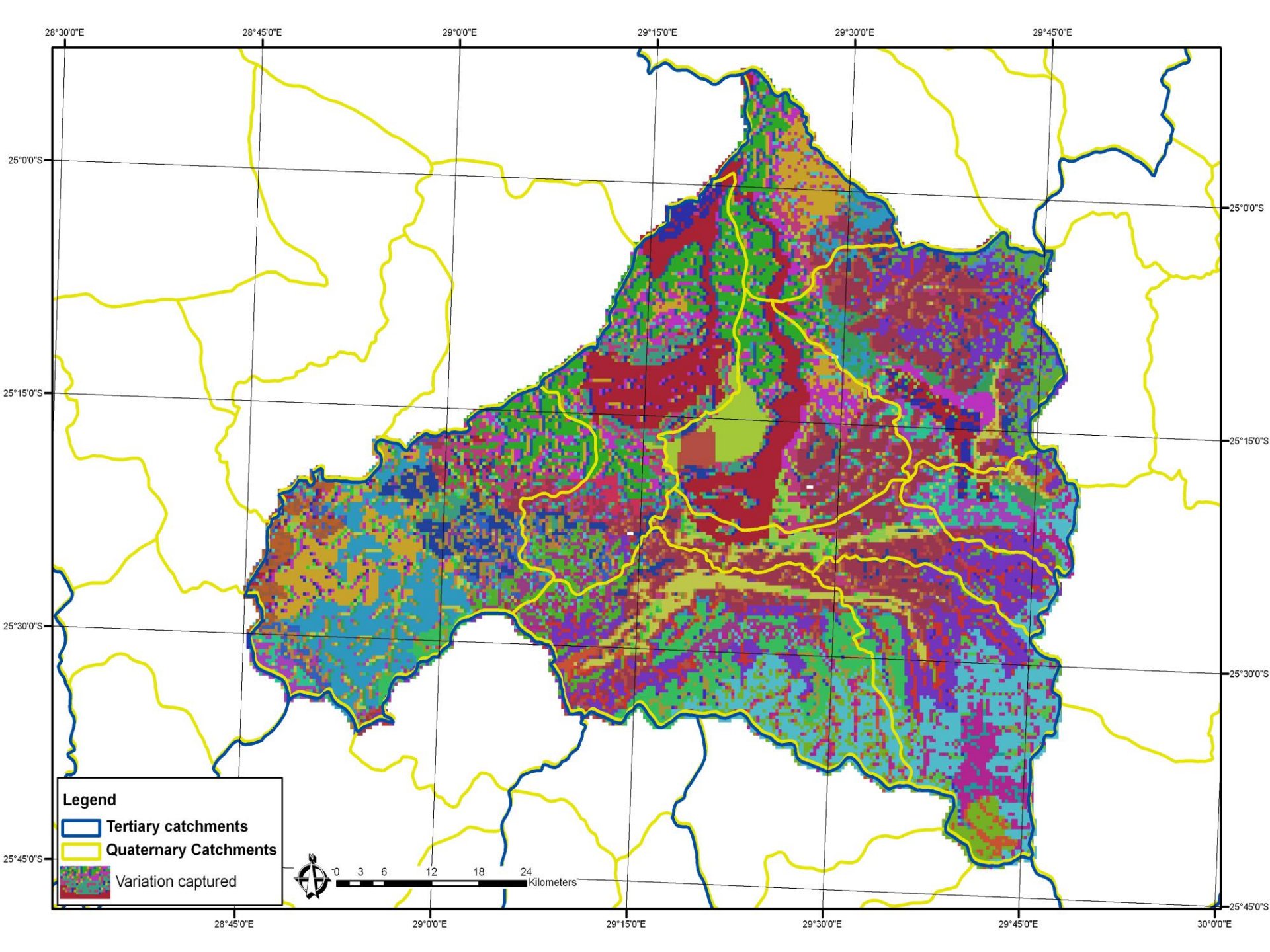
28°30'0"E
28°45'0"E
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29°15'0"E
29°30'0"E
29°45'0"E
30°0'0"E
25°0'0"S
25°15'0"S
25°30'0"S
25°45'0"S
Legend
Tertiary catchments
Quaternary Catchments
Variation captured
0 3 6 12 18 24
Kilometers

Sampling simulation

*Sample %	Percentage of *infestation of a single species (**PI**), Coefficient of variation (**CV**), Standard deviation (**SD**) and Lower and Higher values of the infestation class (**Intv**) for each sample.														
	PI = 1			**PI = 2**			**PI = 5**			**PI = 10**			**PI = 25**		
	CV	**SD**	**Intv**	**CV**	**SD**	**Intv**	**CV**	**SD**	**Intv**	**CV**	**SD**	**Intv**	**CV**	**SD**	**Intv**
40	1.8			1.3			0.7			0.5			0.3		
30	2.1			1.6			0.9			0.6			0.4		
20	2.8			1.9			1.2			0.8			0.4		
10	4.5			2.8			1.9			1.3			0.7		
5	6.5			4.3			2.6			1.8			1.1		
1	12.9	0.13	**0.87 1.13**	9.3	0.19	**1.81 2.19**	6.0			4.3			2.2		
0.5	19.7	0.2	**0.80 1.20**	14.2	0.29	**1.71 2.29**	8.4			6.5			3.4		
0.1	44.2	0.46	**0.54 1.46**	30.6	0.61	**1.39 2.61**	20.4	1.00	**4.00 6.00**	13.1	1.33	**8.67 11.33**	7.4	1.87	**23.13 26.87**

***** Infestation is a single tree per centroid of a hectare square and hectares are 'infested' at random before each sampling. Sample percentage is the number of hectare blocks to be selected at random.

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6 287 485
R968 mil

3 143 742
R484 mil

628 748
R96 mil

314 374
R48 mil

62 874
R9.5 mil

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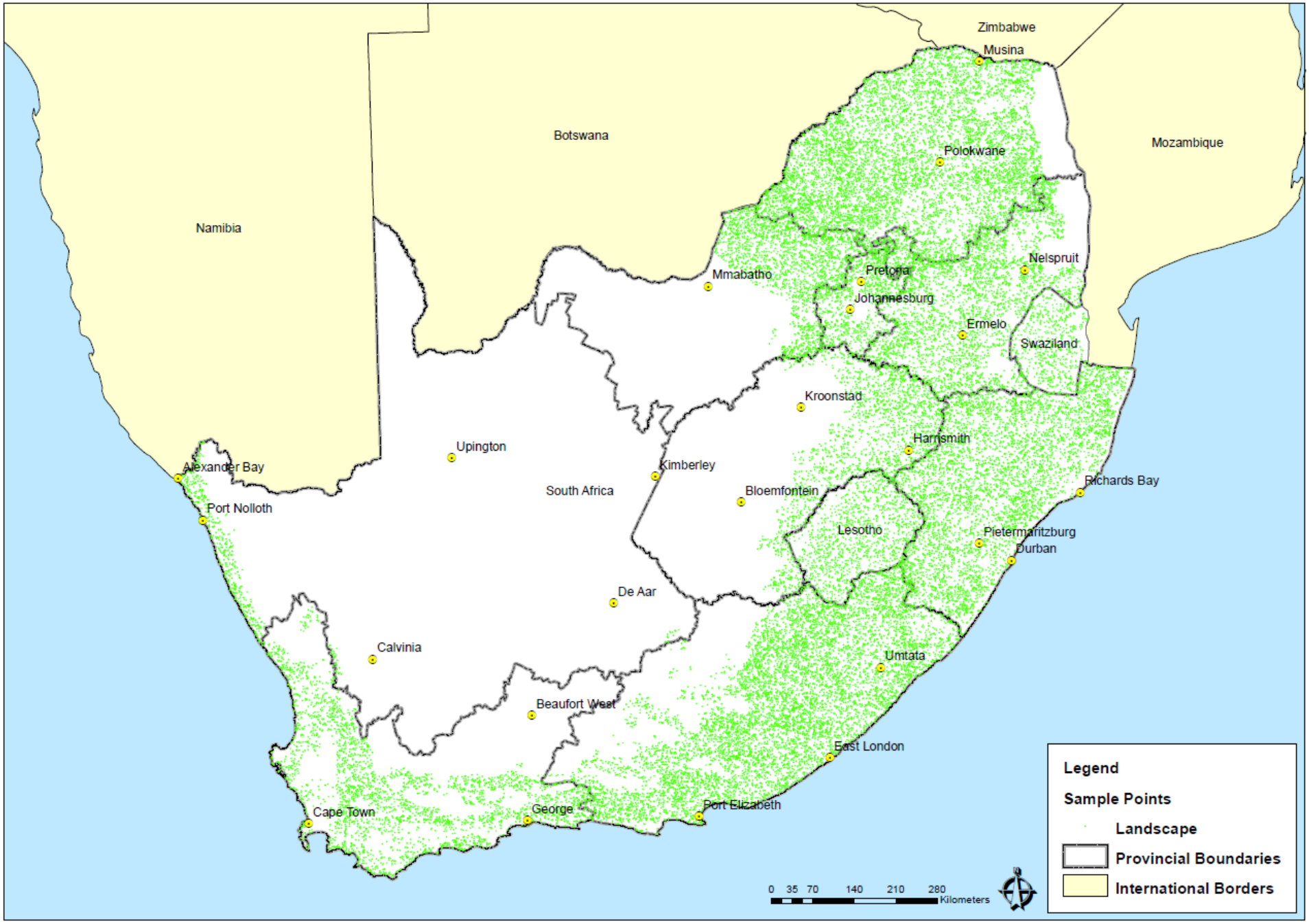
Sampling simulation

- Applied the latter to a wide range of the amount of sampling points (7 256, 10 918, 14 564, 18130, 21 768, 36 381, 43 574, 54 555, 61 769, 72 682, 90 856, 134 451, 181 677, 225 300).
- Observation points were assigned proportionally to tertiary catchments.
- Different sampling procedures were applied i.e. complete random, stratified evenly, stratified proportionally and regular.
- Three replications.
- Unknown – NDVI.
- The optimum number of points taking budget limitations into consideration as well, is 72 682 using stratified proportional.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Musina
Botswana
Mozambique
Polokwane
Namibia
Nelspruit
Pretoria
Mmabatho
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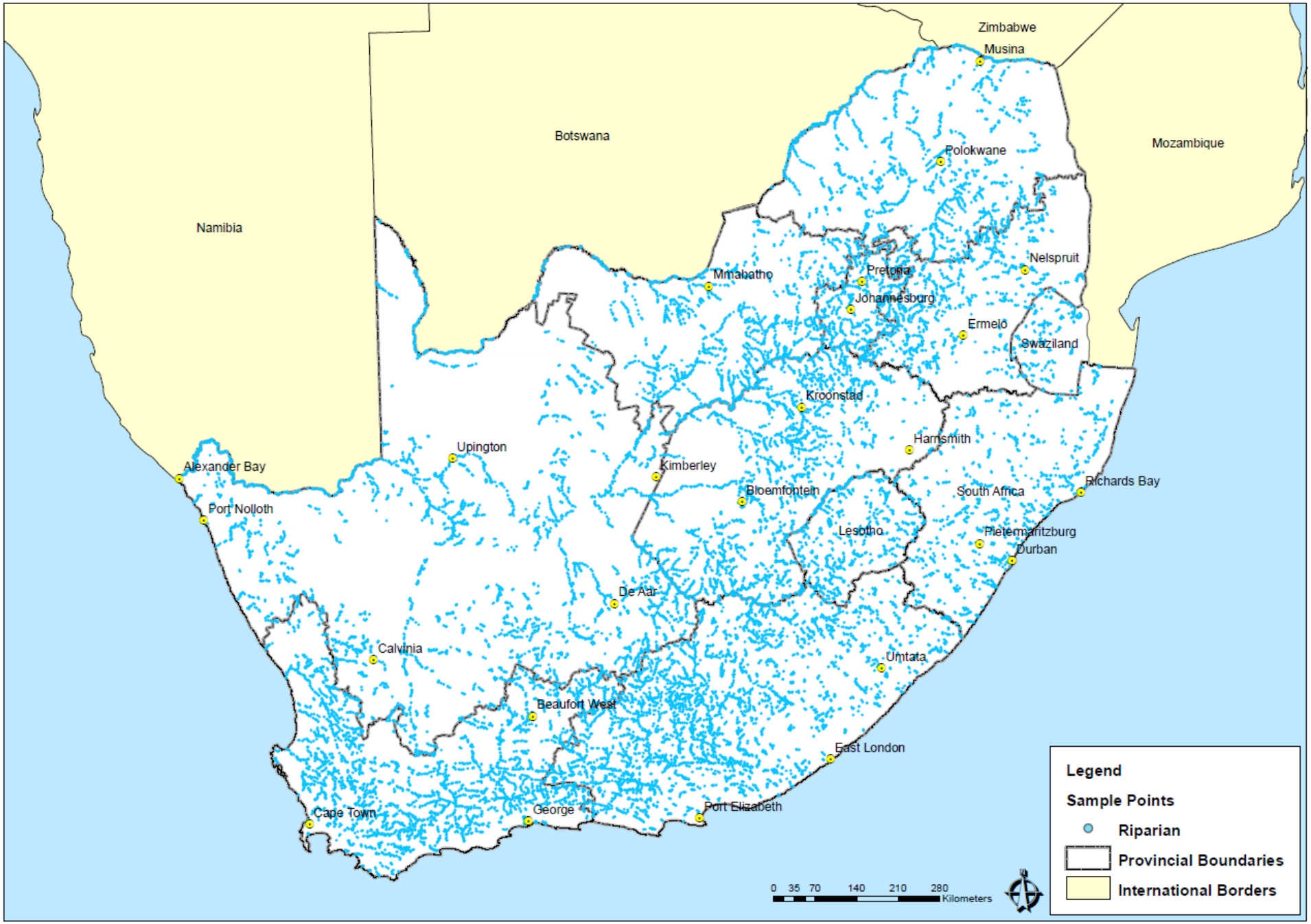
Ermelo
Swaziland
Kroonstad
Harrismith
Upington
Kimberley
Alexander Bay
South Africa
Richards Bay
Bloemfontein
Port Nolloth
Lesotho
Pietermaritzburg
Durban
De Aar
Calvinia
Umtata
Beaufort West
East London
Cape Town
George
Port Elizabeth
Legend
Sample Points
Landscape
Provincial Boundaries
International Borders
0 35 70 140 210 280
Kilometers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George
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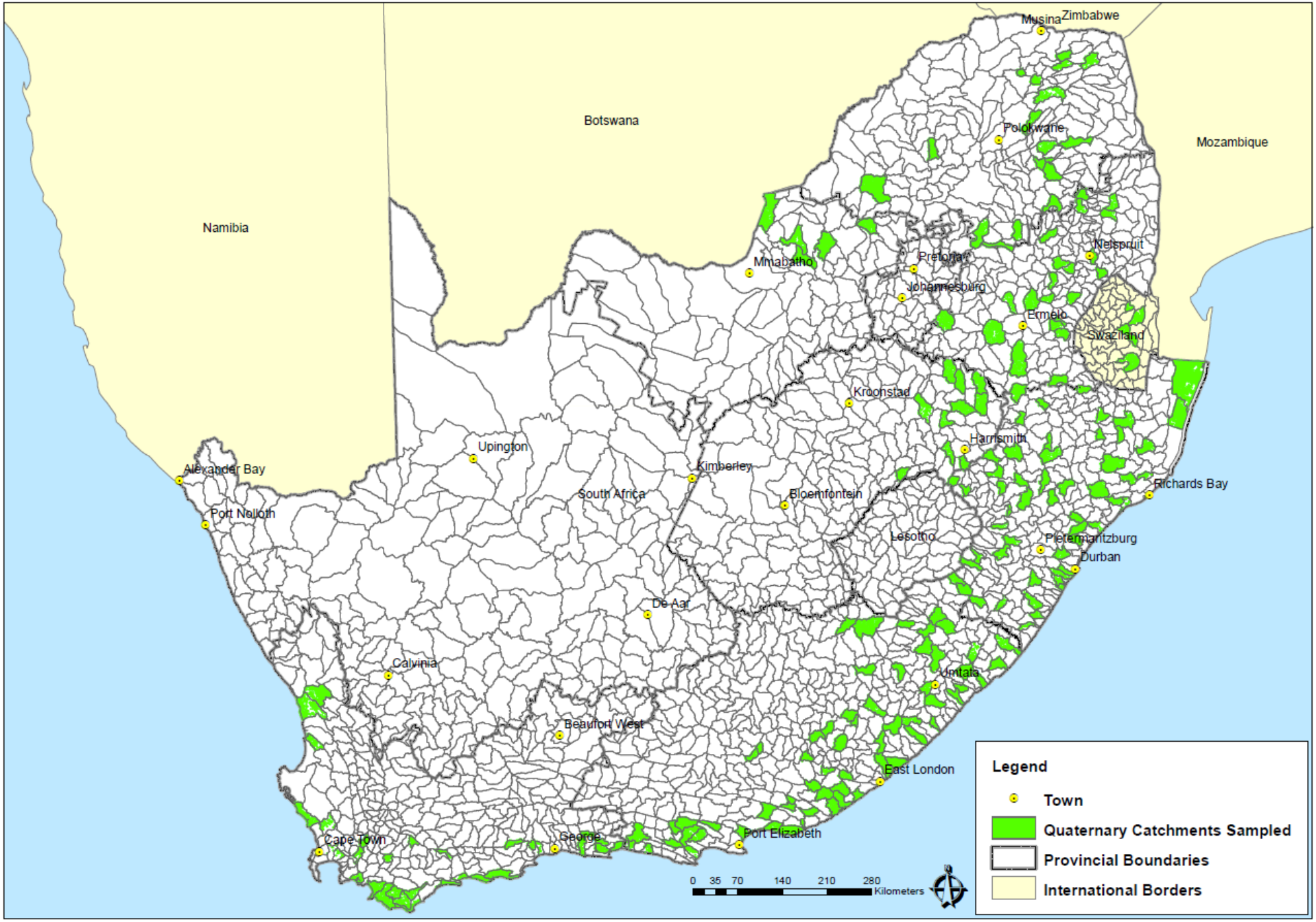
Kilometers
Legend
Sample Points
Riparian
Provincial Boundaries
International Borders


Musina
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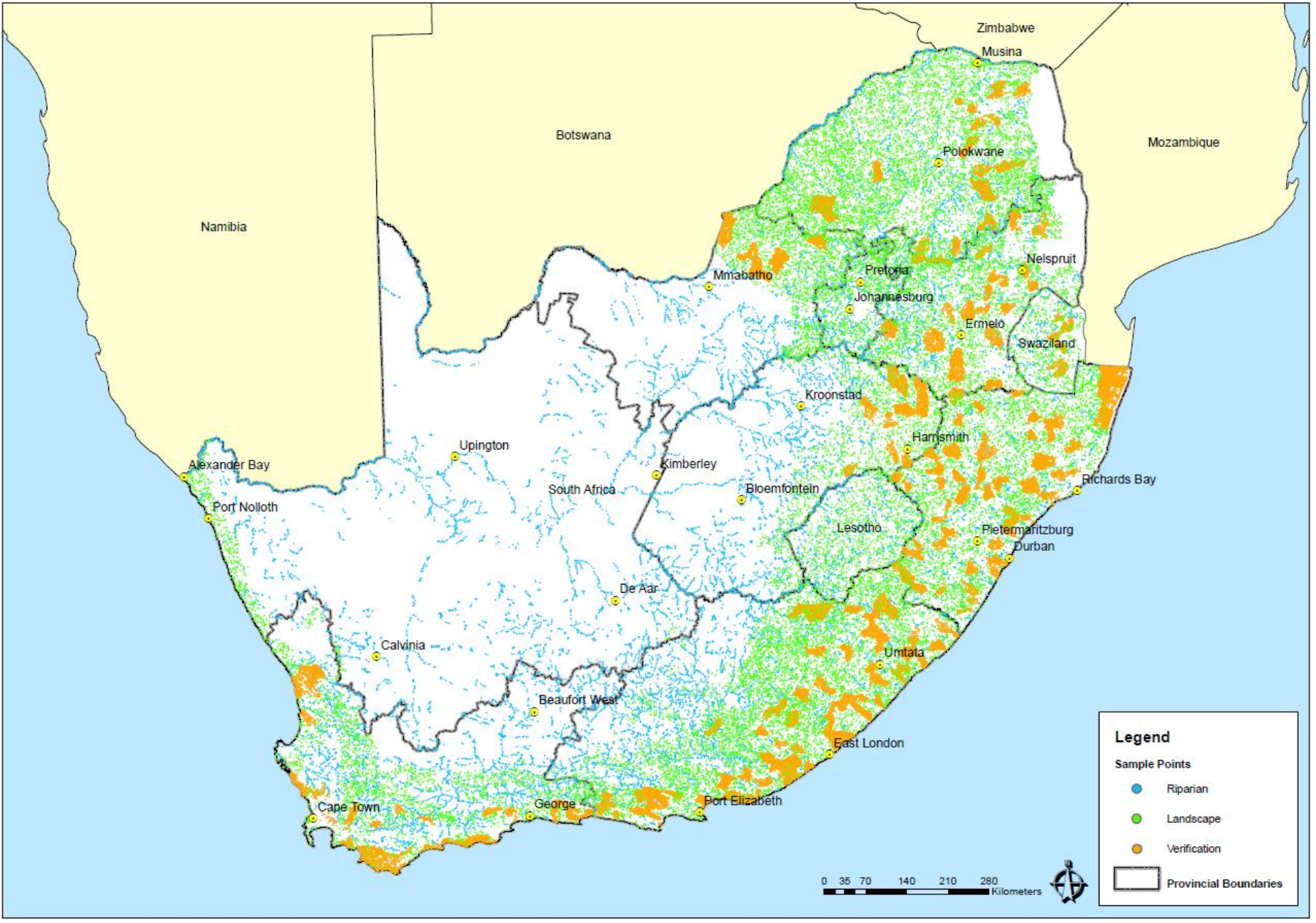
Umtata
Beaufort West
East London
Cape Town
George
Port Elizabeth
0 35 70 140 210 280
Kilometers
Legend
Town
Quaternary Catchments Sampled
Provincial Boundaries
International Borders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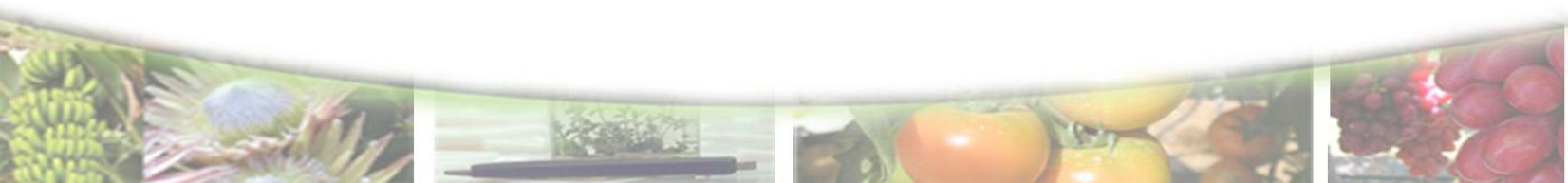
Umtata
Beaufort West
East London
Cape Town
George
Port Elizabeth
Legend
Sample Points
Riparian
Landscape
Verification
Provincial Boundaries
0 35 70 140 210 280
Kilometers

Field survey

- Actual infield survey procedures were determined.
- A road survey was compared with an aerial approach (fixed wing aircraft and helicopter on Agulhas Plain).
- Road survey: 20 points per day per observer at R265/point.
- Road shortages: bias towards disturbance, not random, does not cover all areas.
- Fixed wing aircraft: 46 points/hour/aircraft at R83/point (100km/h).
- Helicopter: 46 points/hour/aircraft at R212/point (100km/h).
- Estimated duration of field work:12 + 2 months (30 July 2007).
- Start in summer rainfall areas (Mapumalanga, Limpopo).



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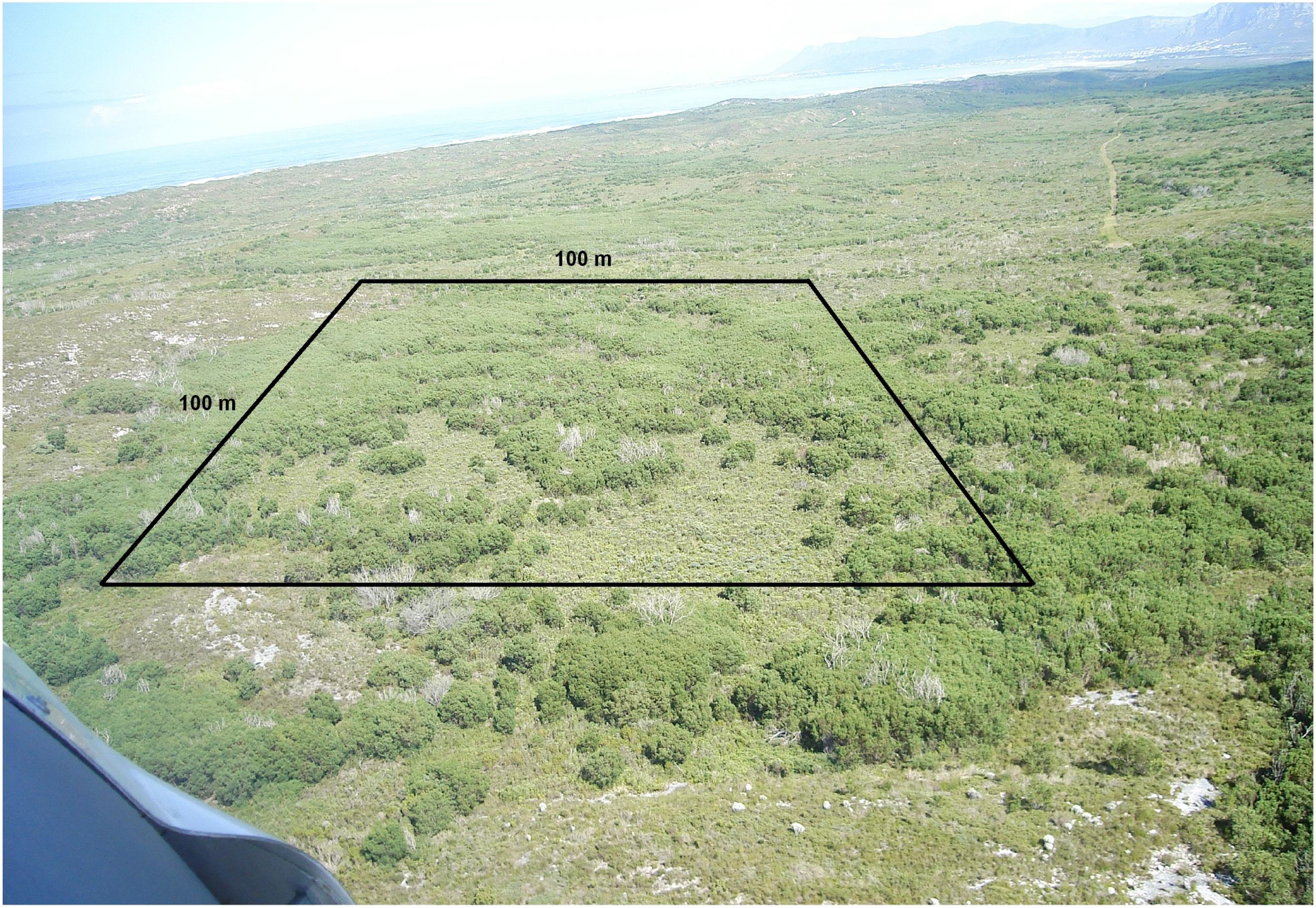
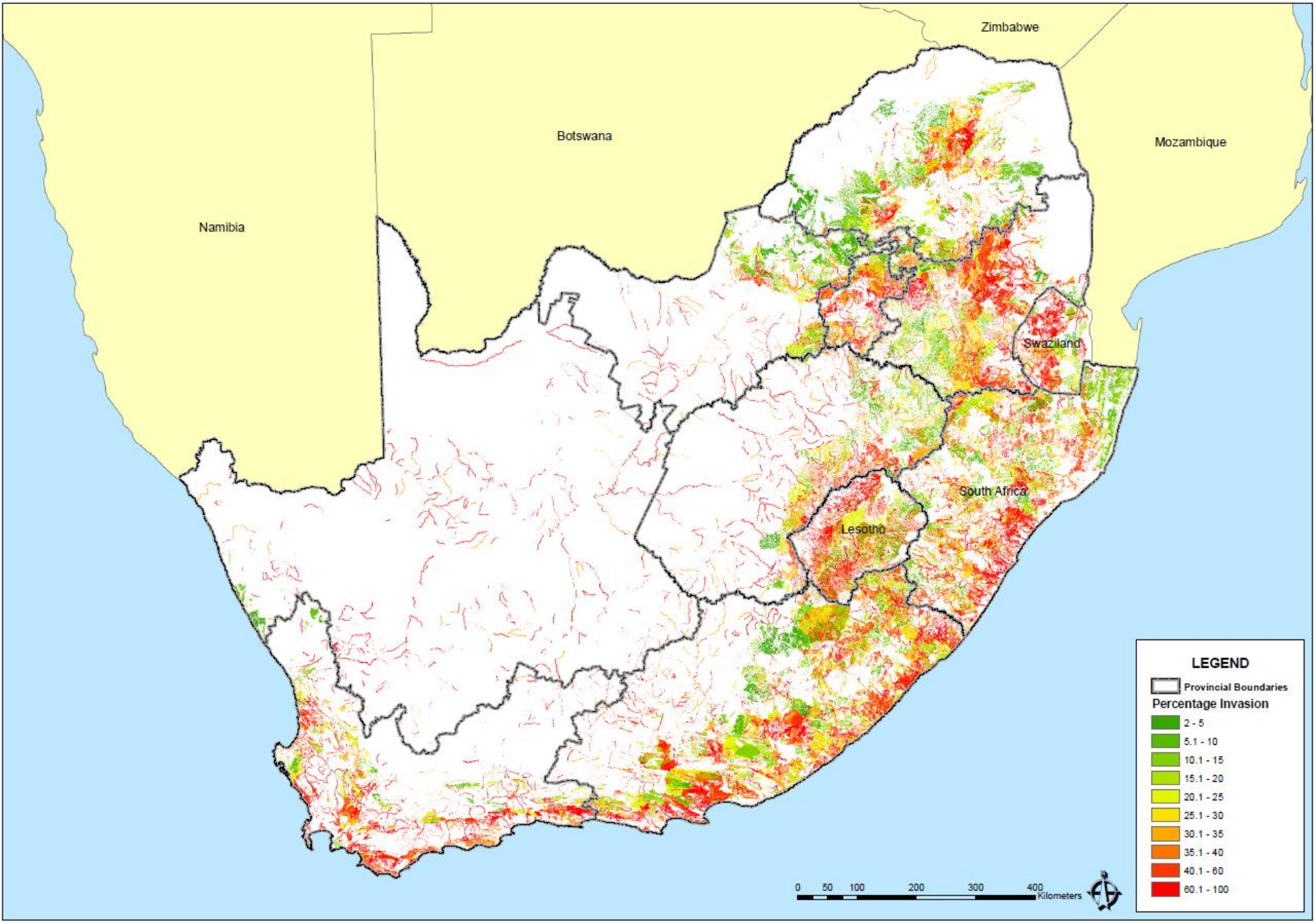
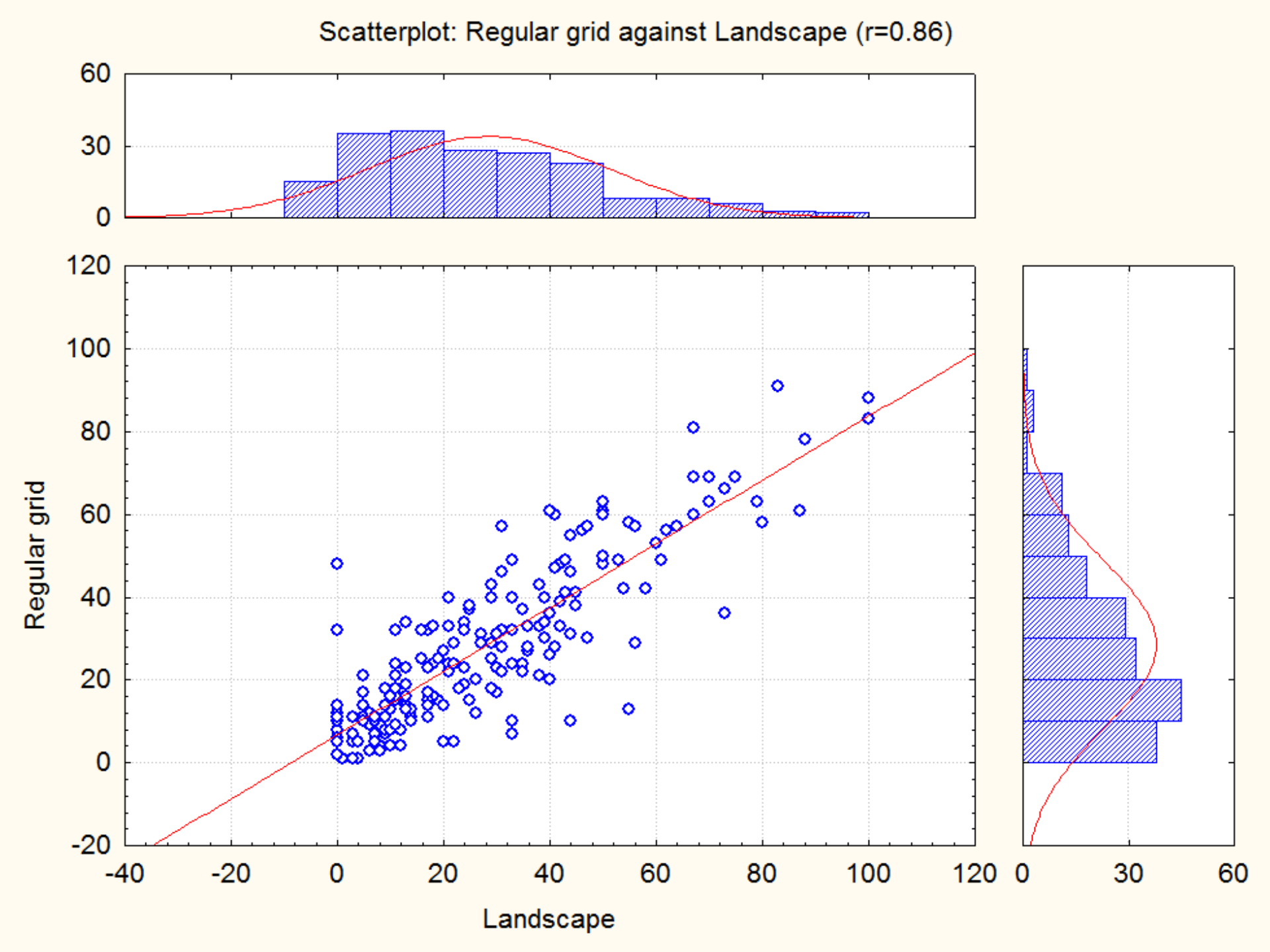

100 m
100 m


Zimbabwe
Botswana
Mozambique
Namibia
Swaziland
South Africa
Lesotho
LEGEND
Provincial Boundaries
Percentage Invasion
2 - 5
5.1 - 10
10.1 - 15
15.1 - 20
20.1 - 25
25.1 - 30
30.1 - 35
35.1 - 40
40.1 - 60
60.1 - 100
0 50 100 200 300 400
Kilometers


Scatterplot: Regular grid against Landscape (r=0.86)
60
30
0
120
100
80
60
40
20
0
-20
Regular grid
-40
-20
0
20
40
60
80
100
120
Landscape
0
30
60

Thank You

Report and data available at:
http://sites.google.com/site/wfwplanning/assessment
under *Kotze et al*. (2010).

Water Affairs
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