Biodiversity in the Peel-Harvey Catchment

Part 1 Introduction

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PEEL-HARVEY CATCHMENT COUNCIL (Inc.)

This PDF document has been compiled in segments from the Biodiversity in the Peel Harvey Catchment Final Report

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Summary

The Need

The tectonic history of the Australian continent has created mega-diversity that qualifies Australia as a “global biodiversity hotspot”. The South West Region of the continent is the most frequently recognised bioregion containing incredible diversity that is under threat from co-varying influences. The complex interdependent endemism of flora and fauna challenges the traditional concepts of “adequate conservation” especially in the context of global climatic change.

Australia’s Biodiversity Priorities (ANZECC, 2001) have been ranked as:

1. Undertake strategic field surveys and document patterns in species composition;
2. Identify native species and map ecological communities;
3. Develop direct measures and indicators of change; and,
4. Organise and integrate data and information

The Task

The objective of assessment of the biodiversity assets of the Peel-Harvey Catchment required simple strategic goals that address the above. It has been directed toward the collation of existing data and to design and implement an assessment methodology that will permit refinement and definition as needs direct.

Clearly the pragmatic project goals had to be: 1), achievable in the timeframe; and 2), provide a competent basic framework for continuity of biodiversity assessment strategies and methods.

The outcome is based on assessing remnant vegetation, wetlands and streamlines and provision of data in accessible layers on which to build soundly-based natural resource measurements and management options.

The initial test has been to spatially-assess the biodiversity assets of the Peel-Harvey Catchment and, with the validated examples included in this report, identify gaps and priorities. The simple premise “that to manage you must first measure” has been adopted.

The Expectation

Biological diversity is not well understood or valued by some sections of the community. Popular focus is usually on charismatic mammalian and avarian fauna and pictorial flora. However, this focus fortuitously provides cultural, economic, educational, environmental, scientific and social benefits for the community, as well as providing a fundamental mandate for a better understanding of entire ecological process.

As natural biodiversity has a strong component of perception, and therefore to be meaningful, those perceptions must be translated into measurable and objective targets. Targets set for the South West Region are indeed a reasonable attempt to satisfy public expectation.

The Targets

- No native species or community to become extinct in the wild in the SW NRM region during the next 20 years
- Improve the condition, viability and conservation status of the region's identified natural biodiversity assets by 2024
- An improvement in the condition of the region's significant wetlands by 2024
- No loss of habitat vital to threatened or at-risk native species by 2024
- No loss of extent or condition of native vegetation on land managed for conservation within representative landscapes
- No further loss of poorly conserved ecological types through preventable causes

The Variables

It must also be understood that these targets are made in a setting of increased anthropogenic development pressure, complex pathogenic pressure and insidious global variables. We should recognise that:

- sustained dry periods, like the last quarter century, are the natural variability, as are also sustained wet periods like that experienced in the first half of the last century;
- the natural climate of the 21st Century will exhibit the same variability;
- the anticipated effects of anthropogenic and greenhouse conditions should be overlaid on this variability; and,
- the greenhouse scenario is an expectation of higher temperatures although rainfall prediction models vary, although most models suggest that decline of autumn and winter rain over the SW is likely.

The Assumptions

This study starts with the basic assumption that: **reasonable-sized remnants of relatively pristine native vegetation, wetland and riverine systems will contain enough of the original provenance of biological elements to warrant conservation as a resistant and sustainable example of the ecosystem or unique habitat of interest.**

This hypothesis may have some basic flaws in that the assumption that all of the symbiotic relationships and elements of change have been locked in time for a specific remnant. Conversely it tends to ignore the opportunity and adaptation of many species to altered environments. Many of which support important diversity, albeit with some potentially unstable balance. Avarian diversity in urban and rural situations can provide some very good examples.

The Methods

Therefore the approach that has been taken for this project in the Peel-Harvey Catchment has been to rely on objective measures, in a spatial and temporal context, that have been assembled from various sources.

The Land Monitor dataset is most relevant for the basic underlying structural framework of such an assessment strategy. It is totally objective and temporally consistent, being based on a series of calibrated and registered satellite data,

acquired since 1988, that have been processed to characterise vegetation status and trend. Part Four of this report covers the limitations and accuracy of these data and it is strongly recommended that this be taken into account prior to use.

These data can be made specifically relevant to the regional context of the PHC with the addition of a Digital Elevation Model (DEM) that gives landscape position (or proportions) of each remnant or bioregion. From this land at risk from change elements such as rising water tables and salinity are objectively integrated. Land tenure overlays, as provided by DCLM, DLI and AGMAPS give an indication of static and management characteristics. This framework permits scale refinement and determination of specific value issues and quantification of elements of change.

The Results

The results of this study indicate that, despite the catchment being relatively rich in remnant vegetation, **decline in condition has occurred** in all bioregions; in most landscape positions; and, to most natural major vegetation types; since 1988. It is therefore with this knowledge, an "**aggressively conservative"** approach should be adopted in the maintenance of as much of the existing natural vegetation, in all landform positions and representing all of the bioregions will be the best "insurance policy" for the protection of existing biological systems.

Amendments to the Environmental Act are currently being developed that affect clearing of native vegetation and provide encouragement for revegetation and habitat restoration. However, permits to clear native vegetation will still be possible and various exemptions will exist. How this will be monitored is not clear but the toolbox assembled here can go a long way toward such a goal.

Note: Figures used in this text are adapted from the data layers that will be used in information retrieval systems. They are likely to be amended and as new data are available will be updated or modified. Consequently, it is intended that modified versions will be made available on the Peel-Harvey website at appropriate times and the printed copies will become superseded.

Introduction

A well-accepted definition of biodiversity in *The National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia 1996) – a document that has been endorsed by the Commonwealth and all Australian State Governments – is:

> "The variety of life forms: the different plants, animals and microorganisms, the genes they contain, and the ecosystems they form."

Biodiversity is usually recognised at three levels including **genetic, species** and **ecosystems**. This study clearly starts at the third, and broadest level, with the basic assumption that:

- reasonable-sized remnants of relatively pristine native vegetation, wetland and riverine systems will contain enough of the original diversity to warrant conservation of that example of the ecosystem "jigsaw";
- the concept of "pristine" relies on surrogate indicators of over-story, mid-story and the ground biotic zone being unaffected by external irreversible factors; and,
- that such indicators must be measurable if change or risk is to be assessed or predicted.

Pressure will grow on those natural resources within the Peel-Harvey Catchment (Figure 1.1) that are not presently covered within the current conservation structure. Mandurah, at the mouth of the catchment, is the focus of the development pressure but all over the catchment there are highly visible (urban, industrial, mining) or subtle and insidious (declining rainfall, salinisation, pathogens) elements of change that will threaten the natural biological diversity.

In a recent study, Mandurah was the fastest growing region in Australia with 20.8% annual population growth and 41.4% employment growth. Future development pressure from urban, industrial and intensive agriculture, with the aid of technology, has the potential to accelerate that rate of change as never before. Biodiversity is not valued in commercial terms at property and regional scales in the same way that water availability and quality, soil function, and vegetation function. Biological diversity provides cultural, economic, educational, environmental, scientific and social benefits for all members of our community, as well as being fundamental to the continued evolution of life.

Local public debate usually stems from some conflict over an identified remnant or refugee of natural ecosystem or from some change in expected outcome, probably from an unidentified or unspecific land management action or process. These situations create what is becoming generally accepted as a "Hot-spot".

Paradoxically, the degree of intensity of the debate about the "Hot-spot" is too often inversely correlated to the level of public information of the issues. This project aims to widen the knowledge base with a method to objectively rank the attributes of the systems. Armed with this knowledge better cost:benefit decisions can be considered.

Endemism (*the character or quality of a plant or animal species being indigenous to a specified area)* is becoming the fundamental plank of the ranking of biodiversity. Together with species richness and an assessment of threatening processes a specified area, or region can be incorporated into more widely adopted conservation strategies as CAR (Comprehensive, Adequate, Representative).

The five generic maxims for maintaining biodiversity are just as important in the Peel Harvey Catchment as in any other, albeit the PHC has the added complexity of spanning 3 major bioregions. However, with one major exception - the Pinjarra Plain, there are still some very good examples of ecosystems in relatively pristine condition although threats are abundant. The generally accepted reasons for preserving biodiversity are as follows:

- **Ecosystem processes**–biodiversity underpins the processes that make life possible. Vegetated ecosystems are necessary for maintaining and regulating atmosphere, climate, fresh water, soil and nutrient cycling;

- **Ethics**–current and future human populations do not have the right to deplete natural resources beyond what can be reasonably be renewed; all organisms have a right to exist;
- **Aesthetics and culture**–biodiversity is intrinsic to values such as beauty and tranquility. Many Australians hold the natural environment within their own sense of person;
- **Economic**–plants and animals provide food and attract tourism, they provide medicines, energy and building materials; current use values may have a short-term perspective.
- **Recreation**-there have been shown to direct benefits for human physical and mental health from recreation in natural environments

This primary study sets out to design an assessment methodology for biodiversity assets in the entire catchment that focuses on remnant natural vegetation. This requires significant initial effort to benchmark the size, landscape position, tenure and condition of these assets. To achieve this the integrated spatial data from Land Monitor, DA's Agmap, a DEM and various map sources have been combined with all of the site-specific data and vector files from such sources as the DCLM. Beneath this level of general habitat targets lie many specific landscape position factors that help to refine ranking and risk and this influences the design of the validation process.

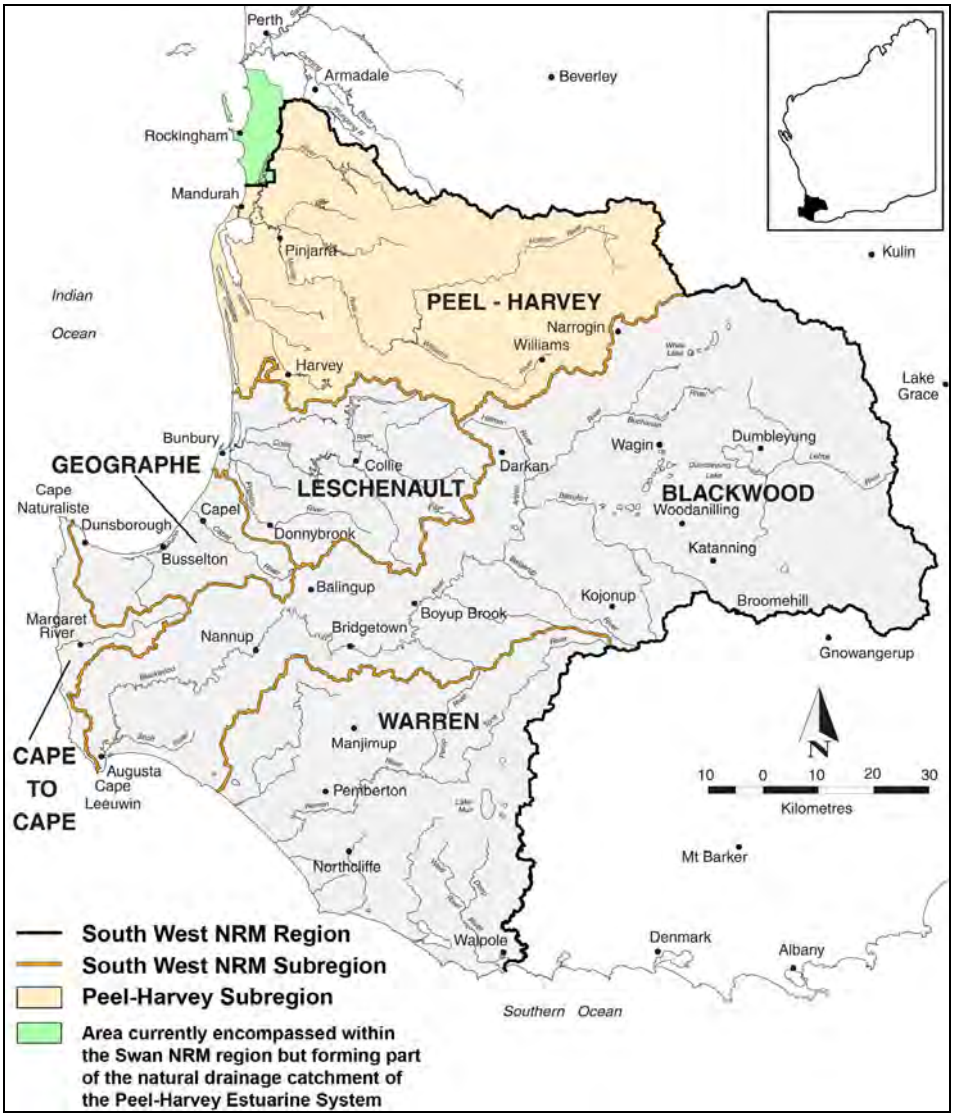
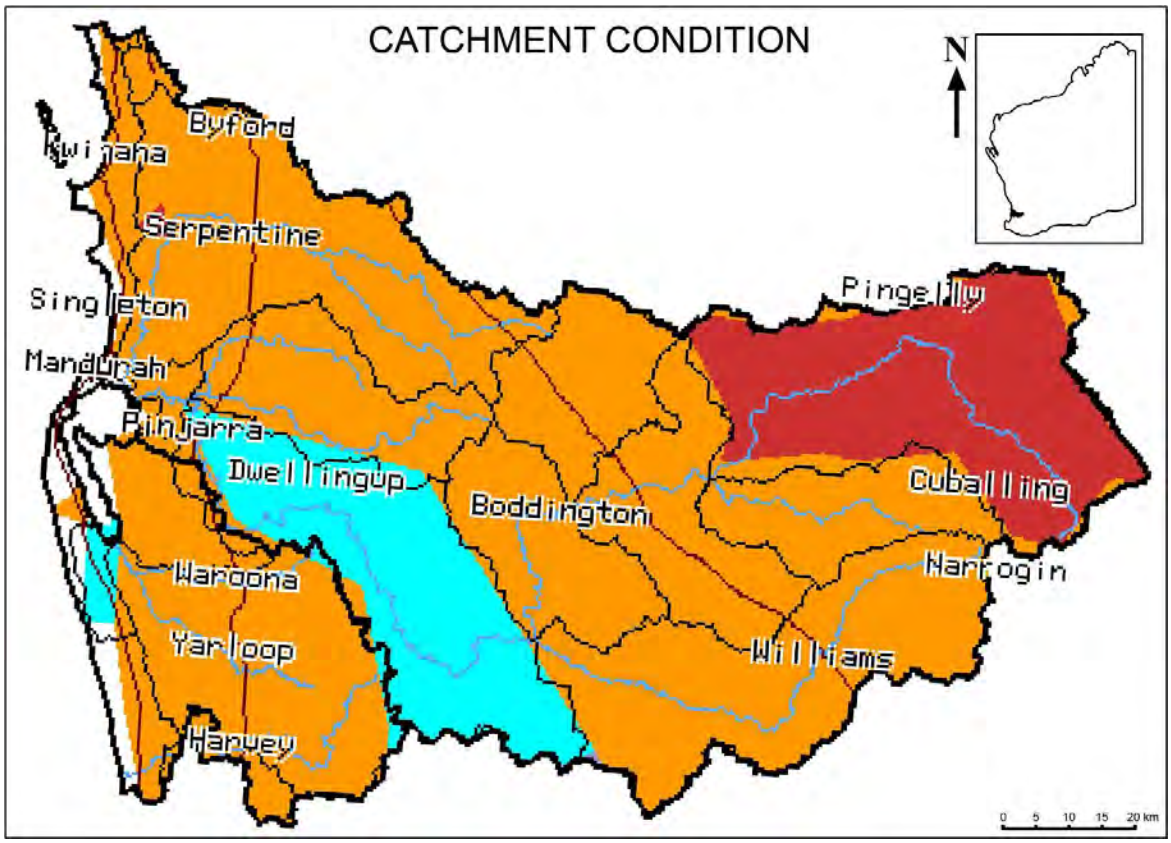


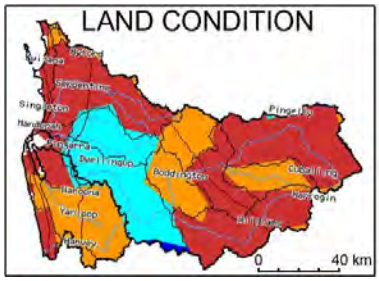
Figure 1.1: The Peel-Harvey Catchment covers approximately 1.15 million ha. It is the Northern portion of the South West NRM region that together makes up the South West Catchment Council (SWCC). *(Source: Land Assessment Pty Ltd)*

Assessing Assets

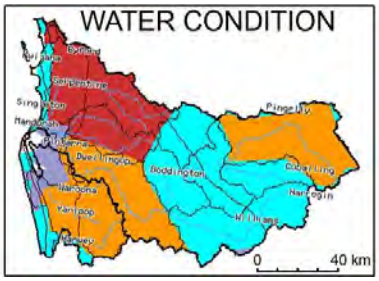
Previous studies reported by the National Land and Water Audit and adapted for Wells (2004) assessed the condition of the assets of the Peel Harvey Catchment in a broad regional context using basic fundamental indicators



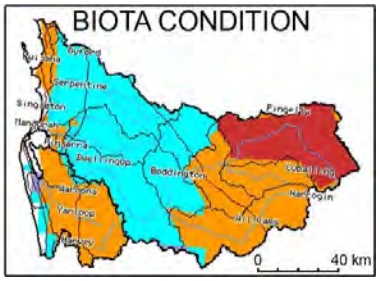
Based on the combination of Land, Water and Biota Condition Sub-indexes.



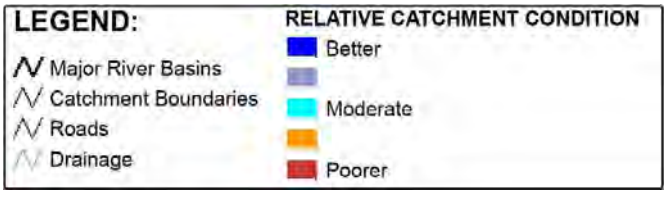
Based on indicators: Predicted 2050 salinity, Soil degradation hazard, and Hillslope erosion ratio.



Based on indicators: Suspended sediment ratio, Pesticide hazard, Industrial point source hazard, and Impoundment density.



Based on indicators: Native vegetation fragmentation, Native vegetation extent, Protected areas, Road density, Feral animal density, and Weed density.



Source: National Land and Water Audit website

Figure 1.2: Catchment Condition

Ranking Assets

The approach taken by a team headed by Ken Wallace at the Department of Conservation and Land Management was presented in a very relevant report "Identification and Ranking of Important Biodiversity Assets – South West Agricultural Region (K J Wallace, B Carr, M Hillier and C Nicholson, 2003) contributes to, and is adapted for the approach of this study.

Despite their admission of the need for further work, the biodiversity asset categories they provide are a useful basis for progression to the next stage of analysis. They have in some cases been slightly modified and this may develop further but the need for regional uniformity is well understood and accepted.

Assets are biodiversity elements that occur at a specific site (can be at a range of scales) and are perceived to be valuable to the community. Given the broad community goal, and the wide range of human values attached to this goal, the sum total of biodiversity assets is taken to be every living thing. This has important implications for how assets are described and evaluated.

In some cases, the scale of management required to conserve an asset is larger than the asset itself. For example, where a biodiversity asset is a living assemblage depending on a wetland, the scale of management may be the whole catchment.

Definition and Description of Assets

As this work is about establishing priorities for the investment of resources, it is important to ask:

"What specific biodiversity assets do we protect, conserve and restore as priorities to meet the goal?"

In answering that question, the need to focus on specific biodiversity assets (living things valuable to humans), and deliberately exclude the regional scale of biodiversity assets is an important paradigm to acknowledge. In this sense, particular environments are needed to conserve particular biodiversity assets, but may not in themselves be an asset as such.

The listing of asset categories is effectively the first act of priority setting.

The draft list of biodiversity categories developed included a long list of things such as:

- Rare native plants, animals and other organisms;
- Rare ecological communities;
- Representative samples of native plants and animals (including common species);
- Plants/animals at the limits of their natural range;
- Uncommon genetic variants;
- Unusual living assemblages;
- "Ancient" species;
- Living natural assemblages that have high levels of biodiversity and/or endemism; and
- A living assemblage that represents a local ecotype.

Biological Criteria

Criteria provide standards to judge whether a thing or a process has certain desired properties, characteristics, or values. Given the complexity of biodiversity and the many ways in which it is valued, the number of criteria that could be used is large and complex. Biologically defined criteria are used in virtually all priority-setting schemes. Some approaches use additional social, economic, institutional, and other criteria.

1. **Richness**: *Species richness refers to the number of species in a given area; the more species, the greater the species richness. Use of this criterion alone (i.e. without additional criteria) implies that all species are of equivalent value, and that areas with more species are of greater value to conservation than areas with fewer species. In isolation, this criterion places no exceptional value on rare or endangered organisms.*

2. **Rarity**: *This criterion is used to assign higher conservation value to the least common genotypes, species, habitats or ecosystems. This criterion also has an advantage in that quantitative information can usually be used. It is common for this criterion to be linked to a threat matrix (as is the case with IUCN categories for rare and threatened taxa) to highlight those taxa or ecosystems that are not only limited in numbers or areas, but are likely to become more uncommon by impending threats. This adds a level of urgency into the prioritisation process, as those that are rare and threatened require more immediate intervention to conserve them, consequently they are usually ranked higher in any prioritisation scheme. In this instance rarity tends to be a physical factor, while threat adds a temporal factor. It is important to realise that rarity, by itself, does not necessarily mandate conservation action, as there are rare species that are not threatened or vulnerable. However rare species, by the nature of their rarity, are more likely to become so.*

3. **Distinctiveness**: *In contrast to rarity, which simply measures the relative quantity of something, distinctiveness is a criterion used to assess the degree of separation of a population, species or ecosystem from its nearest comparable entity. A species, for example, may be numerically common (hence not rare), but could be exceedingly distinct in the sense that it has few, if any, closely related species. This category also includes aspects such as relictual species, species at the limit of their occurrence, outlying habitats etc. Another example is the greater contribution to the conservation of biodiversity made by conserving a plant community with many endemic species (i.e. species found nowhere else in the world) than conserving a community containing many widespread, but only a few endemic species. It is important to note that the SW of WA has many species that are endemic to the region.*

4. **Representativeness**: *This criterion is used to ensure that conservation efforts in a given area, include examples of all species, genotypes, habitats or ecosystems, depending upon the conservation objective. This category is commonly used to design reserve systems containing different biological communities, typical of the region's variety of ecosystems. This criterion may also be used to decide which of two sites within the same ecosystem, has the most representative sample of species and ecosystem processes that characterise that ecosystem*.

Targets set for the South West Region

Biodiversity targets set for the South West Region have been developed to set measurable and objective outcomes that are a reasoned attempt to satisfy public expectation and biological probability.

- No native species or community to become extinct in the wild in the SW NRM region during the next 20 years
- Improve the condition, viability and conservation status of the region's identified natural biodiversity assets by 2024
- An improvement in the condition of the region's significant wetlands by 2024
- No loss of habitat vital to threatened or at-risk native species by 2024
- No loss of extent or condition of native vegetation on land managed for conservation within representative landscapes[1],
- No further loss of poorly conserved ecological types through preventable causes

[1] Representative Landscapes; an agglomeration or group of conservation reserves and other land managed for conservation which contains the full range of soil-landform-vegetation elements within a given area, say 10,000 ha.