Gnangara Sustainability Strategy

An across-government initiative

Groundwater – Biodiversity – Land use

METHODOLOGY AND RECOMMENDATIONS FOR CONNECTIVITY/CORRIDOR ANALYSIS FOR THE GSS STUDY AREA

A report prepared on behalf of the
Department of Environment and Conservation
for the Gnangara Sustainability Strategy

Eco Logical Australia Pty Ltd

2009

Government of Western Australia
Department of Water
Department of Agriculture and Food WA
Department for Planning and Infrastructure
Department of Environment and Conservation
WATER CORPORATION
CSIRO
Forest Products Commission Western Australia

Methodology and recommendations for connectivity/corridor analysis for the GSS study area

Report for the Gnangara Sustainability Strategy prepared by

Ecological Australia Pty Ltd

ASSESSMENT | PLANNING | MANAGEMENT

Gnangara Sustainability Strategy Taskforce
Department of Water
168 St Georges Terrace
Perth Western Australia 6000
Telephone +61 8 6364 7600
Facsimile +61 8 6364 7601
www.gnangara.water.wa.gov.au

This document has been commissioned/produced as part of the Gnangara Sustainability Strategy (GSS). The GSS is a State Government initiative which aims to provide a framework for a whole of government approach to address land use and water planning issues associated with the Gnangara groundwater system. For more information go to www.gnangara.water.wa.gov.au

Methodology and Recommendations for Connectivity/Corridor Analysis for the GSS Study Area

1. Introduction

A connectivity analysis to identify Potential Biodiversity Corridors was undertaken for the Gnangara region. The purpose of this analysis is to analyse the landscape and highlight those areas that may be more valuable in the landscape specifically as potential fauna corridors.

The analysis was undertake using the Spatial Links tool and ESRI ArcMap GIS and based on available datasets. The Spatial Links Tool was originally developed by NSW DECC & has been used by ELA for a number of studies similar to this. The Spatial Links Tools works by mapping the entire study area as a grid and then creating pathways of adjacent grid cells across the landscape according to input datasets and a ruleset. The pathways identified are the potential biodiversity corridors. There are several decisions to make before running the tool which are outlined below.

2. Methods - Characterising the landscape

In order to map corridors that are ecologically realistic, we need to characterise the landscape with regard to how species may travel though it. This essentially involves developing a cost grid that defines potential preferences for species utilisation of different components of the landscape. For example a species may be more inclined to pass through large areas of good condition vegetation rather than to travel through small degraded areas.

The landscape characterisation used is based on a matrix developed using the datasets of vegetation, patch size and landuse as outlined below (i.e. the larger the score the greater the "preference" for species utilisation).

2.1 Vegetation

Vegetation	Score
All Native Vegetation	4
Other (including Cleared)	1

Eco Logical Australia Pty Ltd
Ecological Assessment, GIS, Environmental Management and Planning
Ph - (08) 9227 1070
Fax - (08) 9227 1078

2.2 Patch Size

Patch Size	CSA score
< 20 ha	1
20 – 100 ha	2
100 – 250 ha	3
250 – 1000 ha	4
> 1000 ha	5
Plantation/cleared	0

2.3 Landuse

DEC reviewed and ranked land use codes from the Perth MRS and Gingin TPS and Chittering TPS. This is presented in the table below:

MRS Code	Chittering TPS LUCODE	Gingin TPS LUCODE	Description	Score
	41		LIGHT INDUSTRIAL	not in GSS
	53		SMALL RURAL HOLDINGS	not in GSS
	56		RURAL RETREAT	not in GSS
	57		RURAL TOWNSITE	not in GSS
	60		PUBLIC PURPOSES	not in GSS
	61		PUBLIC PURPOSES	not in GSS
	62		PUBLIC PURPOSES	not in GSS
	63		PUBLIC PURPOSES	not in GSS
	64		PUBLIC PURPOSES	not in GSS
	65		PUBLIC PURPOSES	not in GSS
	80		SPECIAL USE	not in GSS
		0		not in GSS
		1	RESIDENTIAL	not in GSS
		8	TOURIST	not in GSS
		22	COMMERCIAL	not in GSS
		42	INDUSTRIAL	not in GSS
		43	FISHING INDUSTRY	not in GSS
		59	RURAL CONSERVATION	not in GSS
		62	PUBLIC USE	not in GSS
		63	PUBLIC USE	not in GSS
		64	PUBLIC USE	not in GSS
		65	PUBLIC USE	not in GSS
		68	PUBLIC USE	not in GSS
		80	SPECIAL USE	not in GSS
		61	PUBLIC USE	**3** for those areas listed as "Other Reserves - North" in the GSS_CRCat field of the "GSS Conservation Reserves and other DEC Managed Land.shp" **1** for other areas
		66	PUBLIC USE	**3** for those areas listed as "Other Reserves - North" in the GSS_CRCat field of the "GSS Conservation Reserves and other DEC Managed Land.shp" **1** for other areas

Eco Logical Australia Pty Ltd
Ecological Assessment, GIS, Environmental Management and Planning
Ph - (08) 9227 1070
Fax - (08) 9227 1078

MRS Code	Chittering TPS LUCODE	Gingin TPS LUCODE	Description	Score
		67	PUBLIC USE	**3** for those areas listed as "Other Reserves - North" in the GSS_CRCat field of the "GSS Conservation Reserves and other DEC Managed Land.shp" **1** for other areas
95			Public Purposes (Commonwealth Govt)	**3** for those areas listed as "Gnangara Park - Unallocated Crown Land" in the GSS_CRCat field of the "GSS Conservation Reserves and other DEC Managed Land.shp" **1** for other areas
	68		WATER SUPPLY	**3** for those areas listed as "Gnangara Park - Unallocated Crown Land" in the GSS_CRCat field of the "GSS Conservation Reserves and other DEC Managed Land.shp" **1** for other areas
80			Parks and Recreation	3
81			Parks and Recreation (Restricted)	3
	70		PARKS AND RECREATION	3
	74		CONSERVATION	3
		50	PARKS AND RECREATION	3
55			Rural	2
84			State Forests	2
79			Waterways	2
56			Rural - Water Protection	2
	54		AGRICULTURAL RESOURCE	2
		40	DRAINAGE AND WATERWAYS	2
		54	RURAL	2
		55	RURAL RESIDENTIAL	2
		56	RURAL INDUSTRIAL	2
		57	RURAL LIVING	2
75			Primary Regional Roads	1
2			Urban Deferred	1
82			Railways	1
87			Controlled Access Highways	1
1			Urban	1
76			Other Regional Roads	1
40			Industrial	1
98			Public Purposes (WAWA)	1
20			Central City Area	1
50			Private Recreation	1
91			Public Purposes (High School)	1
96			Public Purposes (SECWA)	1
97			Public Purposes (Special Uses)	1
90			Public Purposes (Hospital)	1
92			Public Purposes (Technical School)	1
94			Public Purposes (University)	1
86			Civic and Cultural	1
93			Public Purposes (Car Park)	1
100			Public Purposes (No definition)	1
83			Port Installations	1

Eco Logical Australia Pty Ltd
Ecological Assessment, GIS, Environmental Management and Planning
Ph - (08) 9227 1070
Fax - (08) 9227 1078

MRS Code	Chittering TPS LUCODE	Gingin TPS LUCODE	Description	Score
99			Public Purposes (Prison)	1
89			Important Regional Roads	1
41			Special Industrial	1
	0		**roads**	1
	20		TOWNSITE	1
	55		RURAL RESIDENTIAL	1
	71		HIGHWAY	1
	72		MAJOR ROAD	1
	73		RAILWAY	1
		4	URBAN DEVELOPMENT	1
		58	HORTICULTURE	1
		78	ROADS	1
		150	OCEAN	1

2.4 Corridor start points

In addition to the "cost grid" outlined above, the model also required identification of the habitat areas considered core for the species of interest. This is a "habitat grid" that specifically identifies areas of habitat that the model should try to connect. As such, the habitat grid is the corridors start and end points. It was proposed to develop the habitat grid based on:

1. Vegetation within 500m of a threatened species record; and
2. Native vegetation >4ha patch size and in landuse score 2 or 3.

The spatial links tool places corridor start and end points randomly throughout the landscape, but only in areas covered by the habitat grid. 1000 start points were selected

2.5 Corridor length

The maximum length of the corridor must be specified before running the tool. This determines the maximum length of corridor between a start and end point. Predefining a length was not possible, rather the approach taken was to review the input data (cost and habitat grids) and the nature of the study area and to adjust the corridor length value to suit. A Corridor length of 50km was decided upon for the final mapping.

Eco Logical Australia Pty Ltd
Ecological Assessment, GIS, Environmental Management and Planning
Ph - (08) 9227 1070
Fax - (08) 9227 1078

3. Results

The Cost Grid Map (Figure 1) and the Connectivity Model (Figure 2) are presented below.

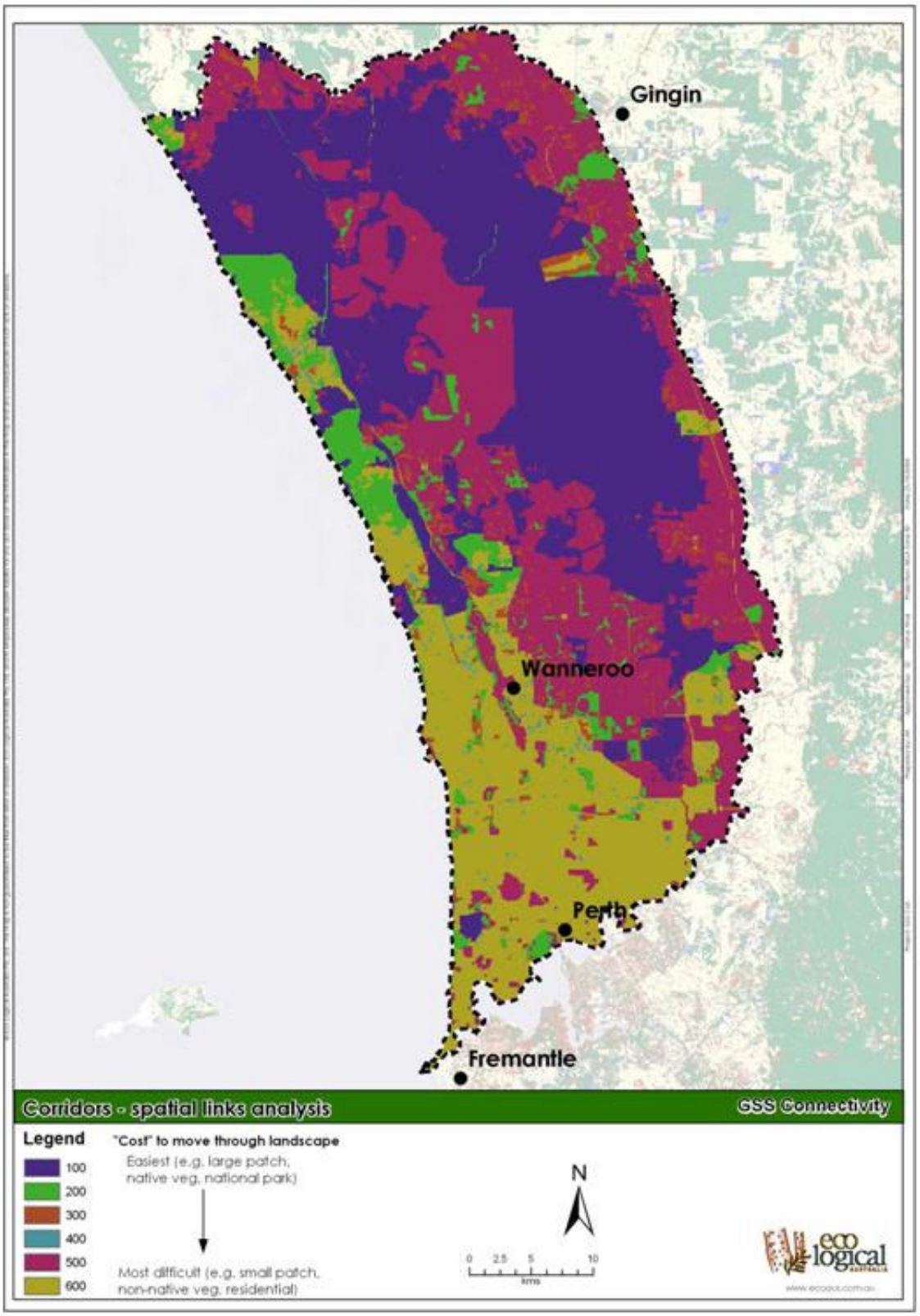

Figure 1: Cost Grid

Eco Logical Australia Pty Ltd
Ecological Assessment, GIS, Environmental Management and Planning
Ph - (08) 9227 1070
Fax - (08) 9227 1078

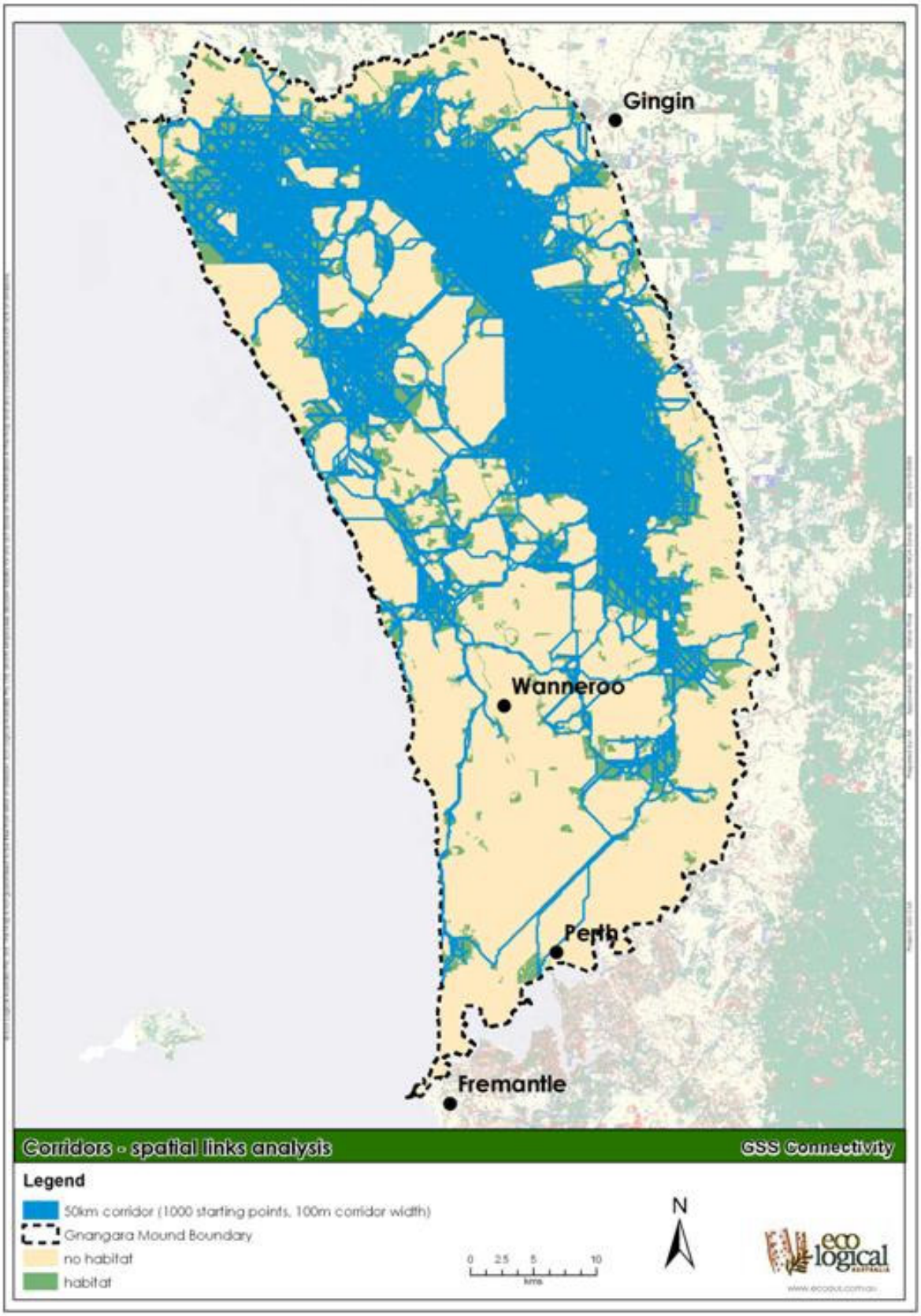

Figure 2: Connectivity model for 50kms and 1000 start points

Eco Logical Australia Pty Ltd
Ecological Assessment, GIS, Environmental Management and Planning
Ph - (08) 9227 1070
Fax - (08) 9227 1078

4. Recommendations

The result of the connectivity modeling is a number of identified "potential biodiversity corridors". It is proposed that these are filtered by the incorporation of "local knowledge" (from DEC) to:

- Identify those corridors that best meet the aims and objectives required by DEC; and
- Are feasible when considering current and potential surrounding landuses and other pressures.

The following recommendations are made with regards to the further use of this study:

- The model represents a least cost path approach whereby the minimum possible barrier to movement is identified based on the pre-determined cost grid. For a more specific, or tailored analysis the following attributes could be further refined:
    - Corridor length: Corridor length could be restricted to varying lengths based on specific investigations.
    - Start/end points: Start and end points could be manually selected in order to target specific areas, habitat types, vegetation communities etc. Alternatively, specific rulesets for where points are allowed to occur could be determined, and a randomised selection within the ruleset limited areas could be undertaken.

Such a tailored analysis would be useful if targeting specific investigations related to particular species, vegetation types or habitat.

- Currently, due to limitations on the availability of data, connectivity analysis does not extend outside the boundaries of the GSS study region. A useful addition to this analysis would be to buffer out connectivity to reach outside study area boundaries by a pre determined distance. This would provide an opportunity to examine paths with the least barrier to movement to vegetation patches outside the study area, and could potentially further inform analysis inside the study area, particularly in regions close to the boundaries of the study area.
- Comparison to expert derived mapping and other analysis:
    - It is understood that a separate project has been undertaken by ecologists looking at linking vegetation patches, with corridors being selected by hand, using expert ecological knowledge to produce a connectivity map for the GSS. The combination of this analysis and the 'expert' model will be a valuable tool in planning a network of habitat corridors across the GSS Study area.
    - The Conservation Significance Assessment mapping, produced as part of this project, will also be a useful tool in building a corridor network. The connectivity model and CSA can be used as a guide for selecting what parts of the landscape can be combined and through what path this would occur.

Eco Logical Australia Pty Ltd
Ecological Assessment, GIS, Environmental Management and Planning
Ph - (08) 9227 1070
Fax - (08) 9227 1078