

16. Information and statistics

Information and statistics are presented in this section to assist in the development of a Local Biodiversity Strategy and in particular the setting of objectives and Natural Area Condition targets.

16.1. Native vegetation extent in the Swan Coastal Plain Interim Bioregionalisation of Australia (IBRA) subregions south of the Moore River for vegetation complexes occurring within the Perth Metropolitan Region

Data presented below is circa 1997 prepared by the Environmental Protection Authority (2003a) and Department of Environment (unpub 2003).

Limitations

It is important to keep in mind that the remnant native vegetation mapping used in the Perth Metropolitan Region (PMR) is derived from dated aerial photography (in this case circa 1997) with limited ground-truthing. As a consequence the percentages of ecological communities remaining is generally an over-estimate of the native vegetation remaining at present. The principal factors contributing to this over-estimation are:

- ▶ the preferential mapping of treed landscapes, leading to some mapping of areas that are parkland cleared or completely degraded
- ▶ the inclusion of areas that are approved for clearing through development approvals and/or clearing permits
- ▶ some areas have been cleared since the time of the aerial photography.

It is very important to bear these limitations in mind when the statistics for percentage of the vegetation complexes remaining are approaching target figures set for assessment criteria, that is, 10% or 30%. At the date of publication of these Guidelines, it is reasonable to expect that there is at least a 10% over-estimate in the statistics listed in Table 15 below (Gary Whisson, pers. comm., April 2003, EPA Service Unit, Department of Environment). For example, if 40% is listed in Table 15, it would be expected that about 30% is what is present on the ground at the time of publication of these Guidelines. Therefore, ecological communities shown in Table 15 with up to and including 40% remaining meet the regional representation assessment criteria for retention of at least 30% of each ecological community within an IBRA subregion.

KEY to Table 15**Vegetation Complex Name**

Name allocated to the vegetation complex by Heddle et al. (1980).

Vegetation Complex No

Number allocated to the complex by Heddle et al. (1980).

Total pre-European extent (ha)

Pre-European extent of each vegetation complex in the Swan Coastal Plain IBRA Subregions South of the Moore River (see Figure 3 for spatial extent of the Region). This was derived using Heddle et al. (1980) and Mattiske and Havel (1998).

c. 1997 extent in the Swan Coastal Plain IBRA Subregions South of the Moore River (ha)

The remaining area circa 1997 of each vegetation complex based on the remnant vegetation mapping of Shepherd et al. (2002) as used by the National Land and Water Resource Audit (Commonwealth of Australia 2001a)

% of each complex remaining c. 1997 in the Swan Coastal Plain IBRA Subregions South of the Moore River

The remaining area of the complex as a percentage of its pre-European extent.

Area in secure tenure (ha)

The remaining area of each complex in secure tenure.

(Secure tenure = National Parks, Nature Reserves, Conservation Parks and 5(g) Reserves from CALM Managed Lands 2002 GIS database).

% of each complex remaining of pre-European extent in secure tenure

The remaining area of each complex in secure tenure as a percentage of its pre-European extent.

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Table 15. Circa 1997 Remnant vegetation extent in the Swan Coastal Plain IBRA Subregions south of the Moore River for vegetation complexes occurring within the Perth Metropolitan Region (combined data from Environmental Protection Authority 2003a and Department of Environment unpub. 2003).

Vegetation Complex Name (grouped by major landform elements)	Vegetation Complex No.	Total pre-European extent (ha)	c. 1997 extent in the Swan Coastal Plain IBRA Subregions South of the Moore River (ha)	% of each complex remaining c. 1997 in the Swan Coastal Plain IBRA Subregions South of the Moore River	Area in secure tenure (ha)	% of each complex remaining of pre-European extent in secure tenure
Dandaragan Plateau						
Mogumber Complex–South	59	13,720	5,477	40*	149	1.1
Gingin Scarp						
Reagan Complex	65	9,097	3,455	38*	168	1.9
Foothills (Ridge Hill Shelf)						
Forrestfield Complex	29	20,169	3,518	17.4**	61	0.3
Coonambidgee Complex	31	6,272	2,830	45.1	589	9.4
Pinjarra Plain						
Guildford Complex	32	92,497	4,662	5.0**	143	0.2
Swan Complex	33	15,783	2,454	15.6**	0	0.0
Dardanup Complex	34	9,504	754	7.9**	0	0.0
Serpentine River Complex	35	19,855	2,103	10.6**	558	2.8
Beermullah Complex	36	6,707	402	6.0**	124	1.9
Yanga Complex	38	26,177	4,884	18.7**	250	1.0
Combinations of Bassendean Dunes / Pinjarra Plain						
Cannington Complex	40	16,661	1,659	10.0**	883	5.3
Southern River Complex	42	57,979	11,501	19.8**	882	1.5
Bassendean Dunes						
Bassendean Complex–North	43	74,147	53,384	72.0	20,369	27.5
Bassendean Complex–Central and South	44	87,626	23,635	27.0*	572	0.7
Bassendean Complex–North Transition	45	17,675	16,308	92.3	10,223	57.8

Table 15 (cont)

Vegetation Complex Name (grouped by major landform elements)	Vegetation Complex No.	Total pre- European extent (ha)	c. 1997 extent in the Swan Coastal Plain IBRA Subregions South of the Moore River (ha)	% of each complex remaining c. 1997 in the Swan Coastal Plain IBRA Subregions South of the Moore River	Area in secure tenure (ha)	% of each complex remaining of pre- European extent in secure tenure
Bassendean Complex–Central and South Transition	46	2,178	2,178	100.0	0	0.0
Spearwood Dunes						
Karrakatta Complex–North	47	25,579	9,444	36.9*	40	0.2
Karrakatta Complex–North Transition	48	5,260	4,803	91.3	2	0.0
Karrakatta Complex–Central and South	49	51,620	14,811	28.7*	1,256	2.4
Cottesloe Complex–North	51	21,412	15,216	71.1	2,119	9.9
Cottesloe Complex–Central and South	52	45,300	18,474	40.8	3,955	8.7
Wetlands						
Herdsmen Complex	53	8,309	2,875	34.6*	952	11.5
Pinjar Complex	54	4,893	1,294	26.4*	23	0.5
Quindalup Dunes						
Quindalup Complex	55	54,476	18,000	33.0*	2309	4.2
Marine (Estuarine and Lagoonal) Deposits						
Vasse Complex	56	11,190	3,287	29.4*	1,227	11.0
Yoongarillup Complex	57	26,580	11,367	42.8	3,632	13.7

* Equivalent to <= 30% in 2004 based on the limitations of these statistics

** Equivalent to <= 10% in 2004 based on the limitations of these statistics

16.2. Remnant vegetation extent in the Bush Forever study area

Limitations

It is important to keep in mind that the remnant native vegetation mapping used in the Perth Metropolitan Region (PMR) is derived from dated aerial photography (in this case 1998) with limited ground truthing. As a consequence the percentages of ecological communities remaining is generally an over-estimate of the native vegetation remaining at present. The principal factors contributing to this over-estimation are:

- ▶ the preferential mapping of treed landscapes, leading to some mapping of areas that are parkland cleared or completely degraded
- ▶ the inclusion of areas that are approved for clearing through development approvals and/or clearing permits
- ▶ some areas have been cleared since the time of the aerial photography.

It is important to bear these limitations in mind when the statistics for percentage of the vegetation complexes remaining are approaching target figures set for assessment criteria, for example, 10%. At the date of publication of these Guidelines, it is reasonable to expect that there is at least a 5% over-estimate present in the statistics listed in Table 16 below. For example, if 15% is listed on Table 16, it would be expected that a figure of about 10% is what is present on the ground at the time of publication of these Guidelines. Therefore, ecological communities shown in Table 16 with up to and including 15% remaining meet the regional representation assessment criteria for retention of at least 10% of each ecological community within the Bush Forever Study Area.

KEY to Table 16

Vegetation Complex Name

Name allocated to the vegetation complex by Heddle et al. (1980).

Vegetation Complex No

Number allocated to the complex by Heddle et al. (1980).

Total pre-European extent (ha)

Pre-European extent of each vegetation complex in the Bush Forever Study Area (see Figure 3 for spatial extent of Bush Forever Study Area). This was derived using Heddle et al. (1980).

1998 extent in the Bush Forever Study Area (ha)

The remaining area in 1998 of each vegetation complex based on the remnant vegetation mapping of AgWest (1998).

% of each complex remaining in 1998 in the Bush Forever Study Area

The remaining area of the complex as a percentage of its pre-European extent.

Areas with some existing or proposed protection

Areas based on 1998 vegetation extent mapping intersected with areas defined as having "some existing protection"* as mapped in 2000 in the following categories:

- area with some existing protection* (ha)
- additional area proposed for protection under Bush Forever (ha)
- total area proposed for protection under Bush Forever (ha)
- % of each complex proposed for protection under Bush Forever (ha)

* *Some Existing Protection defined as Metropolitan Region Scheme - Parks and Recreation, CALM Managed Lands and Crown Reserves with a Conservation Purpose (Government of WA 2000a)*

Table 16. 1998 Remnant vegetation extent in the Bush Forever study area (adapted from Government of Western Australia 2000a)

Vegetation Complex Name (grouped by IBRA subregions and major landform elements)	Vegetation Complex No.	Pre-European extent in SCP/PMR (ha)	1998 extent in SCP/PMR (ha)	% of each complex remaining in 1998 in SCP/PMR	Areas with some existing or proposed protection			
					Area with some existing protection (ha)	Additional area proposed for protection under Bush Forever (ha)	Total area proposed for protection under Bush Forever (ha)	% of each complex proposed for protection under Bush Forever
Dandaragan Plateau/Gingin Scarp								
Mogumber Complex–South	59	866	347	40	0	287	287	33*
Reagan Complex	65	1 655	396	24	33	297	330	20*
Foothills (Ridge Hill Shelf)								
Forrestfield Complex	29	11 328	1 020	9	219	354	573	5*
Coonambidgee Complex	31	40	3	7	0	3	3	7*
Pinjarra Plain								
Guildford Complex	32	24 513	1 369	6	389	451	840	3*
Swan Complex	33	5 962	682	11	292	244	536	9*
Dardanup Complex	34	1 992	309	15	0	211	211	11*
Serpentine River Complex	35	4 445	398	9	25	148	173	4*
Beermullah Complex	36	6 707	433	6	139	214	353	5*
Yanga Complex	38	5 775	1058	18	267	281	549	9*
Combinations of Bassendean Dunes/ Pinjarra Plain								
Cannington Complex	40	601	4	1	0	0	0	0*
Southern River Complex	42	31 148	5 370	17	1775	1 372	3 147	10*
Bassendean Dunes								
Bassendean Complex–North	43	22 933	12 390	54	6 842	3 902	10 744	47
Bassendean Complex–Central and South	44	46 220	10 919	24	2 818	3 065	5 883	13*

Table 16 (cont)

Vegetation Complex Name (grouped by IBRA subregions and major landform elements)	Vegetation Complex No.	Pre-European extent in SCP/PMR (ha)	1998 extent in SCP/PMR (ha)	% of each complex remaining in 1998 in SCP/PMR	Areas with some existing or proposed protection			
					Area with some existing protection (ha)	Additional area proposed for protection under Bush Forever (ha)	Total area proposed for protection under Bush Forever (ha)	% of each complex proposed for protection under Bush Forever
Bassendean Complex–North Transition	45	3 116	2 238	72	1 474	607	2 081	67
Bassendean Complex–Central and South Transition	46	623	622	100	0	622	622	100
Spearwood Dunes								
Karrakatta Complex–North	47	5 155	1 027	20	349	678	1 027	20
Karrakatta Complex–North Transition	48	2 344	1 849	79	16	1 833	1 849	79
Karrakatta Complex–Central and South	49	34 532	6 275	18	1 941	649	2 590	8*
Cottesloe Complex–North	51	8 670	6 082	70	5 579	0	5 579	64
Cottesloe Complex–Central and South	52	34 439	12 362	36	5 289	796	6 085	18
Wetlands								
Herdsmen Complex	53	6 509	2 017	31	1 423	144	1 567	24
Pinjar Complex	54	4 893	1 200	25	620	312	932	19
Quindalup Dunes								
Quindalup Complex	55	24 381	11 598	48	3 527	1 229	4 756	20
Marine (Estuarine and Lagoonal) Deposits								
Yoongarillup Complex	57	664	478	72	379	24	403	61
Vasse Complex	56	751	9	1	6	0	6	1*
Unclassified Remnant Vegetation					20	75	95	
Total for Swan Coastal Plain within the Bush Forever Study Area		290 261	80 455	28	33 423	17 797	51 220	18

* Equivalent to 400 ha or 10% or less (whichever is the greater) in 2004, based on the limitations of these statistics

16.3. Datasets to assist Local Governments identify and describe natural area resources

Tables 19 to 26 provide statistics that were prepared to assist Local Government in completing components of Phase 2 of the local biodiversity planning process. The statistics presented in Tables 19 to 25 were derived from interpretation and analysis of the following datasets:

- ▶ Native Vegetation Extent by Administrative Planning Categories
- ▶ Native Vegetation Extent by Ownership Category
- ▶ Native Vegetation Extent by Vegetation Complex
- ▶ Native Vegetation Extent by Metropolitan Region Scheme Zoning

The above datasets were prepared by interpretation and analysis of the Perth Bushland Mapping dataset 2001 with other GIS datasets (Taylor 2003a). January 2001 aerial photography was used at a scale of 1:20,000 to map those areas of native vegetation considered to be within the native vegetation classes of remnant and modified. When viewing the statistics provided in Tables 19-25 it is important to consider the limitations associated with mapped native vegetation extent in the Perth Metropolitan Region (PMR) and it should therefore not be assumed that the statistics provided are accurate to the nearest hectare. Based on the scale of capture it is estimated that an error of up to 5% may be associated with calculated areas for individual polygons in the Perth Bushland mapping dataset, although the overall error for summarised areas from this dataset will be much lower (Damian Shepherd, pers. comm., November 2003, Policy and Business Services Directorate, Department of Agriculture Western Australia). Additional factors that should be considered when viewing the statistics in Table 17 to 24 include the following:

- ▶ the preferential mapping of treed landscapes, leading to some mapping of areas that are parkland cleared or completely degraded
- ▶ the inclusion of areas that are approved for clearing through development approvals and/or clearing permits
- ▶ some areas have been cleared since the time of the aerial photography.

Where a zero (0) appears in the tables this indicates that mapped native vegetation does occur but it has an area less than 0.5 ha. Where there are blank cells within a table it indicates that no mapped native vegetation exists.

Table 17 Native Vegetation Extent by Administrative Planning Category

This table was derived from the Native Vegetation Extent by Administrative Planning Category dataset and provides a broad overview of the different themes of native vegetation according to existing administrative planning and protection categories. Importantly this table quantifies the spatial extent of vegetated Local Natural Areas. Local Natural Areas are the major focus of Local Biodiversity Strategies.

Key to Table 17

Bush Forever

- ▶ area (ha) of mapped native vegetation occurring in Bush Forever Sites. Includes Bush Forever sites that are within the CALM estate. Note the area of mapped native vegetation occurring within Bush Forever sites for the PMR is different to that indicated in Government of Western Australia (2000a). The reasons for this include:
 - ▶ area of mapped native vegetation occurring within 17 nominated additional sites is included in Table 17 (not included in Government of Western Australia 2000a)
 - ▶ 2001 native vegetation mapping was used for Table 17, Government of Western Australia (2000a) used 1997 native vegetation extent mapping.

CALM Conservation

- ▶ Area (ha) of mapped native vegetation occurring in CALM Conservation Estate (5 (g) Reserve, Conservation Reserve, National Park, Nature Reserve). Excludes those Bush Forever Sites that are within CALM estate.

CALM State Forest

- ▶ Area (ha) of mapped native vegetation occurring in CALM State Forest. Excludes those Bush Forever Sites that are within CALM estate.

CALM Other

- ▶ Area (ha) of mapped native vegetation occurring in CALM estate excluding CALM conservation and CALM State forest. Excludes those Bush Forever Sites that are within CALM estate.

Regional Parks

- ▶ Area (ha) of mapped native vegetation occurring in Regional Parks. Excludes Bush Forever Sites and CALM estate that are within Regional Parks.

Local Natural Areas

- ▶ Area (ha) of mapped native vegetation not occurring within CALM estate, Bush Forever Sites or Regional Parks. This represents only the vegetated extent of Local Natural Areas and therefore does not include the other components of Local Natural Areas (eg open water, rock outcrops etc).

Table 18 Native Vegetation Extent by Ownership Category

This table was derived from the Native Vegetation Extent by Ownership Category dataset and categorises native vegetation extent according to ownership categories, which is an important consideration when determining opportunities and constraints for protection and management of vegetated natural areas and for identifying the extent of vegetated natural areas for which Local Government has a management responsibility.

Key to Table 18

Commonwealth

- ▶ Area (ha) of mapped native vegetation occurring on Commonwealth Land.

Local Government

- ▶ Area (ha) of mapped native vegetation occurring on Local Government Land.

Crown (unknown)

- ▶ Area (ha) of mapped native vegetation occurring on Crown (unknown – don't know whether vested with Commonwealth, State or Local Government) Land.

Private

- ▶ Area (ha) of mapped native vegetation occurring on private land.

State Government

- ▶ Area (ha) of mapped native vegetation occurring on State Government land.

unallocated Crown land

- ▶ Area (ha) of mapped native vegetation occurring on unallocated Crown land.

Multiple Owner

- ▶ Area (ha) of mapped native vegetation occurring on land which has multiple owners.

Table 19 Native Vegetation Extent in Local Government Reserves

This table was derived from the Native Vegetation Extent by Ownership Category dataset and categorises native vegetation extent that occurs within Local Government reserves according to administrative planning categories.

Key to Table 19

Bush Forever

- ▶ Area (ha) of mapped native vegetation occurring within Local Government Reserves that are also Bush Forever Sites.

Local Natural Area

- ▶ Area (ha) of mapped native vegetation occurring within Local Government reserves that are considered to be a Local Natural Area. This represents only the vegetated extent of Local Natural Areas within Local Government reserves and therefore does not include the other components of Local Natural Areas (eg open water, rock outcrops etc).

Regional Parks

- ▶ Area (ha) of mapped native vegetation occurring within Local Government Reserves that are also Regional Parks and are not Bush Forever Sites.

Table 20 Vegetated Local Natural Areas by Ownership Categories

This table was derived from the Native Vegetation Extent by Ownership Category dataset and categorises vegetated Local Natural Areas by ownership categories.

Key to Table 20:

Commonwealth

- ▶ Area (ha) of vegetated Local Natural Area occurring on Commonwealth Land.

Local Government

- ▶ Area (ha) of vegetated Local Natural Area occurring on Local Government Land.

Crown (unknown)

- ▶ Area (ha) of vegetated Local Natural Area occurring on Crown (unknown – don't know whether vested with Commonwealth, State or Local Government) Land.

Private

- ▶ Area (ha) of vegetated Local Natural Area occurring on private land.

State Government

- ▶ Area (ha) of vegetated Local Natural Area occurring on State Government land.

unallocated Crown land

- ▶ Area (ha) of vegetated Local Natural Area occurring on unallocated Crown land.

Multiple Owner

- ▶ Area (ha) of vegetated Local Natural Area occurring on land which has multiple owners.

Table 21 Native Vegetation Extent by Vegetation Complex per Local Government

This table was derived from the Native Vegetation Extent by Vegetation Complex dataset and categorises native vegetation extent according to vegetation complexes mapped by Mattiske and Havel (1998) and Heddle, Longergagan and Havel (1980). For the Perth Metropolitan Region vegetation complexes represent the most appropriate level to interpret ecological communities for establishing quantitative targets based on area. These vegetation complexes are based on the patterning of vegetation at a regional scale reflected by the underlying key determining factors of landform, soil and climate.

Key to Table 21:

<p>Vegetation Complex</p> <ul style="list-style-type: none"> ▶ Name allocated to the vegetation complex by Mattiske and Havel (1998) and Heddle, Longergagan and Havel (1980). <p>Pre-European - Total (ha)</p> <ul style="list-style-type: none"> ▶ Pre-European extent (ha) of each vegetation complex according to Local Government administrative boundaries. <p>Pre-European - %</p> <ul style="list-style-type: none"> ▶ Pre-European extent of each vegetation complex as percentage of the Local Government area. <p>Remaining Extent – Total (ha)</p> <ul style="list-style-type: none"> ▶ The remaining area in 2001 of vegetation complex according to Local Government administrative boundaries. <p>Remaining Extent – %</p> <ul style="list-style-type: none"> ▶ The remaining area in 2001 of vegetation complex as a percentage of the pre-European extent of each vegetation complex.
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Table 22 Native Vegetation Extent by Metropolitan Region Scheme (MRS) Zoning

This table was derived from Native Vegetation Extent by MRS Zoning dataset and is useful for determining the planning constraints associated with the native vegetation and the degree of threat due to future development. For example native vegetation zoned Urban under the MRS faces a different level of threat compared to native vegetation that exists on Rural zoned land.

Key to Table 22

<p>MRS Zoning</p> <ul style="list-style-type: none"> ▶ Area (ha) of native vegetation according to Metropolitan Region Scheme Zoning.

Table 23 Vegetated Local Natural Areas by Metropolitan Region Scheme (MRS) Zoning

This table was derived from the Native Vegetation Extent by MRS Zoning dataset and provides information on the MRS zoning of vegetated Local Natural Areas.

Key to Table 23

<p>MRS Zoning</p> <ul style="list-style-type: none"> ▶ Area (ha) of vegetated Local Natural Areas according to Metropolitan Region Scheme Zoning.

Table 24 Example for the City of Swan of the information that should be considered when setting representation – retention and protection targets

This table provides an example of the information that would be useful for identifying which vegetation complexes should be a priority for protection to contribute to meeting regional biodiversity targets and provide a guide for formulating local biodiversity targets within the Local Government. The City of Swan has been used as an example.

It is important to recognise that the remnant native vegetation mapping used to derive the statistics was created from dated aerial photography (in this case January 2001) with limited ground-truthing. Consequently the statistics for the amount of each vegetation complex remaining are generally an over-estimate of that remaining on the ground at present. The principal factors contributing to this over-estimation are:

- ▶ the preferential mapping of treed landscapes, leading to some mapping of areas that are parkland cleared or completely degraded
- ▶ the inclusion of areas that are approved for clearing through development approvals and/or clearing permits
- ▶ some areas that have been cleared since the time of the aerial photography (Environmental Protection Authority 2003a).

This mapping also does not give any indication of the condition of the native vegetation in the areas mapped.

It is very important to bear these limitations in mind when the statistics for percentage of the vegetation complexes remaining are approaching target figures set for Local Significance Criteria eg. 10 or 30% and take a precautionary approach when determining the future of Local Natural Areas of vegetation complexes indicated to be above threshold targets.

Key to Table 24

Pre-European

- ▶ Pre-European extent of each vegetation complex within the Local Government.

Remaining extent

- ▶ The extent of each vegetation complex remaining in 2001 for the Local Government.

Protection Assumed

- ▶ The area of vegetation complex remaining that has some level of assumed protection. Those areas of each vegetation complex that fall within the administrative planning categories of Bush Forever, CALM estate, Regional Parks.

LNA

- ▶ Those areas of vegetation complex that are considered to be Local Natural Areas, ie. all those areas outside of the "protection assumed" category.

Regional Representation and Rarity, Local Significance Criteria – Essential

- ▶ Those vegetation complexes that are identified in Tables 3 to 7 as being essential for retention to ensure that regional representation and rarity Local Significance criteria are addressed are indicated with a 'yes'. (Note it is essential that vegetation for those complexes indicated with 'yes' are retained).

Regional Representation and Rarity, Local Significance Criteria – Desirable

- ▶ Those vegetation complexes that are identified in Tables 3 to 7 as being desirable for retention to ensure that regional representation and rarity Local Significance criteria are addressed are indicated with a 'yes'.

Local Natural Area Targets to meet Regional Representation and Rarity, Local Significance Criteria – Essential

- ▶ This indicates that for all those vegetation complexes meeting ('yes') Regional Representation and Rarity, Local Significance Criteria – Essential, all Local Natural Areas should be retained.

Local Natural Area Targets to meet Regional Representation and Rarity, Local Significance Criteria – Desirable

- ▶ This indicates that for all those vegetation complexes meeting ('yes') Regional Representation and Rarity, Local Significance Criteria – Desirable, all Local Natural Areas should be retained.

Local Representation 10% Target – Area Required

- ▶ The area of each vegetation complex required to be retained to achieve 10% representation of the pre-European extent of the complex within the Local Government.

Local Representation 10% Target – Achieved

- ▶ Those vegetation complexes that have an area of the complex with 'protection assumed' that is greater than or equal to the 'area required' are indicated with a 'yes'.

Local Representation Suggested Actions for 10% Target – Local Natural Area Protection

- ▶ For those complexes that don't meet the target (indicated by 'no' in the Local Representation 10% Target – Achieved column). Opportunities may exist to protect additional LNAs. The number indicated in the column refers to the amount of LNA that needs to be protected to meet the target.

Local Representation Suggested Actions for 10% Target – Restoration

- ▶ For those complexes that don't meet the target and don't have enough LNA to meet the protection target restoration/revegetation may be considered. The area required to be restored/revegetated is indicated in the column.

Local Representation 30% Target – Area Required

- ▶ The area of each vegetation complex required to be retained to achieve 30% representation of the pre-European extent of the complex within the Local Government.

Local Representation 30% Target – Achieved

- ▶ Those vegetation complexes that have an area of the complex with 'protection assumed' that is greater than or equal to the 'area required' are indicated with a 'yes'.

Local Representation Suggested Actions for 30% Target – Local Natural Area Protection

- ▶ For those complexes that don't meet the target indicated by 'no' in the Local Representation 30% Target – Achieved column, LNAs may be retained to meet the target. The number indicated in the column refers to the amount of LNA that needs to be retained to meet the target.

Local Representation Suggested Actions for 30% Target – Restoration

- ▶ For those complexes that don't meet the target and don't have enough LNA to meet the protection target restoration/revegetation may be considered. The area required to be restored/revegetated is indicated in the column.

Table 17. 2001 Native Vegetation Extent by Administrative Planning Category (Perth Biodiversity Project, unpub. 2003)

Local Government	Bush Forever (ha)	CALM Conservation (ha)	CALM State Forest (ha)	CALM Other (ha)	Regional Parks (ha)	Vegetated Local Natural Areas (ha)	Total (ha)
Armadale	1102	2168	30085	1567	3691	4298	42911
Bassendean	17					7	24
Bayswater	31					26	57
Belmont	430					74	504
Cambridge	487					49	536
Canning	309				0	172	481
Claremont	0					3	3
Cockburn	2739	0			20	1811	4570
Cottesloe							
East Fremantle						1	1
Fremantle	13					6	19
Gosnells	670		414		1656	1011	3751
Joondalup	1035	0	0	0	0	570	1605
Kalamunda	310	496	18386	178	2719	2051	24140
Kwinana	2060	0			2	2756	4818
Melville	200	0		0	6	87	293
Mosman Park	3					8	11
Mundaring	58	2769	19523	60	4315	18038	44763
Nedlands	169					79	248
Peppermint Grove						0	0
Perth	2					4	6
Rockingham	4069	15		9	18	3584	7695
Serpentine–Jarrahdale	2847	4580	35337	158	1228	4549	48699
South Perth	29					28	57
Stirling	416	0			0	276	692
Subiaco						1	1
Swan	11422	5895	460	1684	1779	24803	46043
Victoria Park	9					3	12
Vincent	0					0	0
Wanneroo	22787	22	85		0	11163	34057
PMR Total	51214	15945	104290	3657	15434	75457	265997

IMPORTANT INFORMATION TO HELP IN DEVELOPING A LOCAL BIODIVERSITY STUDY

Table 18. 2001 Native Vegetation Extent by Ownership Category (Perth Biodiversity Project, unpub. 2003)

Local Government	Commonwealth (ha)	Local Government (ha)	Crown (unknown) (ha)	Private (ha)	State Government (ha)	Vacant Crown Land (ha)	Multiple Owner (ha)	Total (ha)
Armadale		1046	0	3004	38225	83	554	42912
Bassendean		6	1	3	14	0		24
Bayswater		9	0	6	39	1	2	57
Belmont	420	6		13	54	3	9	505
Cambridge	0	135	1	4	395		2	537
Canning		126	0	119	204	0	32	481
Claremont		0	0	2	0		1	3
Cockburn	329	513	0	1136	1842	171	579	4570
Cottesloe								
East Fremantle				0	1		0	1
Fremantle	0	13	0	1	4		1	19
Gosnells		960	9	1126	1144	81	430	3750
Joondalup		329	1	395	429	94	358	1606
Kalamunda	16	348	14	2838	20685	115	123	24139
Kwinana	1	223	117	1478	1790	499	708	4816
Melville		188	1	8	81	10	6	294
Mosman Park		4	0	3	4	0	0	11
Mundaring	1	1233	14	6464	35820	63	1168	44763
Nedlands	110	44	1	9	78	1	5	248
Peppermint Grove				0				0
Perth		2		2	0		1	5
Rockingham	0	539	20	1898	4410	55	773	7695
Serpentine–Jarrahdale		333	34	4493	42136	56	1646	48698
South Perth		7	0	17	32		0	56
Stirling		329	0	82	197	15		623
Subiaco				0	1		0	1
Swan	843	823	4	17712	18051	375	8236	46044
Victoria Park		10		2	1			13
Vincent					0			0
Wanneroo	115	1384	1	3331	22188	716	6323	34058
PMR Total	1835	8606	219	44147	187822	2337	20958	265924

Table 19. 2001 Native Vegetation Extent in Local Government Reserves (Perth Biodiversity Project, unpub. 2003)

Local Government	Bush Forever (ha)	Local Natural Area (ha)	Regional Parks (ha)	Total (ha)
Armadale	141	79	826	1046
Bassendean	4	2		6
Bayswater	3	6		9
Belmont	1	5		6
Cambridge	97	38		135
Canning	68	57		126
Claremont		0		0
Cockburn	443	68	2	513
Cottesloe				
East Fremantle				
Fremantle	13	0		13
Gosnells	74	87	798	960
Joondalup	234	95	0	329
Kalamunda	97	63	187	348
Kwinana	140	83	0	223
Melville	146	42	0	188
Mosman Park		4		4
Mundaring	10	283	940	1233
Nedlands	26	18		44
Peppermint Grove				
Perth	0	2		2
Rockingham	323	215	0	539
Serpentine-Jarrahdale	117	101	115	333
South Perth	6	1		7
Stirling	270	58		329
Subiaco				
Swan	162	572	90	823
Victoria Park	9	1		10
Vincent				
Wanneroo	951	433	0	1384
PMR Total	3335	2312	2959	8606

IMPORTANT INFORMATION TO HELP IN DEVELOPING A LOCAL BIODIVERSITY STUDY

Table 20. 2001 Vegetated Local Natural Area by Ownership Categories (Perth Biodiversity Project, unpub. 2003)

Local Government	Commonwealth (ha)	Local Government (ha)	Crown (unknown) (ha)	Private (ha)	State Government (ha)	unallocated Crown land (ha)	Multiple Owner (ha)	Total (ha)
Armadale		79	0	1855	1850	65	449	4298
Bassendean		2	1	2	2	0		7
Bayswater		6	0	5	12	0	2	25
Belmont	28	5		5	34	0	2	46
Cambridge		38	1	3	6		1	49
Canning		57	0	46	37	0	32	172
Claremont		0	0	2	0		1	3
Cockburn	1	68	0	867	500	17	358	1810
Cottesloe								0
East Fremantle				0	1		0	1
Fremantle	0	0		1	4		1	6
Gosnells		87	0	551	39	1	332	1010
Joondalup		95	1	159	172	8	136	571
Kalamunda	2	63	8	1475	309	90	104	2049
Kwinana		83	0	1325	843	43	462	2756
Melville		42	1	8	28	6	3	88
Mosman Park		4	0	0	4	0	0	8
Mundaring	1	283	14	6131	10414	28	1166	18036
Nedlands	7	18	1	2	46	0	5	72
Peppermint Grove				0				0
Perth		2		1	0		0	3
Rockingham	0	215	9	1487	1105	53	715	3584
Serpentine-Jarrahdale		101	1	2652	549	27	1219	4549
South Perth		1		12	15		0	28
Stirling		58	0	65	89	1	63	276
Subiaco			1	0	1		0	2
Swan	255	572	0	15444	1471	8	7053	24548
Victoria Park		1		2	1			4
Vincent					0			0
Wanneroo	0	433	0	2628	2285	43	5772	11161
PMR Total	294	2312	38	34728	19816	391	17875	75160

Table 21. 2001 Native Vegetation Extent by Vegetation Complex per Local Government (Perth Biodiversity Project, unpub. 2003)

Vegetation Complex	Armadale				Bassendean				Bayswater			
	Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001	
	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%
Bassendean Complex–Central and\South	879	2	298	34	679	67	2	0	2750	86	8	0
Beermullah Complex	674	1	27	4								
Cooke	778	1	754	97								
Darling Scarp	1754	3	622	35								
Dwellingup 1	379	1	369	97								
Dwellingup 2	19203	34	17697	92								
Dwellingup 4	1393	2	1365	98								
Forrestfield	1898	3	82	4								
Goonaping	719	1	716	100								
Guildford	1436	3	27	2	88	0	7	8	96	0	5	5
Helena 1	2341	4	1563	67								
Karrakatta Complex–Central and\South									32	1	1	5
Murray 1	8194	15	7297	89								
Murray 2	54	0	54	100								
Southern River Complex	4073	7	1234	30	1	0	0	10	59	2	0	0
Swamp	1913	3	1892	99								
Swan Complex	158	0	23	14	245	24	13	5	259	8	21	8
Vasse Complex									12	0	3	26
Yarragil 1	4031	7	3045	76								
Yarragil 2	5920	11	5834	99								

IMPORTANT INFORMATION TO HELP IN DEVELOPING A LOCAL BIODIVERSITY STUDY

Table 21 (cont)

Vegetation Complex	Belmont				Cambridge				Canning				Claremont			
	Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001	
	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%
Bassendean Complex–Central and\South	2082	54	129	6					3799	59	256	7				
Cannington Complex									430	7	3	1				
Cottesloe Complex–Central and\South					1056	48	438						34	7	2	7
Guildford	201	0	2	1					305	1	5	2				
Herdsmen Complex					88	4	0	1								
Karrakatta Complex–Central and\South					926	42	68	7					463	93	1	0
Quindalup Complex					113	5	30							0		
Southern River Complex	1512	39	344	23					1643	25	160	10				
Swan Complex	44	1	7	16					266	4	56	21				

Vegetation Complex	Cockburn				Cottesloe				East Fremantle				Fremantle			
	Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001	
	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%
Bassendean Complex–Central and\South	6850	46	2680	39												
Cottesloe Complex–Central and\South	4846	33	976	20	366	96			333	100	1	0	1695	95	14	1
Herdsmen Complex	1235	8	442	36												
Karrakatta Complex–Central and\South	1390	9	269	19	16	4							87	5	5	6
Quindalup Complex	139	1	80	57		0										
Southern River Complex	313	2	123	39												

Table 21 (cont)

Vegetation Complex	Gosnells				Joondalup				Kalamunda				Kwinana			
	Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001	
	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%
Bassendean Complex–Central and\South	98	1	6	6									4679	39	2159	46
Cannington Complex	171	1	1	1												
Cooke	27	0	27	99					274	1	274	100				
Cottesloe Complex–Central and\South	1695	12			3972	39	608	15					3790	32	1538	41
Darling Scarp	1122	2	898	80					1420	2	981	69				
Dwellingup 2	1320	9	1164	88					13407	41	11275	84				
Forrestfield	1608	3	180	11					1925	3	230	12				
Guildford	1966	3	176	9					91	0	23	25	19	0	0	0
Helena 1	81	1	73	90					407	1	384	94				
Helena 2									1879	6	1605	85				
Herdsmen Complex					944	9	233	25					579	5	255	44
Karrakatta Complex–Central and\South					2903	28	426	15					1634	14	605	37
Murray 1	253	2	213	84					1997	6	1663	83				
Murray 2									3578	11	3457	97				
Quindalup Complex					2438	24	312	13					1275	11	257	20
Serpentine River Complex													4	0	3	84
Southern River Complex	4871	34	645	13					2319	7	270	12				
Swamp									56	0	56	100				
Swan Complex	928	6	159	17					33	0	33	100				
Yarragil 1	343	2	208	61					4479	14	3396	76				
Yarragil 2									489	2	489	100				

IMPORTANT INFORMATION TO HELP IN DEVELOPING A LOCAL BIODIVERSITY STUDY

Table 21 (cont)

Vegetation Complex	Mundaring				Melville				Mosman Park				Nedlands			
	Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001	
	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%
Bassendean Complex–Central and\South					2210	43	201	9								
Cooke	219	0	174	80												
Coolakin	317	1	287	90												
Cottesloe Complex–Central and\South					334	6	1	0	397	100	9	2	226	11	66	29
Darling Scarp	1231	2	703	57												
Dwellingup 2	10432	16	7526	72												
Dwellingup 4	12074	19	9600	80												
Forrestfield	933	2	50	5												
Goonaping	460	1	420	91												
Guildford	155	0	7	5												
Helena 2	983	2	903	92												
Herdsmen Complex					18	0										
Karrakatta Complex–Central and\South					2609	50	86	3					1639	83	120	7
Murray 2	19050	30	14797	78												
Pindalup	8664	13	5321	61												
Quindalup Complex													85	4	61	72
Southern River Complex	32	0	2	6												
Swamp	193	0	87	45												
Swan Complex	294	0	58	20												
Vasse Complex													27	1		
Yalanbee 5	4770	7	2374	50												
Yalanbee 6	118	0	110	93												
Yarragil 1	4330	7	2332	54												

Table 21 (cont)

Vegetation Complex	Peppermint Grove				Perth				Rockingham				Serpentine-Jarrahdale			
	Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001	
	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%
Bassendean Complex-Central and\South									1976	8	105	5	9854	11	3033	31
Beermullah Complex													3691	4	43	1
Cooke													914	1	895	98
Cottesloe Complex-Central and\South	141	100	0	0					2017	8	1011	50				
Dardanup Complex									879	4	145	16	1113	1	163	15
Darling Scarp													4175	7	2114	51
Dwellingup 1													11030	12	10528	95
Dwellingup 2													11398	13	10688	94
Forrestfield													4128	7	316	8
Goonaping													304	0	283	93
Guildford									641	1	6	1	13244	23	703	5
Helena 1													599	1	592	99
Herdsmen Complex									532	2	326	61				
Karrakatta Complex-Central and\South					431	52	3	1	4276	17	1552	36				
Murray 1													8530	9	6995	82
Quindalup Complex									9799	40	3731	38				
Serpentine River Complex									3658	15	333	9	783	1	51	7
Southern River Complex													7653	9	732	10
Swamp													1797	2	1670	93
Vasse Complex					393	48	1	0								
Yarragil 1													4734	5	4225	89
Yarragil 2													6030	7	5649	94
Yoongarillup Complex									664	3	476	72				

IMPORTANT INFORMATION TO HELP IN DEVELOPING A LOCAL BIODIVERSITY STUDY

Table 21 (cont)

Vegetation Complex	South Perth				Stirling				Swan				Subiaco			
	Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001	
	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%
Bassendean Complex–Central and\South	1670	87	41	2	1268	12	40	3	4632	4	1447	31				
Bassendean Complex–North									14202	14	7975	56				
Bassendean Complex–North–\Transition Vegetation Complex									619	1	426	69				
Beermullah Complex									2342	2	366	16				
Cooke									56	0	45	81				
Coolakin									579	1	222	38				
Coonambidgee Complex									40	0	3	7				
Cottesloe Complex–Central and\South					1894	18	213	11								
Darling Scarp									3070	5	1699	55				
Dwellingup 2									8366	8	3862	46				
Dwellingup 3									3892	4	2713	70				
Dwellingup 4									6598	6	4300	65				
Forrestfield									2405	4	301	13				
Guildford									6346	11	440	7				
Helena 2									12020	12	9401	78				
Herdsmen Complex					1486	14	73	5								
Karrakatta Complex–Central and\South	190	10	1	0	5463	52	292	5	227	0	16	7	580	84	1	0
Mogumber									977	2	389	40				
Murray 2									10376	10	5977	58				
Pindalup									2700	3	1291	48				
Quindalup Complex					407	4	73	18								
Reagan									1655	3	400	24				
Southern River Complex									8669	8	1637	19				

Vegetation Complex	South Perth				Stirling				Swan				Subiaco			
	Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001	
	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%
Swan Complex									3659	4	293	8				
Vasse Complex	68	4											108	16		
Yalanbee 6									2376	2	998	42				
Yanga Complex									5775	6	1026	18				
Yarragil 1									2619	3	792	30				

Table 21 (cont)

Vegetation Complex	Victoria Park				Vincent				Wanneroo			
	Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001		Pre-European		Remaining Extent 2001	
	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%	Total (ha)	%
Bassendean Complex–Central and\South	1624	91	10	1					1107	2	429	39
Bassendean Complex–Central and\South–Transition Vegetation Complex									623	1	623	100
Bassendean Complex–North									8729	13	4565	52
Bassendean Complex–North–\Transition Vegetation Complex									2493	4	1735	70
Cottesloe Complex–Central and\South									13302	20	7044	53
Cottesloe Complex–North									8669	13	6537	75
Herdsmen Complex					132	13			1494	2	692	46
Karrakatta Complex–Central and\South					864	83			10340	15	2253	22
Karrakatta Complex–North									5153	8	1070	21
Karrakatta Complex–North–\Transition Vegetation Complex									2345	3	1848	79
Pinjar Complex									4893	7	1141	23
Quindalup Complex									8722	13	6094	70
Swan Complex	105	6	2	2								
Vasse Complex	55	3			42	4	0	0				

IMPORTANT INFORMATION TO HELP IN DEVELOPING A LOCAL BIODIVERSITY STUDY

Table 22. 2001 Native Vegetation Extent by Metropolitan Region Scheme (MRS) Zoning (Perth Biodiversity Project, unpub. 2003)

MRS Zoning	Armadale	Bassendean	Bayswater	Belmont	Cambridge	Canning	Claremont	Cockbur n	East Fremantle	Fremantle	Gosnells
Central City Area						5		0			
Controlled Access Hwy (Formalised)											
Import. Region. Rd (Formalised)								0			
Industrial	109		2	6		31		186			11
Not Defined	13										
Other Regional Roads	4	0		0	1	2		23		0	9
Parks & Recreation	4757	17	38	37	476	264	2	1570			2035
Parks & Recreation (Restricted)								226			
Port Installations											
Primary Regional Roads	261		3	18	16	25		220		3	22
Private Recreation				1				3			15
Public Purposes (Commonwealth Govt.)				428	0			322		0	
Public Purposes (High School)	7		1	0	3			2			7
Public Purposes (Hospital)		1						0			
Public Purposes (No definition)								11			
Public Purposes (Prison)											49
Public Purposes (Western Power)								21			
Public Purposes (Special Uses)						2		50			30
Public Purposes (Technical School)	6										
Public Purposes (University)								18			
Public Purposes (Water Corp)	1103							73			
Railways	5	0		9		0		6			1
Rural	3430					51		276			730
Rural – Water Protection	117					19		863			
Special Industrial								0			
State Forests	32883										418
Urban	177	6	13	5	41	75	1	373	1	16	252
Urban Deferred	18							326			145
Waterways	21	0	0	0		8		0			25
Total	42911	24	57	504	537	482	3	4569	1	19	3749

Table 22 (cont)

MRS Zoning	Joondalup	Kalamunda	Kwinana	Melville	Mosman Park	Mundaring	Nedlands	Peppermint Grove	Perth	Rockingham	South Perth	Stirling
Central City Area	107									21		10
Controlled Access Hwy (Formalised)												
Import. Region. Rd (Formalised)												
Industrial		7	149	0		0				514		7
Not Defined		4				12				0		
Other Regional Roads	7	8	19	0			0			75		2
Parks & Recreation	695	3932	1560	89	8	7394	57		4	3307	21	408
Parks & Recreation (Restricted)						269	4			3		13
Port Installations			2							3		
Primary Regional Roads	92	31	140	26	0	104	1		0	123	0	49
Private Recreation								0				27
Public Purposes (Commonwealth Govt.)		17					112					
Public Purposes (High School)	6	4	17	5		8	2			10		3
Public Purposes (Hospital)				35		723	9			9		2
Public Purposes (No definition)												
Public Purposes (Prison)			53									
Public Purposes (Western Power)		0										
Public Purposes (Special Uses)	128	0	73	1			2		1	310		0
Public Purposes (Technical School)			5									0
Public Purposes (University)				16					0			0
Public Purposes (Water Corporation)	38		32		2		7			26		
Railways		0	96	0		2				70		
Rural	282	1896	1394	46		17667				1964		
Rural – Water Protection			666									
Special Industrial										7		
State Forests		18008				18054						
Urban	251	221	602	75	1	503	55		1	1009	36	171
Urban Deferred	0		9							244		0
Waterways	0	11		0	0	27	0			0	0	
Total	1606	24139	4817	293	11	44763	249	0	6	7695	57	692

IMPORTANT INFORMATION TO HELP IN DEVELOPING A LOCAL BIODIVERSITY STUDY

Table 22 (cont)

MRS Zoning	Serpentine-Jarrahdale	Swan	Subiaco	Victoria Park	Vincent	Wanneroo	PMR Total
Central City Area						398	540
Controlled Access Highways (Formalised)						0	0
Import. Region. Rd (Formalised)							0
Industrial		50				866	1938
Not Defined	18	26				3	76
Other Regional Roads	8	7				233	399
Parks & Recreation	6683	12812		1	0	7341	53507
Parks & Recreation (Restricted)	28	114					658
Port Installations							5
Primary Regional Roads	52	224				337	1747
Private Recreation				1		22	69
Public Purposes (Commonwealth Govt.)		2380				1488	4746
Public Purposes (High School)		0				13	89
Public Purposes (Hospital)	38						818
Public Purposes (No definition)							11
Public Purposes (Prison)	58						160
Public Purposes (Western Power)		6				142	169
Public Purposes (Special Uses)	0	140				113	850
Public Purposes (Technical School)		13					24
Public Purposes (University)							34
Public Purposes (Water Corporation)						227	1508
Railways	54	47				70	362
Rural	6021	24844				5439	64041
Rural – Water Protection	126						1791
Special Industrial							7
State Forests	35308	4558				11065	120294
Urban	101	691	1	10	0	3974	8661
Urban Deferred	88	30				2327	3187
Waterways		101		0	0	0	193
Total	48583	46043	1	12	0	34058	265884

Table 23. 2001 Vegetated Local Natural Area by Metropolitan Region Scheme (MRS) Zoning

MRS Zoning	Armadale	Bassendean	Bayswater	Belmont	Cambridge	Canning	Claremont	Cockburn	East Fremantle	Fremantle	Gosnells
Central City Area						5					
Controlled Access Hwy (Formalised)											
Import. Region. Rd (Formalised)								0			
Industrial	53		2	6		29		174			11
Not Defined	0										
Other Regional Roads	3	0		0	1	2		19		0	4
Parks & Recreation	59	0	8	16	22	0		6			77
Parks & Recreation (Restricted)							2	2			
Port Installations											
Primary Regional Roads	96		3	9	4	24		151		3	15
Private Recreation				0				3			3
Public Purposes (Commonwealth Govt.)				28				1		0	
Public Purposes (High School)	7		1	0	0			2			2
Public Purposes (Hospital)		1						0			
Public Purposes (No definition)								11			
Public Purposes (Prison)											1
Public Purposes (Western Power)								21			
Public Purposes (Special Uses)						2		14			
Public Purposes (Technical School)	6										
Public Purposes (University)								0			
Public Purposes (Water Corp)	1062							35			
Railways	1	0		9		0		6			0
Rural	2666					30		217			594
Rural – Water Protection	82					19		638			
Special Industrial								0			
State Forests	76										4
Urban	158	5	13	5	23	61	1	334	1	3	208
Urban Deferred	18							175			91
Waterways	11	0	0	0		0		0			1
Total	4298	6	27	73	50	172	3	1809	1	6	1011

IMPORTANT INFORMATION TO HELP IN DEVELOPING A LOCAL BIODIVERSITY STUDY

Table 23 (cont)

MRS Zoning	Joondalup	Kalamunda	Kwinana	Melville	Mosman Park	Mundaring	Nedlands	Peppermint Grove	Perth	Rockingham	South Perth
Central City Area	103									21	
Controlled Access Hwy (Formalised)											
Import. Region. Rd (Formalised)											
Industrial		7	86	0		0				502	
Not Defined						11				0	
Other Regional Roads	6	8	14	0			0			60	
Parks & Recreation	6	28	52	9	5	47	13	0	2	109	1
Parks & Recreation (Restricted)						1	3				
Port Installations			2							3	
Primary Regional Roads	82	18	69	15	0	65	0		0	79	0
Private Recreation											
Public Purposes (Commonwealth Govt.)		2					7				
Public Purposes (High School)	4	4	17	5		8	2			10	
Public Purposes (Hospital)				5		723	6			9	
Public Purposes (No definition)											
Public Purposes (Prison)			0								
Public Purposes (Western Power)											
Public Purposes (Special Uses)	81	0	73	1			1		1	218	
Public Purposes (Technical School)			5								
Public Purposes (University)				0					0		
Public Purposes (Water Corporation)	9		32		2		2			15	
Railways		0	81	0		1				38	
Rural	65	1641	1179	1		16527				1311	
Rural – Water Protection			606			152					
Special Industrial										7	
State Forests		134									
Urban	214	210	532	51	1	503	46		1	1009	27
Urban Deferred	0		9							194	
Waterways	0			0	0	0	0			0	0
Total	570	2052	2757	87	8	18038	80	0	4	3585	28

Table 23 (cont)

MRS Zoning	Stirling	Serpentine-Jarrahdale	Swan	Subiaco	Victoria Park	Vincent	Wanneroo	PMR Total
Central City Area	10						398	537
Controlled Access Highways (Formalised)								0
Import. Region. Rd (Formalised)								0
Industrial	7		48				776	1701
Not Defined		0	16				1	28
Other Regional Roads	1	1	2				207	328
Parks & Recreation	5	14	903		1	0	43	1427
Parks & Recreation (Restricted)	13	28	0					49
Port Installations								5
Primary Regional Roads	44	18	149				268	1110
Private Recreation	27				1		22	56
Public Purposes (Commonwealth Govt.)			52				0	91
Public Purposes (High School)	2		0				5	69
Public Purposes (Hospital)	2	38						784
Public Purposes (No definition)								11
Public Purposes (Prison)		0						2
Public Purposes (Western Power)			6				0	27
Public Purposes (Special Uses)	0	0	11				0	401
Public Purposes (Technical School)	0		13					24
Public Purposes (University)	0							1
Public Purposes (Water Corporation)							193	1350
Railways		15	44				59	254
Rural		4047	22916				3071	54265
Rural – Water Protection		116						1612
Special Industrial								7
State Forests		162	3				18	397
Urban	164	64	622	1	1		3859	8115
Urban Deferred	0	43	9				2243	2782
Waterways		0	12			0	0	23
Total	275	4546	24806	1	3	0	11163	75456

Table 24: Example for the City of Swan of information that should be considered when setting representation – retention and protection targets

City of Swan																	
Vegetation Complex	Original	Remaining				Complexes that meet Regional Representation and Rarity Local Significance Criteria		Local Natural Area (LNA) targets to meet Regional Representation and Rarity Local Significance Criteria		Local Representation							
	Pre-European	Remaining Extent		Protection	LNA	Essential	Desirable	Essential	Desirable	10% Target		Suggested Actions for 10% Target		30% Target		Suggested Actions for 30% Target	
	Total (ha)	Total (ha)	%	Assumed (ha)	Remaining (ha)	(ha)	(ha)	(ha)	(ha)	Area Required (ha)	Achieved	LNA Protection (ha)	Restoration (ha)	Area Required (ha)	Achieved	LNA Protection (ha)	Restoration (ha)
Bassendean Complex-Central And\South	4632	1447	31	1262	185	YES	YES	185	185	463	YES			1390	NO	128	
Bassendean Complex-North	14202	7975	56	6847	1128					1420	YES			4260	YES	0	
Bassendean Complex-North-\Transition Vegetation Complex	619	426	69	366	60					62	YES			186	YES	0	
Beermullah Complex	2342	366	16	341	25	YES	YES	25	25	234	YES			703	NO	25	337
Cooke	56	45	81		45					6	NO	6		17	NO	17	
Coolakin	579	222	38	0	222					58	NO	58		174	NO	174	
Coomabidgee Complex	40	3	7	3	0	YES	YES	0	0	4	NO		4	12	NO	0	9
Darling Scarp Complex	3070	1699	55	797	902					307	YES			921	No	902	19
Dwellingup 2	8366	3862	46	259	3603					837	NO	577	259	2510	NO	2251	
Dwellingup 3	3892	2713	70	1423	1290					389	YES			1168	YES		
Dwellingup 4	6598	4300	65	1082	3218					660	YES			1979	NO	897	
Forrestfield Complex	2405	301	13	265	36	YES	YES	36	36	241	YES			722	NO	36	420
Guildford Complex	6346	440	7	309	131	YES	YES	131	131	635	NO	131	504	1904	NO	131	1463
Helena 2	12020	9401	78	4489	4912					1202	YES			3606	YES		

City of Swan																	
Vegetation Complex	Original	Remaining				Complexes that meet Regional Representation and Rarity Local Significance Criteria		Local Natural Area (LNA) targets to meet Regional Representation and Rarity Local Significance Criteria		Local Representation							
	Pre-European	Remaining Extent		Protection	LNA	Essential	Desirable	Essential	Desirable	10% Target		Suggested Actions for 10% Target		30% Target		Suggested Actions for 30% Target	
	Total (ha)	Total (ha)	%	Assumed (ha)	Remaining (ha)	(ha)	(ha)	(ha)	(ha)	Area Required (ha)	Achieved	LNA Protection (ha)	Restoration (ha)	Area Required (ha)	Achieved	LNA Protection (ha)	Restoration (ha)
Karrakatta Complex-Central And\South	227	16	7	4	11	YES	YES	11	11	23	NO	11	12	68	NO	11	53
Mogumber Complex-South	977	389	40	284	105	YES	YES	105	105	98	YES	0	98	293	NO	9	
Murray 2	10376	5977	58	683	5295					1038	NO	355	683	3113	NO	2430	
Pindalup	2700	1291	48	454	837					270	YES			810	NO	356	
Reagan Complex	1655	400	24	332	68	YES	YES	68	68	165	YES			496	NO	68	96
Southern River Complex	8669	1637	19	1187	450	YES	YES	450	450	867	YES			2601	NO	450	964
Swan Complex	3659	293	8	209	84	YES	YES	84	84	366	NO	84	282	1098	NO	84	805
Yalanbee 6	2376	998	42	107	891					238	NO	131	107	713	NO	606	0
Yanga Complex	5775	1026	18	528	498	YES	YES	498	498	578	NO	49	528	1733	NO	498	706
Yarragil 1	2619	792	30	0	792					262	NO	262	0	786	NO	786	0
TOTAL	104200	46020	44	21231	24789			1593	1593	10420		1664	2476	31260		9859	4872

16.4. Threatened Ecological Communities

Table 25. Threatened Ecological Communities (TECs) that occur in the Perth Metropolitan Region (on CALM Threatened Ecological Community [TEC] database (Department of Conservation and Land Management 2003c), and endorsed by the Minister for the Environment)

City of Armadale

Community identifier	Community name	General Location (IBRA Regions)	Category of Threat and criteria met under WA criteria	Category under Federal Environmental Protection and Biodiversity Conservation Act
16. SCP3a	Eucalyptus calophylla – Kingia australis woodlands on heavy soils, Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
37. SCP08	Herb rich shrublands in clay pans	Swan Coastal Plain	VN B)	
39. SCP10a	Shrublands on dry clay flats	Swan Coastal Plain	EN B) ii)	
20. SCP20b	Banksia attenuata and/or Eucalyptus marginata woodlands of the eastern side of the Swan Coastal Plain	Swan Coastal Plain	EN B) i), EN B) ii)	

City of Canning

1. SCP20a	Banksia attenuata woodland over species-rich dense shrublands	Swan Coastal Plain	EN B) ii)	
23. SCP3b	Eucalyptus calophylla – Eucalyptus marginata woodlands on sandy clay soils of the southern Swan Coastal Plain	Swan Coastal Plain	VN B)	

City of Cockburn

Community identifier	Community name	General Location (IBRA Regions)	Category of Threat and criteria met under WA criteria	Category under Federal Environmental Protection and Biodiversity Conservation Act 1999
13. SCP30a	Callitris preissii (or Melaleuca lanceolata) forests and woodlands, Swan Coastal Plain	Swan Coastal Plain	VN B)	

City of Gosnells

Community identifier	Community name	General Location (IBRA Regions)	Category of Threat and criteria met under WA criteria	Category under Federal Environmental Protection and Biodiversity Conservation Act 1999
1. SCP20a	Banksia attenuata woodland over species-rich dense shrublands	Swan Coastal Plain	EN B) ii)	
20. SCP20b	Banksia attenuata and/or Eucalyptus marginata woodlands of the eastern side of the Swan Coastal Plain	Swan Coastal Plain	EN B) i), EN B) ii)	
16. SCP3a	Eucalyptus calophylla –Kingia australis woodlands on heavy soils, Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
23. SCP3b	Eucalyptus calophylla – Eucalyptus marginata woodlands on sandy clay soils of the southern Swan Coastal Plain	Swan Coastal Plain	VN B)	
37. SCP08	Herb rich shrublands in clay pans	Swan Coastal Plain	VN B)	
39. SCP10a	Shrublands on dry clay flats	Swan Coastal Plain	EN B) ii)	
36. SCP07	Herb rich saline shrublands in clay pans	Swan Coastal Plain	VN B)	

Shire of Kalamunda

Community identifier	Community name	General Location (IBRA Regions)	Category of Threat and criteria met under WA criteria	Category under Federal Environmental Protection and Biodiversity Conservation Act 1999
1. SCP20a	Banksia attenuata woodland over species-rich dense shrublands	Swan Coastal Plain	EN B) ii)	
16. SCP3a	Eucalyptus calophylla–Kingia australis woodlands on heavy soils, Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
17. SCP3c	Eucalyptus calophylla–Xanthorrhoea preissii woodlands and shrublands, Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN

IMPORTANT INFORMATION TO HELP IN DEVELOPING A LOCAL BIODIVERSITY STUDY

Shire of Peppermint Grove

Community identifier	Community name	General Location (IBRA Regions)	Category of Threat and criteria met under WA criteria	Category under Federal Environmental Protection and Biodiversity Conservation Act 1999
13. SCP30a	Callitris preissii (or Melaleuca lanceolata) forests and woodlands, Swan Coastal Plain	Swan Coastal Plain	VN B)	

City of Rockingham

Community identifier	Community name	General Location (IBRA Regions)	Category of Threat and criteria met under WA criteria	Category under Federal Environmental Protection and Biodiversity Conservation Act 1999
4. SCP19	Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
13. SCP30a	Callitris preissii (or Melaleuca lanceolata) forests and woodlands, Swan Coastal Plain	Swan Coastal Plain	VN B)	
6. Richmond-microbial	Stromatolite-like microbialite community of coastal freshwater lakes (Lake Richmond)	Swan Coastal Plain	CR B) i), CR B) ii)	EN

Shire of Serpentine-Jarrahdale

Community identifier	Community name	General Location (IBRA Regions)	Category of Threat and criteria met under WA criteria	Category under Federal Environmental Protection and Biodiversity Conservation Act 1999
16. SCP3a	Eucalyptus calophylla – Kingia australis woodlands on heavy soils, Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
20. SCP20b	Banksia attenuata and/or Eucalyptus marginata woodlands of the eastern side of the Swan Coastal Plain	Swan Coastal Plain	EN B) i), EN B) ii)	
37. SCP08	Herb rich shrublands in clay pans	Swan Coastal Plain	VN B)	
39. SCP10a	Shrublands on dry clay flats	Swan Coastal Plain	EN B) ii)	
15. SCP02	Southern wet shrublands, Swan Coastal Plain	Swan Coastal Plain	EN B) ii)	
17. SCP3c	Eucalyptus calophylla – Xanthorrhoea preissii woodlands and shrublands, Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN

21. SCP15	Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain	Swan Coastal Plain	VN C)	
23. SCP3b	Eucalyptus calophylla – Eucalyptus marginata woodlands on sandy clay soils of the southern Swan Coastal Plain	Swan Coastal Plain	VN B)	
37. SCP08	Herb rich shrublands in clay pans	Swan Coastal Plain	VN B)	
36. SCP07	Herb rich saline shrublands in clay pans	Swan Coastal Plain	VN B)	
38. SCP09	Dense shrublands on clay flats	Swan Coastal Plain	VN B)	

City of Swan

Community identifier	Community name	General Location (IBRA Regions)	Category of Threat and criteria met under WA criteria	Category under Federal Environmental Protection and Biodiversity Conservation Act 1999
11. Muchea Limestone	Shrublands and woodlands on Muchea Limestone	Swan Coastal Plain	EN B) ii)	EN
7. Mound Springs SCP	Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain)	Swan Coastal Plain	CR A) i), CR A) ii), CR B) i), CR B) ii)	EN
8. SCP20c	Shrublands and woodlands of the eastern side of the Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
1. SCP20a	Banksia attenuata woodland over species-rich dense shrublands	Swan Coastal Plain	EN B) ii)	
16. SCP3a	Eucalyptus calophylla–Kingia australis woodlands on heavy soils, Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
17. SCP3c	Eucalyptus calophylla–Xanthorrhoea preissii woodlands and shrublands, Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
20. SCP20b	Banksia attenuata and/or Eucalyptus marginata woodlands of the eastern side of the Swan Coastal Plain	Swan Coastal Plain	EN B) i), EN B) ii)	
36. SCP07	Herb rich saline shrublands in clay pans	Swan Coastal Plain	VN B)	
37. SCP08	Herb rich shrublands in clay pans	Swan Coastal Plain	VN B)	
21. SCP15	Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain	Swan Coastal Plain	VN C)	

IMPORTANT INFORMATION TO HELP IN DEVELOPING A LOCAL BIODIVERSITY STUDY

City of Wanneroo and City of Joondalup

Community identifier	Community name	General Location (IBRA Regions)	Category of Threat and criteria met under WA criteria	Category under Federal Environmental Protection and Biodiversity Conservation Act 1999
1. SCP20a	Banksia attenuata woodland over species-rich dense shrublands	Swan Coastal Plain	EN B) ii)	
24. Caves SCP01	Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain	Swan Coastal Plain	CR B) i), CR B) ii)	EN
4. SCP19	Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
62. Limestone ridges (SCP 26a)	Melaleuca huegelii–Melaleuca acerosa shrublands on limestone ridges (Gibson et al. unpub. 1994 type 26a)	Swan Coastal Plain	EN B) iii)	

16.5. Key to map figures

Provided below is a key to the legend contained within each map (Figures 1, 3, 4, 7, 9 - 14) that appears in the Guidelines.

Figure 1 Native Vegetation Extent by Administrative Planning Categories

Legend Key:

- ▶ Local Government Boundary
Defines the boundaries of the 30 Local Governments occurring within the Perth Metropolitan Region.
- ▶ Open Water
Wetlands identified using the Geomorphic wetland database.
- ▶ Local Natural Area
Represents the mapped native vegetation component of Local Natural Areas, where Local Natural Areas are those natural areas that exist outside of the CALM estate, Bush Forever Sites and Regional Parks.
- ▶ Regional Park
Areas of mapped native vegetation located within Regional Parks and are not within the CALM estate or Bush Forever Sites.
- ▶ Private Conservation
Areas of mapped native vegetation that are designated as private conservation through their listing with the Australian Wildlife Conservancy.
- ▶ CALM
 - ▶ Conservation
Areas of mapped native vegetation located within CALM conservation reserves.
 - ▶ Conservation (proposed)
Areas of mapped native vegetation located within proposed CALM conservation reserves as identified by the Conservation Commission of WA (2002).
 - ▶ State Forest
Areas of mapped native vegetation located within CALM State Forest reserves.
 - ▶ Other
Areas of mapped native vegetation located within CALM reserves that are not either conservation or State Forest reserves.
- ▶ Bush Forever
 - ▶ CALM
Any mapped native vegetation within a Bush Forever site that is also a CALM reserve. No distinction is made as to the management category the CALM reserve.
 - ▶ Other
Any mapped native vegetation within a Bush Forever Site that is not also a CALM reserve.

Figure 3 Natural Resource Management, Biogeographical, Administrative and Study Regions of relevance to local biodiversity planning in the Perth Metropolitan Region

Map key

- ▶ Perth Metropolitan Region
As defined by the Perth Metropolitan Region Scheme Boundary.
- ▶ Bush Forever Study Area

- As defined by Government of Western Australia (2000a) for the Bush Forever Study.
- ▶ RFA Study Area
As defined by the Regional Forest Agreement study Boundary.
- ▶ Moore River
Moore River is used to delineate the northern boundary of the Swan Coastal Plain Interim Bioregionalisation of Australia (IBRA) Subregion South of the Moore River. The Swan Coastal Plain South of the Moore River defines the region for which much of the statistics referred to in the guidelines are derived from.
- ▶ IBRA Subregions:
 - ▶ Northern Jarrah Forest (JF1)
 - ▶ Southern Jarrah Forest (JF2)
 - ▶ Dandaragan Plateau & Scarp (SWA1)
 - ▶ Swan Coastal Plain (SWA2)
 As defined by the Interim Biogeographical Regionalisation of Australia (Environment Australia, 2001).
- ▶ NRM Regions (natural resource management)
 - ▶ Swan Catchment Council
 - ▶ MoU (Memorandum of Understanding) between SCC and Avon Catchment Council
 - ▶ South West Catchment Council
 - ▶ Under negotiation for possible inclusion in SCC
 - ▶ Avon Catchment Council
 - ▶ Northern Agricultural Catchment Council
 Boundaries were determined using datasets provided by the Swan Catchment Council and Agriculture WA.

Figure 4 Potentially Locally Significant Natural Areas in the Perth Metropolitan Region

Map Key:

- ▶ Local Government Boundary
Defines the boundaries of the 30 Local Governments occurring within the Perth Metropolitan Region.
- ▶ Swan/Jarrah IBRA Boundary
Represents the boundary between the Swan Coastal Plain and Northern Jarrah Forest Biogeographical Regions.
- ▶ Protected Natural Areas (Assumed)
Includes the mapped native vegetation component of all CALM reserves, Bush Forever Sites, Regional Parks and private conservation areas.
- ▶ Local Natural Areas
The mapped native vegetation component of Local Natural Areas that don't meet Local Significance Criteria based on interpretation of regional GIS datasets (they may meet Local Significance Criteria once field assessment is undertaken).
- ▶ Open water
Wetlands identified using the Geomorphic wetland database.
- ▶ Potentially Locally Significant Natural Areas (PLSNAs)
 - ▶ Essential Criteria *
The mapped native vegetation component of Local Natural Areas that potentially meets the Essential local significance criterion 1v (of an ecological community with only 400 ha or 10% or less protected for conservation in the Bush Forever Study

area) based on interpretation of regional GIS datasets. Only a portion of these Local Natural Areas identified need to be protected to meet the criterion.

- ▶ Essential Criteria

The mapped native vegetation component of Local Natural Areas that potentially meet Essential Local Significance Criteria.

- ▶ Desirable Criteria*

The mapped native vegetation component of Local Natural Areas that potentially meets the Desirable local significance criterion 1 iv (of an ecological community with only 1500 ha or 15% or less protected for conservation in the Jarrah Forest IBRA subregion area) based on interpretation of regional GIS datasets. Only a portion of these Local Natural Areas identified need to be protected to meet the criterion.

- ▶ Desirable Criteria

The mapped native vegetation component of Local Natural Areas that potentially meet Desirable Local Significance Criteria.

Figure 7 Regional Ecological Linkages for the Perth Metropolitan Region

Map Key

- ▶ Draft Regional Ecological Linkages
Identifies Regional Ecological Linkages that aim to link protected regionally significant natural areas by retaining Local Natural Areas between them.
- ▶ Local Government Boundary
Defines the boundaries of the 30 Local Governments occurring within the Perth Metropolitan Region.
- ▶ Open Water
Wetlands identified using the Geomorphic wetland database.
- ▶ Local Natural Area
Represents the mapped native vegetation component of Local Natural Areas, where Local Natural Areas are those natural areas that exist outside of the CALM estate, Bush Forever Sites and Regional Parks.
- ▶ Regional Park
Areas of mapped native vegetation located within Regional Parks and are not within the CALM Estate or Bush Forever Sites.
- ▶ Private Conservation
Areas of mapped native vegetation that are designated as private conservation through their listing with the Australian Wildlife Conservancy.
- ▶ CALM
 - ▶ Conservation
Areas of mapped native vegetation located within CALM conservation reserves.
 - ▶ Conservation (proposed)
Areas of mapped native vegetation located within proposed CALM conservation reserves as identified in the Conservation Commission of WA (2002).
 - ▶ State Forest
Areas of mapped native vegetation located within CALM State forest reserves.
 - ▶ Other
Areas of mapped native vegetation located within CALM reserves that are not either conservation or State forest reserves.
- ▶ Bush Forever
 - ▶ CALM

Any mapped native vegetation within a Bush Forever site that is also a CALM reserve. No distinction is made as to the management category of the CALM reserve.

▶ Other

Any mapped native vegetation within a Bush Forever Site that is not also a CALM reserve.

Figure 9 Native Vegetation Extent by Administrative Planning Categories (Local Biodiversity Discussion Paper – Example 1)

Map Key:

- ▶ Local Government Boundary
Defines the boundary of the Local Government.
- ▶ Local Natural Area
Represents the mapped native vegetation component of Local Natural Areas, where Local Natural Areas are those natural areas that exist outside of the CALM estate, Bush Forever Sites and Regional Parks.
- ▶ Regional Park
Areas of mapped native vegetation located within Regional Parks and are not within the CALM estate or Bush Forever Sites.
- ▶ Private Conservation
Areas of mapped native vegetation that are designated as private conservation through their listing with the Australian Wildlife Conservancy.
- ▶ CALM
 - ▶ Conservation
Areas of mapped native vegetation located within CALM conservation reserves.
 - ▶ State Forest
Areas of mapped native vegetation located within CALM State forest reserves.
 - ▶ Other
Areas of mapped native vegetation located within CALM reserves that are not either conservation or State forest reserves.
- ▶ Bush Forever:
 - ▶ CALM
Any mapped native vegetation within a Bush Forever site that is also a CALM reserve. No distinction is made as to the management category of the CALM reserve.
 - ▶ Other
Any mapped native vegetation within a Bush Forever Site that is not also a CALM reserve.

Figure 10 Local Government Controlled Natural Areas and Local Natural Areas by Ownership Category (Local Biodiversity Discussion Paper – Example 2)

Map Key:

- ▶ Local Government Boundary
Defines the boundary of the Local Government.
- ▶ Protected Natural Areas (Assumed)
Includes the mapped native vegetation component of all CALM reserves, Bush Forever Sites, Regional Parks and private conservation areas.
- ▶ Local Government Managed Regional Natural Areas
Areas of mapped native vegetation within Local Government Reserves that are also either Bush Forever Sites or Regional Parks.

- ▶ Ownership of Local Natural Areas
 - ▶ Commonwealth Government
 - ▶ Local Government
 - ▶ Private
 - ▶ State Government
 - ▶ unallocated Crown land
 - ▶ Crown (Unknown)
 - ▶ Strata (multiple owner)
 - ▶ Represents the mapped native vegetation component of Local Natural Areas (where Local Natural Areas are those natural areas that exist outside of the CALM Estate, Bush Forever Sites and Regional Parks) according to ownership categories determined from interpretation of cadastral datasets.

Figure 11 Native Vegetation Extent by Vegetation Complex (Local Biodiversity Discussion Paper – Example 3)

Map Key:

- ▶ Local Government Boundary
Defines the boundary of the Local Government.
- ▶ Vegetation Complex
 - ▶ Cannington
 - ▶ Darling Scarp
 - ▶ Dwellingup 2
 - ▶ Forrestfield
 - ▶ Guilford
 - ▶ Helena 1
 - ▶ Helena 2
 - ▶ Murray 1
 - ▶ Murray 2
 - ▶ Southern River
 - ▶ Yarragil 1

Represents the mapped native vegetation component of all natural areas according to vegetation complexes determined using Heddle, Loneragan and Havel (1980) and Mattiske and Havel (1998).

Figure 12 Native Vegetation Extent by Metropolitan Region Scheme Zoning (Local Biodiversity Discussion Paper – Example 4)

Map Key:

- ▶ Local Government Boundary
Defines the boundary of the Local Government.
- ▶ Vegetated Natural Areas by Metropolitan Region Scheme Zoning
 - ▶ Urban
Includes mapped native vegetation that occurs within the Urban and Urban Deferred zonings of the Metropolitan Region Scheme.
 - ▶ Central City Area
Includes mapped native vegetation that occurs within the Central City zoning of the Metropolitan Region Scheme.
 - ▶ Industrial
Includes mapped native vegetation that occurs within the Industrial and Special Industrial zonings of the Metropolitan Region Scheme.
 - ▶ Parks and Recreation

Includes mapped native vegetation that occurs within the Parks and Recreation zonings of the Metropolitan Region Scheme.

- ▶ Rural

Includes mapped native vegetation that occurs within the Rural and Rural – Water Protection zonings of the Metropolitan Region Scheme.

- ▶ Regional Roads

Includes mapped native vegetation that occurs within the Primary Regional Roads, Other Regional Roads, Controlled Access Highways, Other Mayor Highways and Important Region Roads zonings of the Metropolitan Region Scheme.

- ▶ Railways

Includes mapped native vegetation that occurs within the Railways zonings of the Metropolitan Region Scheme.

- ▶ State Forest

Includes mapped native vegetation that occurs within the State Forest zonings of the Metropolitan Region Scheme.

- ▶ Public Purposes

Includes mapped native vegetation that occurs within the Public Purpose zonings of the Metropolitan Region Scheme, which includes such purposes as hospital, high school, technical school, car park, university, commonwealth government, SECWA, special uses, WAWA, prison and no definition.

- ▶ Waterways

Includes mapped native vegetation that occurs within the Waterways zonings of the Metropolitan Region Scheme.

- ▶ Not Defined

Includes mapped native vegetation that occurs within areas that have no zoning defined by the Metropolitan Region Scheme.

Figure 13 Potentially Locally Significant Natural Areas (Local Biodiversity Discussion Paper – Example 5)

Map Key:

- ▶ Local Government Boundary
Defines the boundary of the Local Government.
- ▶ Protected Natural Areas (Assumed)
Includes the mapped native vegetation component of all CALM reserves, Bush Forever Sites, Regional Parks and private conservation areas.
- ▶ Local Natural Areas
The mapped native vegetation component of Local Natural Areas that does not meet Local Significance Criteria based on interpretation of regional GIS datasets (they may meet Local Significance Criteria once field assessment is undertaken).
- ▶ Potentially Locally Significant Natural Areas (PLSNAs)
 - ▶ Essential Criteria
The mapped native vegetation component of Local Natural Areas that potentially meet Essential Local Significance Criteria.
 - ▶ Desirable Criteria
The mapped native vegetation component of Local Natural Areas that potentially meet Desirable Local Significance Criteria.

Figure 14 Local Natural Area Protection Status

Map Key

- ▶ Local Government Boundary.
Defines the boundary of the Local Government.

- ▶ Protected Natural Areas (Assumed).
Includes the mapped native vegetation component of all CALM reserves, Bush Forever Sites, Regional Parks and private conservation areas.
- ▶ Local Natural Area - Protection Status.
 - ▶ Locally Significant Natural Area - Protected
Protection of the Locally Significant Area achieved and formalised through appropriate mechanism.
 - ▶ Locally Significant Natural Area - Retained
Locally Significant Natural Area has been retained through refusal of clearing or development of the natural area, but protection has not been formalised.
 - ▶ Natural area not locally significant – retained
The Local Natural Area is not locally significant but clearing or development of the natural area has been refused.
 - ▶ Natural area not locally significant – not retained
The Local Natural Area is not locally significant and the clearing or development of the natural area has been approved.
 - ▶ Local natural areas - not assessed
Local Natural Areas that have not been field assessed

16.6. Useful GIS datasets

The following datasets may be useful during the preparation of a Local Biodiversity Strategy. It is suggested that the relevant Agency is contacted to determine availability and usefulness of data.

Theme	Name	Agency	Contact
Planning	Metropolitan Region Scheme (MRS)	Department for Planning and Infrastructure	Geographical Information Officer 9264 7827
	Town Planning Schemes (TPS)	Department for Planning and Infrastructure	Geographical Information Officer 9264 7827
Native Vegetation Administrative Boundaries	Bush Forever Study Boundary	Department for Planning and Infrastructure	Geographical Information Officer 9264 7827
	Bush Forever Site Boundaries	Department for Planning and Infrastructure	Geographical Information Officer 9264 7827
	Bush Forever Sites – Nominated Additional Areas	Department for Planning and Infrastructure	Geographical Information Officer 9264 7827
	Interim Biogeographical Regions (IBRA)	Department of Environment	GIS Support Analyst 9278 0333
	Eastern side of Swan Coastal Plain	Department of Environment	GIS Support Analyst 9278 0333
	CALM Managed Regional Parks	Department of Conservation and Land Management	Spatial Database Administrator (GIS) 9334 0350
	CALM Estate (CALM managed and owned lands)	Department of Conservation and Land Management	Spatial Database Administrator (GIS) 9334 0350
Native Vegetation Extent	Perth Bushland Mapping	Department for Planning and Infrastructure, Department of Agriculture WA	Geographical Information Officer 9264 7827
	Native Vegetation extent by Administrative Planning Categories	Western Australian Local Government Association	Information Coordinator 9213 2050
	Native Vegetation Extent by Metropolitan Region Scheme Zoning	Western Australian Local Government Association	Information Coordinator 9213 2050
	Native Vegetation Extent by Vegetation Complex	Western Australian Local Government Association	Information Coordinator 9213 2050
	Native Vegetation Extent by Ownership Category	Western Australian Local Government Association	Information Coordinator 9213 2050

Native Vegetation Rarity	Declared Rare Flora (DRF) and Priority Flora	Department of Conservation and Land Management	Spatial Database Administrator (GIS) / Technical Officer, Rare Flora Database 9334 0350
	Threatened Ecological Communities (TEC)	Department of Conservation and Land Management	Spatial Database Administrator (GIS)/ Ecologist, WA Threatened Species and Communities Unit 9334 0350
	Threatened or Poorly Reserved Plant Communities	Department of Environment	GIS Support Analyst 9278 0333
Native Vegetation Complexes	Hedde Vegetation Complexes	Department of Environment	GIS Support Analyst 9278 0333
	Mattiske and Havel Regional Forest Agreement (RFA) Vegetation Complexes	Department of Conservation and Land Management	Spatial Database Administrator (GIS) 9334 0350
Ecological Linkages	Regional Ecological Linkages for the Perth Metropolitan Region	Western Australian Local Government Association	Information Coordinator 9213 2050
Local Significance	Potentially Locally Significant Natural Areas	Western Australian Local Government Association	Information Coordinator 9213 2050
	Potentially Significant Local Government Natural Areas	Western Australian Local Government Association	Information Coordinator 9213 2050
Floristic Survey Plots	CALM Flora Survey 1991-93 (Gibson et al, 1994)	Department of Conservation and Land Management	Spatial Database Administrator (GIS) 9334 0350
Fauna	CALM Threatened Fauna and Priority Fauna	Department of Conservation and Land Management	Spatial Database Administrator (GIS)/ Senior Zoologist, Wildlife Branch 9334 0350
	Bird Atlas	Birds Australia	Birds Atlas Coordinator, 9383-7749
Wetlands and Streamlines	Geomorphologic Wetland Mapping	Department of Environment	GIS Support Analyst 9278 0333
	Hydrography	Department of Environment	GIS Support Analyst 9278 0333
	Environmental Protection Policy Lakes	Department of Environment	GIS Support Analyst 9278 0333

17. The science behind biodiversity conservation thresholds

It is now widely accepted that the conservation of biodiversity depends on a mix of retained and protected natural areas across the landscape. The question is, what proportion of natural areas is adequate to conserve biodiversity and maintain ecological processes?

While biodiversity conservation thresholds will vary across different landscapes and among different groups of biota, multiple studies on the relationship between habitat and the diversity of species have identified common thresholds below which biodiversity decline accelerates. There appears to be a trend that the loss of biodiversity caused by habitat fragmentation is significantly greater once a habitat type falls below 30% of its pre-European extent (Miles 2001). Some examples of this research and situations in which this threshold has been applied in biodiversity planning are provided below.

Andr n (1994), in a worldwide review of both modelling and empirical studies of a variety of fauna, identified that in most landscapes the total area of suitable habitat is of greater importance than its spatial arrangements for species living in this particular habitat. Andr n suggested that the negative effects of patch size and isolation on the original sets of species may not occur until the landscape consists of only 10% to 30% of the original habitat. Beyond this threshold, reductions in habitat and species would exponentially increase.

Reid (2000) analysed landscape relationships by modelling bird atlas data against vegetation cover in a study of threatened and declining birds in the New South Wales sheep-wheat belt. Species richness at a landscape scale was strongly dependent on the amount of vegetation cover (most woodland bird species appear to be adversely affected by vegetation clearance). While the author suggested there was no maximum point or threshold for an acceptable level of vegetation, and that more is simply better, one of the recommendations made from a broader biodiversity perspective was the principle for Habitat Conservation and Ecosystem Function, that vegetation communities should not be cleared below 30% of their pre-European extent in that landscape.

Fahrig (1998) studied the circumstances in which fragmentation of breeding habitat affected wildlife population survival. Using spatially explicit simulation models, he found that above 20% habitat cover there were no fragmentation effects on the survival of wildlife populations. The spatial pattern of habitat was unimportant. Once the breeding habitat of the organism covered less than 20%, fragmentation affected population survival.

A report prepared for the New South Wales Department of Land and Water Conservation and the Southern Mallee Regional Planning Committee (Freudenberger, Nobel & Morton 1997) used a form of the generalised relationship between the area of vegetation and number of species to generate theoretical proportions of species that might be lost through clearing in the Southern Mallee.

The report also considered the Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia (ANZECC/MCFFA 1997) where one of the criteria states that at least 15% of the pre-European distribution of each forest ecosystem should be within a reserve system. For the Southern Mallee region, this benchmark was regarded as too low, hence the recommendation that at least 20% of each vegetation type as present at the time of European settlement, should be in a permanent reserve system that excludes livestock grazing and artificial watering points.

In addition to the proposed reservation target, a retention target of 70% of the 'pre-European' distribution of each vegetation type (that is, no more than 30% of any vegetation type, based on the pre-European coverage, be cleared). Freudenberger, Nobel and Morton (1997) considered that a 30% maximum clearance rate might result

in about 10% loss of species in the long term. In contrast much of the sheep–wheat belt has experienced up to 80% clearance, which has already resulted in unacceptable losses of species (up to 30%) (Freudenberger, Nobel and Morten 1997).

McIntyre, McIvor and MacLeod (2000) formulated a set of principles promoting the sustainable management of sub-tropical grassy woodlands for livestock production. In setting thresholds relating to indicators of soils, pastures, trees and wildlife, two kinds of evidence were considered: published empirical observations of ecosystem function at a landscape scale and published landscape simulations. Landscape models undertaken by Pearson et al. (1996) (cited in McIntyre, McIvor & MacLeod 2000) have shown that habitat occupying 70% of the landscape generally has a high degree of connectivity for organisms of any level of mobility. Suitable habitat covering 30% to 40% of the landscape will provide connectivity for only the more mobile organisms.

From this, McIntyre, McIvor and MacLeod (2000) proposed that the extent of habitat element on a landscape/property scale should be:

- ▶ 70% native grassland (for high and low mobility organisms)
- ▶ 60% to 70% tall tussock structure within native grassland habitat
- ▶ a minimum of 30% woodland cover, and its capacity to regenerate (high and low mobility organisms)
- ▶ a minimum size of 5 ha to 10 ha for woodland patches
- ▶ a maximum of 30% to 40% bare ground.

Also proposed was that at least 10% of the property to be managed specifically for wildlife.

Barrett and Davidson (1999) support the recommendations put forward by McIntyre, McIvor and MacLeod (2000), stating that bird diversity could probably be maintained with 10% of farms being managed for wildlife, providing that at least 30% of the property was covered with trees.

Dr Barry Traill, Manager of a Birds Australia woodland birds project, supported the need to conserve indigenous vegetation if the aim is to minimise the loss of bird species (Traill 2000). As a conservative minimum, a target to aim for would be 30% reservation of the pre-European extent of all vegetation types (protected in conservation reserves on public and private land). Traill (2000) emphasised reservation rather than retention because many areas of existing vegetation will degrade and disappear in the long term owing to inappropriate management. In cases where there is less than 30% native vegetation remaining, all vegetation requires management for bird conservation if this is the aim.

It should be noted that the position in the landscape should be considered when attempting to set targets for habitat representation, especially to allow for genetic movement between natural areas. Protecting sub-types within broader habitat types is also important, for example, vegetation associations, wetland and upland areas, fauna refuges.

Other natural resource management (NRM) objectives support the retention of even higher percentages of perennial vegetation. In the Wellington River catchment, clearing of only 23% of the catchment's native vegetation has resulted in the Wellington Dam becoming increasingly saline (Government of Western Australia 1992).

In determining how much habitat is required for conserving biodiversity at a regional level in Queensland, Boulter et al. (2000) examined the literature on species and habitat loss and applied a benchmark for the retention of regional ecosystems (regarded as the best available surrogate for biodiversity at the species level). On available evidence (for example, Andr n 1994; Freudenberger, Nobel & Morton 1997) the benchmark was set at a minimum of 30% retention of regional ecosystems to ensure against substantial extinction in the longer term.

The National Objectives and Targets for Biodiversity Conservation 2001–2005 (Commonwealth of Australia 2001b) recognise that the retention of 30% or more of

the pre-European extent of each ecological community is necessary if Australia's biological diversity is to be protected. A target was set for all jurisdictions to have clearing controls in place that prevent clearance below this level. This level of recognition is in keeping with the targets set in the Environmental Protection Authority's (EPA) Position Statement No 2 on Environmental Protection of Native Vegetation in Western Australia (Environmental Protection Authority 2000b) and ANZECC (2000b).

The Bush Forever target to conserve 10% of each vegetation complex should not be interpreted as sufficient to conserve biodiversity. In fact, Soule and Sanjayan (1998) claimed that around 50% of each ecosystem is required to represent and protect most elements of biodiversity. They go on to say that 10%, while politically feasible, is simply not adequate from an ecological perspective. The Bush Forever initiative has clearly struck a compromise for the Perth Metropolitan Area.

A background paper (Smith & Sivertsen 2001) on landscape composition for the maintenance of biodiversity values in production-oriented landscapes, diagrammatically represented biodiversity loss in relation to habitat loss (Figure 2 Section 1.6).

18. Some helpful hints for involving the community

By Michelle Mackenzie and Carolyn Betts, Community Policy, Western Australian Local Government Association

These guidelines have been produced to help Local Governments take a more strategic approach to protecting their bushland, wetlands and other natural areas. A Local Biodiversity Strategy will help Local Government best work with their communities to not only manage existing natural areas but also to identify and work towards protecting other important natural areas.

Is you and your Council's vision for your local biodiversity the same as your communities? The best way to find out is to ask!

18.1. Consult your community during preparation of the Strategy

Local Government will need to consult with and involve their community at every available opportunity during the preparation of a Local Biodiversity Strategy. The four Phases of the local biodiversity planning process are outlined in Section 7.1. Some recommendations for the type and level of consultation required during these Phases are provided in Sections 18.2 – 18.9. Of course, there are many other ways of consulting with your community to achieve similar results.

The consultation with, and involvement of your community in the above local biodiversity planning process will be important at each and every stage of the process. Community involvement in the preparation of a Local Biodiversity Strategy cannot be underestimated. Local Governments are encouraged to consult with their community as widely as possible and as often as possible. Some handy hints to help Local Governments work towards this are provided below, as well as a list of references for further information.

18.2. Identifying your community

Every local Council will have the latest Australian Bureau of Statistics (ABS) Basic Community Profile, based on their Local Government area. Data from the Community Profile will tell you the demographic make-up of your community: for example if there is a large Aboriginal population, population from different cultural backgrounds, or if there are lots of young people, seniors and children in your area. Your Council may have developed a Social or Demographic Profile for their area based on the Census.

Of course the community of interest for many natural areas may not be geographically based in your Local Government area. For many Western Australians icons like Ningaloo Reef or Karijini, the community of interest is far beyond the Local Government boundary. In thinking about public involvement you need to determine:

- ▶ Which public?
- ▶ Who needs to be involved?

Here are some ideas.

External to Council

- ▶ Indigenous people are the traditional custodians of the land. The Aboriginal Heritage Act 1972 and Native Title Act 1993 recognise the rights of Aboriginal people. Every effort must be taken to engage Aboriginal people in a culturally appropriate way in progressing all aspects of a Local Biodiversity Strategy, and to respect their needs and wishes. Consultation with Aboriginal people is discussed in more detail below. The next section will talk specifically about consultation with Aboriginal people.

- ▶ Are there special communities of interest: Local Land Care Groups, Conservation Councils, Friends Groups, Volunteer, Local Landholders, and Schools? Special care must be taken to include these communities in your plan.

Internal to Council

- ▶ Strategic Planners
- ▶ Engineering staff
- ▶ Recreation, parks and gardens staff
- ▶ Town planners
- ▶ Cultural planners
- ▶ Community Development Staff

18.3. Consulting with the Indigenous community

Talking with Aboriginal groups is an important part of community consultation. Aboriginal people have a strong interest in the land, particularly in relation to conserving bushland and the natural environment. Aboriginal rights and interests are also protected under the Aboriginal Heritage Act 1972 and the Native Title Act 1993.

Councils should include the Aboriginal community from the earliest possible opportunity and should be mindful of the legal requirements under legislation. Consultation has to be undertaken respectfully and in a culturally appropriate way. The best way to ensure this is to contact local Aboriginal organisations for advice on how to proceed. The engagement of an Aboriginal person to advise and assist with consultation processes is invaluable.

The Department of Indigenous Affairs, the Aboriginal and Torres Strait Islander Services, the National Native Title Tribunal and the local Representative Body for Native Title claimants (for Perth the South West Aboriginal Land and Sea Council) are valuable points of contact for initiating a dialogue with Aboriginal people. Councils may also have local contacts as a place to start.

Here are some useful websites:

Department of Indigenous Affairs	www.dia.wa.gov.au
Aboriginal and Torres Strait Islander Services	www.atsic.gov.au
National Native Title Tribunal	www.nntt.gov.au
South West Aboriginal Land and Sea Council	www.noongar.org.au

Local Governments can also contact the Community Policy Team at the Western Australian Local Government Association (WALGA) for further assistance in involving the Indigenous community.

18.4. Why involve the public?

Involving the community in this process will encourage community support and ownership of the Local Biodiversity Strategy. You can undertake this project in a way that builds on the strengths and capacity of your community. This will lead to a richer plan and a richer community.

Community involvement will lead to:

- ▶ better planning for your Strategy
- ▶ greater acceptance and support of the biodiversity strategies and decisions
- ▶ full use of resources in the community
- ▶ increased trust and partnership
- ▶ ideas and inspiration beyond the technical expertise of Council staff
- ▶ a common vision for the Strategy
- ▶ increased capacity of your community
- ▶ increased standing of the Local Government within the community
- ▶ increased confidence by Councillors of community support for the project

18.5. What is your purpose behind public involvement?

Generally the earlier and more involvement people have in identifying assets and opportunities, and the greater respect and response given to their views, the more ownership and support they have for the solution!

You need to determine what you want to achieve by involving the community:

- ▶ What do you want to find out?
- ▶ Who has the information?
- ▶ Who has to be involved?
- ▶ Do they have the capacity and interest to take part in consultation?
- ▶ What is the size of the consultation?
- ▶ How is the best way to gather that information?

You can then determine the best way to involve the public in decision making through:

- ▶ yarning – you involve yourself in individual and community dialogue-developing ideas bubble up that you can both respond to
- ▶ participation – you ask the community to participate in decision making
- ▶ consultation – you ask the community what they think – then you make the decisions
- ▶ endorsement – you make a decision and ask the community if they approve.

18.6. Suggested consultation methods

Like your Council, the community is a diverse range of individuals with different ways of receiving and imparting knowledge. Do you need a variety of consultation methods and processes to engage with the different parts of your community? For example what would be the most effective way to engage young people in this process, Aboriginal people, families and people from different cultural backgrounds? Involvement in this process will depend on the engagement of people and the opportunity for them to participate. Here are some simple ideas – but remember there are many more!

To bring people together

- ▶ seminars
- ▶ public meetings
 - ▶ brainstorming
 - ▶ small working groups
 - ▶ panel presentations
 - ▶ workshops
- ▶ community arts workshops
- ▶ focus groups
- ▶ on site workshops
- ▶ visioning workshops
- ▶ charettes
- ▶ round tables
- ▶ advisory groups
- ▶ web chat rooms

If you are bringing people together some important things you will need to consider are:

- ▶ the process that you will be using to involve the public
- ▶ an appropriate facilitator
- ▶ the information you will have ready to open discussions
- ▶ refreshments
- ▶ providing a crèche so that parents can fully participate
- ▶ organising transport / or having the venue close to public transport
- ▶ accessibility of the venue to people with disabilities

To inform people

- ▶ discussion papers
- ▶ briefing documents
- ▶ action plans
- ▶ information displays at the library, shopping centre, schools.
- ▶ street stalls
- ▶ advertisements in the local paper, school newsletter, and community newsletters
- ▶ fact sheets in the local paper, school newsletter, and community newsletters
- ▶ feature stories in the paper
- ▶ press releases
- ▶ info on the Council web site
- ▶ brochures

Surveys/questionnaires

Surveys/questionnaires can also be a useful tool. There are two types of questionnaires - open ended questions where a response can be filled in, or closed questions where people respond from a range of given answers.

Care must be taken in writing the questionnaire to obtain the information that is needed and not to lead the respondents to certain answers! Thought needs to be given to the best way to distribute the survey, whether by post, telephone, face to face, in focus groups, or over the internet. Thought also needs to be given to compiling the results. What time and resources are available to you to survey the appropriate sample size, code the questions and statistically analyse results.

18.7. Some common problems of public involvement

Badly conducted public consultation or public participation exercises can lead to public cynicism and jeopardise future community involvement in this project.

Some common problems include low and unrepresentative community participation, confusion between the public and the organisers about the issue and an inconsistent understanding of the purpose of the project, and a lack of consensus on how to move forward. Public perception about your willingness to listen and respond is important for consultation to work well.

You need to minimise the problems that commonly occur and maximise the benefits that public involvement can offer. Consultation needs to be undertaken in a spirit of trustworthiness, honesty, openness, responsiveness and respect.

18.8. Committees or working groups of Council

Councils have the capacity to establish Committees of Council, Working Groups and Advisory Groups. The purpose of the Group/Committee is to oversee the development and implementation of the Strategy. The development of a Terms of Reference is the first undertaking to set the purpose of the group and its way of working.

Committees or Working Groups consist of Councillor, staff and community representation. Some questions you need to consider is should you establish a Committee or Advisory Group to oversee this project and what is the best way to ensure that this group is representative?

18.9. Handy references

The following are a list of publications and other useful tools in public consultation processes to assist you.

Carson L. & Gelber K. (2001). *Ideas for Community Consultation*, Department of Urban Affairs, Sydney.

Department of Premier and Cabinet Citizens and Civics Unit, (2003) *Consulting Citizens: Planning for Success*, <http://www.ccu.dpc.wa.gov.au>.

Government of Western Australia. (2004). *Consulting Citizens: Engaging with Aboriginal Western Australians*: Department of the Premier and Cabinet Citizens and Civics Unit, Perth.

Griffith University (2002). Development and Indigenous Land: A Human Rights Approach; Human Rights & Equal Opportunity Commission.

Muirhead, Tim (2002). *Weaving Tapestries A Handbook for Building Communities*, Local Government Community Services Association of WA, www.lgcsawa.asn.au.

Rietbergen-McCracken J. & Narayan D. (1998). *Participation and Social Assessment Tools and Techniques*, The World Bank, Washington

Sotirios Sarantakas (1996). *Social Research*, McMillan.

Wadsworth Yoland (1997). *Do it Yourself Social Research*, Victorian Council of Social Service, <http://www.vcss.org.au>

Useful websites:

IAP2 Public Participation Spectrum developed by the International Association for Public Participation, <http://www.iap2.org/practitionertools/spectrum>

International Association for Public Participation, Core values for the Practice of Public Participation <http://www.iap2.org/corevalues>

IAP2 Public Participation toolbox, Principles of Public Participation, www.co-intelligence.org/CIPol_publicparticipation.html