# COMMON NATURE CONSERVATION CLASSIFICATION SYSTEM

for

Western Subregional Organisation of Councils


*ACN 076 992 991*
*Level 20, 344 Queen Street, BRISBANE 4000*
*Telephone (07) 3831 8582 Facsimile (07) 3831 8587*

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# DOCUMENT CONTROL SHEET


## Chenoweth Environmental Planning & Landscape Architecture Pty Ltd

***Address*** Level 20, 344 Queen Street,
BRISBANE Qld 40000

***Phone*** 07 3831 8582

***Facsimile*** 07 3831 8587

***e-mail*** mail@chenoweth.com.au


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| ***Reviewer*** | D Francis | | |
| | | | |

## Study Team

| | | |
|---|---|---|
| ***Project Manager*** | Alan Chenoweth | BAgrSc, GDLA, MURP, FAILA,FPLA, MRAPI, MEIA,MAIH |
| ***Authors*** | A. Chenoweth, D. Francis , D. Moore | Chenoweth EPLA |

## Steering Committee

| | | |
|---|---|---|
| ***Chair*** | Michael Petter | Brisbane Regional Environment Council |
| | Peter Mackay | WesROC Coordinator |
| | Peter Lawson | Qld Parks & Wildlife Service |
| | Craig Maudsley | Ipswich City Council |
| | Alan Barton | Brisbane City Council |
| | Jason Searle, Carmel Peacock, David Corkill | Gold Coast City Council |
| | Steven Howell | Department of Natural Resources |
| | Peter Loose | Pine Rivers Shire Council |


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# APPENDICES

# EXECUTIVE SUMMARY

The Western Subregional Organisation of Councils (WESROC), comprising the councils of Boonah, Esk, Gatton, Ipswich, Laidley, and Toowoomba, recognised the need for a regional system for:

> *"defining areas of high conservation value as a sound basis for planning, development control, environmental protection and rehabilitation".*

Chenoweth Environmental Planning & Landscape Architecture Pty Ltd (Chenoweth EPLA) was commissioned to develop a Common Nature Conservation Classification System for South east Queensland, in close collaboration with the WESROC Steering Committee and other stakeholders in State agencies and local government. This system has been developed through reviews of existing systems and available data, workshops with relevant experts and likely users of such a system, field trials and application by Environmental Protection Agency for the Regional Nature Conservation Strategy.

The Common Nature Conservation Classification System classifies the significance of mapped remnant vegetation units for nature conservation, with standardised criteria and levels of data collection, that can be consistently applied throughout the region. The system is robust, objective, transparent and reliable, and although the number of options appears initially complex, the outputs are legible and capable of flexible use in regional and local government planning and conservation management.

The criteria cover three broad 'themes' of conservation values (rarity, general habitat and ecosystem processes) and achieve a balance between a reductionist (based on site-specific and species-focused data) and a more holistic approach (oriented towards systems and processes). Differences in the uniformity and reliability of data require a two-stage process:

**Stage 1: Mappable criteria** using data that are sufficiently consistent of being reliable and available in database format, to be queried and combined to automatically generate mapped significance classes:

- Essential Habitat for 'At Risk' Species;
- Ecosystem Value;
- Remnant Size;
- Relative Size of Ecosystem;
- Integrity;
- Community Diversity; and
- Context & Connection.

These seven criteria contribute to a "**First cut**" classification of remnants as **State, Regional,** or **Local** conservation significance.

**Stage 2 Other Desirable criteria** are an additional six parameters which require expert interpretation of non-uniform data to modify the '1st cut' rankings:

- Other Habitat for 'At Risk' Species;
- Habitat for Other Species;
- Corridor Links;
- Geomorphological Variation; and

- Localised Contribution to Biodiversity;
- Other Ecosystem Values.

Application of both the Stage 1 and Stage 2 criteria requires a consistent approach to mapping of remnant units based on vegetation polygons, and to data collection. However the system recognises the differences in resources which can be allocated to nature conservation studies by local governments throughout the region, and provides for three **Feasibility Levels** of data input:

**(i) Basic** - mainly desktop assessments using regionally-available 1:100,000 data with limited additional ground truthing;

**(ii) Intermediate** - assessment at a subregional scale (generally 1:25,000), requiring additional vegetation mapping and some field verification of ecological data, with GIS analysis;

**(iii) Advanced** - field surveys, vegetation mapping and field investigations at 1:25,000 or finer level, with expert analysis.

Standardisation of these levels throughout the region will allow the degree of detail required for each criterion to be specified for a range of processes, from broad scale strategic planning to site-specific applications, and to describe the reliability of outputs.

Each mappable criterion is rated as **Low**, **Medium**, **High** or **Very High**, as defined by descriptive statements and measurable indicators. These ratings are then combined through database combination filtering, to derive the 'First cut' level of significance of each remnant unit, ranked in Stage 1 as **State, Regional** or **Local Conservation Significance**.

In Stage 2 (expert panel review and application of the six Other Desirable Criteria), the '1st cut' maps and database outputs of significant remnant units are confirmed or modified, and additional layers of information from other sources or processes may be added (eg. critical areas of State significance may be shown with cross-hatching).

Although the final output is a simple legible map of relative conservation significance in three categories with consistency throughout the region, the accompanying GIS database will allow users to examine the range of values that contributes to classification. These layers of information can be effectively utilised for a wide range of land use planning, development assessment and conservation management,.

# 1. Introduction

## 1.1 Background

Various classification systems have been used in Queensland to assess the relative significance of natural areas, in order to prioritise conservation measures. The degree of inconsistency between these approaches has hindered regional approaches to nature conservation.

Within South east Queensland, the Western Subregional Organisation of Councils[1] (WESROC), with the support of the Environmental Protection Agency (EPA), Department of Natural Resources (DNR) and the South east Queensland Subregional Organisation of Councils (SEQROC), issued a brief to develop a common regional system for:

> *"defining areas of high conservation value as a sound basis for planning, development control, environmental protection and rehabilitation"* (see Appendix F).

Chenoweth Environmental Planning & Landscape Architecture Pty Ltd (Chenoweth EPLA) was commissioned to work closely with the steering committee (see Document Control Sheet) to:

- develop a common system of classifying the significance of areas for nature conservation purposes, with standardised criteria, utilising standard scales and, as appropriate, methods of assessment and data collection which can be readily integrated into a regional database; and

- ensure that such a system can be used by Local Governments for statutory planning, nature conservation management and other nature conservation objectives.

As the system was developed, a wider group of stakeholders contributed to workshops, field trials and review of draft outputs for applicability throughout South east Queensland. Considerable work was undertaken by Environmental Protection Agency officers in testing the Common System for application to the SEQ Regional Nature Conservation Strategy, and by SEQROC representatives on various committees and review panels. The Common System therefore represents the outcomes of a collaborative effort involving many people, whose contributions are gratefully acknowledged.

[1] Ipswich and Toowoomba City Councils, Boonah, Esk, Gatton and Laidley Shire Councils

## 1.2 Key Definitions

### 1.2.1 Biological Diversity

Biological Diversity has been variously defined for international, national and State strategies. The *Nature Conservation Act 1992* defines "biological diversity" as the natural diversity of native wildlife, together with the environmental conditions necessary for their survival, and includes regional, ecosystem, species and genetic diversity. Regional diversity includes landscape components (landforms, soils, water, climate, wildlife and land uses). However, for application to planning at regional or local government level, the following modified definition is appropriate:

**Biological diversity** (biodiversity) is the variety of natural flora and fauna and their interactions with environmental conditions for their long-term survival and viability. This includes:

- **Regional diversity** - the variety of land systems in a region, and their environmental components* and functional interactions that affect ecosystems;
- **Ecosystem diversity** - the variety of vegetation structural formations, and associations in a region, and their component and determining ecological processes and faunal habitats;
- **Species diversity** - the variety of flora and fauna species, especially rare and endangered species;
- **Genetic diversity** - the variety of subspecies and ecotypes[#] or geographically separated populations of any species.

*Environmental components: vegetation structure and composition, soil, geology (lithology, stream pattern, toposequence and modal slope) and climate.
# Ecotype: Group of plants within a species adapted genetically to a particular habitat but able to cross freely with other ecotypes of the same species.

### 1.2.2 Nature Conservation Significance

Under the *Nature Conservation Act 1992* (8.1 & 2), "nature" includes all aspects of nature including ecosystems and their constituent parts, all natural and physical resources, natural dynamic processes and the characteristics of places, however large or small, that contribute to their biological diversity and integrity or their intrinsic or scientific value.

The same Act defines "conservation" as the protection and maintenance of nature while allowing for its ecologically sustainable use.

At any given scale of land use planning and resource management (national, State, regional or local), the various areas of remnant natural habitat vary in their importance for biodiversity protection and nature conservation generally[2]. Their relative significance may be assessed according to various attributes including ecosystem representation, critical habitat for biological populations, contribution to ecosystem function and other special characteristics which make areas worthy of conservation. The Integrated Planning Act (1997) requires local

[2] The terms 'biodiversity protection' and 'nature conservation' are, in practice, interchangeable.

government to identify valuable features including *"Resources or areas that are of ecological significance (such as habitats, wildlife corridors, buffer zones, places supporting biological diversity or resilience) and features contributing to the air quality, water (including catchments or recharge area) and soil; … "*.

However for the purposes of developing this Common System, Nature Conservation Significance is more specifically defined as:

**Nature Conservation Significance** is the relative importance, as assessed by valid scientific criteria, of places, features, ecosystems and populations of species (and other taxa) which represent or contain the remaining natural and biological diversity of a bioregion or area, and the habitats, resources and ecological processes on which they depend.

## 1.3 Conservation Planning Obligations

### 1.3.1 International Obligations

The Commonwealth of Australia is a party to several international environmental conventions to protect national and international biodiversity generally, and significant areas, species or groups of species in particular. It was also a signatory to the Rio Declaration on Environment and Development at the United Nations Conference ('Earth Summit') in 1992, which consisted of 27 non-binding principles for world-wide achievement of Ecologically Sustainable Development (ESD).

The global Convention on Biological Diversity, ratified by Australia in 1993, aims to conserve the full range of biodiversity, sustainable use of its components, and equitable sharing of the benefits from the use of genetic resources. Australia is accordingly committed to protecting and maintaining biological diversity as a national priority, in recognition of the country's mega-diverse biota and relatively high rates of species extinctions to date (Commonwealth Biodiversity Unit 1994).

Australia's commitments to international agreements on both ESD and biodiversity conservation are expressed in national strategies, as outlined in 1.3.2 below.

Other relevant international treaty and convention obligations to which Australia is committed *" … range from agreements about the protection of the habitats of migratory species, World Heritage properties, Antarctica and the South Pacific region, to agreements on trade in wildlife and pollution control."* (Clearing House Mechanism: Convention on Biological Diversity, Home Page 2000)

### 1.3.2 National Strategies and Agreements

The development and application of a Common Nature Conservation Classification System is consistent with and contributes to implementation of the following national strategies.

**(a) National Strategy for Ecologically Sustainable Development**

The National Strategy for Ecologically Sustainable Development (1992) is aimed at satisfying the present needs of society without jeopardising the ability of ecosystems to satisfy the needs of future generations, and defines ESD as:

*"using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased".*

The strategy encourages governments to develop effective mechanisms for protection, conservation and management of biological resources, which includes management of threats. To meet this challenge, measures need to be put in place which will:

- Protect and manage nature conservation values both inside and outside areas protected under legislation;
- Develop and enhance natural resource inventories;
- Evaluate areas of conservation value;
- Improve our knowledge of biodiversity;
- Conserve, and where appropriate restore native vegetation to maintain and enhance biodiversity;
- Protect river quality and conserve soil resources; including on private land; and
- Facilitate nature conservation on private land.

**(b) National Strategy for the Conservation of Australia's Biological Diversity**

The goal of the National Strategy for the Conservation of Australia's Biological Diversity is *" … to protect biological diversity and maintain ecological processes and systems"*. The following principles guide implementation of the Strategy (Clearing House Mechanism: Convention on Biological Diversity, Web Site 2000):

1. Biological diversity is best conserved in-situ.
2. Although all levels of government have clear responsibility, the cooperation of conservation groups, resource users, indigenous peoples, and the community in general is critical to the conservation of biological diversity.
3. It is vital to anticipate, prevent and attack at source the causes of significant reduction or loss of biological diversity.
4. Processes for and decisions about the allocation and use of Australia's resources should be efficient, equitable and transparent.
5. Lack of full knowledge should not be an excuse for postponing action to conserve biological diversity.
6. The conservation of Australia's biological diversity is affected by international activities and requires actions extending beyond Australia's national jurisdiction.
7. Australians operating beyond our national jurisdiction should respect the principles of conservation and ecologically sustainable use of biological diversity and act in accordance with any relevant national or international laws.
8. Central to the conservation of Australia's biological diversity is the establishment of a comprehensive, representative and adequate system of ecologically viable protected areas integrated with the

sympathetic management of all other areas, including agricultural and other resource production systems.

9. The close, traditional association of Australia's indigenous peoples with components of biological diversity should be recognised, as should the desirability of sharing equitably benefits arising from the innovative use of traditonal knowledge of biological diversity.

**(c) Commonwealth - State Agreements**

The Inter Government Agreement on the Environment between the Commonwealth and State Governments and the Local Government Association was signed in 1992. This commits all levels of government to protect biodiversity and to conserve and improve resources that are basic to the maintenance of essential ecological process and integrity. The implications for local government include a requirement to consider national nature conservation objectives, including the protection and management of species outside reserves, and of remnant vegetation, to complement the reserve system further. This requires local governments to cooperate to identify, manage and protect nationally-significant remnants, and to coordinate research initiatives.

Also in 1992, Commonwealth and State Governments signed a National Forest Policy Statement as a framework agreement for the ecologically sustainable management of Australia's forest estate, primarily through Regional Forest Agreements (RFAs) (Agriculture, Fisheries and Forestry Web Site, 2000). These 20 year agreements aim to establish ecologically sustainable use of forests and certainty for industry and communities, as well as a Comprehensive, Adequate and Representative (CAR) forest reserve system (see JANIS criteria in 3.1.2).

Following establishment of the national Natural Heritage Trust (NHT) In 1997, all State and Territory governments signed NHT partnership agreements with the Commonwealth to reverse the long term decline in Australia's native vegetation. The parties also agreed at that time to a National Framework for the Management and Monitoring of Australia's Native Vegetation (see 3.2 below), which identifies 'best practice' native vegetation management mechanisms and establishes work plans for Commonwealth and State governments (Environment Australia, 2000).

### 1.3.3 Commonwealth Legislation

The *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) came into force in July 2000, replacing five previously separate statutes relating to impact assessment, endangered species, national parks and wildlife conservation, World Heritage properties and whale protection. *"The Act enables the Commonwealth to join with the States and Territories to provide a national scheme of environment protection and biodiversity conservation"*. Under the EPBC Act, any 'action' (development, project or activity) likely to have significant impact on matters of national environmental significance (NES) is subject to rigorous assessment and approval processes (Environment Australia Home Page 2000). Of particular relevance for Queensland's system of Regional Ecosystems, and for the Common Nature Conservation Classification System, is the identification of endangered ecosystems and threatened species as matters of national environmental significance.

### 1.3.4 Integrated Planning Act (1997)

The Queensland *Integrated Planning Act (1997)* (IPA) encourages local governments to exercise their powers in a way that advances ecological sustainability, including the protection of biodiversity, ecological processes and natural systems at local, regional, state and wider levels. In addition to this, local government are also obliged to ensure the sustainable use of renewable natural resources and the prudent use of non-renewable natural resources; and generally to achieve these objectives in a manner that is cost effective and benefits the public.

The main planning instrument is the planning scheme, which must include the identification of valuable features and desired environmental outcomes. Valuable features include:

(a) Resources or areas that are of ecological significance (such as habitats, wildlife corridors, buffer zones, places supporting biological diversity or resilience) and features contributing to the air quality, water (including catchments or recharge area) and soil;

(b) Areas contributing significantly to amenity (such as high scenic value, physical features that form significant visual back drops or that frame or define places or localities, and attractive built environment);

(c) Areas or places of cultural heritage significance (such as area or places of indigenous cultural significance, or aesthetic architecture, historical, scientific, social or technological significance, to the present or past or future generations); and

(d) Resources or economic values (such as extractive deposits, forestry resources, water resources, sources of renewable and non-renewable energy and good quality agricultural land).

### 1.3.6 Nature Conservation Act 1992

The *Nature Conservation Act (1992)* and *Nature Conservation (Wildlife) Regulation 1996* recognise that local government planning should be consistent with management plans for protected areas and areas under conservation plans (including critical habitat or areas of major interest), In order to protect biological diversity. Local governments have a responsibility for protection of rare and threatened species and their habitats, native flora and fauna.

### 1.3.7 Regional Framework for Growth Management

The South East Queensland Regional Framework for Growth Management (RFGM 1998) establishes principles to conserve areas of regional significant nature conservation value. Among these principles are:

*1.1 The diversity of landscapes, plants and animals in the region and the ecological processes essential for their continued existence should be maintained and restored; and*

*1.6 Significant nature conservation areas should be maintained and protected by preventing urban and rural residential encroachment.*

The land considered at that stage to be of "significant nature conservation areas" was identified on Map 2A as:

- **Critical Nature Conservation Areas** – Areas of high priority for maintenance and protection of regional biodiversity
- **Broad Nature Conservation Areas** – Multi-use areas that are important to the maintenance and protection of the region's biodiversity.

Among the priority actions of RFGM (1998) were to:

*1.2 Prepare a Regional Conservation Strategy on the basis of comprehensive inventories of the natural environment. This strategy and the identification and assessment of remnant vegetation and bushland corridors by local planning, should be used to ensure protection of significant remnant vegetation in the region.*

*1.3 Significant nature conservation areas are shown on the Environmental Constraints Map (Map 2). Update the Map, through the Regional Conservation Strategy, as relevant information becomes available from DoE and Councils and use it as a basis for Local Government Planning.*

*1.4 Review planning schemes to ensure that critical nature conservation areas, together with the linkages connecting these, are retained.*

*1.5 Continue the program of nature conservation studies and data acquisition with emphasis on:*

- *remnant vegetation including that on public lands*
- *native fauna and significant habitat information*
- *analysis of Nature Search 2001 data*
- *critical nature conservation areas*

The RFGM objectives and priority actions require local governments to work closely with Department of Environment (now Environmental Protection Agency) to prepare a regional conservation strategy based on inventories of remnant vegetation, habitat and corridors, and their relative significance.

Areas of remnant vegetation identified for protection in the strategy will also include those with significant attributes of scenic amenity, outdoor recreation, open space, land and water conservation values, cultural heritage and social significance to a community.

At the time of writing this report (December 2000), the draft Regional Nature Conservation Strategy for South-east Queensland and accompanying map of relative nature conservation significance was about to be released by the Regional Coordination Council.

### 1.3.8 Other Regional Initiatives

In addition to the recent initiatives to develop a revised Regional Nature Conservation Strategy, there has been considerable collaboration between State government agencies and local governments in South east Queensland in conservation policy development associated with:

- Regional Coastal Management Plan under the *Coastal Protection and Management Act*
- Regional Natural Resource Management & Conservation Strategy for South east Queensland, coordinated by Department of Natural Resources.

In the near future, there will also need to be similar planning efforts directed towards a Regional Vegetation Management Plan under the *Vegetation Management Act.*

# 2. CONSERVATION PRINCIPLES

## 2.1 Vegetation, Habitat and Biodiversity

Australia has such a large number of native flora and fauna species, relative to other continents, that our biota is rated as " Flannery 1994); and within Australia the natural biodiversity of South-east Queensland and North-east New South Wales is exceptionally high (Catterall and Kingston 1993). However, over the past 200 years our record in species extinctions has been the basis of an unenviable reputation (Lines 1991), and there is no doubt that *"the staggering loss of vegetation, especially trees, since European occupation has been of profound significance to Australia's biodiversity"* (Greening Australia 1995).

In South-east Queensland, population expansion and associated land development are of particular concern for native vegetation and habitat. In these areas, undeveloped bushland provides the habitat for all natural terrestrial biodiversity, but significant areas of fauna habitat have been detrimentally affected by extensive clearing, especially in the coastal and subcoastal lowlands where whole ecosystems have been selectively removed (RPAG 1993). Vegetation removal and fragmentation has also caused loss of refuges, disruption of habitat complexes and wildlife corridors, and the replacement of interior forest habitats with ecotones and edge effects. These impacts can cause a reduction in local and regional species populations from an area, and ultimately lead to species extinctions (Catterall and Kingston 1993).

At present, bushland occupies approximately 35% of dryland parts of South-east Queensland, most of which is represented by large tracts of integral forest on the steep mountain ranges, offshore sand islands and Cooloola. Since European settlement, approximately two-thirds (65-70%) of the former distribution of native vegetation within the region has been lost. Current rates of loss appear to be continuing the historical trend, 33% of the mainland vegetation that existed in the coastal region in 1974 had been removed by 1989, a period of only 15 years. The remaining vegetation is under threat from urban expansion, expected to accommodate a 60% increase in population within the next 25 years (Catterall and Kingston 1993).

This information has been updated by the State Landcover and Tree Survey (SLATS) (Dept of Natural Resources 2000) which indicates that the rate of clearing of remnant native vegetation in South east Queensland between 1997 and 1999 remains high at almost 16,000 hectares per year. However remnant vegetation is increasingly being protected, through local laws, planning schemes, acquisitions and voluntary agreements with private landholders.

Biodiversity strategies which aim to maintain viable populations of all remaining species (both known and yet-to-be identified) require that their habitats be identified and representative examples protected and linked. This requires a systematic approach to classification and mapping of natural ecosystems, representing not only the various recognisable vegetation communities (forests, wetlands, shrublands and grasslands etc) but also their variations across geological and climatic gradients.

## 2.2 Approaches to Conservation Significance

### 2.2.1 Protected Area Planning

For most of the past 100 years, the main mechanism to protect valuable natural areas has been by gazettal as parks and reserves, for public enjoyment and for nature conservation. The system of national parks gazetted for these purposes initially included mainly scenic mountainous areas unsuited for rural production. However as the dependence of native flora and fauna on relatively undisturbed natural areas became more widely accepted, both scientifically and politically, a more rational approach to national park acquisition and management developed (see 3.1.1 for current Queensland criteria).

An early approach to defining Australia's biodiversity to plan for a representative system of nature reserves (Specht et al 1974) listed all known vegetation communities in Australia and their conservation status, as part of an international Man and the Biosphere (MAB) Task Force which aimed:

> *"To conserve for present and future use the diversity and integrity of biotic communities of plants and animals within natural ecosystems, and to safeguard the genetic diversity of species on which their continuing evolution depends"* (UNESCO, 1974).

Within this primary objective, the MAB Task Force envisaged both 'Representative' reserves which would contain representative examples of broad 'biomes' and their main subdivisions[3]; and 'Unique' reserves which would possess some specific characteristics that would distinguish them from other parts of the biome to which they belong.

### 2.2.2 Inventories of Nature Conservation Values

Description and analysis of regional biodiversity has undergone considerable evolution over the past 25 years, as exemplified in South-east Queensland by a series of overview studies. The introduction of National Estate listings in the early 1970s sparked a serious national effort to place on record the places and features regarded as significant national heritage, both natural and cultural. In 1976, the Queensland Museum described the key elements of the National Estate in the Moreton and Wide Bay-Burnett Regions. While necessarily broadscale and limited by a paucity of specific data on fauna, it stressed the high biological value of the region as habitat for a number of endemic species and rainforest associations, as the northern extent of cool temperate rainforests (relics of the Pleistocene era) and as an important overlap region for species distributions.

The report on Non Urban Land Suitability as part of the Moreton Region Growth Investigation (1976) reinforced the high regional and State significance of the MacPherson Range, not only for nature conservation and faunal habitat, but also for outdoor recreation and scenic values.

[3] The MAB concept of broad biomes and their subdivisions is echoed in Queensland by the hierarchy of Bioregions and Regional Ecosystems

This report also documented the high values associated with southern Moreton Bay and fringing terrestrial and intertidal areas, which were further assessed and described in the Queensland Government's Coastal Management Investigation (GHD 1975).

Also in the mid to late 1970s, the Queensland Department of Primary Industries mapped the native vegetation of South-east Queensland at 1:100 000 and identified areas of remnant native vegetation suitable for conservation.

This period of intense State Government resource inventories in the 1970s then appeared to wane, to be revitalised in the late 1980s as a result of the combined pressures of population growth, community conservation awareness, the lack of effective regional planning processes and data, and a concerted attack by the conservation movement on management of public forests.

### 2.2.3 Bioregional Planning

Also in the mid 1970s, Stanton (1977) described the broad biogeographic regions in Queensland as a basis for identification of key and endangered sites, and the then National Parks and Wildlife Service started to rationalise the process of national park acquisitions throughout Queensland on this basis. This approach has been subsequently developed by the the Department of Environment (now the Environmental Protection Agency) into a major strategic policy basis for biodiversity conservation, based on 13 biogeographic regions identified in the State.

Bioregional approaches are now used by all State and Territory conservation agencies to protect representative examples of all identified ecosystems in each region (Sattler 1993). The recognition of different vegetation communities and their associations with geology and landform is a consistent basis for identifying the diversity of ecosystems and habitats for both flora and fauna.

In Queensland, Biogeographic Regions each consist of broadly-similar patterns of geology, landform, hydrology, native vegetation and fauna. Within each of the 13 recognised biogeographic regions, provinces and Regional Ecosystems (REs) provide the basis for identifying and protecting biodiversity. REs are vegetation communities consistently associated with a particular association of geology, landform and soil, in each bioregion (Sattler & Williams 1999).

### 2.2.4 Representation of Regional Ecosystems

Regional conservation and forest management strategies aim to identify and protect the biodiversity of each Regional Ecosystem through a Comprehensive Adequate and Representative (CAR) system of reserves. In each region, priority is given to those REs which are endangered by or vulnerable to development or clearing, which are rare or limited, or which are poorly represented in reserves. An important part of any regional conservation strategy is the acquisition of viable representative samples of these REs within gazetted parks and reserves.

However these protected areas can provide only part of the network of habitat needed for biodiversity conservation, and 'off-reserve' habitat retention and management measures are essential. These measures include land use planning and appropriate designation of significant areas of native vegetation.

## 2.3 Planning and Management Units

While Regional Ecosystems and their conservation status are important criteria for determining significance, they do not represent the full range of nature conservation values to be taken into account in land use planning and resource management. RE assessment alone does not include spatial considerations such as size and connectivity eg. an 'Endangered' RE within a large continuous area of bushland has no greater value than the same RE in a small isolated patch.

Inclusion of spatial considerations requires definition of mapping units for planning and management, such that each unit (remnant, Conservation Management Units, Vegetation Management Units, MUIDs[4] etc) can be managed as a parcel of land with a suite of conservation values. These units have proven particularly useful as a framework for strategic planning and development control in local government planning (Greening Australia 1995).

Most of the factors relevant to the classification of conservation significance are readily applicable to land units. Some factors (such as size, connectivity, viability/'manageability' and location of threatened species) apply to particular patches of habitat and are assessable only on a unit basis. Others (such as integrity, condition, diversity and representativeness) can be categorised and mapped in various ways, including assessment on a land unit basis. However some factors (such as buffer distances, wilderness quality etc) represent gradients across the landscape, and are not readily addressed in a unit-based system.

A conservation classification system based on mapped units can include most of the above nature conservation values and can also address a broad range of conservation planning activities related to parcels of land. The determination of appropriate planning and management units is controlled by:

(a) mapping scale (eg. a 1:25,000 map can portray a polygon of 2 ha);
(b) the intensity of management required to address issues (eg. effective management of riparian vegetation needs mapping of strips of 50 metres width); and
(c) the quality of information.

Subject to the above considerations (and especially the availability of information at the relevant scale), such a system can be applied at the regional, local government, catchment and site level.

[4] Management Unit Identifiers, used in the Regional Forest Agreement process

# 3. Criteria for Conservation Significance

## 3.1 Reserve Systems

Considerable research and consultation in Australia over the past 20 years has gone into developing criteria for selecting areas which should be reserved and managed for conservation. The criteria of size, structure, representativeness and replication were first recommended on a national basis by the Australian Academy of Science (1975) for the establishment and choice of biosphere reserves. Subsequent development of this approach has included:

### 3.1.1 Queensland Protected Area Acquisition Program

Criteria for selection of priority areas for acquisition and/or gazettal of national parks and other protected areas include:

- **Representation** – the reserve system should include "comprehensive and adequate representation" (CAR) of each identifiable ecosystem;

- **Viability & Manageability** – areas reserved should be of appropriate size, shape, condition connectedness' to provide habitat for viable populations in the long term, considering the adjacent land uses, activities, edge effects and buffers, the fragility or robustness of the ecosystem to human or natural disturbance and other management issues;

- **Diversity** – provided criteria of representation and viability are satisfied, higher priority is accorded to areas with a high diversity of ecosystems and their component elements (species and local variants, land types, ecological gradients and ecotones); and

- **Ecological Function & Special Values** – other values which influence priorities for national park acquisition include habitat of particular species, cultural heritage, scenic quality, nature-based recreation opportunities, geological features and catchment protection.

Several of the factors considered in Viability and Manageability are drawn from the theory and practice of conservation biology, and in particular the following general principles of island biogeography (Diamond and May 1976):

- Size: A single large reserve will support viable populations of more species than several small reserves of equivalent area;
- Shape: A circular reserve shape with simple boundaries maximises the proportion of internal volume to boundary, while a narrow linear shape has a higher proportion of 'edge predation, opportunistic species, human disturbance etc);
- Linkage: Reserves linked by corridors for faunal movement are more likely to maintain viable populations of species than isolated reserves.

In addition to the above intrinsic factors, the QPWS program considers the degree and immediacy of threatening processes, and opportunistic factors relating to land availability and price.

### 3.1.2 JANIS Criteria for a CAR Reserve System for Forests

The National Forest Policy Statement (Commonwealth of Australia 1992) is an agreement by the Commonwealth, State and Territory Governments on broad goals for the ecologically sustainable management of Australia's forests. The policy statement includes commitment to a Comprehensive, Adequate and Representative (CAR) reserve system, as well as protection of 'old growth' forests and wilderness, as part of Regional Forest Agreements (RFAs). The CAR reserve system is one that is (Regional Forest Agreement Home Page 2000):

**Comprehensive**: includes the full range of forest communities recognised by an agreed scientific classification at appropriate hierarchical levels;

**Adequate**: the maintenance of the ecological viability and integrity of populations, species and communities;

**Representative**: those sample areas of the forest that are selected for inclusion in the reserves should reasonably reflect the biotic diversity of the communities.

Since 1992, draft criteria for a CAR reserve system have been developed by agencies, advisory groups and committees, and in particular by a Joint ANZECC[5] / MCFFA[6] National Forest Policy Statement Implementation Sub-committee (JANIS). The Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia, published in 1997, have become known as the JANIS Criteria:

**(a) Biodiversity**

- 15 % of the pre-1750 distribution of each forest ecosystem should be protected in the CAR reserve system;
- Forest ecosystems recognised as vulnerable should have at least 60% of their remaining extent reserved; where a 'vulnerable' forest ecosystem is defined as one which is depleted (approaching an areal reduction of 70%) and still subject to threatening processes; or not depleted but subject to continuing and significant threatening processes;
- All remaining occurrences of rare and endangered forest ecosystems should be reserved or protected by other means as far as possible; where 'rare' means a total range of less than 10,000 ha, a total area less than 1,000 ha or patch sizes less than 100 ha; and 'endangered' means a distribution contracted to less than 10% of the ecosystem's former range or area;
- Reserved areas should be replicated across the geographic range of the forest ecosystem;
- The reserve system should seek to maximise the area of high quality habitat for all known elements of biodiversity wherever practicable;
- Reserves should be large enough to sustain the viability, quality and integrity of populations;

[5] Australian and New Zealand Environment and Conservation Council
[6] Ministerial Council on Forestry, Fisheries and Aquaculture

- To ensure representativeness, the reserve system should, as far as possible, sample the full range of biological variation within each forest ecosystem; and
- In fragmented landscapes, remnants that contribute to sampling the full range of biodiversity are vital parts of a forest reserve system.

**(b) Old-growth Forests**[7]

JANIS recognised the need for flexibility in application of this criterion according to regional circumstances and the different age-related features in different forest ecosystems, and recommended that areas of old-growth forest be included in areas identified for biodiversity criteria where possible. The criteria are:

- Where old-growth forests are rare or depleted within a forest ecosystem, all viable examples should be protected, wherever possible;
- For other forest ecosystems, 60% of the identified old-growth forest should be protected, or more if necessary to achieve the following objectives:
  - Representation of old-growth forest across the geographic range of the forest ecosystem;
  - Protection of high quality habitat for species identified under biodiversity criteria;
  - Appropriate reserve design;
  - Protection of the largest and least fragmented areas of old-growth; and
  - Aesthetic and cultural values, and community needs for recreation and tourism.

**(c) Wilderness**[8]

Wilderness quality, as assessed by the National Wilderness Inventory, combines four standard indicators (remoteness from settlement and access, apparent naturalness and biophysical naturalness. Areas to be included in reserves are 90% or more of the area of high quality wilderness, defined as:

- Minimum NWI rating of 12 (plus minimum ratings for each of the 4 indicators, as set for each region); and
- Minimum area of 8000 ha (or less in certain circumstances);

The areas to be included may be modified by the presence of nodal areas of very high wilderness quality, and the impacts of exotic species on biophysical naturalness.

### 3.1.3 Bioclimatic & predictive modelling

During the development of nationally-accepted criteria for a forest reserve system, a number of regional studies and inquiries were based on alternative approaches. Chief among these was the bioclimatic modelling approach developed by Nix *et al* to develop environmental domains and provinces, and applied to the forests of south eastern NSW (Richards *et al* 1990 ). This was a major research effort to recommend a reserve system and conservation strategies for a major region based on an objective assessment of its environmental and biological attributes.

[7] ***Old-growth forest*** *is ecologically mature forest where the effects of disturbance are now negligible* (JANIS 1997)

[8] ***Wilderness*** *– land that, together with its plant and animal communities, is in a state that has not been substantially modified by, and is remote from, the influences of European settlement or is capable of being restored to such a state; is of sufficient size to make its maintenance in such a state feasible; and is capable of providing opportunities for solitude and self-reliant recreation* (National Forest Policy Statement 1992)

The principle is that a reserve system should adequately sample all combinations of biological, topographic and climatic attributes to ensure that it contains appropriate habitat for all dependent species. Data inputs include vegetation patterns, rainfall, elevation, slope and aspect, geology and soil, species-environment relationships, representation, diversity, stability, wilderness, and the known distribution of rare / threatened species. The resultant output mapping is a mosaic of bioclimatic categories that can indicate the adequacy of reserve systems and guide the selection of appropriate boundaries.

Bioclimatic modelling has also been used in the Wet Tropics World Heritage Area, and similar approaches have been used to predict the distribution of species dependent on particular combinations.

## 3.2 National Framework for Vegetation Management

The National Framework for the Management and Monitoring of Australia's Native Vegetation aims "*to reverse the long term decline in the extent and quality of Australia's native* , and identifies 'best practice' native vegetation management mechanisms under seven headings:

1.Roles and Responsibilities of Governments and Community,
2.Planning and Assessment,
3.Formal Reserves System,
4.Communication and Capacity building,
5. Incentives,
6. Regulatory Mechanisms,
7. Monitoring and Evaluation.

The best practice mechanisms for vegetation planning and assessment have three major components:

- Vegetation inventory, data collection and mapping
- Biodiversity Assessment
- Regional Vegetation Management Planning

The Framework will be implemented through work plans in each State and Territory, with monitoring and evaluation to assess performance.

## 3.3 Wetlands

Approaches to classifying the conservation significance of wetlands in Australia has followed a different process to that for forests, because the ecosystems involved are so different in structure, ecological processes and relationship to surrounding systems. Wetland evaluation has also been largely driven by internationally-accepted criteria such as the Ramsar Convention and agreements regarding migratory birds. There are particular issues associated with definition of wetlands and mapping of boundaries that differ from those of forests, and their classification into wetland classes covers a wide range of land-water interface situations.

Criteria used to list wetlands under the Convention on Wetlands of International Importance (the Ramsar Convention) include:

- Substantial hydrological, biological or ecological role in the natural functioning of a major river basin or coastal stream;
- Support substantial numbers of waterbirds,
- Support an appreciable assemblage of rare, vulnerable or endangered species or subspecies.

Among the criteria used to determine Nationally Important Wetlands (Australian Nature Conservation Agency 1992) are:

- Size and integrity;
- Ecological or hydrological role in the natural functioning of a major wetland system/complex;
- Provision of habitat for 1% or more of the national populations of any native plant or animal taxa;
- Significant breeding or roosting area for significant migratory species; and
- Historical or cultural significance.

Wetlands may be listed as nationally-important if they satisfy one or more criteria.

In South east Queensland, coastal wetlands have been classified according to their conservation significance following mapping of remnant vegetation at 1:25,000 by Queensland Herbarium. The criteria for conservation significance were applied at four levels (Chenoweth EPLA 1999):

- Vegetation Communities
- Mapped Vegetation Polygons (many of which were heterogeneous[9])
- Wetland Unit (a discrete area of wetland associated with a geographic place)
- Wetland Complex (a grouping of wetland units sharing the same river, estuary or bay)

Two groups of criteria were developed by EPA and Chenoweth EPLA (and tested by expert panels and consultative workshops) for application to the mapped polygons:

***(a) Mappable Criteria*** (applied to uniform and reliable quantitative data which can be queried on database, to provide a '1st cut' map of relative conservation significance):

- **Size** (of wetland units and of polygons)
- **Representativeness** (proportion of vegetation mapping unit remaining in the bioregion)
- **Diversity** (of vegetation mapping units within each wetland unit)
- **Boundaries** (the number of internal vegetation boundaries, representing mosaics of different communities)
- **Connectivity** (to water and to other wetland units)
- **Adjoining habitat** (where GIS mapping was available) eg. terrestrial remnant bushland

Each of these criteria was rated on a non-arithmetic 4-point scale (Very High to Low) and overall significance calculated by rules of combination as either:

- Regionally Significant
- Valuable Habitat
- Major Habitat
- Local Significance

[9] Heterogeneous polygons are mapped areas which contain two or more types of vegetation, which cannot be distinguished or separated at the applied scale of mapping

Some 'Very High' ratings (eg significant species habitat, representativeness and size) represented sufficient justification for regional significance, irrespective of other criteria. Regional significance could also be 'triggered' by other combinations of Very High and High ratings.

**(b) Modifying Criteria** (applied by expert panels in review of '1st cut' maps and data, using non-quantitative data or information which may vary in uniformity and reliability):

- Records and known habitat for significant species, especially those scheduled under the *Nature Conservation (Wildlife) Regulation 1996*
- Wader Habitat
- Connectivity to non-mapped wetland habitat (seagrass beds, mudflats/sandbanks etc)
- Other values

Following classification according to conservation significance, wetlands were also assessed for their current levels of effective protection (by tenure and/or planning schemes), and ranked for priority conservation measures.

The methodology for assessment of conservation significance, based largely on accurate vegetation mapping data at 1:25,000 plus a 2nd stage expert panel review, proved to be a robust, transparent and practical approach for application at a regional scale (Chenoweth EPLA 1999).

## 3.3 Heritage Listing

Criteria for listing places or features on a catalogue of significant heritage ("things we want to keep") have a fundamentally different basis to those for biodiversity conservation. Heritage listing is oriented towards identification of the best or most representative remaining examples of things (including ecosystems) valued by the community; while the CAR principles aim for comprehensive representation to ensure protection of all ecosystem components, both known and yet-to-be described. However, there is considerable overlap of objectives, and most nature reserves meet the criteria of both processes.

**(a) Australian Heritage Commission:** The Register of the National Estate aims to conserve the natural or cultural environment of aesthetic, historic, scientific or social significance for present and future generations. The criteria relating to the natural environment are:

- Significant in the evolution and pattern of Australia's natural or cultural history. This includes importance in the evolution of Australian flora, fauna, landscapes or climate; in maintaining existing processes or natural systems; and in exhibiting unusual richness or diversity.

- Significant in possessing rare, endangered or uncommon aspects of Australia's natural or cultural history. This includes importance for rare, endangered or uncommon flora, fauna, communities, ecosystems, natural landscapes and phenomena, or as wilderness;

- Its potential to yield information that will contribute to an understanding of Australia's natural or cultural history.

- Its importance in demonstrating the principal characteristics of a class of Australia's natural or cultural places and environments, including the range of landscapes, environments, or ecosystems, the attributes of which identify them as being characteristic of their class.

- Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.

**(b) World Heritage Listing**

The purpose of listing sites under the United Nations Convention on World Heritage is to conserve major stages of earth's evolutionary history, unique, rare or superlative natural phenomena, formations or features of areas of exceptional natural beauty, habitats where populations of rare or endangered species of plants and animals still survive.

Criteria are:

- Be outstanding examples representing the major stages of the earth's evolutionary history;
- The sites described should contain all or most of the key interrelated and interdependent elements in their natural relationships;
- Be outstanding examples representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment;
- The sites described should have sufficient size and contain the necessary elements to demonstrate the key aspects of the process and be self perpetuating;
- Contain superlative natural phenomena, formations or features;
- The sites described should contain those ecosystem components required for the community of the species or of the other natural elements or processes to be conserved;
- Contain the most important and significant natural habitats where threatened species of animals or plants of outstanding universal value, from the point of view of science or conservation, still survive;
- The area containing threatened species should be of sufficient size and contain necessary habitat requirements for the survival of the species;
- In the case of migratory species, seasonal sites necessary for their survival, wherever they are located, should be adequately protected. Agreements made in this connection, either through adherence to international conventions, or in the form of other multilateral or bilateral arrangements, would provide this assurance; and
- The sites described in the criteria should have adequate long-term legislative, regulatory or institutional protection. They may coincide with or constitute part of existing or proposed protected areas such as national parks. If not already available, a management plan should be prepared and implemented to ensure the integrity of the natural values of the site in accordance with the Convention.

**(c) Levels of Significance**

In various studies and inquiries (eg Commission of Inquiry into the Conservation, Management and Use of Fraser Island and the Great Sandy Region 1990), a range of natural attributes have been ranked according to their international, national, State, regional or local significance. Criteria for such ranking have included (variously): rarity, relative size/height/extent, diversity, size, naturalness, productivity, fragility, representativeness, and importance to wildlife.

## 3.4 Regional and Local Government Conservation Strategies

### 3.4.1 South east Qld Regional Nature Conservation Strategy

Within South east Queensland, the Regional Framework for Growth Management (RPAG 1998) included a map of 'Critical Nature Conservation Areas' and 'Broad Nature Conservation Areas', based on criteria of representativeness, diversity, special values, naturalness and viability (SouthROC Nature Conservation Supporting Document). One of the priority actions identified by RFGM was to prepare a Regional Conservation Strategy, with more transparent criteria for designation of priority conservation areas (currently in draft form).

Nevertheless the distinction between 'critical' and 'broad' conservation priorities has been useful in indicating that some conservation values are constraints on development, while others may represent opportunities for productive or residential land uses provided they are ecologically sustainable or sensitive to the identified values.

In general, the regional inventories of the 1970s (see 2.2.2 above) were consistent with a 'land capability model' for strategic land use planning, where nature conservation was regarded as a Preferred Dominant Land Use in competition with other land uses (agriculture, urban development etc). In this model, areas of high conservation significance are regarded as a constraint on development. While this approach identifies areas that should be reserved, it does not adequately provide the layers of information required to make land use planning decisions for ecologically-sustainable development. A more holistic approach to identification of nature conservation values is now feasible with Geographic Information Systems (GIS) and more comprehensive information on the flora and fauna of the region.

### 3.4.2 Local Government Conservation Classification Systems

Many local authorities in South east Queensland have undertaken vegetation mapping and assessment of conservation significance as part of their Planning Studies over the past decade, and a brief comparison of their mapping scale, purpose and method (Appendix A) indicates the progressive increase in standards. However the vegetation mapping undertaken over the past 10 years of local government areas in South east Queensland has been variable in scale and in vegetation classification. Regional correlation between the systems used by adjoining local governments has been hampered by the various mapping scales and differing approaches to vegetation community classification. The recent rationalisation of mapped vegetation types and associations by Olsen (2000, in prep) will bring much-needed consistency to vegetation mapping throughout the region.

Several local governments have also developed planning units (Conservation Management Areas, Vegetation Management Units or similar) based on mapped vegetation polygons.

In general, the approaches may be categorised as either:

(a) Significance based primarily on ecosystem representation and current conservation status in the region/district ie. each mapped area of an ecosystem (or forest type or vegetation community) has similar significance, depending on its relative rarity and threatening processes, sometimes with factors such as condition, protection and presence of EVR[10] species taken into account where data is available;

(b) Significance based primarily on vegetation remnants, taking into account their size, condition (integrity), diversity, connectivity and role in a habitat network (core areas and corridor links), with factors such as Regional Ecosystem status, EVR species, protection and threats taken into account where data is available.

The above dichotomy is partly a tension between a 'holistic' or systems approach which recognises the significance of all remnant integral bushland as faunal habitat (especially in fragmented and/or urbanising regions), and a 'reductionist' approach that proves significance of each part according to its identifiable ecosystems and species.

Not surprisingly, the variety of approaches, objectives, scales, base information and budgets for these projects, and the different consultants and researchers involved, has led to considerable variety in the outputs. There are advantages of both approaches, and this Common Nature Conservation Classification System combines the best features of each.

### 3.4.3 Summary of Principles

The following principles emerge from a review of local government conservation classification systems in South east Queensland (Appendix A) and field trials (Appendix D):

1. Relative nature conservation significance can be assessed only within the context of an explicit or implicit purpose. In most cases, the purpose is to retain, enhance and manage biodiversity at regional and local levels, through a network of identified habitat core areas and corridor links. The assessment of relative significance for other purposes (such as catchment protection or an open space system) may assign other priorities.

2. The process of ascribing relative significance to places and features should be reliable, transparent, accountable, achievable, legible, robust and flexible; and should also be open to community participation and values. It should have integrity as a 'stand-alone' assessment, independent of current levels of protection and threat and previous assessments, and independent of other factors (landscape, wilderness, cultural values etc).

3. The process should also take into account the precautionary principle, in that the lack of specific data regarding an area of natural vegetation should 'default' to a higher significance level, especially if it is in a strategic location in a network of habitat and corridors. The precautionary principle also applies to heterogeneous mapped units, which should be assessed at the level of the most significant component.

[10] EVR = Endangered, Vulnerable or Rare species under State or Commonwealth legislation

4. In broad overview, relative nature conservation significance is a function of three broad 'themes':
   **(a) rarity values** (relative abundance of remaining ecosystems/species and threatening processes ie "there's not much left and it's disappearing")
   **(b) general habitat values** (size, integrity and diversity ie. "there's lots of it and it's in

   **(c) ecosystem process values** (connectivity, ecosystem processes ).

5. Most of the 'hard' data available or able to be collected are site-specific and focused on species identification, while information regarding ecosystem processes and the role of inter-connected bushland tends to be less quantitative. The assessment of nature conservation significance must be balanced between 'reductionist' criteria (site-specific, species-oriented) and 'holistic' criteria (interconnected system, process-oriented).

6. For a region-wide or city-wide comparison, the body of data must be relatively uniform in scale, reliability and content. Remnant vegetation mapping provides such data, and is also a reasonable surrogate for biodiversity (especially when combined with some geomorphological categories). It is also a reasonable surrogate for habitat quality for some fauna, especially if combined with structural and integrity assessment. However in highly fragmented and disturbed areas, remnant mapping will not identify all habitat values and additional factors need to be taken into account.

7. Assessment of spatial considerations (size, integrity, ecological role etc) need vegetation mapping to be re-interpreted into planning or management units, based on mapped remnants (see Glossary) or other units.

8. Broadscale vegetation mapping available at one scale needs to be field validated and re-surveyed if used at a finer scale of resolution.

9. Vegetation mapping alone is an inadequate representation of relative significance for individual species of fauna, especially in a fragmented landscape. Fauna data is frequently variable in its uniformity and reliability of coverage and requires expert interpretation.

10. A composite assessment of significance requires that multiple parameters with complex criteria are simplified to a common ratings base, such as a four or five point scale. Ratings should be expressed qualitatively (High to Low), and should be combined in a transparent non-numeric manner.

11. Although Nature Conservation Significance should be evaluated independently of existing levels of protection and threat, these are appropriately considered when assessing conservation action priorities.

12. Relative nature conservation significance is one layer of information to be considered in land use planning decisions. However this information is a composite of several sub-layers of data, each of which represents important natural values that may need to be considered separately in some circumstances. This database is most useful to planners if it can be

accessed, updated and re-interpreted in separate layers for development assessment and for different planning and resource management purposes. This is most effectively handled in a Geographic Information System (GIS).

13. GIS data and mapping also has the advantage that it can be interrogated to consistently, transparently and 'objectively' indicate attribute combinations that meet pre-determined criteria.

14. Each of the layers of information that contribute to overall nature conservation significance is a 'snapshot' at a point in time, and needs to be updated. However it is very complex to develop and maintain a completely 'live' database that combines many data layers from various agencies and local governments. In most cases the best that can be achieved is regular or periodic updates of the input data, with a system of 'flags' to alert users to changes to (and occasional complete updates of) the composite Conservation Significance layer. This will be facilitated by maximising the commonality of data sets across the region in terms of accuracy, terminology, storage etc.[11]

15. Although mapping is an important outcome, the decision-support system should also allow data to be used to make site-specific assessment and development control decisions outside mapped areas.

[11] This is a key action in Sub Strategy 1 of the Regional Nature Conservation Strategy.

# 4. Methodology

## 4.1 Approach

The development of the Common Nature Conservation Classification System has followed the following approach :

1. A review of available data sets in South east Queensland (maps, databases, reports, air photos) on vegetation, ecosystems, species records, habitat, values and conservation needs of native vegetation (see tabulated summary in Appendix B).

2. A review of various models and criteria for classifying areas according to their conservation values, and previous regional and local government approaches to conservation classification systems, and a comparison of the criteria and purposes of each system to develop an appropriate draft model of conservation significance (see 3.4 above and Appendix A).

3. Together with the project steering committee, a review and selection of criteria which can be applied to mapped remnant units using available data, taking into account:
   - the balance between 'reductionist' and 'holistic' inputs (see 3.4.3 above);
   - the distinction between data that can be interrogated via GIS ('Mappable Criteria') and data that needs expert interpretation ('Other Desirable Criteria'), and
   - the wide discrepancies between Councils in their capacity to fund investigations ie data inputs may be at a 'basic' level, or at an 'advanced' or 'intermediate' level.

4. For each of the criteria, a review and selection of quantitative threshold values ('Indicators') for ratings of Low, Medium, High and Very High, also in close collaboration with the steering committee and/or through analysis of Herbarium polygon data.

5. Development of standard mapping rules to identify remnant units[12] for application of criteria.

6. A workshop for peer and expert panel review of the criteria, ratings and threshold values, and to select an appropriate model for combining the various criteria ratings into an overall composite "First Cut" ranking of Conservation Significance in three categories (State, Regional, Local).

7. Testing of the mapping rules, criteria and '1st cut' significance rankings by trial applications in several local government areas, using remnants of various sizes and scales of mapping; and amend system following feedback.

[12] See Glossary - a 'remnant' is a continuously connected area of natural vegetation, and a 'remnant unit' is a remnant (or aggregation or part of one or more remnants) mapped in accordance with Appendix C.

8. Review and amendment of criteria to meet Environmental Protection Agency requirements and agency responsibilities; EPA application of the draft Common System at regional scale to the South-east Queensland bioregion to prepare '1st cut' maps of areas of regional conservation significance, as an input to a revised South-east Queensland Regional Nature Conservation Strategy.

Development of Other Desirable Criteria (for future trial and application) to refine and validate the '1st cut' significance rankings at State, regional and local scales.

9. Scientific peer review of the Common Conservation Classification System (2000) by The Ecology Centre, University of Queensland; and subsequent amendments.

The Common Nature Conservation Classification System has been designed in order to be a widely applicable and useful tool, with several potential applications:

- A consistent region-wide basis for land use planning and development assessment decisions by local government and regional planning, and for infrastructure planning and impact assessment by all agencies;
- A resource management tool, indicating priorities for rehabilitation, park management, fire management etc;
- A basis for conservation awareness, community education, participation in community nature conservation activities and a database of natural assets and values.

To accomplish the above expectations, the Common System should meet the following performance requirements:

**Value-based:** The classification system should be based on, and able to respond to, clear values as expressed by the regional and local community (eg. biodiversity values);

**Robust & Precautionary**: The classification system must be sufficiently robust for consistency throughout the region despite differences between local governments in the level and scale of investigations, in the availability of data, and in the division of mapped vegetation into remnant units. The two-stage process (GIS queries followed by expert panel review) also conveys robustness. As part of the robustness of the classification system, uncertainty should 'default' to higher significance, consistent with the precautionary principle.

**Transparent / Repeatable:** The system is based on specified criteria for mapping, database interrogation and combinations in order to reduce bias and subjectivity in the '1st cut' assessments.

**User Friendly:** Although the number of criteria, levels, indicators and rules of combination are complex, the outputs of the system are several simple and legible categories of conservation significance. Users with moderate database skills to easily discover the main reasons for classification of each area. However more advanced database skills and environmental planning expertise is unavoidably necessary in order to 'drill down' through the various layers of data. The process also encourages community 'ownership' through the second stage expert panel review, drawing upon community expertise.

**Appropriate:** The criteria are based on the theories and practice of conservation biology and the regional context of ecosystem conservation status; and the system is designed to provide mapped categories and data appropriate for regional conservation strategies, land use planning and development assessment decisions.

**Uniform:** The common system is designed to provide a consistent classification throughout South east Queensland, making maximum use of data that is uniformly available.

**High Resolution of Data:** The system is designed to reflect the resolution of data (especially the scale of vegetation mapping), which may be collected at varying levels of accuracy and reliability; but at the same time it encourages a higher resolution of data.

**Flexible:** The categories of conservation significance, and the layers of data that contribute to the overall composite rating, are also useful as a basis for site specific development assessment, resource management, community nature conservation, rehabilitation and open space planning.

## 4.2 Criteria

The criteria selected for classifying mapped remnants according to their relative nature conservation significance were:

- Habitat – known critical habitat for 'At Risk' species of flora and fauna, and habitat generally for other species;
- Regional Ecosystem Conservation/Threat Status (Endangered, Of Concern and 'Not of Concern at Present') – referred to herein as "Ecosystem Value";
- Remnant size - both absolute size (hectares) and size relative to other patches of the same broad vegetation group in the region (based on percentile distributions of polygon sizes);
- Integrity and lack of disturbance, especially of the forest canopy layer;
- Community diversity* (number of vegetation types within each remnant);
- Connection to other remnants and to water, and corridor links;
- Localised contribution to biodiversity, including refuge quality;
- Geomorphological variation (including elevation, aspect, geology etc) within each remnant; and
- Other ecosystem values

** Note: The relative diversity of plant and animal species within each remnant is not a reliable criterion because the information is not uniformly available.*

The above represent a spread across the three broad 'themes' of conservation significance as follows:

**(a)** ***Rarity Values:*** Endangered Species Habitat; RE 'Ecosystem Value'; and Relative Size;

**(b)** ***General Habitat Values:*** Remnant Size; Integrity; Diversity; General Species Habitat; Local Biodiversity Contribution and Geomorphological Variation;

**(c)** ***Ecosystem Process Values:*** Connections, Context and Linkages; and Other Ecosystem Values.

These criteria were matched to available data to derive 13 criteria (A to M in Table 5.1 below) grouped as

- **Mappable Criteria** - Using data that is relatively reliable, uniform and available in database format, and which can be queried and combined to automatically generate significance classes and contribute to a "first cut" level of conservation significance; and
- **Other Desirable Criteria -** Using available data which is non-uniform (ie too patchy allow desktop assessment and database queries), and which require expert interpretation to modify the "first cut" assessment of conservation significance.

Criteria are rated on a four-point scale (**Low, Medium, High, Very High**) according to specific indicators as defined in 5.2 and 5.4 below. It should be noted that the ratings are not arithmetic, and the system specifically avoids assigning numerical values to non-numeric assessments of relative value.

## 4.3 Levels & Scales of Investigation

Regional consistency in nature conservation significance requires that all the above criteria are investigated to the same level of detail for each local government area, but in practice the resources available for nature conservation studies will vary. Despite variations in the scale and detail of investigations, the common system can achieve consistency in mapping units, categories and criteria; and ensure that the outcomes of different studies are comparable.

Investigations may be undertaken at various levels according to practical feasibility and the scale of applicability, as well as the funds, time and expertise available. Most of the 13 criteria can be assessed at either a 'basic' level using coarse and/or readily available data with little additional investigation, or at a more advanced level based on studies at a finer scale of resolution. Specification of the appropriate level and scale of investigation for each criterion clearly indicates the detail and accuracy required for a range of processes, from broad scale strategic planning to detailed site-specific applications, and provides a guide to reliability, as follows:

**(i) Basic** - mainly desktop assessments using regionally-available 1:100,000 data with limited additional ground truthing;

**(ii) Intermediate** - assessment at a subregional scale (generally 1:25,000), requiring additional vegetation mapping and some field verification of ecological data, with GIS analysis;

**(iii) Advanced** - field surveys, vegetation mapping and field investigations at 1:25,000 or finer level, with expert analysis.

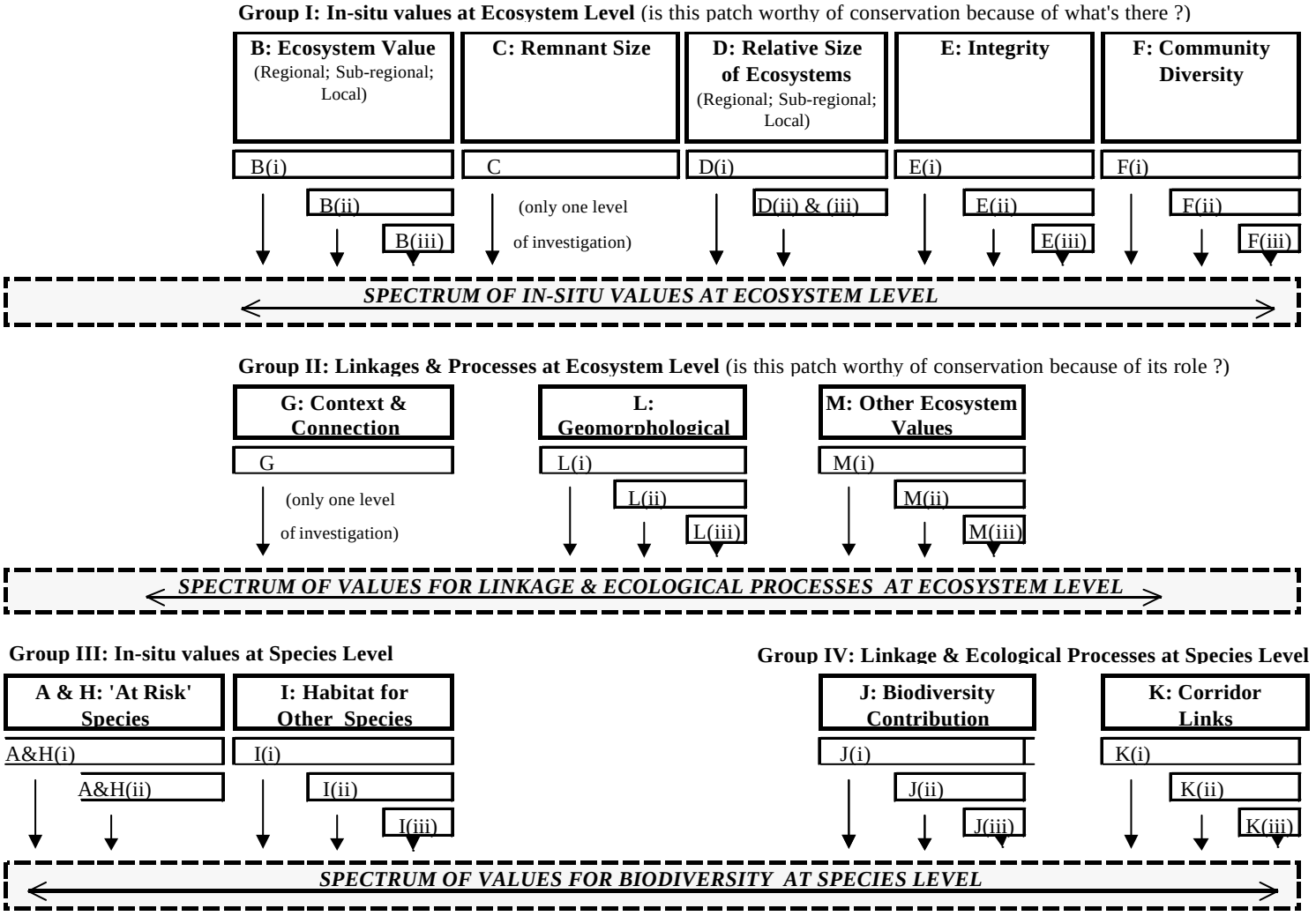
Standardisation of these levels throughout the region will allow regional and local government planners to specify the degree of detail required for each criterion for a range of processes, from broad scale strategic planning to detailed site-specific applications.

The data required for each level are nominated in 5.2 below.

Conceptually, the relationship between the criteria, the broad 'themes' of conservation significance and the levels of investigation are outlined in Figure 4.1 overleaf.

Two of the criteria (B & D in Table 4.1) also require separate assessment at several scales ie. an initial determination of attributes at a broad regional scale prior to determination at subregional and/or local government scale. It is not appropriate to rate these criteria only at local scale without first considering their broader context.

**Figure 4.1: SUMMARY CRITERIA FOR CONSERVATION SIGNIFICANCE**




**Note:** Criteria may be assessed at three levels of data & survey requirements:
**i: Basic**
**ii: Intermediate**
**iii: Comprehensive**

## 4.4 Composite Conservation Significance

During development of the Common Nature Conservation Classification System, several options were considered for combining the ratings of each indicator for a composite 'score'. Because the criterion ratings are non-numeric, there is (deliberately) no opportunity to arithmetically add individual scores to a combined sum or average figure.

One option considered is a 'Cumulative Threshold' scoring system based on the number of individual Very High, High, Medium or Low scores[13]. This is a feasible approach when the number of possible combinations is relatively low, but becomes unwieldy and overly complex with the number of potential combinations in the Common System.

The second (and adopted) option is 'Filtering Combinations' where sequential data queries identify units of high conservation significance. These are then in effect 'filtered' out of the process, so that the subsequent query considers only those remnants which did not 'trigger' significance at the previous level (see 5.3, Figure 5.3a and Table 5.3b).

## 4.5 Field Trials

A draft set of criteria and ratings, with accompanying procedures for mapping and composite significance values, was subject to trials in September 1999 by three local governments (Gold Coast City Council, Brisbane City Council and Pine Rivers Shire Council). Feedback from these trials (see Appendix D) was generally supportive but demonstrated the need for more detailed mapping rules (see Appendix C).

Following amendment to the criteria, a subsequent trial application to the Helidon Hills area (by the WesROC Coordinator) indicated that the system had difficulty in dealing with large tracts of bushland where the 1:100,000 mapping of Regional Ecosystems had not distinguished different REs. Mapping at a finer scale of resolution often identifies 'new' REs not mapped at 1:100,000, so their regional conservation significance is difficult to determine.

Any process reliant on the 1:100,000 RE mapping (which is partly based on 1:250,000 geological mapping) will encounter problems of accuracy and resolution, and areas of bushland subject to threat require more than a 'basic' level of investigation. It is anticipated that the progressive upgrading of vegetation and ecosystem mapping in South east Queensland (currently being undertaken by EPA) will alleviate these problems. In the meantime, areas with large relatively homogeneous tracts of bushland subject to threat should be subject to a higher level of investigation ('intermediate' or 'advanced').

In early 2000, the draft Common System was subjected to trial on a regional basis by Environmental Protection Agency as part of the Regional Nature Conservation Strategy, and will be separately reported when released in early 2001.

[13] For example, a remnant may be regarded as regionally significant if it has 4 or more criteria rated as 'Very High' (>3 VHs) and no more than one rated as 'Low' (<2 Ls); OR 2-3 VHs & >3 Hs & <2 Ls; etc.

# 5. Common Nature Conservation Significance Criteria

## 5.1 Nature Conservation Significance Criteria

The criteria for classifying mapped Remnant Units according to their relative conservation significance broadly relate to the rarity, habitat and ecosystem process values associated with remnant areas of native vegetation. Many factors contribute to nature conservation values, and the search for consistent and reliable criteria has focussed on 13 key indicators which are relatively objective and defensible. The 13 criteria are in two groups which are applied sequentially. The first group is based on existing or obtainable data which is relatively uniform and reliable across a region or sub-region. These criteria are "diagnostic" in that they are used to filter available data and provide a "first cut" or draft determination of significance. This draft assessment is then adjusted and amended using a second group of Other Desirable criteria. These supplementary criteria rely more upon expert opinion than on quantitative data, which in most cases is not available uniformly across the region.

**Table 5.1: Conservation Significance Criteria**

| 1st Stage: Mappable Criteria<br>For analysis of uniformly available data - see 5.2 below | 2nd Stage: Other Desirable Criteria<br>Assessed by expert panel, using non-uniform data – see 5.4 |
|---|---|
| **A:** Significant Habitat for 'At Risk' Species (site-specific) [#]<br>**B:** Ecosystem Value: at three scales –<br>▪ B1: Regional;<br>▪ B2: Sub-regional; and<br>▪ B3: Local government<br>**C:** Remnant Size*****<br>**D:** Relative Size of Ecosystem: at three scales –<br>▪ D1: Regional;<br>▪ D2: Sub-regional; and<br>▪ D3: Local government<br>**E:** Condition<br>**F:** Ecosystem Diversity<br>**G:** Context & Connection (relationship to water, endangered ecosystems and physical connection between contiguous remnants) – *if data is available* | **H:** Other Habitat for 'At Risk' Species<br>**I:** Habitat for Other Species<br>**J:** Localised Contribution to Biodiversity<br>**K:** Corridor Links (between non-contiguous remnants), plus Context and Connections *(if not dealt with under Criterion G above)*<br>**L:** Geomorphological Variation<br>**M:** Other Ecosystem Values |
| ***** Absolute size is assessed at the largest aggregated remnant size ie. bushland tracts or wetland complexes (see Appendix C: Mapping Rules)<br>[#] Assessment of the accuracy of faunal records and their habitat implications require input from faunal experts | |

## 5.2 Mappable Criteria

The following seven mappable criteria use reliable and uniformly available information which is usually accessible in database format, and which can be queried to automatically generate significance classes, using consistent rules of combination (see 7.3 below). A 'filtering' process has been designed to assess remnant units by these criteria in order, from A to G (see Tables 7.3a and 7.3b). The criteria have been designed for consistent assessment, whether the required investigations are undertaken at a

(i) Basic;

(ii) Intermediate; or

(iii) Advanced level,

according to the resources available for investigation and mapping (see 4.3 above).

### *A: Significant Habitat for 'At Risk' Species*

**Definition & Rationale:** Recorded locations of 'At Risk' Endangered, Vulnerable and Rare (EVR) species of flora and fauna indicative of essential remaining habitat, are of very high nature conservation significance for the maintenance of biological diversity. An area of remnant vegetation surrounding each recorded location is considered to be significant habitat, not the entire remnant unit (unless a very high proportion is significant habitat). EVR species are those scheduled under the *Nature Conservation (Wildlife) Regulation 1994* and/or Commonwealth *Environmental Protection & Biodiversity Conservation Act 2000.* Where discrepancies occur between schedules, the highest (most endangered) status should be used.

**Notes**:

- This criterion uses mainly records that are spatially precise (based on georeferencing precision of +/- 500 m) and less than 50 years old, screened to remove any records which appear to be inaccurate.
- EVR faunal records confer significance only on the location and a surrounding buffer, comprising a circle with radius twice the precision of the record (eg. a record with 500 m precision will have a buffer of 1 km radius}. These buffers may overlap (in which case they are coalesced) or extend across adjacent remnant units, but do not extend into non-vegetated areas.
- Records that are less precise or older may be considered as contributing to 'potential habitat' by ranking a wider area (up to 2km radius) as 'Medium' or by graphically 'flagging' an entire remnant unit eg. by stippling. Advice from faunal experts may be required to interpret available data, select appropriate buffer areas and advise whether remnant units should be flagged as potential EVR species habitat.
- If the coalesced buffer areas (significant habitat) comprise > 80% of a remnant unit, then the entire remnant unit is classified as significant habitat.
- This criterion excludes EVR fauna with home ranges, territories or movement patterns that extend beyond the remnant unit[14] where they have been recorded, unless the record is of a breeding site or significant roosting site. These wide-ranging species (and any records excluded due to doubtful accuracy) are considered by faunal experts in Other Desirable Criterion H.
- For some species, Criterion A habitat may be limited to that known to be needed for breeding populations, and expert faunal advice should be sought regarding the appropriate threshold criteria.

[14] As a guide, records should be included in Criterion A only where they are predictive of the presence of the EVR species ie. where there is a > 80% chance of finding it in the buffer area and/or remnant unit

- Expert advice should be sought as to whether particular records apply to a particular entire remnant, and the reliability of data linking species to remnant units should be documented.
- The term 'species' includes inadequately-described taxa.

**(i) Basic** - Herbarium, Queensland Museum, EPA, Wildnet and other relevant records of plants, fauna which are restricted to particular locations, and known breeding sites of EVR species.

**(ii/iii) Intermediate/Advanced** - As for A (i) Basic, as confirmed by survey

| ***Rating:*** | **Low** | **Medium** (Potential Habitat) | **High** | **Very High** |
|---|---|---|---|---|
| *Indicator:* | The coalesced buffer has no records of any EVR species | The coalesced buffer area has imprecise records for 1 or more EVR species | The coalesced buffer area has confirmed records for 1 Vulnerable or 1 or more Rare species | The coalesced buffer area has confirmed records for 1 or more Endangered species OR 2 or more Vulnerable or Rare species |

## *B: Ecosystem Value*

**Definition & Rationale:** The current level of conservation concern (at bioregional, sub-regional or local scale) associated with each identifiable ecosystem or wetland represented in the remnant unit.

**Note:** The scale of application of this criterion is progressive ie. B1 should be assessed first, followed by B2 then B3 if applicable. It should be applied at the finest scale of mapping available. For heterogeneous remnant units, the highest rating applies, provided the RE represents at least 30% of the polygon area ie if a component Regional Ecosystem is 'Endangered' (and it is 30% or more of the area), then the entire mapped remnant unit is assessed as 'Very High'. The presence of an endangered RE which comprises < 30 % of the remnant unit may be indicated by graphic 'flagging' eg. by hatching/stippling.

### *B1: Regional Ecosystem Value*

**(i) Basic** - Bioregional conservation status of each Regional Ecosystem (RE)[15] OR ecosystem status under Commonwealth Environmental Protection & Biodiversity Conservation Act[16] OR nationally important wetlands (from 'A Directory of Important Wetlands in Australia', or Regional Coastal Management Plans) OR other special ecosystems[#].

[15] REs as mapped at 1:100,000, with up-to-date conservation status as advised by EPA and/or DNR&M (see agency Web sites to update information in 'The Conservation Status of Queensland's Bioregional Ecosystems', Sattler and Williams 1999**Note**: in the case of discrepancies between agency Web sites, the highest value shall apply.

[16] Ecosystem conservation status under EPBC should be used when available as mapped product. In the case of any discrepancy between State and Commonwealth ranking, the highest (most endangered) ranking should apply. In general, any new mapping should be incorporated into the Common Nature Conservation Classification System when it becomes available.

**(ii/iii) Intermediate/Advanced -** As for B1 (i) Basic, as confirmed by ground truthing and/or more accurate mapping to check that the vegetation and other ecosystem attributes match the RE and/or wetland descriptions; and/or to divide heterogeneous polygons; and/or to check the status of REs that overlap into adjacent bioregions.

| ***Rating:*** | **Low** | **Medium** | **High** | **Very High** |
|---|---|---|---|---|
| *Indicator:* | No Concern RE* (> 50% of the original extent remains in the region) OR Not Mapped (eg Mosaic Remnant Units) | No Concern RE* (30 – 50% of the original extent remains) OR Coastal Wetland of 'Local' Significance ** | 'Of Concern' RE* OR Coastal Wetland of 'Regional'/ 'Major Habitat' Significance ** | 'Endangered' RE* OR Nationally Important Wetland** OR Ramsar-listed wetland OR World Heritage Area OR Intertidal wetland*** |

[#], *, **, *** & [#] - see notes below under B3

**Note:** Boundaries of World Heritage Areas and Ramsar sites may not conform to remnant units or wetland mapping.

***B2: Sub-regional Ecosystem Value***

**(i) Basic -** Sub-regional conservation status of 1:100,000 mapped Regional Ecosystems, as determined for the particular Province as part of the Regional Nature Conservation Strategy (RNCS) for South East Queensland; and important wetlands (from *A Directory of Important Wetlands* or as identified in Regional Coastal Management Plans).

**(ii) Intermediate -** As for B2 (i) plus additional ground truthing and/or more accurate mapping to check that vegetation and other ecosystem attributes match the RE and wetland descriptions; and/or to divide heterogeneous polygons; and/or to check the status of REs that overlap into adjacent provinces.

**(iii) Advanced -** As for B2 (i) and (ii) but based on full mapping at a scale of 1:50,000 or 1:25,000 of vegetation types, land systems, wetlands or community / habitat types.

| ***Rating:*** | **Low** | **Medium** | **High** | **Very High** |
|---|---|---|---|---|
| *Indicator:* | Of Limited Conservation Value RE* within the Province OR Not Mapped (eg Mosaic Units) | Moderate Conservation Value RE* within the Province OR 'Local Significance' Coastal Wetland | High Conservation Value RE* (and only 10-30% of the pre-clearing extent remains in the Province) OR 'Valuable Habitat' Coastal Wetland** OR other Special Ecosystems[#]. | High Conservation Value RE* (and < 300 ha, or < 10% of pre-clearing extent, remains in the Province) OR Nationally Important Wetland** OR Coastal Wetland of 'Regional'/ 'Major Habitat' Significance ** |

[#], *, **,*** & [#] - see notes below under B3

***B3: Local Government Ecosystem Value***

**(i) Basic** - Not applicable (ie the minimum level of evaluation is Level (ii) for local government scale assessments).

**(ii) Intermediate** – Conservation values (within each local government area) of identifiable ecosystems (or vegetation/soil type/topography combination) and important wetlands (from Regional Coastal Management Plans or Conservation Assessment of Coastal Wetlands in Southeast Queensland); as mapped at 1:50,000 and cross-referenced to Regional Ecosystems, with ground truthing to check that the vegetation and other ecosystem attributes match descriptions (but recognising that additional ecosystems may be identified at this scale).

**(iii) Advanced** - As for B3 (ii) Intermediate but based on detailed survey and mapping at 1:25,000, cross-referenced to Regional Ecosystems; but recognising that additional ecosystems may be identified at this scale.

| ***Rating:*** | **Low** | **Medium** | **High** | **Very High** |
|---|---|---|---|---|
| *Indicator:* | Of Limited Local Conservation Value RE* within the Local Government area<br>OR<br>Not Mapped (eg Mosaic Units) | Moderate Local Conservation Value RE* within the Local Government area<br>OR<br>any other intertidal wetland vegetation*** | High Local Conservation Value RE*<br>(and only 10-30% of the pre-clearing extent remains in the Local Government area)<br>OR<br>"Local Significance" Wetlands** | High Local Conservation Value RE*<br>(and < 300 ha,<br>or < 10% of pre-clearing extent, remains in the Local Government area)<br>OR<br>"Valuable Habitat" Wetlands**<br>OR<br>other Special Ecosystems#. |

**Notes** to accompany ratings tables for B1, B2 & B3:

***** Regional Ecosystems (REs) that are **'Endangered'**, **'Of Concern'**, **'Of No Concern at Present'** and **'Poorly Conserved'**, as defined in the *Vegetation Management Act 1999* and Sattler & Williams 1999, identify conservation status at bioregional scale only. The categories **'High Conservation Value', 'Moderate Conservation Value'**, **'Limited Conservation Value'** and **'Poorly Conserved in Province'** are equivalent terms applicable at sub-regional and local government scales, using similar threshold criteria eg. 'Poorly Conserved' REs have <10% in Conservation Reserves in the province (B2) or local government area (B3).

****** All wetlands idenitified in *A Directory of Important Wetlands in Australia* (ANCA) are rated as High or Very High. 'Valuable Habitat' and 'Local Significance' wetlands as identified in *Conservation Assessment of Coastal Wetlands in Southeast Queensland* (Chenoweth EPLA 1999, for Environmental Protection Agency)

******* Intertidal wetland vegetation is protected under the Fisheries Act. All intertidal wetlands are classified as 'Very High' unless mapped in regional assessments as a 'lower' calssification eg. regional or local significance

# Special Ecosystems are those of high species richness, geographically restricted distribution or with specialised ecosystem functionality (irrespective of whether they are also Endangered or Of Concern). Such ecosystems may be nominated in relevant legislation (eg. *Vegetation Management Ac, Fisheries Act*), the Regional Nature Conservation Strategy and Regional Vegetation Management Plans, State and regional policies, or as listed in Sattler & Williams 1999.

## *C: Remnant Size*

**Definition & Rationale**: The area in hectares of each mapped Remnant Unit. The size of any area of natural vegetation is a major indicator of ecological significance, diversity, and is also strongly correlated with viability. Larger remnants are less susceptible to ecological edge effects, and as a consequence are more likely to be able to sustain viable populations of native flora and fauna.

**Notes:** Uniform size thresholds apply at regional, subregional and local government scales within Southeast Queensland. Different thresholds may apply in other regions.

Where a large tract (>5,000 ha) of continuous bushland has been divided into two or more mapping units by an ecosystem or catchment boundary (in accordance with 6.1), the size of the combined large tract is used to evaluate each unit.

**(i/ii/iii) Basic/Intermediate/Advanced** *(one feasibility level only)* - Size (ha) of entire tract or remnant as mapped at the same scale as used for Criterion B.

| ***Rating:*** | **Low (ha)** | **Medium (ha)** | **High (ha)** | **Very High (ha)** |
|---|---|---|---|---|
| *Indicator:* | < ## (and Mosaic Units) | –## | ## | ## |
| *Proportion of tracts in this size range** | 41 - 60% of tracts are in this size range | 11 - 40% of tracts are in this size range | 6 - 10% of tracts are in this size range | 5% of tracts are in this size range |

* Expressed as a percentage in each size range (using log transformation) of the 3092 remnant vegetation polygons in Southeast Queensland, as mapped by Queensland Herbarium. The largest mapped vegetation polygon is approximately 309,000 ha.

**## YET TO BE CALCULATED**

## *D: Relative Size of Ecosystem*

**Definition & Rationale**: The area of each mapped Remnant Unit, expressed as a percentile category relative to other similar remnants. Some regional ecosystems commonly cover large areas, while others are normally restricted to small patches. A measure of the area of each remnant, relative to other remnants of similar ecosystem, indicates whether this remnant unit is likely to be a 'good' representative sample of its type, and whether it is likely to represent a significant proportion of its type remaining in the area. A remnant which includes a relatively high proportion of the remaining ecosystem has high conservation significance.

**Notes:** Size thresholds vary according to scale of application (regional, subregional and local government). For heterogeneous remnant units, the area of each component vegetation map unit is the relevant percentage of the total mapped polygon; then relative sizes are assigned to these derived areas and the highest component rating is ascribed to the total remnant.

**(i) Basic** - Size (ha) of remnant unit in relation to other remnant units in the region / sub-region / local government area, derived from GIS analysis of vegetation mapping at 1:100,000 for each sub-region and/or local government area; with size classes representing four equal percentile groups of the size distribution (equal numbers of each polygon in each percentile).

**(ii/iii) Intermediate/Advanced** - Size (ha) of remnant unit (or RE or vegetation map unit within each remnant unit) in relation to other remnants of this ecosystem / vegetation type in the region / sub-region, derived from GIS analysis of vegetation mapping at 1:25,000 or 1:50,000 for each sub-region and/or local government area; with size classes representing four equal percentile groups of the size distribution (equal numbers of each polygons in each percentile). For REs close to bioregion boundaries, some manual adjustment of ratings may be necessary to account for overlaps into adjacent bioregions.

***D1: Regional Relative Ecosystem Size -*** Size (ha) as mapped at the same scale as used for Criterion B, calculated from most recent available Queensland Herbarium polygon data.

| ***Rating:*** | **Low (ha)** | **Medium (ha)** | **High (ha)** | **Very High (ha)** |
|---|---|---|---|---|
| *Indicator:* | < 25% of largest* in the bioregion | 25 - 50% of largest* in the bioregion | 50 - 75% of largest* in the bioregion | > 75% of largest* in the bioregion |

***** Average of the five largest RE polygons in the bioregion or planning region

***D2: Sub-regional Relative Ecosystem Size***

| ***Rating:*** | **Low (ha)** | **Medium (ha)** | **High (ha)** | **Very High (ha)** |
|---|---|---|---|---|
| *Indicator:* | In the smallest 25% in the province | In the second quarter percentile of size in the province | In the third quarter percentile of size in the province | In the largest 25% in the province |

***D3: Local Government Relative Ecosystem Size***

| ***Rating:*** | **Low (ha)** | **Medium (ha)** | **High (ha)** | **Very High (ha)** |
|---|---|---|---|---|
| *Indicator:* | In the smallest 25% | In the second quarter percentile of size | In the third quarter percentile of size | In the largest 25% |

## *E: Condition*

**Definition & Rationale –** The extent to which each remnant patch resembles its pre-clearing condition, as indicated by canopy integrity, degree of disturbance, regrowth etc. In the absence of a consistent assessment of vegetation condition across the South east Queensland bioregion, the 1991 mapping of Bushland 'Integrity' in the SEQ planning region (Catterall & Kingston 1991) is one of the indicators of ecosystem "quality" in each remnant. In areas not mapped by Catterall & Kingston, the remnant vegetation mapping by Queensland Herbarium is considered to represent natural vegetation. Although the indicators of integrity vary considerably between regional ecosystems, the classification and mapping of integrity should be consistent across all ecosystems at each level of investigation.

**Note**: If the data is available in digital form, Criterion E is 'mappable' (1st stage) consideration. If relevant data is not available, it should be considered as a 'Other Desirable' criterion.

**(i) Basic** - Landcover canopy fragmentation (integral/thinned/mosaic bushland), from Catterall & Kingston 1991 mapping of South east Queensland bushland; checked against State-wide Land and Tree Survey (SLATS) data from the Department of Natural Resources.

| ***Rating:*** | **Low** | **Medium** | **High** | **Very High** |
|---|---|---|---|---|
| *Indicator:* | Bushland / Clearance Mosaic OR unclassified vegetation not mapped by Queensland Herbarium | Integral / Thinned Bushland Mosaic | Thinned Bushland | Integral Bushland OR vegetation mapped by Queensland Herbarium |

**(ii) Intermediate** - As above, confirmed by age and completeness of canopy cover as assessed by air photo interpretation (including historical air photos) and Forestry records, and mapped at 1:50,000 or 1:25,000 in the categories following E(iii).

**(iii) Advanced** - As for E (ii) Intermediate, based on field survey and mapping at 1:25 000.

| ***Rating:*** | **Low** | **Medium** | **High** | **Very High** |
|---|---|---|---|---|
| *Indicator:* | Grossly disturbed ecosystem | Young / moderately disturbed ecosystem | Well-developed and lightly disturbed ecosystem | Old Growth forest * (ecologically mature forest where the effects of disturbance are negligible) |

**Notes:**

* Old Growth forest as defined in "Sustainable Forest Management Technical Report: Old Growth Forest in South-east Queensland" (DNR 1998), taking into account the particular forest type, its maturity and disturbance criteria (mainly fire, logging and grazing).

## *F: Ecosystem Diversity*

**Definition & Rationale:** - The number of different ecosystems present in an area is a broad indication of its habitat diversity, ecotones (boundaries) and ecological processes which contribute to biodiversity. Ecosystem diversity must be considered both within each remnant unit and within its 'neighbourhood' of abutting and nearby ecosystems. This requires a neighbourhood buffer around each remnant unit to 'capture' adjacent ecosystems.

Ecosystem diversity is commonly classified using concepts of 'Richness' (number of different ecosystems) and 'Evenness' (relative abundance of the different ecosystems). Simpson's Diversity Index (SDI) is a commonly used index that incorporates both concepts, by calculating the probability that two sample sites selected at random from a defined area will have different ecosystem characteristics.

The formula for Simpson's Diversity Index is: $SDI = 1 - \sum_{i=1}^{m} P_i^2$

Where $P_i$ = Area of remnant unit *i*
Total area of REs in the buffered region

m = Number of REs in the buffered region

**Notes:**

- In South east Queensland, 600 metres is an appropriate buffer[17] width around each remnant unit for determination of neighbouring ecosystem diversity
- Where detailed vegetation mapping indicates that additional habitats are present (eg. riparian or littoral strips, farm dams, pasture grass and other non mapped vegetation), these should be counted as extra ecosystems at Advanced Level.

**(i) Basic** - SDI for each remnant unit based on mapped REs plus 200 m buffer OR the number of wetland classes recorded for important wetlands (from A Directory of Important Wetlands in Australia).

**(ii) Intermediate –** As for F (i) Basic, plus air photo interpretation and ground truthing to check vegetation and other ecosystem attributes

**(iii) Advanced –** As for F (i) and (ii), based on field surveys and mapping at 1:25,000; with buffer widths based on modal size of remnant units in South east Queensland. . Distinguishable riparian and littoral vegetation and non-native vegetation may be counted as additional ecosystems or wetland classes.

[17] Alternatively, the buffer width may be calculated as the radius of a circle with an area equivalent to either the average or modal size of remnant units in the bioregion (depending on ecosystem fragmentation patterns)

| ***Rating:*** | **Low** | **Medium** | **High** | **Very High** |
|---|---|---|---|---|
| *Indicator:* | SDI < 0.25 | SDI > 0.25 and < 0.5 | SDI > 0.5 and < 0.75 | SDI > 0.75 |

## *G: Context & Connection*

**Definition & Rationale:** The extent to which the remnant unit incorporates, borders or buffers other areas of conservation significance, other remnant units, or important ecological processes; as follows:

- **Water**: The presence / inclusion of, or other relationship to, a natural waterbody, watercourse or marine / estuarine system increases the significance of remnant bushland for contributing to ecological processes and to protecting water quality and stream bank stability.
- **Endangered Ecosystem**: Remnant units bordering Endangered Regional Ecosystems have additional importance as buffers and habitat extension.
- **Physical Connection**: The degree to which remnant units are connected to other contiguous areas of vegetation. Patches of bushland which are connected to others contribute more to a habitat network than isolated fragments with significant barriers to wildlife movement, are significant for the long term survival of plants and animals, and have greater resilience to the effects of disturbance than isolated fragments.

This criterion is 'Mappable' only if consistent data is available in GIS format for the region or planning area. If data is not availabel, Criterion G may be deferred for consideration by the expert panel as part of Other Desirable Criterion 'K'. In some cases, data for Endangered Res and for physical connection may be available, but not for the presence of wetlands and watercourses, in which case just the 'water' component of Criterion G should be deferred for consideration under 'K'.

**Notes**:

- Where a continuous area of bushland has been divided into separate remnants according to the mapping rules in Appendix C, this criterion balances the assessment by taking the connection into account. Within tracts of bushland, almost all remnant units (apart from some on the edge) will have "Very High" connections.
- An Endangered RE in adjacent heterogeneous remnant unit is taken into consideration for buffering only where it comprises 30% or more of the remnant unit.

**(i) Basic –** Presence/absence of any association to natural waterbodies and/or streams; proximity to a remnant unit with an Endangered RE; and/or extent of physical linkage to other remnant units, as mapped at 1:100,000 or 1:50,000

| ***Rating:*** | **Low** | **Medium** | **High** | **Very High** |
|---|---|---|---|---|
| *Indicator:* | No permanent waterbodies or watercourses apart from gullies and 1st order streams<br>OR<br>Not physically connected to another remnant unit** | The remnant unit includes one or more seasonal watercourses or wetlands*;<br>OR<br>Connected to another remnant unit along < 50 % of its total perimeter length | The remnant unit borders# one or more important waterways* or wetlands*<br>OR<br>Connected to another remnant unit along 50 – 75% of its total perimeter length<br>OR<br>Connected to another remnant unit with an Endangered RE along a common boundary of 10 - 25% of that unit's perimeter# | The remnant includes one or more important waterways* or wetlands*<br>OR<br>Connected to another remnant unit along >75% of its total perimeter length<br>OR<br>Connected to another remnant unit with an Endangered RE along a common boundary of >25% of that unit's perimeter# |

See notes under G (ii/iii) below

**(ii/iii) Intermediate/Advanced –** Presence/absence of any association to natural waterbodies and/or streams; proximity to a remnant unit with an Endangered RE; and/or extent of physical linkage to other remnant units, as mapped at 1:25,000 or finer resolution Assessment may be by air photo interpretation or overlay of reliable hydrological and vegetation maps.

| ***Rating:*** | **Low** | **Medium** | **High** | **Very High** |
|---|---|---|---|---|
| *Indicator:* | No permanent waterbodies or watercourses apart from gullies and 1st order streams<br>OR<br>Not physically connected to another remnant unit** | The remnant unit includes one or more seasonal watercourses or wetlands*;<br>OR<br>Connected to another remnant unit along < 50 % of its total perimeter length or < 50 metres of common perimeter | The remnant unit borders# one or more important waterways* or wetlands*<br>OR<br>Connected to another remnant unit along 50 – 75% of its total perimeter length or 51 – 500 metres of common perimeter<br>OR<br>Connected to another remnant unit with an Endangered RE along a common boundary of 10 - 25% of that unit's perimeter# | The remnant includes one or more important waterways* or wetlands*<br>OR<br>Connected to another remnant unit along >75% of its total perimeter length or > 500 metres of common perimeter<br>OR<br>Connected to another remnant unit with an Endangered RE along a common boundary of >25% of that unit's perimeter# |

* **Note**: Important waterways are stream sections identified by resource management agencies and/or relevant published regional maps or lists as high conservation value, plus all natural streams of 2nd Order and above, and other permanent streams and bodies of water, including marine/estuarine waters. Where a waterway divides an area of otherwise continuous bushland into two mapped remnants (in accordance with Appendix C), each should be assessed as if they include the waterway. Important wetlands are those defined under B3 above.

# A maximum buffer of 200 m extends into the remnant unit adjacent to the Endangered RE.

** Gaps of varying widths between adjacent remnants are assessed as " Corridors" under Other Desirable Criterion "K".

# At Local Government scale, riparian buffers (outside mapped polygons of existing native vegetation) are also rated as "High" as follows:

| **Stream Order** | **Width of buffer classified as 'High' Conservation Value** |
|---|---|
| 1st Order Streams | 20 metres either side |
| 2nd Order Streams | 40 metres either side |
| 3rd Order Streams | 80 metres either side |

## 5.3 Filtering Combinations

In order to combine the above seven Mappable Criteria and determine a 'first cut' analysis of relative nature conservation significance, a series of sequential data queries is required. These queries have been designed to 'interrogate' a GIS database and efficiently filter large volumes of data for an entire region, but can also be used as a series of questions applied to a particular site. The process progressively filters out remnants that are clearly of high significance in the State[18], then applies similar filters to identify remnants of significance at regional and local government scale; as indicated in the Flow Diagram (Figure 5.3a).

While the criteria are not specifically 'weighted', the query order and the rules of combination (see Table 5.3b below) effectively accord priority to Criteria A (Essential Habitat of 'At Risk' Species), B (Ecosystem Values), C and D (Absolute Size of Remnant, and Relative Size of Ecosystem).

The importance of remnant size is also reinforced in Criteria F (Community Diversity) and G (Context & Connections) because large areas of bushland are more likely to include more than one ecosystem, more likely to include or abut an endangered ecosystem, and more likely to include creeks and waterholes.

The rules of combination establish 'triggers' for identification of significant areas, and place greater emphasis on Criteria A, B, C and D by the use of "AND / OR / Not Relevant" combinations, as follows:

- Remnant Units with essential habitat for two or more species scheduled as Endangered under the *Nature Conservation (Wildlife) Regulation 1994* (Criterion A = Very High); and Regional Ecosystems that are 'Endangered' (Criterion B1 = Very High); will always be assessed as having regional conservation significance irrespective of their size, condition, connectivity etc (ie. all other criteria are Not Relevant);

- Remnant Units with essential habitat for species scheduled as Vulnerable or Rare (Criterion A = High); and Ecosystems that are 'Of Concern' (B1 = High) will be assessed as having regional conservation significance if they are a relatively very large area of that ecosystem (D = Very High) or a relatively large or integral area of that ecosystem (D = High, E = High or Very High) within a large remnant or tract of bushland (C = High or Very High);

[18] Places, features, ecosystems and populations of species (and other taxa) assessed by valid scientific criteria as being of State Nature Conservation Significance are those which represent or contain the remaining natural and biological diversity of a bioregion, and the habitats, resources and ecological processes on which they depend.

It should be noted that areas of State, national and international significance will generally be included in the above definition. However these critical areas are subject to separate government agency processes of identification and assessment, including factors additional to nature conservation, and may be separately mapped.

- Within large tracts of bushland (C = Very High), other remnant units may also be regionally significant if they are High integrity (D = High or Very High) or a relatively large area of an ecosystem (C = High or Very High) ; and

- Other 'triggers' of significance require combinations of High/Very High ratings for integrity (E), community diversity (F), or context and connections (G).

Differences in relative emphasis can also be inferred from the ratings which trigger significance ie. a criterion which triggers regional significance at either a "Very High" or "High" rating has greater influence than a trigger that operates only at "Very High" rating.

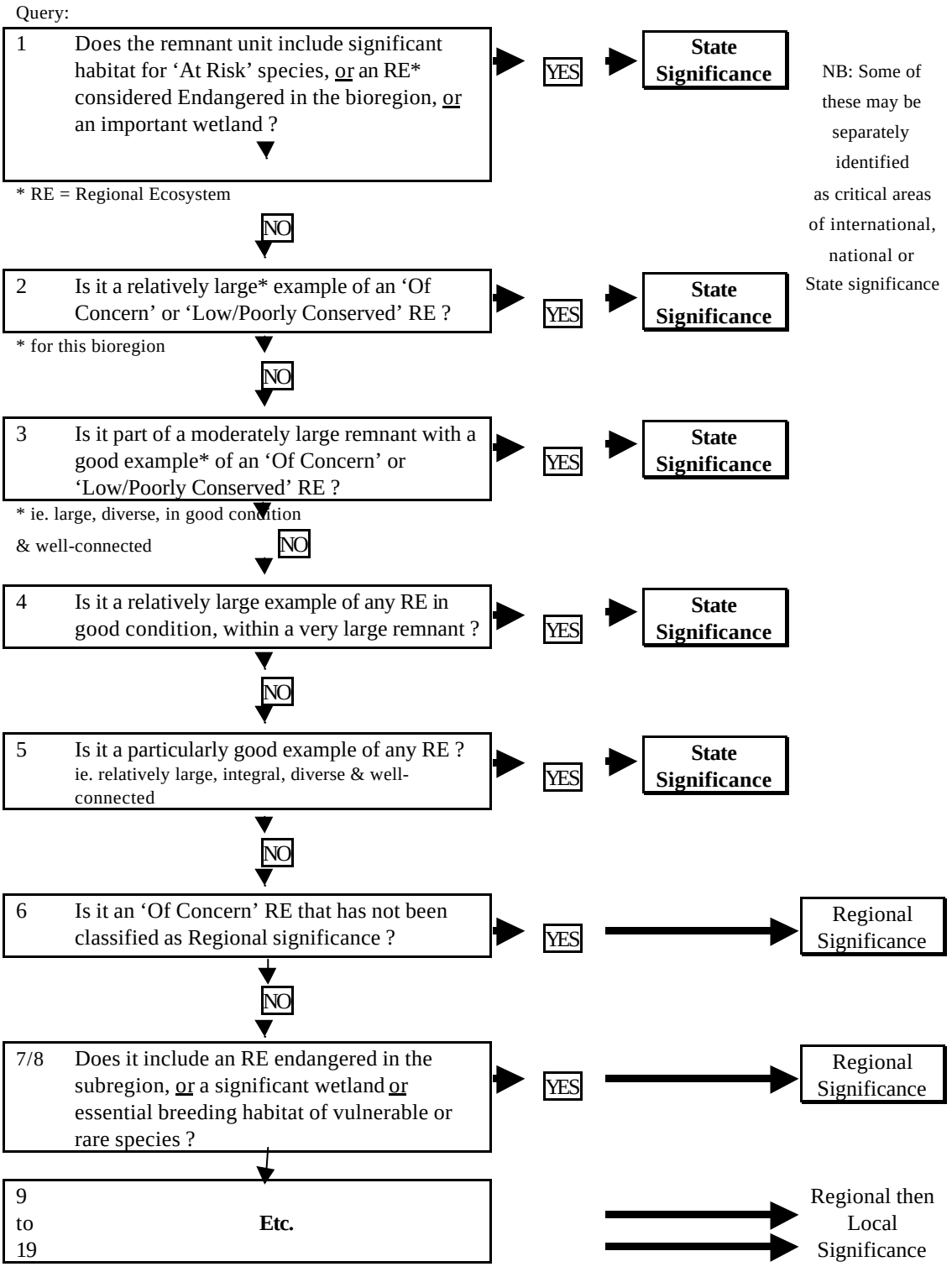
Figure 5.3b details the series of 19 data queries for the 'first cut' mappable criteria, which are conducted in order (1 to 19) to progressively filter out those remnants of high conservation significance, then proceeding to the next query of those remnants which did not 'trigger' significance at the previous level.

The end-product of the data queries is a draft ('1st Cut') classification of mapped remnant units, which is then subject to review and modification by an expert panel, using the additional 'Other Desirable Criteria' as detailed in 5.4.

It should be noted that any process of combining data sets to derive an aggregate or composite value is a convenience adopted for a particular purpose, in this case to assess the relative nature conservation significance of remnant units as an aid to land use planning and development control. Aggregation for other purposes may need different filtering combinations.

**Figure 5.3a:**

**FLOW DIAGRAM for FILTERING DATA to identify CONSERVATION SIGNIFICANCE**




**NOTE 1**: The above 'filters' allow the key criteria of absolute size and relative rarity (ecosystem values and proportion of total ecosystem remaining) to dominate the "1st Cut" of conservation significance. Only those remnants assessed as Very High for rarity or size, or High for both rarity and size, are filtered out as significant at regional, subregional or local scale. The other criteria of ecosystem processes (integrity, diversity, relationship to water and physical connections) support but do not dominate the selection.

**NOTE 2**: The criterion for absolute size is uniformly applied irrespective of the scale of mapping and level of investigation; but all other criteria vary according to the scale and level of investigation.

**Table 5.3b : FILTERING COMBINATIONS (Data Query Logic) to identify '1st Cut' CONSERVATION SIGNIFICANCE**

| Conservation Significance of Remnant Units | Query No. | A: Significant Habitat for 'At Risk' spp. | | B: Ecosystem Value | | C: Remnant Size | | D: Relative Size of Ecosystem | | E: Condition | | F: Ecosystem Diversity | | G: Context & Connection (if data is available) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S: State** | **1** | **A: VERY HIGH** | OR | **B1: VERY HIGH** | | N/R | | N/R | | N/R | | N/R | | N/R |
| OR | **2** | N/R | | **B1:HIGH** | | N/R | **&** | **D1: VERY HIGH** | | N/R | | N/R | | N/R |
| OR | **3** | N/R | | **B1: HIGH** | **&** | **C: HIGH** | **&** | **D1: HIGH** | **&** | E: VERY HIGH[1] | OR | F: VERY HIGH[1] | OR | G: VERY HIGH[1] |
| OR | **4** | N/R | | N/R | | **C: VERY HIGH** | **&** | **D1: VERY HIGH** | **&** | **E: VERY HIGH** | | N/R | | N/R |
| OR | **5** | N/R | | N/R | | N/R | | **D1: VERY HIGH** | **&** | E: VERY HIGH[1] | OR | F: VERY HIGH[1] | OR | G: VERY HIGH[1] |
| **R: Regional** | **6** | N/R | | **B1: HIGH** | | N/R | | N/R | | N/R | | N/R | | N/R |
| OR | **7** | N/R | | **B2: VERY HIGH** | | N/R | | N/R | | N/R | | N/R | | N/R |
| OR | **8** | **A: HIGH** | OR | **B2: HIGH** | **&** | **C: VERY HIGH** | OR | **D2: VERY HIGH** | | N/R | | N/R | | N/R |
| OR | **9** | N/R | | N/R | | **C: VERY HIGH** | **&** | **D2: VERY HIGH** | **&** | **E: VERY HIGH** | | N/R | | N/R |
| OR | **10** | N/R | | N/R | | **C: VERY HIGH** | | N/R | **&** | E: VERY HIGH | **&** | F: VERY HIGH | OR | G: VERY HIGH |
| OR | **11** | N/R | | **B2: HIGH** | **&** | **C: HIGH** | **&** | D2: HIGH[2] | OR | E: VH or HIGH[2] | OR | F: VH or HIGH[2] | OR | G: VH or HIGH[2] |
| OR | **12** | N/R | | N/R | | N/R | | **D2: VERY HIGH** | **&** | E: VH or HIGH[2] | OR | F: VH or HIGH[2] | OR | G: VH or HIGH[2] |
| **L: Local** | **13** | N/R | | **B2: HIGH** | | N/R | | N/R | | N/R | | N/R | | N/R |
| OR | **14** | N/R | | **B3: VERY HIGH** | | N/R | | N/R | | N/R | | N/R | | N/R |
| OR | **15** | **A: HIGH** | OR | **B3: HIGH** | **&** | **C: VERY HIGH** | OR | **D3: VERY HIGH** | | N/R | | N/R | | N/R |
| OR | **16** | N/R | | N/R | | **C: VERY HIGH** | **&** | **D3: VERY HIGH** | **&** | **E: VERY HIGH** | | N/R | | N/R |
| OR | **17** | N/R | | N/R | | **C: VERY HIGH** | | N/R | **&** | E: VH or HIGH[2] | OR | F: VH or HIGH[2] | OR | G: VH or HIGH[2] |
| OR | **18** | **A: MEDIUM** | OR | **B3: HIGH** | OR | **C: HIGH** | **&** | D3: HIGH[2] | OR | E: VH or HIGH[2] | OR | F: VH or HIGH[2] | OR | G: VH or HIGH[2] |
| OR | **19** | N/R | | N/R | | N/R | | **D3: VERY HIGH** | **&** | E: VH or HIGH[2] | OR | F: VH or HIGH[2] | OR | G: VH or HIGH[2] |

**Notes:**

- The assessment is progressive ie. a query is 'triggered' only if the preceding set has not been satisfied.
- Criteria B & D vary according to the scale (regional, sub-regional, local government) – all the others are independent of scale
- N/R = Not Relevant
- VERY HIGH[1] : A single 'Very High' score is not sufficient - at least two of the criteria (E, F and G) must be rated as "Very High" to qualify as significant
- HIGH[2] : A single 'High' score is not sufficient - at least two of the criteria marked as HIGH[2] must be rated as "High" to qualify as significant
- 'OR' = Options which apply only to the query immediately preceding the '___

  (ie. A & B OR C OR D *means* A+B or A+C or A+D;  A OR B & C *means* A+C or B+C;  A OR B & C OR D *means* A+C or A+D or B+C or B+D )

## 5.4 Other Desirable Criteria

As Stage 2 of the Common System process, an expert panel should be convened to review the '1st cut' results of data queries based on the Mappable Criteria, and apply Other Desirable criteria to amend the conservation significance of each remnant unit. The panel should include people familiar with both the flora and fauna of the region and local government area, and must undertake the assessment in a structured, consistent and transparent manner.

The expert panel should review the draft maps for inconsistencies and anomalies in '1st cut' composite significance and the ratings applied to each of the mappable criteria. In most cases, the mapped remnant boundaries *per se* should not be amended at Stage 2, because the Common System is sufficiently robust to compensate for minor variations in map interpretation. However in some cases buffer areas may be changed or mapped polygon areas may be extended to include adjacent areas where appropriate. For example, some areas mapped by Queensland Herbarium as cleared may support vegetation which meets the definition of 'remnant' or 'mosaic' (see Appendix C), especially if mapped as vegetated in SLATS. Conversely, some mapped breaks between polygons may comprise only narrow breaks (eg. transmission line routes) that do not prevent effective continuity, and amalgamation may be appropriate.

Data available to the expert panel in Stage 2 should include the recorded locations of rare and threatened species in each remnant (ie Criterion A raw data), even if data is patchy. However even where such information is available as GIS data, caution should be exercised and expert opinion sought. Species records can reflect survey effort as much as actual distribution. For this reason, most species records are appropriately considered as Other Desirable criteria at present, although increasing data reliability will allow greater reliance on GIS in the future.

The application of these Other Desirable criteria can either upgrade the '1st cut' significance of a remnant unit on the basis of additional information, or downgrade its significance if data is inaccurate or does not adequately take degradation into account. The reasons for any change must be clearly documented and relate to the following specific queries:

### *H: Other Habitat for 'At Risk' Species*

**Query:** Does the known presence of endangered, vulnerable or rare (EVR) species scheduled under the *Nature Conservation (Wildlife) Regulation 1994*, Commonwealth *Environmental Protection & Biodiversity Conservation Act 2000*, international conventions, charters and agreements, or species at risk at regional level, warrant change to the "1st cut" conservation significance of this remnant unit ?
eg. Is it critical habitat for the species or important for part of its life cycle, does it represent a significant part of the known geographic range, or does it support a high proportion of the known population etc ?

**(i) Basic** - Vegetation Maps, Regional GIS Data on location of scheduled species and species at risk regionally (Qld Museum, NatureSearch, HERBRECS)
**(ii) Intermediate** - As above plus broadscale field scans and/or surveys of likely habitats
**(iii) Advanced** - As above plus intensive surveys of likely habitats.

**Notes**.
- The term 'species' includes other taxa

- The reliability of data linking species to remnant units should be documented
- Habitat areas for EVR species with locationally-precise records are considered under Mappable Criterion A, but the buffer areas mapped around each record should be reviewed by faunal experts.

## *I: Habitat for Other Species*

**Query:** Does the known presence of locally significant, 'icon' or other species, sub-species or locally endemic variants, or migratory species, or populations that are isolated or at their geographic range limits (even though defined as 'common' under the *Nature Conservation Act 1992*), warrant change to the "1st cut" conservation significance of this remnant unit ?
eg. Is it critical habitat for one or more species or important for part of their life cycle, does it represent a significant part of the known geographic range or distribution, or does it support a high proportion of known populations etc ?

**Query:** Does the remnant support an unusually high species richness relative to other remnants of similar ecosystem ?

**(i) Basic** - Vegetation Maps, Regional GIS Data on location of species (Qld Museum, NatureSearch, HERBRECS)
**(ii) Intermediate** - As above plus broadscale field scans and/or surveys of likely habitats
**(iii) Advanced** - As above plus intensive surveys of likely habitats.

**Note**: the reliability of data linking species to remnant units should also be documented.

## *J: Localised Contribution to Biodiversity*

**Query:** Is the area of such local importance as a centre for biodiversity and/or endemism[19] (eg moist mountain tops and other topographic isolates, shrubby communities on siliceous soils, rainforest remnants, springs etc.) that the "1st cut" of conservation significance should be upgraded, taking into account the potential for enhancement, rehabilitation and maintenance through appropriate planning and management ?

**Query:** Is the area a wildlife refugium[20] of sufficient quality (as assessed by known species dependence, or the extent to which it is buffered/protected from natural perturbation or anthropogenic disturbance) which warrants a change to the "1st cut" of conservation significance, taking into account the extent of past, current or anticipated habitat removal in surrounding areas of habitat ?

**Query:** Does the remnant unit include an artificial waterbody or managed/manipulated wetland of ecological significance ?

**Query:** Does the remnant unit contain hollow-bearing trees that provide habitat for arboreal mammals and nesting birds etc. ?

[19] The *Vegetation Management Act 1999* defines a centre of endemism as *an area containing concentrations of species that are largely restricted to the area.*
[20] The *Vegetation Management Act 1999* defines a wildlife refugium as *an area that is a sanctuary to which a species or a group of species has retreated, or been confined, in response to threatening processes, including a climatic change.*

**(i) Basic** - Vegetation Maps, Topographic maps, air photos, species distribution maps, rainforest/vineforest distribution maps.
**(ii) Intermediate** - As above plus remote sensing, logging history, old air photos, broadscale field scans and/or field surveys of likely habitats,
**(iii) Advanced** - As above plus intensive surveys of likely habitats.

## *K: Corridor Links, Context & Connection*

**Query:** Is this area a link between non-contiguous remnants, of sufficient importance to warrant a change to the "1st cut" of conservation significance (eg riparian habitats, corridors and 'stepping stones' for particular species or suites of fauna), taking into account the potential for enhancement, rehabilitation and maintenance through appropriate planning and management ?

**(i) Basic** - Vegetation Maps, Topographic maps, Air photos
**(ii) Intermediate** - As above plus remote sensing, broadscale scans and/or field surveys of likely corridor links, especially between large remnants
**(iii) Advanced** - Intensive surveys of likely corridor links

**Note**: If mappable data is available, the physical connections between contiguous vegetation remnants may be addressed in Criterion G (Context & Connection). This Corridor Links criterion allows consideration of other faunal movement patterns & opportunities. However if mappable data is not available for watercourses, wetlands and other factors contributing to Criterion G (buffering of Endangered Ecosystems, connectivity etc), then these factors should all be considered by the expert panel under this criterion.

## *L: Geomorphological Variation*

**Query:** Does the remnant include or represent a land system known to support high biodiversity or species of significance, or do the geomorphological and ecological variations within the remnant warrant a change to the "1st cut" of conservation significance (because they indicate likely habitat diversity and ecosystem micro-variation) ?

**(i) Basic** - Topographic and Vegetation Maps, Air photos
**(ii) Intermediate** - As above plus Land System information
**(ii) Advanced** - As above plus intensive surveys of likely gradients

## *M: Other Ecosystem Values*

**Query:** Are there other ecological processes and values of the ecosystem associated with this remnant that warrant a change to the "1st cut" of conservation significance ?
eg. catchment and flood plain values, scenic values, protection from land degradation.

**(i) Basic** - Topographic and Vegetation Maps, Air photos, National Estate listings.
**(ii) Intermediate** - Catchment studies, broadscale field scans
**(iii) Advanced** - Intensive surveys of likely habitats.

# 6. Conclusions and Recommendations

Despite the recent standardisation of vegetation mapping and ecosystem conservation status at regional (1:100,000) scale in Queensland, there is still wide variation in the approach taken by planning agencies, and by researchers and consultants, to the classification of nature conservation values. This is particularly apparent in the differences between local government mapping of relative conservation values in South east Queensland, where lack of a commonly-accepted system has hindered regional planning. The Western Region Organisation of Councils (WESROC) has commissioned this Common Nature Conservation Classification System to standardise the mapping and collection of data in the region, in parallel with a project to develop a common vegetation layer at 1:25,000 (Olsen 2000, in prep).

The Common Nature Conservation Classification System classifies the significance of mapped remnant vegetation units for nature conservation purposes, with standardised criteria and levels of data collection, that can be consistently applied throughout the region. Classifications adopted are a simple hierarchy of three categories (State, Regional and Local significance), but care must be taken to ensure that these are not used without reference to the underlying data layers. It is strongly recommended that the 'final map of Nature Conservation Significance be not published on its own, without supporting maps showing each of the mappable criteria, with legend text that explains their relative ranking[21]. It may also be useful at regional planning level to also distinguish critical areas of State significance (eg. by cross-hatching or stippling parts of remnant units ).

The system is robust, objective, transparent and reliable, and although the number of options appears initially complex, the outputs are legible and capable of flexible use in regional and local government planning and conservation management. Nevertheless, this system has been developed primarily from desktop studies, and further research and field trials at various scales need to be undertaken to refine its effectiveness and potential application to other regions. In particular, the emphasis on mapped remnant units may be appropriate in the fragmented and high diversity habitat areas of South-east Queensland, but may not be an appropriate basis in some other regions.

Previous systems and criteria for assigning relative priorities to natural asset values at regional or local scale have focused on the need to establish a system of conservation reserves, have taken a reductionist approach (based on site-specific and species-focused data) or have been too broad and holistic approach (oriented towards systems and processes). The proposed common system achieves a balance between these approaches, with criteria covering three broad 'themes' of conservation values (rarity, general habitat and ecosystem processes).

It is recognised that the process of classifying conservation significance may take place at various times in the cycle of land use planning, and will be subject to wide variations in agency resources and objectives. The common system is adapted to these circumstances by flexibly accommodating data inputs at varying feasibility levels (basic, advanced and intermediate). Information collected at 'advanced' level will of course be more reliable, and although the investigations are costly, such data can be sued for a wider range of purposes (including State of the Environment reporting) and is less likely to need re-collecting at some future

date. The system also accommodates differences in the uniformity and reliability of data by a two-stage process using mappable criteria to draft a '1st cut' database and maps of relative significance, followed by expert panel review using Other Desirable criteria.

Although the system indicates that the input from an expert panel (especially including local fauna experts) is part of the 2nd stage Other Desirable criteria, it is strongly recommended that such advice be sought at the outset. Several of the initial mappable criteria requires some level of initial expert evaluation prior to decisions, especially regarding Criterion A ('At Risk' species habitat)

The preparation of regional and local maps and databases of relative conservation significance represent 'snapshots' of composite values at a particular point in time, and draw information from a number of databases which are (or should be) regularly updated. It is a very complex process to develop a completely live database that will automatically respond to changes in the component database sources held by a variety of agencies. A process is therefore required for periodic (preferably annual) updating of the composite database and maps, and/or a system of 'flagging' units and classifications for which updated information is available. For the regional conservation strategy maps and database, this process should be an EPA responsibility. Local governments and regional planning agencies should ensure that the accuracy, scale, terminology and storage of of more detailed information is consistent across the region, and is regularly updated. This will require allocation of funds and skilled staff to database maintenance.

Although the final output is a simple legible map of relative conservation significance in three categories with consistency throughout the region, the accompanying GIS database will allow users to examine the range of values that contributes to classification. These layers of information can be effectively utilised for a wide range of land use planning, development assessment and conservation management applications.

[21] ie. not simply as eg. CiterionB1: *Very High/High/Medium/Low*; but as '*Very High: Endangered RE or nationally important wetland or World Heritage Area* etc)

# GLOSSARY

**Biological diversity** (biodiversity) is the variety of natural flora and fauna and their interactions with environmental conditions for their long-term survival and viability. This includes:

- **Regional diversity** - the variety of land systems in a region, and their environmental components* and functional interactions that affect ecosystems;
- **Ecosystem diversity** - the variety of vegetation structural formations, and associations in a region, and their component and determining ecological processes and faunal habitats;
- **Species diversity** - the variety of flora and fauna species, especially rare and endangered species;
- **Genetic diversity** - the variety of subspecies and ecotypes# or geographically separated populations of any species.

*****Environmental components: vegetation structure and composition, soil, geology (lithology, stream pattern, toposequence and modal slope) and climate.

**#** Ecotype: Group of plants within a species adapted genetically to a particular habitat but able to cross freely with other ecotypes of the same species.

**Nature Conservation Significance** is the relative importance, as assessed by valid scientific criteria, of places, features, ecosystems and populations of species (and other taxa) which represent or contain the remaining natural and biological diversity of a bioregion or area, and the habitats, resources and ecological processes on which they depend.

**Old-growth forest** is ecologically mature forest where the effects of disturbance are now negligible (JANIS 1997)

**Remnant**: a continuously connected area of natural vegetation[1] with canopy exceeding 50% coverage and 70% height of the undisturbed predominant canopy.

**Remnant Unit**: a mapped remnant, aggregation of remnants or part of a remnant, or an area of wetland, with identifiable conservation values

**Wilderness** – land that, together with its plant and animal communities, is in a state that has not been substantially modified by, and is remote from, the influences of European settlement or is capable of being retored to such a state; is of sufficient size to make its maintenance in such a state feasible; and is capable of providing opportunities for solitude and self-reliant recreation (National Forest Policy Statement 1992).

[1] "Natural vegetation" includes "vegetation" as defined in the Vegetation Management Act 1999, plus native grass and mangroves.

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Appendix **A**

# Review of Local Government Conservation Classification Systems in South east Queensland

**Review by Brisbane City Council staff (A1)**

**and**

**Chenoweth EPLA (A2)**

# APPENDIX A:
# REVIEW OF LOCAL GOVERNMENT , VEGETATION MAPPING, SIGNIFICANCE ASSESSMENT AND CONSERVATION CLASSIFICATION SYSTEMS

Many local authorities in South east Queensland have undertaken vegetation mapping and assessment of conservation significance as part of their Planning Studies over the past decade. Several have also developed conservation strategies based on mapped planning units (Conservation Management Areas, Vegetation Management Units or similar), which have been developed from mapped vegetation polygons. The following review provides a brief comparison of the various approaches, mapping scales, data inputs and significance criteria. Many local government programs, with the assistance of consultants and State government agencies, have progressively increased the data base and developed more comprehensive approaches to evaluation over the past decade, as tabulated below.

## A1: Brisbane City

(a) **Brisbane City Conservation Atlas:** The Draft Register of Brisbane's Most Highly Valued Natural Assets – Background Information, Brisbane. BCC. December 1984.

**Approach:** Nomination Based (scale not applicable). The register is one of three sections of the Conservation Atlas (BCC, 1992). The register identifies those features of Brisbane's 'natural' environment that are of special conservation value and therefore worthy of special care and management.

**Data Input:** Aerial Photograph Interpretation, community nominations and literature review.

**Criteria:** For an item to be listed on the register it must satisfy at least one of the following criteria:

- be a representative example of a landform or vegetation community which was once widespread in Brisbane;
- contain species or communities which are either rare or unusual in a Brisbane or broader context;
- make a substantial contribution to the scenic amenity of the City as a whole, or of a local community;
- provide high quality, nature based recreational opportunities;
- provide opportunities for the public to learn about and appreciate the values of remnant natural features and areas within the city; or
- have a historical link with the early discovery and settlement of Brisbane.Special

No quantitative information is provided.

(b) **Brisbane City Conservation Inventory:** An Inventory of Conservation Management Units in the City of Brisbane. Cameron McNamara. July 1985.

**Approach:** An inventory of Conservation Management Units to:

- document the major components of the city's natural environment at 1:25,000 ie. wetlands, reservoir catchments, beach & dune complexes, river and creek corridors, forests, reserves,

parks, transport corridors etc.;

- assess conservation values in terms of landscape and ecological features of local, regional and national significance;
- identify existing and likely future pressures and threats being placed on different components of the City's natural environment; and
- recommend priorities for detailed investigation.

**Data Input:** Conservation Management Units were mapped at 1:25,000 scale using aerial photography. No field work was undertaken. Areas greater than 2500m$^2$ were mapped and some smaller areas aggregated. Conservation Significance and the degree of disturbance were assessed through aerial photograph interpretation.

**Criteria:** The criteria for determining conservation management units, sub-units and their significance was not outlined. No quantitative information is provided.

(c) **Brisbane City Bushland Management Study.** Environment Science and Services. January 1988. Information not found.

**Approach:** Assessment of the values of bushland in an urban context. Scale not applicable.

**Data Input:** Aerial Photograph Interpretation and literature review.

**Criteria:** Significance was based on tenure and zoning considerations rather than environmental factors. No quantitative information is provided.

(d) **Brisbane City Draft Wetlands Management Strategy.** University of New England. June 1990. (Planning for Brisbane Wetlands: Background Information Report. University of New England, June 1989.

**Approach:** A review of the current distribution, use and values of wetlands in Brisbane and in the wider Moreton Bay, Queensland and Australian context; scale most likely 1:30,000.
Wetlands included in this study were those identified in the Conservation Management Unit Study (1985). Wetlands not included were:

- wetlands attached to waterways – these would be assessed in the Waterways Strategy Study;
- melaleuca forests – covered in the bushland management study; and
- wetlands associated with the Brisbane River.

**Data Input:** Aerial Photograph Interpretation.

**Criteria:** Defined wetlands with one or more of the following three characteristics (Cowardin *et al*, 1979):

- at least periodically, the land supports hydrophytes (plants adapted to aquatic conditions);
- the substrate is predominantly undrained hydric soil; and/or
- the substrate is non-soil and is saturated with water or covered by shallow water at some

time during the growing season each year.

Only wetlands greater than 2 hectares were assessed. No quantitative information is provided.

(e) **Brisbane City Bushland Study** – An examination of Selected Areas of Brisbane's Bushland. BCC. June 1990. Part A.

**Approach:** The first phase of the Bushland Task Force was to accurately map (at 1:10,000 and 1:50,000) the boundaries of Council owned freehold bushland considered to have development potential and determine the significance of those areas in terms of their ecological, scientific, scenic, historical, recreational and educational values.

**Data Input:** 1:10,000 & 1:50,000 colour aerial photography (1990). 1:25,000 colour aerial photography (1987). Field work and literature review.

**Criteria:** Bushland was defined as: "*land on which there is vegetation which is either a remainder of natural vegetation of the land or, if altered, is still representative of the structure and floristics of the natural vegetation"*.

Significance was assigned based on the site's ecological, scenic/landscape amenity, recreational, educational, natural and cultural heritage, catchment protection/flood mitigation and corridor values. Ecological significance was rated on:

- Whether the site supports rare, endangered or uncommon significant species;
- Whether the site is a good representative of the vegetation type/s occurring on site;
- The size of the site;
- The condition of the site; and
- The presence of nesting and roosting sites for fauna;

No quantitative information is provided.

(f) **Brisbane City Bushland Task Force**: Phase 2 – October, 1990

**Approach:** A comprehensive city-wide assessment of all bushland and its values of in mainland Brisbane (scale not applicable).

**Data Input:** The mainland portion of the City was divided into 26 'study areas' the boundaries of which were based as far as possible on cadastral and ecological boundaries. Bushland contained within each study area was further divided into 'bushland localities' or what would now be termed polygons.

**Criteria:** An analysis of each bushland locality in the City was undertaken taking account of:

- the condition (quality) of each bushland locality;
- the forest types(s) and structural classification of bushland present;
- species present, including those rare, threatened, biogeographically important and otherwise notable;
- the botanical representativeness of vegetation associations present;
- evidence of various types of disturbance eg. rubbish dumping, clearing *et al*
- the proximity of other natural areas and whether those areas are linked, or have potential

to be linked to the subject area;

- topographical correlations with the type of bushland present;
- subjectively, the visual amenity of the site in local, district and metropolitan contexts, particularly with respect to elevated areas;
- suspected values for fauna habitat; and
- subjectively, the sites potential for recreational and educational pursuits, and scientific purposes.
- The conservation significance of each bushland was subsequently determined on the basis of these analyses.

No quantitative information is provided.

(g) **Brisbane City Natural Area Conservation Strategy:** *"A natural area conservation strategy for Brisbane City"*. C.P. Catterall. December 1990.

**Approach:** A strategy for the conservation of Brisbane's natural areas, with the goal of long-term ecological sustainability. Mapping of bushland, wetlands and waterways was initially mapped at 1:25,000 then reviewed at 1:50,000, to provide information on the distribution and conservation significance of natural areas in Brisbane.

**Data Input:** Literature Review, aerial photograph interpretation, Moreton Region 1:100,000 Vegetation Map Series: Summary Report and Species Checklist for Caloundra, Brisbane, Beenleigh and Murwillumbah Sheets.

**Criteria:** Conservation categories were assigned to each unit of bushland, wetland, waterway or Bay island. The highest value was assigned to units already listed in the Conservation Atlas, Bushland Report and Wetland Report. Waterway units were assigned a value of 1,2 or 3 based on the amount and condition of riparian vegetation. No quantitative information is provided.

**(h) Brisbane City: Supplement to Planning for Brisbane Wetlands. N. Hungerford. April 1991.**

**Approach:** Information on wetlands additional to those outlined in the Draft Planning for Brisbane Wetlands – Background Information Report. Approach as per 1990 Planning Study - see (d) above

**Data Input:** As per 1990 Planning Study - see (d) above

**Criteria:** As per 1990 Planning Study - see (d) above

**(i) Brisbane City Inventory and Evaluation of the < 2 ha Brisbane Wetlands. N. Williams. Volume 1 & 2. December 1991.**

**Approach:** A listing of wetlands < 2 ha. in the Greater Brisbane area, with records of wetland attributes, classification and evaluation of each wetland, at scales of 1:10,000 and 1:16,666. Wetlands were defined as *'land where the water table is at, near, or above the land surface long enough to promote the formation of hydric (wet) soils or to support the growth of hydrophytes (plants that grow in water or very wet soil)'.*

**Data Input:** 1:10,000 and 1:16,666 aerial photography, field surveys

**Criteria:** The same attributes of wetlands were recorded as per the 1990 Wetlands Planning Study - see (d) above. However in contrast to the 1990 study, small *Melaleuca* forests were included where they make up part of a bushland unit, and discrete wetlands associated with waterways were also included. No quantitative information is provided.

(j) **Brisbane City Vegetation Protection Orders (VPO). BCC 1991.**

**Approach:** Mapping of remnant native vegetation and assessment of its role and significance, on a cadastral basis, in order to apply the Vegetation Protection Ordinance (now Local Law) to protect important vegetation. The scale of air photo interpretation was most likely 1:30,000 and 1:10,000, but interim VPOs were mapped at scales to 1:5000.

**Data Input:** Previous assessment reports, aerial photograph interpretation and field visits.

**Criteria:** Significance of remnant vegetation was based on qualitative evaluation of one or more of the following values:

- natural habitat &/or wetland habitat
- erosion, slope or bank stabilisation
- wildlife corridor & vegetated link
- habitat or corridor along a creek
- Koala habitat, food trees or corridor
- Seed source for natural regeneration
- rainforest remnant
- part of original plant community
- scenic & landscape
- historical/cultural significance
- woodland with notable species
- Hoop Pine trees of distinctive character

**(k) *"The Animals of Brisbane: A vertebrate status review".* Tim Low. 1993.**

**Approach:** Literature Review of each animal species outlining the habitat, description, distribution and status.

**Data Input:** Queensland Herbarium data, Queensland Museum Data.

**Criteria:** Based on observations and knowledge of the author, Queensland Herbarium, Queensland Museum and BCC staff.

**(l) Brisbane City "*Vegetation 1993*" (Kordas, 1993)**

**Approach:** 1:30,000 City wide extent and distribution of vegetation communities, highlighting distribution of significant flora and fauna communities.

**Data Input:** 1993 air photography

**Criteria:**
- Stereoscopic air photography interpretation of vegetation community boundaries, classification of vegetation using dominant genera, height, life form and FPC, codification according to NFI methodology. Field validation and subsequent mapping of vegetation codes.
- Assignment of connectivity criteria to map boundaries of bushland remnants
- Assignment of the presence of rare, threatened or endangered flora and fauna species within polygons.
- Refinement of Kordas (1993) line work and updates on vegetation loss have been made retrospectively for 1991 and updated for 1995 and 1997.
- Localised vegetation mapping has also been undertaken for key natural areas.

**Current Work:** The Environment and Parks Branch of BCC are currently undertaking Small wetlands mapping at 1:12,000 using air-born scanner and Regional Ecosystem Mapping at 1:25,000

**(m) Brisbane City State of Environment Report 1996 & 1998**

**Approach:** The City of Brisbane was divided into conservation planning regions. For each of the planning regions the known, likely and possible occurrence of native terrestrial mammals was recorded (and also in 1998 the native terrestrial amphibians and freshwater fish), and formed the basis of rating each region for conservation significance.

**Data Input:** Various sources.

**Criteria:** Conservation Planning Regions were based on the approach taken in Catteral et al 1993, *A strategy for the conservation of flora, fauna and natural communities within Moreton Shire, south East Queensland.* Five categories of conservation significance were assigned, based on the number of mammal species known or likely to occur, and the number of mammal species which possibly occur.

(n) **Brisbane Wetlands Mapping, Classification and Evaluation Project. June 2000.**

**Approach:** Mapping at 1:30,000 and 1:10,000 of wetlands >2 hectares**,** and assessment of the their significance, as a basis for development assessment, as well as providing information for the wetlands program.

Wetlands were defined as per the National Wetlands Program, which is based on the Ramsar Convention ie. "*Areas of permanent or periodic/intermittent inundation, whether natural or artificial, static or slow flowing, fresh, brackish or saline, extending to the seaward boundary of the coastal vegetation line, including waterlogged soils, ponds, billabongs, lakes, forest swamps, marsh swamps, tidal flats, salt marshes, estuaries and flood plains ".* However waterways and the offshore areas of Moreton Bay were excluded from Brisbane City

mapping as other local and state programs were responsible for those.

**Data Input:** Existing 1993 vegetation mapping, stereoscopic analysis of 1:30 000 colour aerial photographs that was updated with 1997 aerial maps.

**Criteria:** Each wetland was assessed based on six ecological values, consistent with the Environmental Protection Agency criteria for wetlands assessment:

- special values
- representativeness
- diversity
- connectivity
- condition
- viability

Qualitative information is provided.

**(o) Environmental significance designations in Brisbane City Plan 2000.**

**Approach:** Various schedules in City Plan 2000 list specific sites, plus ecological features, vegetation communities and fauna and flora species considered to be significant at a city levelas identified through previous studies and research.

Various Local Plans in City Plan 2000 also designate sites of regional, city or local significance as areas of 'scenic and environmental constraint', environmental and waterway corridors or natural corridors.

**Data Input:** Various sources.

**Criteria:** Features and processes considered essential to the maintenance of biodiversity are identified as Valuable ecological features.

Significant Vegetation Communities are those recognised in international agreements, international, national or state legislation and/or policy, or the vegetation community is rare or uncommon in Brisbane.

Significant flora and fauna species are those that are:

- Listed in the Conservation (Wildlife) Regulation 1994 of the Nature Conservation Act 1992 as 'presumed extinct', 'endangered', 'vulnerable' or 'rare' (as defined by the Act)
- Regarded by a recognised authority as otherwise significant at either the regional or local level.

Areas of scenic and environmental constraint in Local Plans have high scenic amenity, wetlands or support significant species. Criteria are not explicit, but plans are cross-referenced to particular studies.

## A2. Other Local Government Conservation Significance Mapping

(a) **Gatton Shire**: ***"Assessment of the Vegetation and Nature Conservation Requirements of Gatton Shire"*** (Wilkinson & Grimshaw 1992) at 1:25,000

**Approach:** 1:25,000 mapping of Vegetation Mapping Units (VMU's).

**Data Input:** 1982-84 monochrome aerial photography (1:25 000) and field inspections, geological and topographical mapping.

**Criteria:** Distribution - area, pattern and shape.
Structure - formation (growth form, height and crown separation class).
- stratum (emergents, upper, mid and lower ).
Composition - plant species (native, introduced).
Function - wildlife habitat, water regime, land stability.

**(b) Maroochy Shire**: ***"Vegetation Survey and Assessment of Landscapes within the boundaries of the*** (Turnbull & Olsen 1992)

**Approach:** Vegetation mapping and classification at 1:25,000, to establish a data base for decision making

**Data Input:** Review of previous studies, Air photo interpretation to establish natural vegetation units, verification by field reconnaisance and field survey of sites in each unit.

**Criteria:** Conservation significance based on the values of each identified and mapped vegetation unit, incorporating the occurrence of:

- Naturally restricted vegetation types
- Vegetation now restricted due to human activity
- Important habitats for landscape protection / integrity
- Noteworthy species
- Rare & Threatened species
- Narrow endemic species
- Habitat of rare/threatened fauna
- Other important fauna habitat

(c) **Beaudesert Shire**: ***"Beaudesert Shire Natural Environment and Landscape Assessment Report"*** (Chenoweth & Assoc 1993)

**Approach:** 1:100,000 mapping of remnant vegetation (from Landsat imagery) for relative conservation significance, as a basis for Strategic Plan review

**Data Input:**

- DPI 1:100,000 Vegetation Map Series 1978-79 (Beenleigh and Murwillumbah sheets) for eastern part of the Shire;
- DPI 1:250 000 Pre-European Vegetation Map Series 1989-91 (Ipswich and Warwick sheets) for the western parts of the Shire;
- Remnant Bushland of SEQ 1:100,000 (Catterall, Kingston & Cooper 1992)
- 1990 colour aerial photography & 1992 Landsat image (rectified)
- Field surveys of remnant vineforest patches and Koala habitat

**Criteria:** Relative conservation significance (Categories 1 – 4) based on:

- Presence of / connectivity to national and environmental parks, State forests and riverine corridors
- Presence of /connectivity to vineforest remnants;
- Presence of rare, endangered or restricted species;
- Presence of swamps, lagoons and seasonally wet areas supporting a range of fauna including native waterbirds and frogs;
- Size and shape of remnant integral forests - large areas with a high ratio of volume to edge are more viable and resistant to perturbations and edge effects, are more likely to include several structural and floristic forest types and to support specialist fauna species (ie higher diversity) and provide sufficient habitat for viable breeding faunal populations;
- Active use of eucalypt forests and woodland by koala populations in the northern part of the Shire; and
- Landscape values of forested ridges and skylines.

**Current Work** Currently being updated by Chenoweth EPLA.

(d) **Moreton Shire:** "***A Strategy for the Conservation of Flora, Fauna and Natural Communities within Moreton Shire, South East Queensland***" (Catterall *et al* 1993)

**Approach:** 1:50,000 mapping of conservation significance of flora, fauna and ecological communities as an input to strategic land use planning.

**Data Input:** Vegetation maps, satellite imagery and colour aerial photography (made available by the Moreton Shire Council), at 1:16 000 or 1:25 000).

**Criteria:** Size, integrity, conservation status, position and ecological relationships with the wider region.

(l) **Pine Rivers Shire**: ***"Pine Rivers Greenplan"*** (Chenoweth & Associates, Catteral et al, Mary Maher & Assoc, Brannock Humphreys 1993)

**Approach:** Conservation Management Areas (CMAs) in 4 orders of priority (Priority, Major, General and Environmental Enhancement) for various ecological roles (habitat, corridor, landscape, tidal etc), mapped at 1:50,000 on GIS based on remnant vegetation mapping, to provide a data base for development assessment and for conservation, management and rehabilitation of the natural heritage

**Data Input:** Air photo and Landsat image interpretation, remnant vegetation maps, vegetation type maps, public submissions and other input maps.

**Criteria:** Size, connectivity, integrity, diversity, rare & threatened species, core habitat and linkages

(e) **Caboolture Shire**: ***"Caboolture Shire Atlas of Natural Assets , Technical report and*** (Loose, 1994)

**Approach:** An assessment of the natural assets and values, classified into manageable groups at 1:50,000, based on ecosystems

**Data Input:** 1:50 000 topographic maps, aerial photography (1:25 000), field work and existing information to map vegetation

**Criteria:** Size, integrity, viability, connection, habitat value, diversity.

(f) **Brisbane Future Urban Zone**: ***"Southern Brisbane Urban Fringe Study Area Future Urban Zone Conservation Significance"*** (Chenoweth & Assoc 1994)

**Approach:** Assessment of relative conservation significance of fragmented remnant bushland parcels on land zoned for future residential development, at 1:10,000, for a Planning & Environment Court Appeal. Methodology was based on 'scoring' each remnant on a 5-point scale and 'adding' the number of high/very high ratings

**Data Input:** Existing air photos (1:10 000), maps and previous BCC Bushalnd taskforce studies, followed by field inspection using a standard checklist of significance criteria.

**Criteria:**

**On-Site Attributes**
- Presence of bushland
- Plant species
- Number of plant communities
- Number of habitat 'niches'
- Size of Integral Vegetation
- Viability
- Fauna Species
- Geomorphology & Landform
- Sensitivity to physical disturbance
- Integrity Rating

**Local/sub-regional context**
- Similarity to nearby viable areas already protected
- Connectivity and Corridor Role
- Buffer & Catchment Protection.
- Threats to surrounding bushland.
- Representativeness

**Significance ascribed by others**
- Brisbane City Council strategies
- Regional Studies

(g) **Laidley Shire**: *"An Assessment of Native Vegetation Areas within Laidley Shire"*

**Approach:** Mapped vegetation types, integrity and ecological significance

**Data Input:** Vegetation maps, vegetation loss maps, status, values and conservation needs of native vegetation, remnant maps, air photos.

**Criteria:** Presence of endangered, rare and vulnerable plant species, regional significance of vegetation type, structural integrity, remnant size/connectivity, corridor function, catchment function, presence of riparian or wetland area.

(h) **Toowoomba City**: ***"Inventory of the Remnant Native Vegetation of Toowoomba"*** (Spence & Swarbrick 1995)

**Approach:** 1:25,000 inventory of remnant vegetation of the city of Toowoomba

**Data Input:** Pre-existing information on the remnant native vegetation within the city (very limited, and extensive surveys in the field.

(i) **Logan City**: ***"Remnant Vegetation Inventory and Conservation Assessment for Logan City Green Plan"*** (Ecograph 1996).

**Approach:** 1:25,000 mapping of vegetation type, ecological significance and conservation priorities of bushland areas

**Data Input:** Remnant vegetation mapping, existing vegetation mapping, aerial photos (1:15 000), field survey.

**Criteria:** Size, vegetation status, rare and endangered species, riparian status, koala habitat, diversity, remnant type.

(j) **Logan City**: "***Draft Logan City Greening Plan"*** (Chenoweth & Associates 1996)

**Approach:** Vegetation Management Areas (VMAs) in 4 categories based on the 1:25,000 vegetation mapping of Ecograph, as a trial implementation of Greening Plan methodology, as a basis for planning and development assessment.

**Data Input:** Vegetation mapping, GIS database and conservation significance (from Kingston et al 1996)

**Criteria:** Size, connectivity, integrity, diversity, rare & threatened species, core habitat and linkages

(k) **Gold Coast City: *"Gold Coast City Nature Conservation Strategy"*** (Mary Maher and Associates and Ecograph. 1997)

**Approach:** A comprehensive strategy to identify and ensure the protection of flora, fauna and other natural heritage and visual amenity values, based on vegetation and habitat mapping at 1:25,000 plus extensive community input to evaluate relative conservation significance.

**Data Input:** Remnant bushland maps, fieldwork, satellite imagery, aerial photography, relevant literature, previous studies.

**Criteria:** Size, vegetation type status, connectivity, presence of riparian, wetland or estuarine areas, number of vegetation types within the remnant.

(l) **Esk Shire**: "***Assessment of Vegetation and Nature Conservation Values of Esk Shire***" (Johnson *et al* 1998)

**Approach:** 1:40,000 mapping of vegetation type and conservation status as a basis for effective planning.

**Data Input:** Cadastral, topographical and forestry maps plus colour aerial photographs (Esk 1:25 000, Caboolture 1:40 000 and Nanango 1:40 000), satellite imagery, other vegetation maps, numerous plant lists, pre-clearing vegetation maps (Qld Herbarium - 1:100 000) covering the Esk, Caboolture and Nanango areas, plus field surveys for dominant tree species

**Criteria:** Conservation status of vegetation communities

**(m)** **Maroochy Shire**: ***"Conservation Assessment and Management Plans for Remnant Vegetation in Maroochy Shire"*** (Mary Maher and Associates *et al* 1998).

**Approach:** Mapping of ecological and conservation significance to develop a conservation strategy

**Data Input:** Fieldwork, satellite imagery and aerial photography, relevant literature, studies, agency data and local naturalists, GIS remnant vegetation coverage across the Shire.

**Criteria:** Remnant size, vegetation type status, connectivity / isolation, condition, remnant diversity and presence of significant species.

**(n)** **Ipswich City**: ***"Ipswich Northern and Inner Western Corridor study"*** (Humphreys Reynolds Perkins/Chenoweth EPLA 1997)

**Approach:** Assessment of relative conservation significance of mapped & coded Vegetation Management Units at 1:50,000, based on pre-existing vegetation mapping and available data on flora and fauna.

**Data Input:** GIS mapped remnant vegetation and Regional Ecosystems, Qld Herbarium 1:100,000 vegetation maps, previous Catterall and Ecograph studies, Open Space & Enviro-Plan studies, Museum and EPA databases.

**Criteria:** Regional significance, size, diversity, connectivity, shape and boundary, fragmentation, ecosystem categories, rare, threatened and significant species and corridors and links.

(o) **Caloundra City**: "The Vegetation Mosaic of lands within the boundaries of Caloundra City Council" (Olsen & Drane 1993)

**Approach:** Mapping of vegetation types and conservation status

**Data Input:** Air photo interpretation at 1:25,000

**Criteria:** Conservation categories were determined from the following three priorities:

**Priority 1** - the most significant from a conservation viewpoint and based on a variety of community types (rainforest, ecotonal forests, less common Eucalypt forests, wetlands, heathlands and intertidal vegetation) subject to those communities being in relatively good condition.

**Priority 2** - based on the more common Eucalypt forests, as well as any degraded or regenerating examples of priority 1.

**Priority 3** - degraded or regenerating common Eucalypt forests and all other areas (pine plantations, rural areas etc).

| | |
|---|---|
| **Current Work:** | Updated by LAMR 2001 and Chenoweth EPLA 2001, as inputs to new Caloundra City Plan. |

Appendix **B**

# Data Source Review

**Chenoweth EPLA and Ian Smith**

# Appendix B: Data Source Review

The following broad groups of data are available in South east Queensland as inputs to assessments of relative nature conservation significance:

| Data | Scale | Uniform | Accuracy | Available | Format | Source | Purpose |
|---|---|---|---|---|---|---|---|
| Vegetation Mapping (Existing Terrestrial) | 1:100 000 | All SEQ map sheets | | REMAT | Digitised | Queensland Herbarium | communities, associations and ecosystem types |
| Vegetation Mapping (Existing Tidal Wetlands) | 1:25 000 | Coastal only | | REMAT | | Queensland Herbarium | |
| Vegetation Mapping (Pre-1750) | 1:100,000 | All SEQ map sheets | | REMAT | | Queensland Herbarium | |
| Corveg Data<br>- species lists<br>- disturbance<br>- area<br>- boundaries<br>- no. of different community types | | | | | | Queensland Herbarium | Site Assessment |
| Rare and Threatened Species Data | state | | | | • Database in DBF format or Excel Spreadsheet<br>• Access Database | • EPA Species Database<br>• CORVEG<br>• NatureSearch<br>• EPA Significant Species Database<br>• Wildnet | • Information on sightings of fauna for the study area. Also contains occurrences of rare and threatened species<br>• Database containing structural and floristic information for representative sites.<br>• Database containing information on species distribution, taxonomy, biology, conservation status, ecological requirements etc.<br>• Information database on Qld's wildlife. Also contains HERBECS records and distributional data. |

| Data | Scale | Uniform | Accuracy | Available | Format | Source | Purpose |
|---|---|---|---|---|---|---|---|
| Bushland Integrity; integral, thinned and mosaic | 1:100,000 | | | | - hardcopy<br>- maps<br>- GIS Format | Catterall and Kingston | |
| Conservation Priority Mapping by Local Governments | | | | | various | Local Governments | |
| SEQ2001 and ROSS maps<br>- Critical Nature Conservation Area<br>- Broad Nature Conservation Area<br>- Regional Open Space "frame" | | | | | | | |
| Waterways and Riparian Vegetation | | | | | Auslig Drainage Local Govt. | DNR | |
| Wetlands | 1:25 000 | | | | EPA / AMCS database<br>- DOS Based | EPA<br>AMCS / EPA<br>BCC | • Polygon coverage of wetland vegetation showing vegetation type, % each vegetation unit, area, perimeter and reliability costs<br>• Queensland wetland information. |
| Catchment Mapping of Vegetation | state | ✓ | ✓ | ✓ | **?** | DNR | Catchment Management Plans |
| Site-specific Studies of Flora and Fauna | | | | | | EIS reports etc. | |
| Locality Studies<br>- Development Control Plans<br>- Local Area Plans | | | | | | local government | |
| Moreton Bay Mapping; wetlands, zones, strategic plan | local | ✓ | ✓ | ✓ | Digital Arcinfo 7.0.3 under DEC Utrix | | Will assist in assessing the level of planning protection. |

| Data Option | Scale | Uniform | Accuracy | Available | Format | Source | Purpose |
|---|---|---|---|---|---|---|---|
| Records for particular Fauna Groups - frogs, birds, wader birds | local | ✓ | ✓ | ✓ | hardcopy | • Brisbane Frog Society<br>• Wader Site Survey Project | |
| Particular Vegetation Communities<br>- Vine Forest Atlas<br>- Paperbark swamps | SEQ | ✓ | ✓ | ✓ | hardcopy | Forster et al. | provides conservation status, reserves, additional reserves, distribution, frequency, community types. |
| Old Logging Records/ historical air photos. | | | | | | DPI & sunmap | |
| Remnant and PreClearing Vegetation Mapping | 1:100 000 | | | | | Herbarium | to measure change in distributions |
| Areas of Conservation, National Parks etc. | State Land | | | | Estates Data Layer 1996<br>- unsure scale | EPA | Will assist in assessing the levels of planning protection. |
| Cadastral Information | 1:25 000 | | | | | DNR | Shows information on roads, boundaries, tenure, lot numbers etc. |
| geological maps | | | | | | | |
| topographical maps | | | | | | | |
| biogeographic regions | | | | | | | |
| aerial photography | 1:25 000 | ✓ | ✓ | ✓ | | DNR | Scanned images which may be used as backdrop to aid in interpretation of data |
| supplementary data | This data can be derived from expert opinions and local knowledge in the area under investigation | | | | | | |

Appendix C

# Mapping Remnant Units

**Chenoweth EPLA**

# Appendix C. Mapping Remnant Units

## C1. Assessment Units

Mapped remnant units are the basis of the Common Conservation Significance criteria B to M, and consistent application of the criteria require a uniform approach to their definition and mapping. (Note: Criterion A is based on circular buffers around known locations of 'at risk' species).

Classification of areas of land according to their relative nature conservation values and significance is based on mapped units of remnant natural vegetation or wetland ("Remnant Units") defined as:

> ***Remnant Unit**: a mapped remnant*, aggregation of remnants or part of a remnant, or an area of wetland, with identifiable conservation values*
> * as defined in Vegetation Management Act 1999 – see Glossary

Mapped remnant units are derived from Regional Ecosystem polygons, and may be:

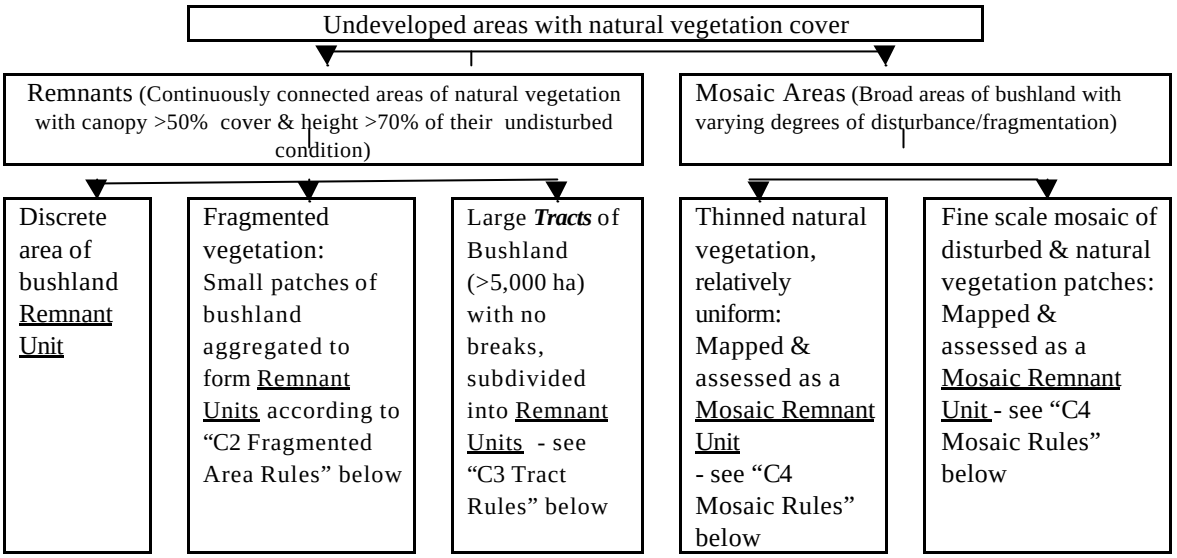
- a single mapped polygon of remnant vegetation;
- a subset of a large ***tract*** of bushland; or
- an aggregation of small remnants.

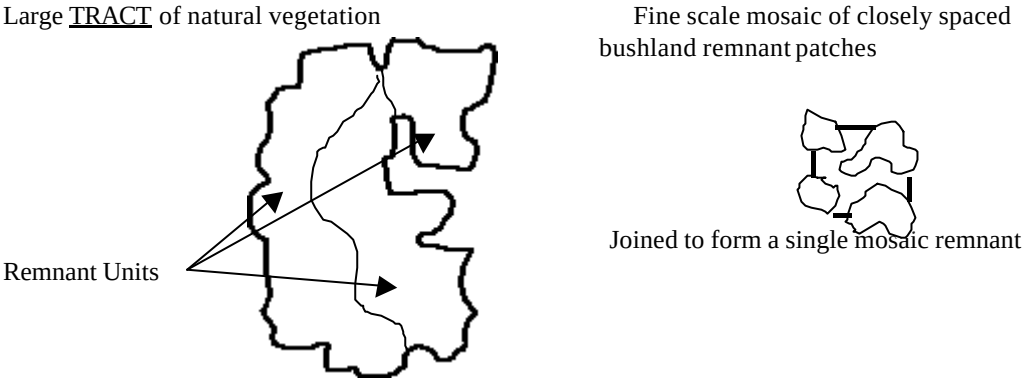
In areas of fragmented habitat, many remnant units will be self-evident as discrete patches of bushland, but wherever remnant vegetation comprises large tracts of bushland, or where patches are connected to varying degrees (eg. by narrow 'isthmus' bands), there is considerable margin for mapping interpretation. While the division of continuously connected areas into two or more remnant units is partly a convenience to break up unwieldy large or convoluted units, it has the potential to affect the evaluation because size *per se* is one of the criteria for conservation significance. Consistency of mapping is therefore desirable.

Some areas of patchy or thinned vegetation do not meet the definition of a remnant, but have conservation values worthy of recognition and classification at local government scale. For conservation significance classification at local scale, areas of disturbed natural vegetation (eg thinned woodland used for grazing) may be mapped and assessed as Mosaic Remnant Units, to distinguish them from polygons of remnant vegetation mapped by Queensland Herbarium.

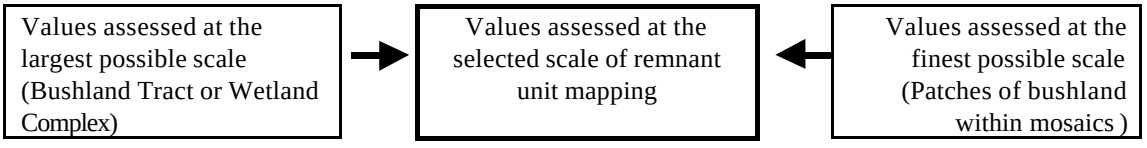
Remnant units are not necessarily homogenous in composition, and may include a number of different types of vegetation mapped as heterogeneous polygons.

The following diagrams illustrate the approach to mapping of remnant and mosaic units:




Some conservation values (eg. those related to size) are more appropriately assessed at the largest possible aggregation (ie at tract scale), whereas other values (eg. those related to rarity) are more accurately assessed at the finest possible scale of resolution. The significance of each mapped remnant unit must therefore be influenced both by the attributes of the broad tract of bushland, and those of component sub-units.



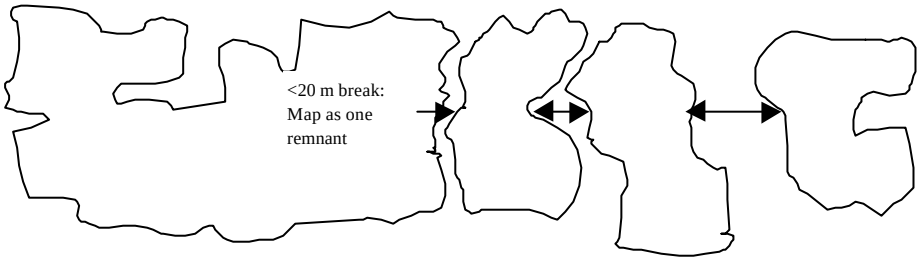

This two-way influence 'buffers' the assessment process from much of the subjectivity associated with mapping the boundaries of remnant units. A decision to split or aggregate areas of bushland into one or more mapped units will not 'lose' values associated with the larger or smaller units.

## C2. Dividing or Aggregating Remnants and Fragmented Areas:

The mapping of remnant units will vary according to the scale of mapping. An area of bushland which appears to form a single remnant at a coarse scale of mapping may prove to be several discrete remnants, when assessed in greater detail. Conversely areas which have been mapped at 1:100,000 as separate remnants may prove to be interconnected when assessed at 1:25,000.
Some of the criteria for conservation significance should be applied at the finest and most accurate scale of mapping available. However assessment of remnant size should consistently recognise the importance of large bushland areas, even though these may be subdivided into smaller units at a finer scale of mapping.

The degree of connection needs to be consistently applied at each mapping scale. A "continuously connected area" means a continuity of vegetation with no apparent breaks, as follows:

- A separation distance >50 metres should be mapped as a break between Remnant Units;
- A separation distance < 20 metres does not constitute a break in continuous connection;
- Separation distances of 20 – 50 metres may be regarded as breaks between remnant units, or as "continuously connected", at the discretion of the mapping team and according to the degree of fragmentation encountered, provided the process is transparent and repeatable, and is consistently applied at each scale of mapping for conservation significance classification;
- Conversely, several small mapped patches of remnant vegetation in close proximity may be aggregated into a single remnant unit if the separation distance is 20 – 50 metres




However in areas of fragmented canopy cover, many remnants will have highly convoluted boundaries, and comprise patches that are tenuously connected to each other by narrow bands of vegetation (eg riparian strips) that could be considered as "continuously connected".

Even continuously connected areas of bushland may be subdivided into separate Remnant Units if:

- The connecting band is less than 50 metres wide (unless the remnant is narrow-linear in shape eg riparian or littoral vegetation, in which case any significant narrowing may be used to divide it);
- A compact area of vegetation is connected to a narrow 'peninsula' or corridor;
- A large area (300 to 5,000 ha.) of vegetation has a significant narrow point corresponding to a change in ecosystem or vegetation type; or
- A large area (300 to 5,000 ha.) of vegetation is divided by a road or cleared easement or other barrier (even if the break is < 20 metres wide).

**NOTE:** The criteria for assessing whether areas of remnant bushland are sufficiently 'connected' to be regarded as a single mapped remnant unit (*intra-connection within units*) are not to be confused with those for determining connectivity between adjacent contiguous remnants (*inter-connections between units*) nor between adjacent but non-contiguous remnants. Two areas of bushland mapped as separate remnant units according to the above rules may still be classified as well-connected under the criteria for Physical Connection (7.2 Mappable Criterion 'G') and Corridor Links (7.3 Other Desirable Criteria 'K').

## C3. Mapping Rules for large Tracts of Continuous Bushland

Large tracts (> 5,000 ha) of natural bushland without breaks or narrow points are assessed as entire remnants for conservation values associated with size (see 5.2C "Remnant Size"). However their size and internal diversity generally confound the assessments of other criteria, and they should be subdivided into Remnant Units as follows:

- Large diverse tracts should be subdivided into Units along boundaries between Regional Ecosystems, at the finest scale of mapping available; and
- Large but relatively homogeneous tracts (ie which cannot be subdivided using Regional Ecosystem polygon boundaries) should be subdivided into Remnant Units by natural ecological boundaries such as a watershed or watercourse; or by topographic categories where elevation is relevant to ecological thresholds.
- Note: It is not valid to subdivide large natural tracts by using administrative or management borders, tenure, cadastral, protected area boundaries etc.

## C4. Mapping Rules for Mosaic Areas

Areas of thinned and grazed natural forest or woodland may be mapped as Mosaic Remnant Units and assessed for their conservation values and significance, provided:

- The degree of canopy cover over the whole mapped Mosaic Area is > 25% of its original Foliage Projective Cover (Note that vegetation with >50% of original FPC, and >70% of original height is defined as a "remnant");
- Disturbance is limited to tree thinning, shrub removal, fencing and grazing, with no buildings, dams, cultivation or improved pastures; and
- The species composition matches the original (pre-clearing) vegetation and ecosystems.

**NOTE:** If additional mapping rules are used to delineate Remnants or Remnant Units, the criteria must be specified so that the process is transparent and repeatable.

Appendix **D**

# Feedback from Gold Coast City Council Trial Application

**Gold Coast City Council**

# Appendix D: Feedback from Gold Coast City Council Trial Application

**RESULTS OF PRELIMINARY TRIALLING OF THE**
**COMMON SYSTEM FOR NATURE CONSERVATION CLASSIFICATION**

**GOLD COAST CITY COUNCIL**
**COOMERA LOCAL AREA PLAN AREA**

## Details of Trial Area

Western portion of the Coomera Local Area Plan area which is bounded approximately by the Pacific Highway, Hotham Creek, and the Coomera River.

## Characteristics of Area

| | |
|---|---|
| Size: | Approximately 2,000 hectares |
| Dominant Vegetation Types: | Vineforest<br>Dry Sclerophyll Forest<br>Wet Sclerophyll forest |
| Vegetation Remnants: | Includes both large intact remnant patches which provide a link from the extensive eucalypt forests of the Darlington Ranges in the west to the mangrove and coastal wetland habitats of Southern Moreton Bay area in the east, and smaller fragmented and isolated remnant patches. |
| Geology: | Neranleigh – Fernvale beds (greywacke, silts, cherts, quartzites) |
| Topography: | Varies from Subcoastal ranges to low lying floodplains bordering Hotham Creek and Coomera River |
| Current Landuses: | Predominantly rural and rural residential. |

## Data Available and Used

Basic Level: Regional Ecosystem & Mapping Analysis Tool Version 1.0 (EPA 1999) including:

- Regional Conservation Status Mapping at 1:100,000
- Regional Vegetation Mapping at 1:100,000
- Remnant Bushland of South East Queensland including Remnant Integrity Mapping at 1:100,000 (Caterall et al, 1993)

Intermediate Level:

- Gold Coast City Nature Conservation Strategy including Vegetation Mapping at 1:25,000 (Gold Coast City Council, 1998)
- GCCC Flora & Fauna Database
- Geology Mapping at 1:25,000 (Gold Coast City Council)
- Soils Mapping at 1:25, 000 (Gold Coast City Council)

Advanced Level: Coomera Environmental Study including Vegetation Mapping and Remnant Integrity Mapping at 1:10,000 and some fauna trapping sites (Chenoweth & Associates, 1995)

For Comparison of Results: Coomera Local Area Plan Precincts Map (Gold Coast City Council, 1999)
Ecological Significance Map (GCC Nature Conservation Strategy, 1998)

## Approach Used

1 Following planning and collation of the data, 2 officers worked through each of the criterion for each of the levels of assessment (ie: basic, intermediate and advanced).

2 The results obtained from the trial were then compared with existing studies which had used alternative methods for assigning conservation significance.

3 This summary of the process was then prepared.

## Time taken

Planning: 4 hours

Collation of data: 8 hours (NB: only existing data was utilised - no additional fieldwork was undertaken for the purposes of the trials)

Assessment: 16 hours (ie: 2 people x 8 hours)

Write up: 5 hours

**Total time taken: 33 hours**

## Comments on Application of the Criteria

Each of the identified vegetation remnants within the Study Area was assessed using the all of the assessment criteria (ie: both mappable and Other Desirable) at both the basic and the intermediate level. A number of observations about this part of the process and the assessment criteria were made. These are summarised below:

***Defining the Vegetation Remnants:***

The biggest initial challenge is the identification of the boundaries of the vegetation remnants. Depending on the scale of the exercise, this could be quite a task because:

- the definition of the remnants could be rather subjective; and
- if the study area is sizeable or consists of numerous fragmented remnants, it would be a large task to define the individual remnants. If GIS analysis were to be used, algorithms would need to be developed to define remnant boundaries. This could place the exercise beyond the technical capabilities in some Councils.

### *A. Conservation Status*

This criteria could also take into account the extent of the vegetation type incorporated in Protected Areas.

### *B. Size*

In terms of the table provided for the Intermediate/Advanced level of assessment:

- we assumed that the first row of 'wetlands generally' referred to 'open forests generally'
- the results of applying this criteria could differ depending on how the remnant boundaries were defined in the first instance
- there is some concern about how the chosen figures relate to the Local Government area level – eg: GCC may contain a greater proportion of large open forest remnants than other LGAs. Similarly, 5 hectares of wetland in GCC would be considered to rate as 'very high' whereas 5 hectares of wetlands in Cooloola might be considered to only have a 'medium' rating. At present, this criterion only provides for an assessment of Regional Significance.

- the table should be expanded to contain more specific vegetation types (eg: different open forest communities, rainforest, vineforest, etc.)

## *C. Integrity*

This could be a difficult criterion to measure at the intermediate level as it would require a level of field work more suited to the advanced level of assessment. Perhaps the criterion could refer to canopy disturbance visible on aerial photographs for the intermediate level.

Proportion of Area: No comments

## *D. Community Diversity*

What is the definition of ecosystems/vegetation types for this criterion? Ie:
- Is disturbed grassland a vegetation type?
- How do we deal with different structural formations?

The measure for the "Low" rating should just read '1 vegetation type/community'.

## *F: Relationship to Water*

This could be a difficult criterion to use if you have grouped similar remnants together to reduce the size of the task.

## *G: Physical Linkages*

The measures defined in the table are very prescriptive and somewhat confusing.

- Does the assessor need to consider all three things (ie: connection, fragmentation and corridor) or are these alternatives whose application depends on the function of the remnant?
- It may be useful to have at least two levels of assessment to enable a more simplistic measure for the basic level leaving the more complex measures for the advanced level.
- Where the study area is large and a large number of remnants are involved, GIS algorithms would be the most practical method for addressing this criteria. However, this could be complex and beyond the technological resources of most Local Governments.
- How should roads, creeks and other infrastructure items be treated in this sense?

## *H: Scheduled Species*

No comments

## *I: Other Species*

No comments

## *J: Refuge Quality*

Some of the terms in here are fairly complex eg: 'natural perturbation and anthropogenic disturbance'. Perhaps they should be simplified.

## *K: Connectivity*

No comments

## *L: Geomorphological Variation:*

No comments

### *M: Other Ecosystem Values:*

No comments

*Complexity of the Assessment Process:*

The complexity of the task and level of resources required to undertake the assessment can dramatically increase as the number of individual remnants or size of the study areas increases: For example:

- at the basic level our study area consisted of only 1 remnant
- at the intermediate level, we had 5 remnants types (we took the option of grouping similar remnants on the basis of there size, integrity and vegetation type)
- at the advanced level, we had in excess of 30 remnants which would each require assessment.

## Results of the Assessment

Following the above consideration of all of the assessment criteria at both the basic and the intermediate level, the results were put through both of the options for determining the level of significance for each of the remnants. The results are as follows:

*Under Option 1: Cumulative Threshold Scoring System:*

The method found that at the:

Basic level:
Only one large remnant was identified. This was rated as Locally Significant using the Diagnostic Criteria and elevated to Regionally Significant following consideration of the Supplementary Criteria.

Intermediate level:
There were five types of remnants identified. Using the diagnostic criteria, these were rated as:

| | |
|---|---|
| Type A-D (small to medium sized remnants) | : Locally significant |
| Type E (large relatively intact remnants) | : Citywide significance |

Upon consideration of the Supplementary Criteria, the ratings were altered as follows:

| | |
|---|---|
| Type A remained | : Locally significant |
| Type B remained | : Citywide significance |
| Type C-E were elevated to | : Regionally significant |

*Under Option 2: Filtering Combination*

The method found that at the:

Basic level:
The one large remnant was identified as Regionally Significant

Intermediate level:
Of the five types of remnants identified:

| | |
|---|---|
| Type A (smaller, more fragmented remnants) | : Locally significant (presumed) |
| Type B-D (intermediate sized remnants) | : Citywide significance |
| Type E (large relatively intact remnants) | : Regionally significant |

Advanced level:
As there were over 30 remnants, this level was not done in detail. However, it was considered that the likely outcome would be that a smaller core area of the site would be found to be of Citywide Significance and the remainder to be of local significance.

**Comments on the Two Scoring Options:**

Of the two Scoring Systems, Option 2, the Filtering Combination is considered to be the better option.

***Option 1: Cumulative Threshold Scoring System:***

This is considered to be a more arbitrary method for the scoring system which does not adequately weight the more important criterion nor recognise the critical criteria for each site. In addition, the results listed above for the Coomera LAP area suggest that this method understates the significance of a particular site at the broad scale (ie: basic level) which may result in poor recognition of an area's conservation values. This in turn will have negative implications for regional planning projects.

***Option 2: Filtering Combinations:***

This is considered to be the better option for defining the level of conservation significance because:
- it enables a weighting to be given to the more important criterion;
- it recognises which of the criteria have been triggered to enable a given remnant to be given conservation significance; and
- at least in the Coomera area, it provides a cautious approach whereby the values of an area are flagged at the broader scale of assessment. This is then successfully refined to core areas as more detailed levels of study are undertaken. This results in the automatic application of the 'precautionary principle'.

Under this option, the supplementary criterion could be treated in a similar manner to the other criterion – in particular criterion H: Scheduled Species, I: Other Species and K: Connectivity.

The table should be extended to provide for defining areas as being of local significance.

**Comments on the Reliability of the Conservation Classification System:**

Overall, the Conservation Classification System method worked relatively well for the Coomera Local Area Plan study site with the results being comparable to the findings of other studies.

- The results of the intermediate assessment are supported by the findings of the work done by Ecograph during the preparation of the Gold Coast City Nature Conservation Strategy.

- The results of the advanced assessment would have been similar to the findings of Chenoweth & Assoc. during the preparation of the Coomera Environmental Study.

Appendix **E**

# Project Brief

**Western Regional Organisation of Councils**

# Specific Conditions of Contract

## 1. Aims of the Study

The main aims of the study are:

(a) to develop a common system of classifying the significance of areas for nature conservation purposes, with standardised criteria, utilising standard scales and, as appropriate, methods of assessment and data collection which can be readily integrated into a regional database; and

(b) to ensure that such a system can be used by Local Governments for statutory planning, nature conservation management and other nature conservation objectives.

## 2. Study Tasks

2.1 The consultant shall:

- review existing schema used in the region for classifying areas as of nature conservation significance;
- review resources held by DEH and DNR including the Queensland Herbarium mapping and methodology and the nature conservation eco-system categorisation for use as the basis for a common scheme;
- assess other primary data sources for their usefulness in this process;
- liaise with the Steering Committee over access to member data sources;
- review existing Council and other classifications, criteria and data sets used in the region in terms of potential in a common system; and
- make preliminary recommendations to the Steering Committee on a common approach.

2.2 The Steering Committee shall:

- assess the recommendations, and
- direct the consultant to develop a common system for use in the region.

2.3 The consultant shall:

- develop a common system for use in the region, and
- submit a draft report to the Steering Committee.

2.4 The Steering Committee should:

- obtain legal and academic opinion of the draft report, and
- require the consultant to adjust the draft report to conform as required.

2.5 The consultant shall submit a final report to the Steering Committee.

## 3. Study Management

3.1 The Steering Committee shall consist of representatives from each of the following:

- Brisbane City Council
- NORSROC
- SouthROC
- WESROC
- Nonurban Consultative Committee catchment groups
- Nonurban Consultative Committee environmental groups
- DEH
- DNR
- RLS (2 - one from the RLS Unit and one representing the QCC)

3.2 The Steering Committee will:

- determine the consultant,
- decide the system to be developed,
- obtain the legal and academic review in terms of the aim set out above,
- receive the final report, and
- submit copies of the report to the SEQROC Technical Working Party and each of the bodies represented on the Steering Committee, with a recommendation that SEQROC publish the report.

## 4. Project Management

4.1 Day to day management of the study will be by a project manager provided by WESROC.

## 5. Timing and Reports

5.1 Following commissioning of the study, the consultant shall meet with the Steering Committee to discuss the project. This meeting shall be deemed the commencement date for the purposes of this section.

Six weeks after the commencement date, the consultant shall present a progress report in dot point form to the Steering Committee.

Three months from the commencement date, a draft report at the end of Task 1 should be submitted to the Steering Committee. This will be the basis for a workshop to be run by the consultant with the Steering Committee to inform them of the results and recommendations at that stage.

5.2 The Steering Committee will decide a preferred format for the report and inform the consultant in writing within eight weeks of the workshop.

5.3 The draft final report at the end of Task 3 should be presented to the Steering Committee within four weeks of the Steering Committee informing the consultant in writing of its decision in Task 2.

5.4 The Steering Committee will advise any changes required in the draft final report within four weeks of receipt.

5.5 The consultant shall prepare the final report within four weeks of receiving such advice.

5.6 The consultant shall supply 10 copies each of the progress report, the Task 1 report, the draft final report and the final report at the designated times. A copy of each on disk (Word 6 for Windows format) shall also be supplied.