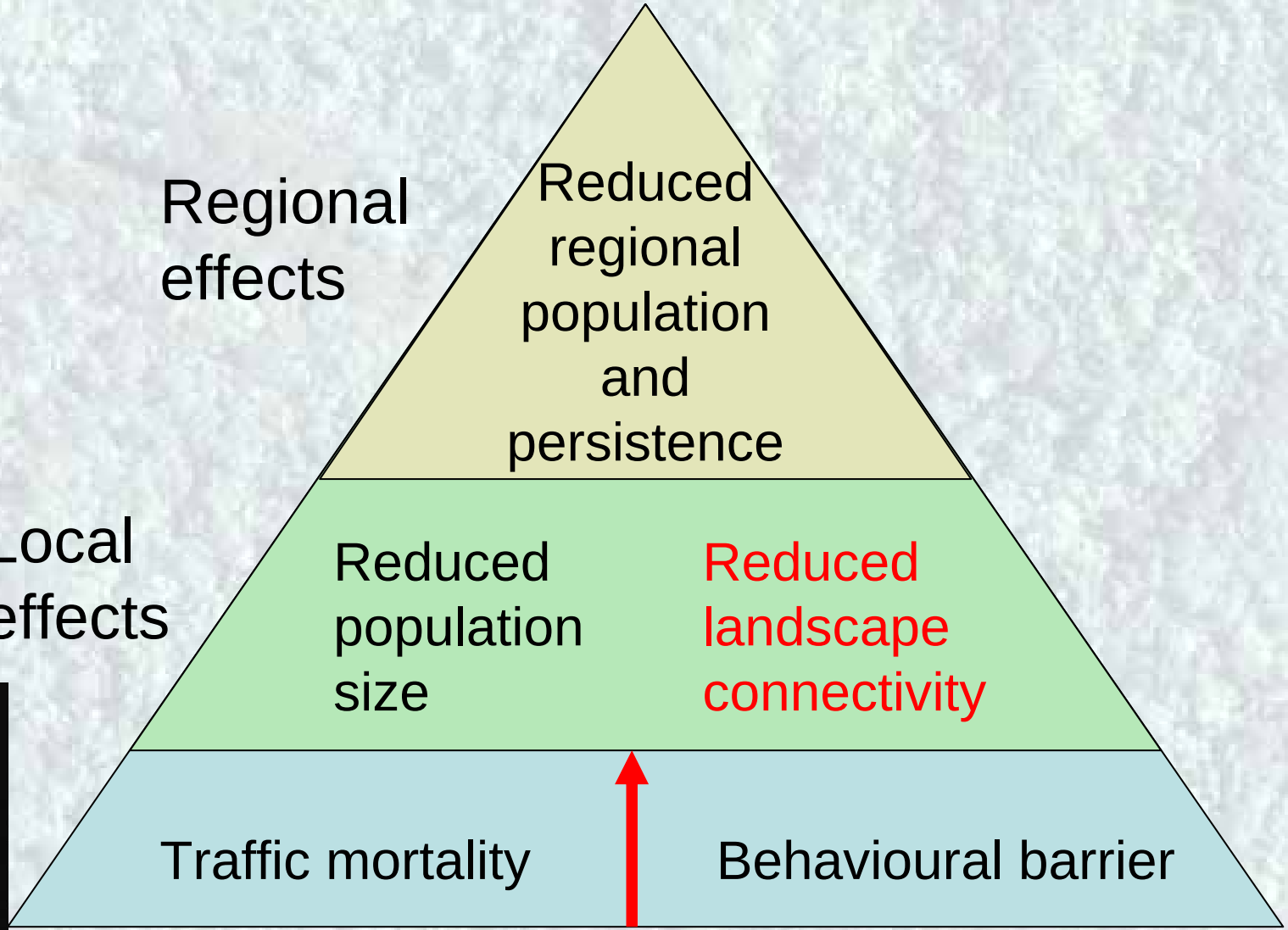
Estimating rainforest canopy connectivity across highways in the Wet Tropics World Heritage Area

Professor David Gillieson and Mr Les Searle

School of Tropical Environment Studies & Geography, James Cook University, Cairns

Road ecology



Aims and significance

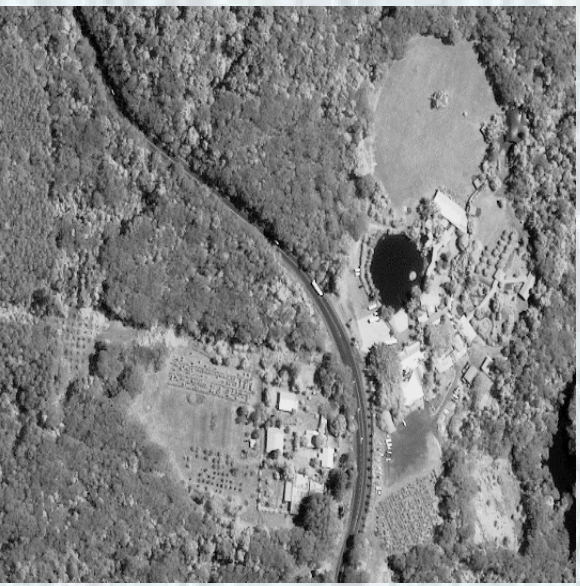
- Canopy integrity and connectivity measures
- Monitoring and evaluation of rehabilitation work
- Design of roadside revegetation
- Provides spatial context for No Nett Loss evaluation

Integration of data sources

- Integration of data in different formats in ArcGIS
- Imagery is pan-sharpened IKONOS multispectral data, orthorectified RMS <10cm
- AutoCAD road data from ground surveys by Main Roads Dept.
- Digital Elevation Model - 10m cells, 5m contours derived from 1:25,000 topo map series – used for orthorectification

Pan sharpening of imagery

- 1m and 4m data fused & resampled giving output of 1m multispectral data (Brovey Transform)



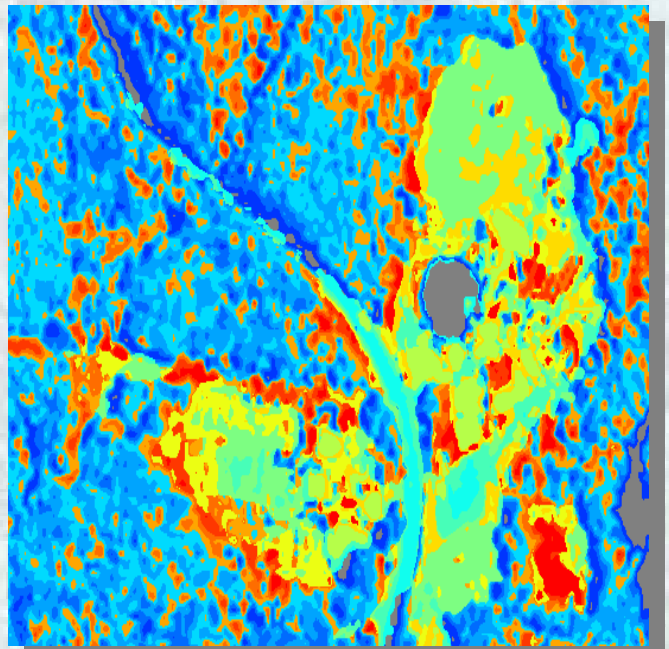
1m pan

4m multispectral

1m multispectral

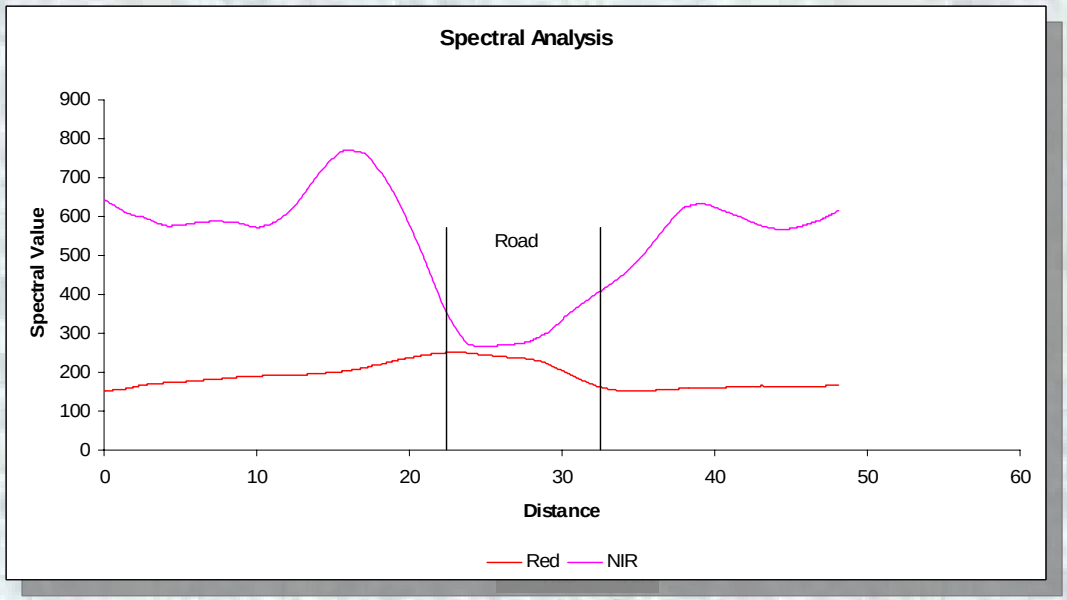
Classification of imagery

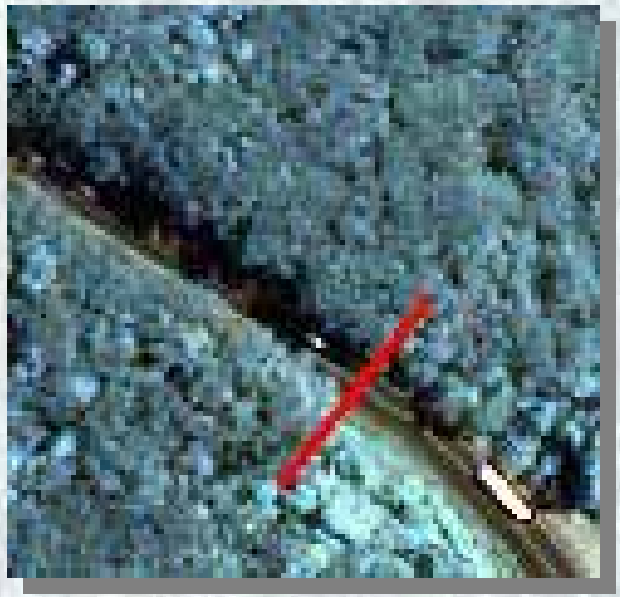
- Unsupervised classification to identify spectral classes of information
- Good separability due to greater data range (11bit)
- Potential to map vegetation cover and composition along road verges



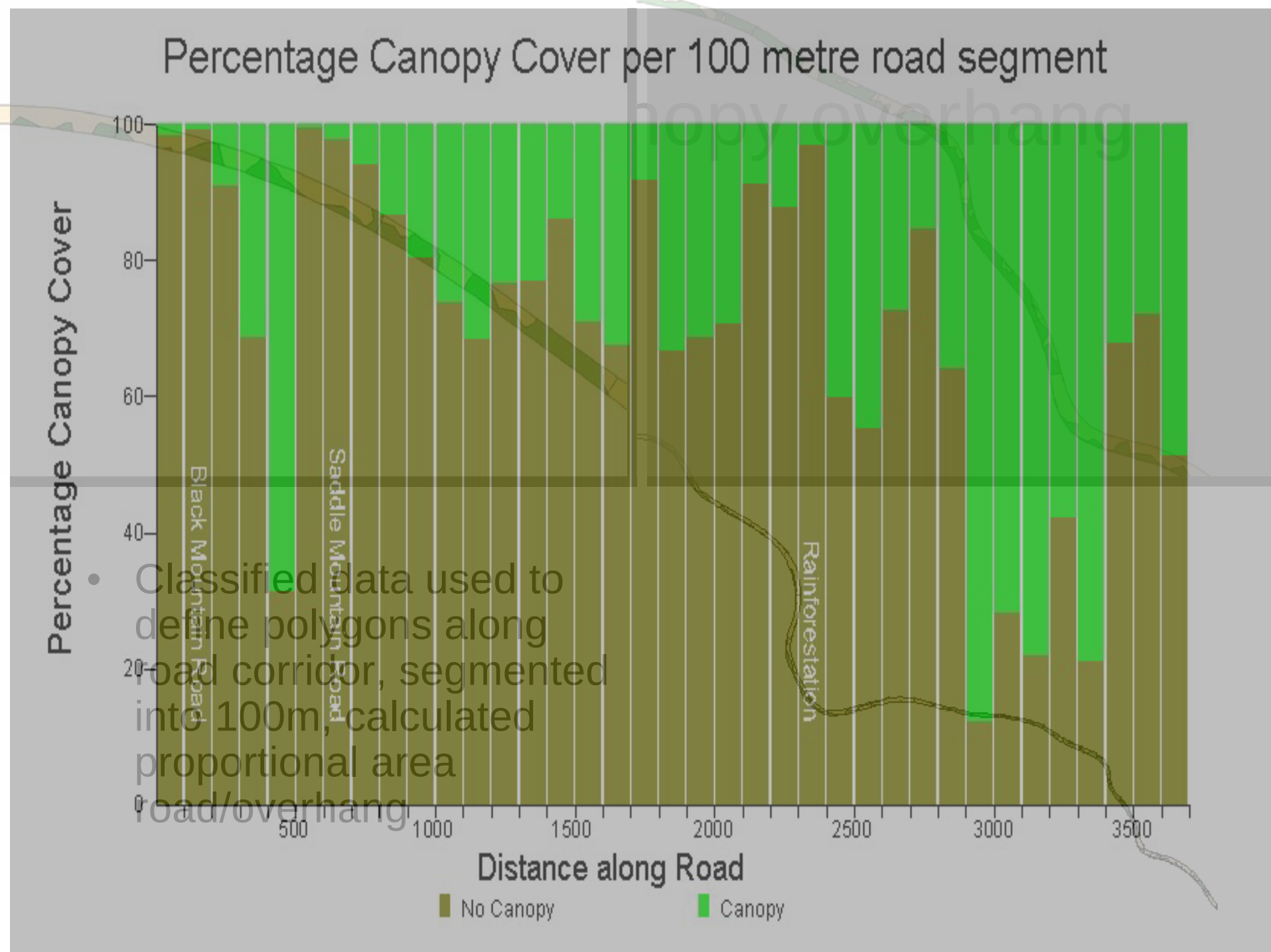
Thresholding

- Properties of spectral curves used to differentiate between road and woody vegetation
- Used NIR/Red thresholding on spectral transects
- Improve in future using ground and canopy radiometry to get better spectral curves

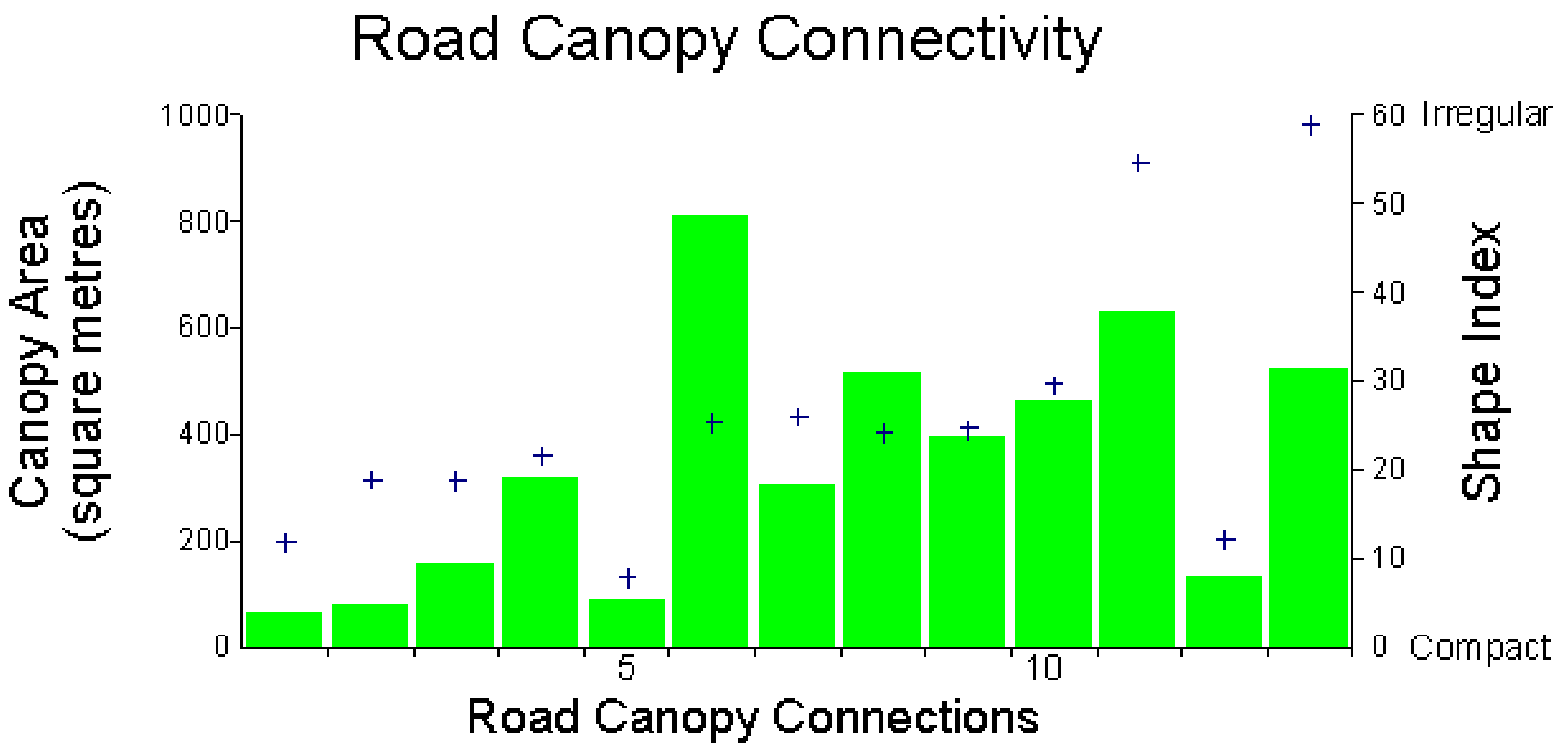




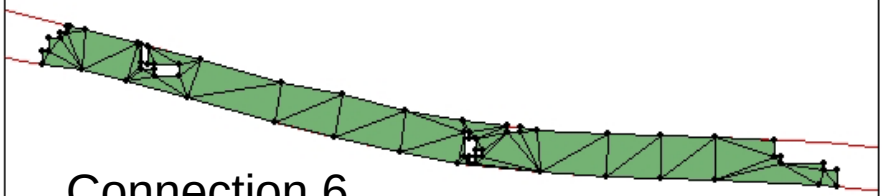
Canopy connectivity - Kuranda



- Classified data used to define polygons along road corridor, segmented into 100m, calculated proportional area road/overhang

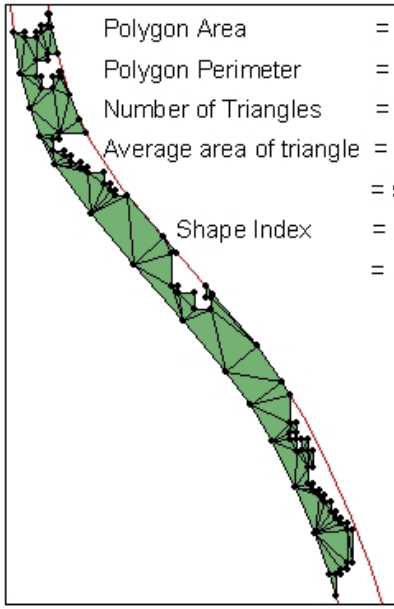

Road Canopy Connectivity
Canopy Area (square metres)
1000
800
600
400
200
0
5
10
Road Canopy Connections
60 Irregular
50
40
30
20
10
0 Compact
Shape Index

Polygon Area = 808.3 M^2
Polygon Perimeter = 311.3 m
Number of Triangles = 66
Average area of triangle = Polygon Area/Number of Triangles
= 12.3 M^2
Shape Index = Polygon Perimeter/Average area of Triangle
= 25.4



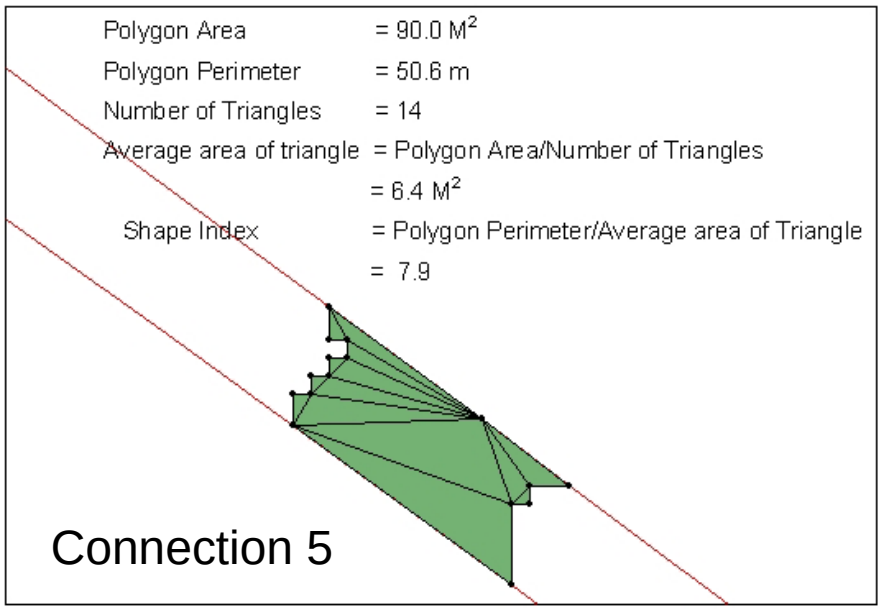
Connection 6

Polygon Area = 627.0 M^2
Polygon Perimeter = 312.0 m
Number of Triangles = 110
Average area of triangle = Polygon Area/Number of Triangles
= 5.7M^2
Shape Index = Polygon Perimeter/Average area of Triangle
= 54.7



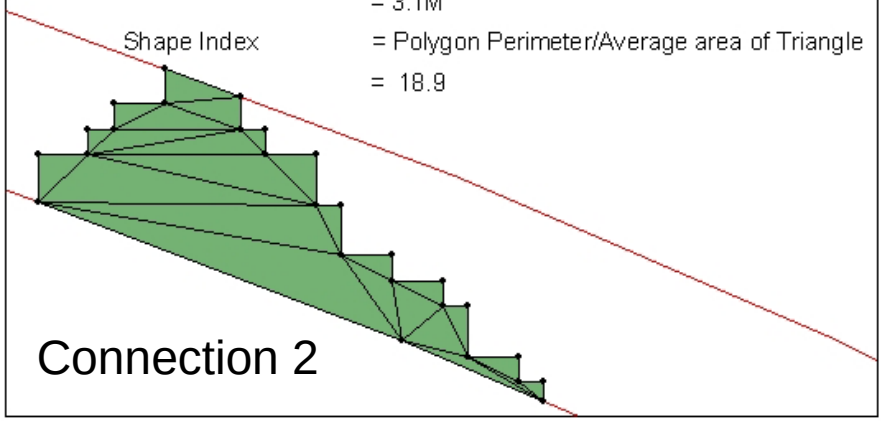
Connection 11

Polygon Area = 90.0 M^2
Polygon Perimeter = 50.6 m
Number of Triangles = 14
Average area of triangle = Polygon Area/Number of Triangles
= 6.4 M^2
Shape Index = Polygon Perimeter/Average area of Triangle
= 7.9



Connection 5

Polygon Area = 77.8 M^2
Polygon Perimeter = 59.0 m
Number of Triangles = 25
Average area of triangle = Polygon Area/Number of Triangles
= 3.1M^2
Shape Index = Polygon Perimeter/Average area of Triangle
= 18.9



Connection 2

So what?

- Can apply these statistics to provide geospatial context in “No Net Loss” scenarios
- Extensible using landscape ecology metrics (connection shape, perforations, disturbance haloes)
- Can identify areas where replanting of roadside trees would enhance connectivity
- Can also gauge effectiveness of revegetation given a time series of images
- Potential for assessing effectiveness of restoration corridors in highly fragmented landscapes

Conclusions

- Integrative methodology for assessing canopy cover and connectivity across road and other corridors
- Provides robust quantitative measures and can be adapted to landscape ecology metrics
- Next steps will be to include better spectral signatures for individual canopy species and improved classifiers/ canopy gap model

Thanks to:

- Paul Jones of Main Roads for road survey data
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- Clive Poole of ER Mapper for software advice