

Accounting for Nature Quick Guide

Guidelines for Constructing Regional Scale
Environmental Asset Condition Accounts

WENTWORTH GROUP OF CONCERNED SCIENTISTS
IN ASSOCIATION WITH NRM REGIONS AUSTRALIA

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The Accounting for Nature model

The purpose of creating environmental accounts is to enable society to take practical action to maintain healthy and productive land, freshwater and marine resources.

This *Quick Guide* provides an overview of the steps required to construct, at a regional (landscape) scale, an environmental asset condition account. Comprehensive information describing each Step in detail can be found in the full version of the *Guidelines for Constructing Regional Environmental Asset Condition Accounts* (*Guidelines*). This guide is based on the experience of Australia's natural resource management groups in the regional environmental accounts trial 2013 using the *Accounting for Nature* model.

The Wentworth Group of Concerned Scientists in association with other experts have developed the *Accounting for Nature* model.¹ This model provides a consistent assembly of information at the regional level, allowing for aggregation to state and national levels.

Accounting for Nature places scientific information in an accounting framework which allows policy makers and the community to:

- Better understand complex scientific information;
- Set and evaluate measurable standards and policy targets;
- Estimate the cost of meeting those standards and targets;
- Evaluate the cost-effectiveness of investment decisions; and then
- Monitor progress over time.

Accounting for Nature is built on two concepts:

1. Environmental asset condition is measured both at scales where biophysical processes operate, and at scales where economic and policy decisions are made; and
2. Asset condition accounts are constructed using a common unit of measure – a common currency – so that the relative condition of different assets can be compared in different places, at different scales, using (where appropriate) different indicators.

The common currency is called an **Econd**.² The purpose of the **Econd** is to measure relative change to the condition of each environmental asset in your region to inform management actions and to direct environmental investment. It describes the condition of any environmental asset against a scientific estimate of the condition of that asset in the absence of significant post-industrial human alteration, on a scale between 0 and 100. It does not imply a monetary value, nor does it describe a desired state.

A complete set of resources, including an evaluation of the regional trial is in development and will be available from both www.nrmregionsaustralia.org and www.wentworthgroup.org.

The set will comprise:

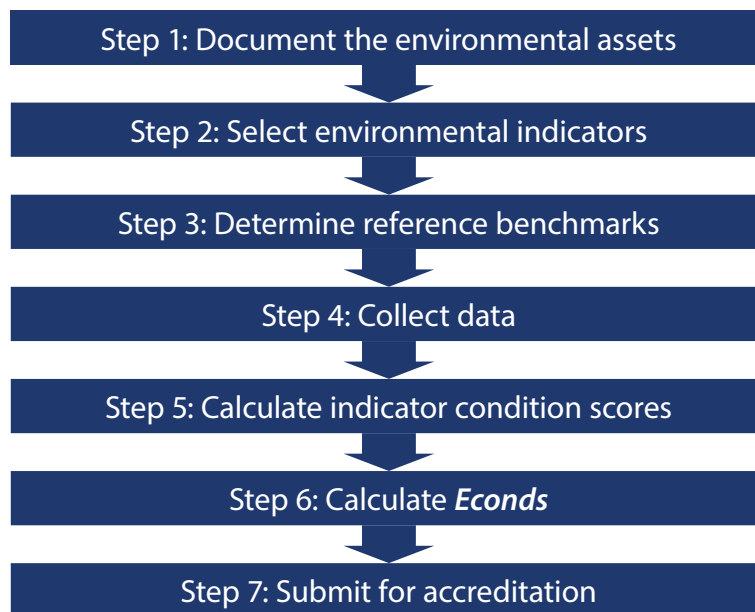
- *Guidelines for Constructing Regional Environmental Asset Condition Accounts*;
- *Technical Paper Series*, providing scientific advice for the accounting of specific assets;
- *Accreditation Manual* that outlines the accreditation process and criteria;
- *Proof of Concept Environmental Asset Condition Accounts*; and
- *Information Statements*, which accompany the regional environmental accounts.

Seven Steps for Constructing Environmental Asset Condition Accounts

The accounting tables, which form the Accounts, are a way to house, calculate and present condition information for assets within your region.

Condition is a scientific measure of the capacity of an environmental asset to continue to provide benefits to society.³ It incorporates elements of both the quantity of an asset (for example, the area of a forest) and the quality of that asset (for example, the diversity of plant and animal species that inhabit that forest).

Regional Environmental Asset Condition Accounts, utilising the concept of the *Econd*, are developed using the following seven steps, outlined in this *Quick Guide*:



The accounts constitute three types of tables:

- Summary tables – outline the *Econds* for each asset class, e.g. Land, Freshwater and Marine, in each year.
- Asset tables – are completed for each asset class, arranged according to individual assets, e.g. vegetation types within the Native Vegetation asset, or sub-catchments within the River asset (see Appendix 1, page 11 of this *Guide*).
- Data tables – used to store and calculate data for specific indicators.

A complete set of Accounts may have multiple Summary, Asset and Data tables, depending on the nature of your region's assets. You may find it helpful to populate the different types of tables concurrently.

An *Information Statement*, which accompanies each regional account, documents the actions taken to populate each of the steps summarised in this *Quick Guide*. The statement provides information on the rationale behind selection of assets, choice of indicators, the origins of the data, the analysis and treatment of data, construction of the *Econd* and account accreditation status. Templates for all the tables which accompany this *Quick Guide* and the *Information Statement* are available from www.nrmregionsaustralia.org

Step 1: Document the environmental assets

The first step is to nominate assets that are used in the account. Environmental assets are biophysical features in the landscape that are measurable in time and space.⁴

Environmental accounts are premised upon selecting assets which represent significant ecological, economic and social value to people in the region.⁵ Thus the process for the selection of assets is a critical step in the development of environmental accounts.

A set of regional environmental assets must be determined through consultation with communities and must accommodate the community-valued assets alongside nationally and internationally-valued assets, such as Ramsar wetlands.⁶ Environmental assets comprise natural resources with economic value (e.g. a forest, a fishery, agricultural soils, or groundwater), ecosystems (native vegetation, rivers, estuaries) and any other feature in nature (such as a species of mammal or bird).⁷

Assets belong to one of five asset classes:⁸

- Land (comprising, for example, soil, native vegetation, native fauna, forest assets);
- Freshwater (comprising, for example, rivers, groundwater, wetlands, floodplains assets);
- Coast (comprising, for example, estuaries, beaches, dunes assets);
- Marine (comprising, for example, fisheries, corals, seagrasses, reefs, marine fauna assets);
- Atmosphere.

'Atmosphere' is included here as an asset class as it is an important natural feature that interacts with the other asset classes.

Selected assets must:

1. Be derived from a consultation process inclusive of a variety of regional stakeholders and the community, incorporate assets of state and national significance and be endorsed by the NRM governing body as being consistent with the region's vision and goals; and
2. Meet the definition of 'environmental asset'; and
3. Be comprehensive enough to collectively describe the condition of the Asset Class in the region (e.g. native vegetation and soil assets sufficiently represent the Land Asset Class).

The rationale for the selection of assets must be documented in your *Information Statement* which accompanies the Accounts. Assets used in the account are documented both in a Summary Table and an Asset Table, which include the number and types of asset and the accounting period (see Appendix 1, page 11 of this *Guide*).

Step 2: Select the indicators

Determining the condition of an environmental asset requires an understanding of the state of an asset at a particular point in time and the direction and rate of change over time. Indicators must provide a means of measuring both the condition of the asset and changes in the condition of the asset.⁹

Indicators should measure both the quantity and the quality of the asset and reflect the asset's vigour (level of ecological productivity), organisation (structure and interactions), and resilience (ability to rebound from a shock).¹⁰ For example, indicators of native vegetation condition may include the extent of native vegetation classes, the composition of the vegetation, such as indigenous plant species richness, number of tree hollows and number and density of pest species, and the configuration of the native vegetation across the landscape. Indicators should be selected based on recommendations in scientific literature and on the advice of experts.

Indicators used in the accounts must be able to measure the condition of the regional asset, and do not have to conform to a uniform set of indicators across the regions unless it is relevant to do so.

The Scientific Accreditation and Standards Committee will assess your chosen indicators against the six Indicator Selection Principles (refer also to Step 7).

Indicator Selection Principles¹¹

1. **Relevant** – the indicator is a measure or surrogate of the condition of an environmental asset appropriate to your region.
2. **Simple** – the indicator is easily interpreted, monitored, and appropriate for your community's use.
3. **Sensitive** – the indicator is able to detect change in the condition of the environmental asset and represent different aspects of the asset.
4. **Measurable** – the indicator is statistically valid and can be reproduced.
5. **Timely** – the indicator shows trends over time, provides early warning of potential problems and highlights future needs or issues.
6. **Aggregative** – the indicator is amenable to combination with other indicators to produce more general information about environmental conditions.

Where it is not possible to meet all six principles, select the indicators you believe, on balance, best meet these principles.

The rationale for the selection of indicators must be documented in your *Information Statement* which accompanies the Accounts. Indicators used in the account are documented in the relevant Asset Table alongside the asset types.

Step 3: Determine the reference benchmarks

The conversion of scientific information into a statistical accounting format is possible through the use of reference benchmarks. Reference benchmarks allow the creation of a standardised numerical unit. This 'common denominator' approach ensures the consistent construction of the **Econd**, even when different indicators and different measures are used for the same asset. In doing so, the benchmarks provide a reference point, or baseline, by which both past and future changes in the condition of an environmental asset can be measured and the relative condition of the assets can be compared across regions.

The reference benchmark is a scientific estimate of the condition of an asset in the absence of significant post-industrial human alteration.^{12,13}

Although the benchmarks must meet the standard definition, the way in which the benchmark measure is sourced may differ between regions and assets. The benchmark measure of an environmental asset can be:

- A fixed point in time (for example, an estimate of its condition prior to industrial development);¹⁴ or
- Observed at reference sites;¹⁵ or
- A scientifically accredited model that estimates the condition of the asset in the absence of significant post-industrial human alteration;¹⁶ or
- In the absence of sufficient data, based on expert opinion. This may be founded on anecdotal observations, data from other locations and/or expert interpretation of incomplete data sets. This method can be used in combination with other methods or in the short-term while data are being collected.

Natural variation may need to be considered and incorporated into the benchmark measure. For example, variation may be expected depending on season, prevailing climatic conditions (e.g. rainfall) or temporal shifts (e.g. decadal shifts).

The method used to measure the reference benchmark and a description of the source of data must be provided in your *Information Statement* which accompanies the Accounts.

Step 4: Collect the data

The environmental accounts are only as good as the data that underpins them. By using quality data you maximise the reliability of the decisions based on that information. By meeting the *Data Quality Standards*¹⁷ you will provide confidence that your data is fit for its intended use and suits its context. However, we do not have, nor will we ever have, enough money to systematically measure everything in nature.

The data used in the regional account needs to be of sufficient precision to reliably inform regional scale policy and investment decisions. Use existing data where relevant and available, when it meets the data quality standards.

Where existing data is insufficient you will need to collect new data. Consult available literature for appropriate methodologies, or seek advice from the Scientific Standards and Accreditation Committee to confirm that your proposed sampling program meets the data quality standards.

Data quality standards^{18,19}

1. Field data should be collected under appropriately designed sampling programs that: are fit for the issue, question or hypothesis of interest; are of an acceptable spatial and temporal resolution; can be repeated; and can detect change.
2. Data sets should be suitably accurate and precise, statistically valid and reproducible.
3. Data sets should be treated and analysed to accepted standards.
4. Data should be managed in a way to be retrievable and accessible.

It is important to ensure that the units of measure for the reference benchmark are the same as those for the indicator (i.e. if you are measuring native vegetation extent in hectares then the reference benchmark will also be in hectares).

The rationale for selection of data, the details of the data provider and description of data analysis must be documented in your *Information Statement* which accompanies the Accounts, preferably using a standardised metadata, such as the ANZLIC metadata profile.²⁰

This *Information Statement* should describe the data and provide a rapid way to assess that data's fitness for its specific purpose, document the assumptions made as part of the analysis and describe the level of confidence associated with use of the data. Further information on describing data confidence can be found in the *Guidelines*.

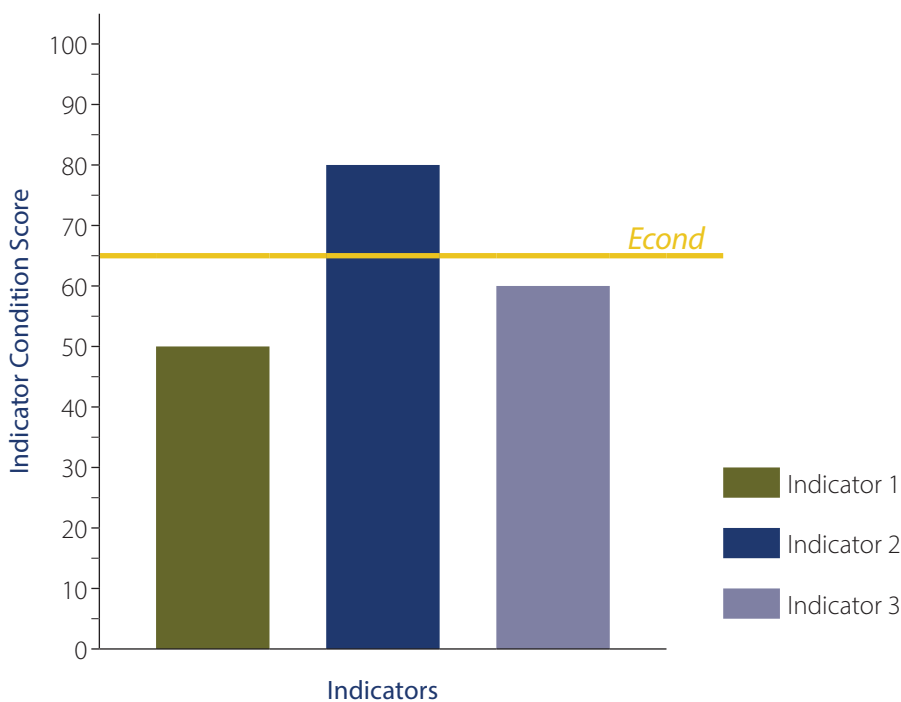
Step 5: Calculate the indicator condition scores

The indicator condition score is calculated by measuring the level of departure of the measured indicator from the reference benchmark and is calculated for each indicator of each asset.

Indicator condition scores document the state of each indicator at a particular point in time. The indicators (and therefore the indicator condition scores) reflect individual aspects of the asset's condition, which provide a means of determining cause of environmental change. For example, a low 'pH' indicator condition score compared to the higher scores for 'erosion' and 'organic carbon' may demonstrate that acidification is the primary driver of poor soil condition in a particular region (Figure 1).

An indicator condition score is a number between 0 and 100, where 100 is the reference benchmark for each indicator, and 0 indicates system function is absent.²¹

Figure 1: Individual indicator condition scores for an asset



There are several methods for calculating the indicator condition score. The method used may vary on the specific nature of the indicator, the method of sampling, or the advice of experts.

Further information on calculation of indicator condition scores can be found in the *Guidelines*.

A description of how the indicator condition scores were calculated must be provided in your *Information Statement* which accompanies the Accounts.

Step 6: Calculate the *Econds*

The purpose of the *Econd* is to measure the relative change of the condition of each environment asset in your region to inform management actions and to direct investment decisions.

The *Econd* is calculated by combining the individual indicator condition scores in a meaningful way to provide a representation of the condition of the asset as a whole.²²

An *Econd* describes the relative condition of any environmental asset at any scale against a scientific estimate of the condition of that asset in the absence of significant post-industrial human alteration (the reference benchmark).

An *Econd* is a number between 0 and 100, where 100 indicates the asset is in the same condition as it was prior to significant post-industrial human alteration, and 0 indicates system function is absent.²³

An *Econd* is calculated for the categories within the asset (e.g. for each subcatchment in the rivers asset, for each native vegetation type in the native vegetation asset, or for each land management unit within the soils asset). These are then assembled to generate an overall *Econd* for each asset in a region (e.g. for rivers, for native vegetation, for soils).

There are several methods for calculating the *Econd*. The method used may vary on the specific nature of the asset, the presence of identified thresholds, or the advice of experts.

An *Econd* can be generated by:

- Taking the arithmetic mean (the average) of the indicator condition scores;²⁴ or
- Taking the geometric mean or the lowest performing indicator of the indicator condition scores; or
- Spatially scaling the overall *Econd*, expressed as a proportional percentage of the total area (if your asset can be divided by area e.g. forest); or
- Using expert rules,²⁵ where scientific literature and/or experts have developed processes for how indicator condition scores are combined into an overall index (e.g. Sustainable Rivers Audit); or
- Combining scientifically accredited weighted indicators^{26,27} (e.g. Index of Wetland Condition).

Further information on the calculation of *Econds* can be found in the *Guidelines*. The methodology used to combine the indicator condition scores to formulate the *Econds* must be documented in your *Information Statement* which accompanies the Accounts.

Step 7: Submit the accounts for accreditation


Upon completion of Steps 1-6, an account must then be submitted to the Scientific Standards and Accreditation Committee, who assess each account against standards for data quality and confidence.²⁸ The Scientific Standards and Accreditation Committee is an independent body comprised of scientific experts established to assess regional environmental accounts.

The *Accounting for Nature* model requires any environmental account, at any scale, to be accredited by an independent scientific body against national environmental accounting standards. Each asset receives a quality grading so that policy makers can have confidence that the data contained within the account meets a minimum standard.²⁹ Accreditation standards are provided in the *Accreditation Standards Manual*.

An account comprises the accounting tables, the *Information Statement* which documents the processes undertaken to construct each account, and visual presentations of the data in the form of maps and graphs which help to interpret the accounts (see Appendix 1 and 2).³⁰

Appendix 1: Structure of the accounts

This example outlines the features of an Asset Table. The boxes in **BLUE** indicate the relevant Step for constructing an environmental asset condition account, outlined in this *Quick Guide*.

Asset (See Step 1)		Reference benchmark (See Step 3)		Indicator Condition Score (See Step 5)		
Indicator (See Step 2)				Data (See Step 4)	Econd (See Step 6)	
NATIVE VEGETATION ASSET ACCOUNT - EYRE PENINSULA, SOUTH AUSTRALIA - 2012						
						
Asset Category	Indicator of Asset Condition (unit of measure)	Reference Benchmark	% Total Area	2012		
				Condition Measure	Indicator Condition Score	Econd
Eyre Peninsula Region		5,130,353				25.0
Arid & semi-arid acacia low open woodlands & shrublands with chenopods						
	Extent (Ha)	186,558	3.6	165246	89	62
	Composition (index)	100		66.30	66	
	Configuration (index)	100		73.62	74	
Arid & semi-arid hummock grasslands						
	Extent (Ha)	23,320	0.5	5013	21	11
	Composition (index)	100		59.67	60	
	Configuration (index)	100		46.67	47	
Callitris forests & woodlands						
	Extent (Ha)	23,320	0.5	17595	75	42
	Composition (index)	100		62.80	63	
	Configuration (index)	100		48.17	48	
Casuarina & Allocasuarina forests & woodlands						
	Extent (Ha)	233,198	4.5	30911	13	7
	Composition (index)	100		54.40	54	
	Configuration (index)	100		50.67	51	
Chenopod shrublands						
	Extent (Ha)	233,198	4.5	190628	82	52
	Composition (index)	100		61.16	61	
	Configuration (index)	100		66.01	66	
Eucalyptus low open woodlands with tussock grass						
	Extent (Ha)	46,640	0.9	148	0	0
	Composition (index)	100		55.54	56	
	Configuration (index)	100		32.28	32	
Eucalyptus forests & woodlands with grassy understorey						
	Extent (Ha)	46,640	0.9	8130	17	9
	Composition (index)	100		69.91	70	
	Configuration (index)	100		35	35	
Eucalyptus woodlands with shrubby understorey						
	Extent (Ha)	46,640	0.9	13112	28	15
	Composition (index)	100		69.73	70	
	Configuration (index)	100		35.14	35	

Appendix 2: Visual presentations of the accounts

Figure 2 (below right): Graphical presentation of native vegetation *Econd*s for the Queensland Murray-Darling basin, Queensland. The native vegetation assets are arranged with lowest *Econd* on the left and highest *Econd* on the right. Adapted from Blackley, R.M. (2013) Queensland Murray-Darling Committee Regional Environmental Account Trial, Proof of Concept Account 2013. Adapted with permission.

Figure 3 (below): Spatial presentation of native vegetation *Econd*s for the Queensland Murray-Darling basin, Queensland. The darker colour represents those native vegetation assets in better condition (higher *Econd*). Adapted from Blackley, R.M. (2013) Queensland Murray-Darling Committee Regional Environmental Account Trial, Proof of Concept Account 2013. Adapted with permission.

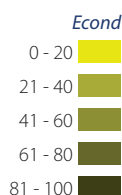
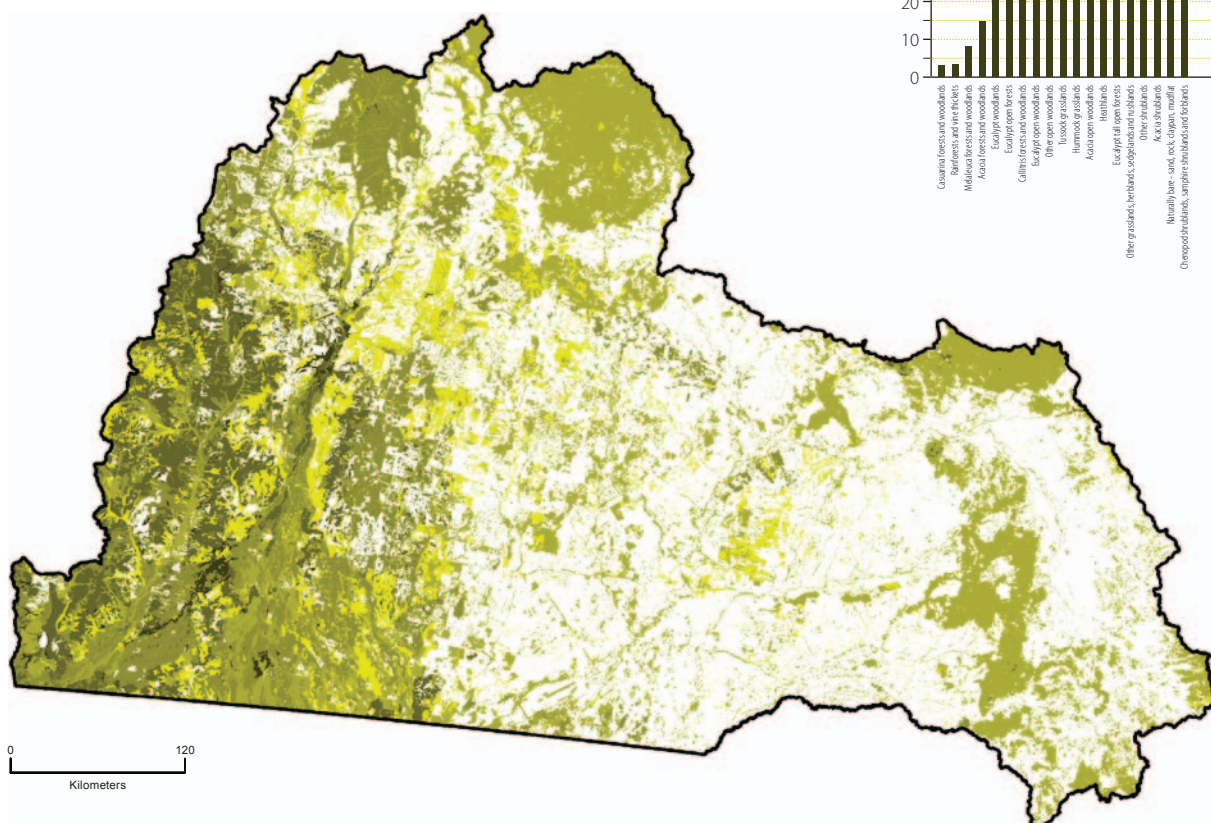
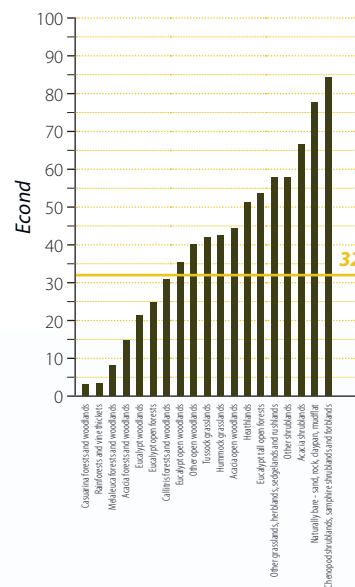


Figure 4 (below): Graphical presentation of native vegetation **Econds** for the Northern Agricultural Region, Western Australia. The native vegetation assets are arranged with lowest **Econd** on the left and highest **Econd** on the right. Adapted from Jackson, E. (2013) Northern Agricultural Catchments Council Regional Environmental Account Trial, Proof of Concept Account 2013. Adapted with permission.

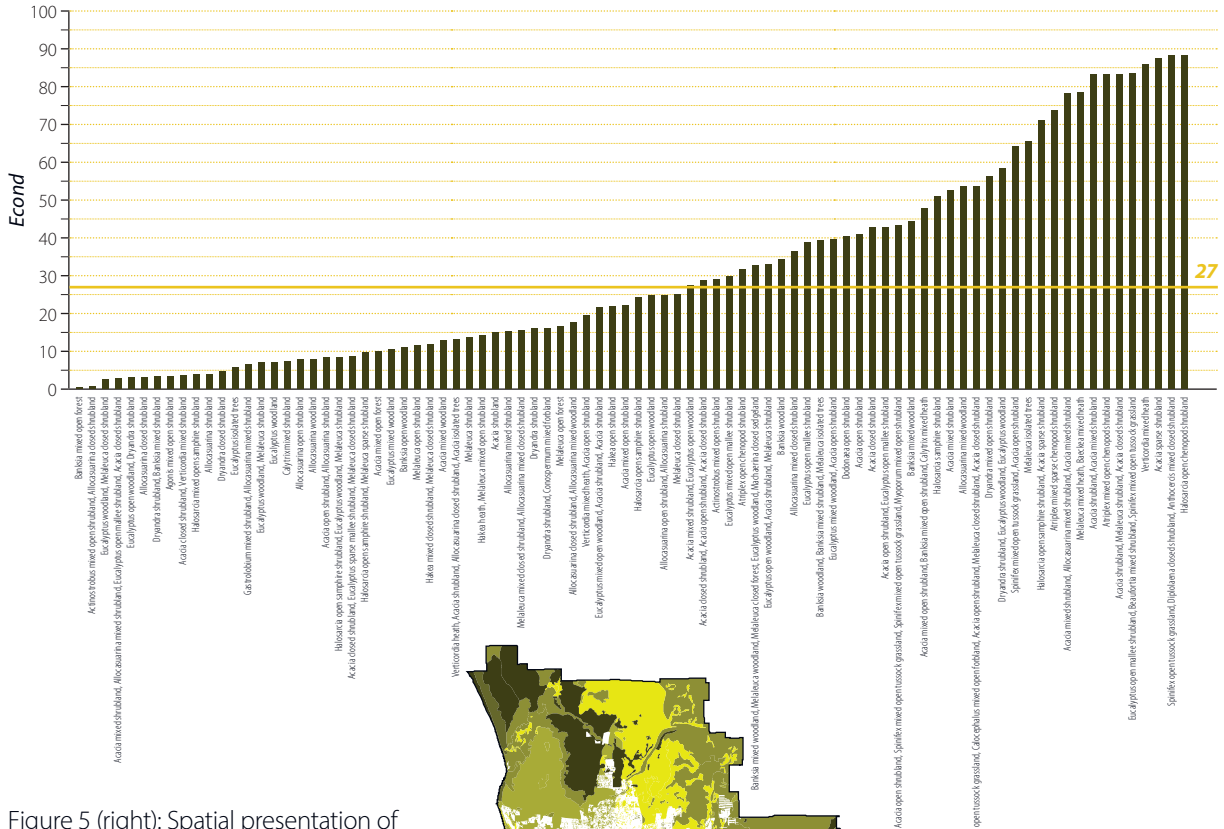
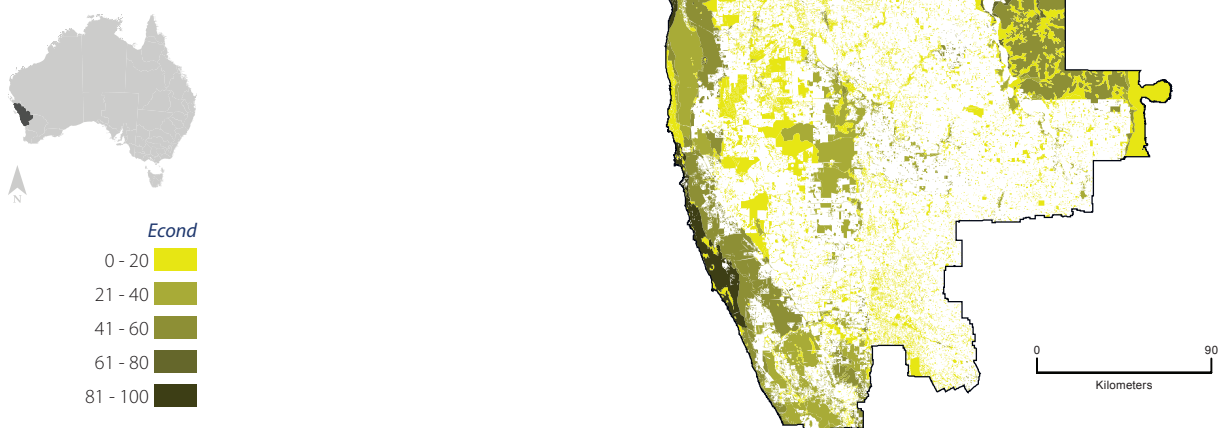


Figure 5 (right): Spatial presentation of native vegetation **Econds** for the Northern Agricultural Region, Western Australia. The darker colour represents those native vegetation assets in better condition (higher **Econd**). Adapted from Jackson, E. (2013) Northern Agricultural Catchments Council Regional Environmental Account Trial, Proof of Concept Account 2013. Adapted with permission.



Visual presentations of the accounts continued

Figure 6: Native vegetation **Econds** and indicator condition scores for the Eyre Peninsula, South Australia. Adapted from Poole, E. and Weibkin, A. (2013). Eyre Peninsula Natural Resources Management Board Regional Environmental Account Trial, Proof of Concept Account 2013. Adapted with permission.

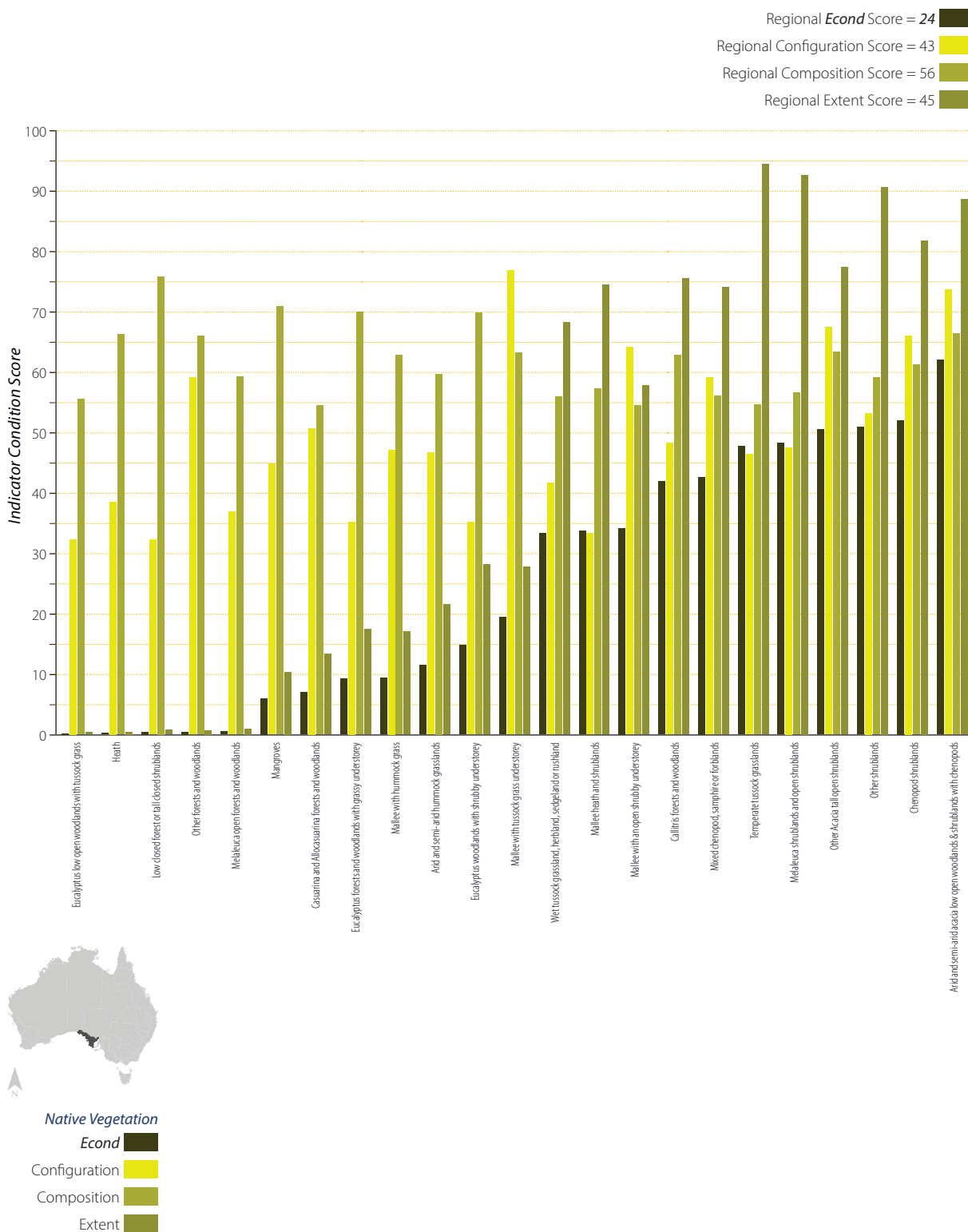
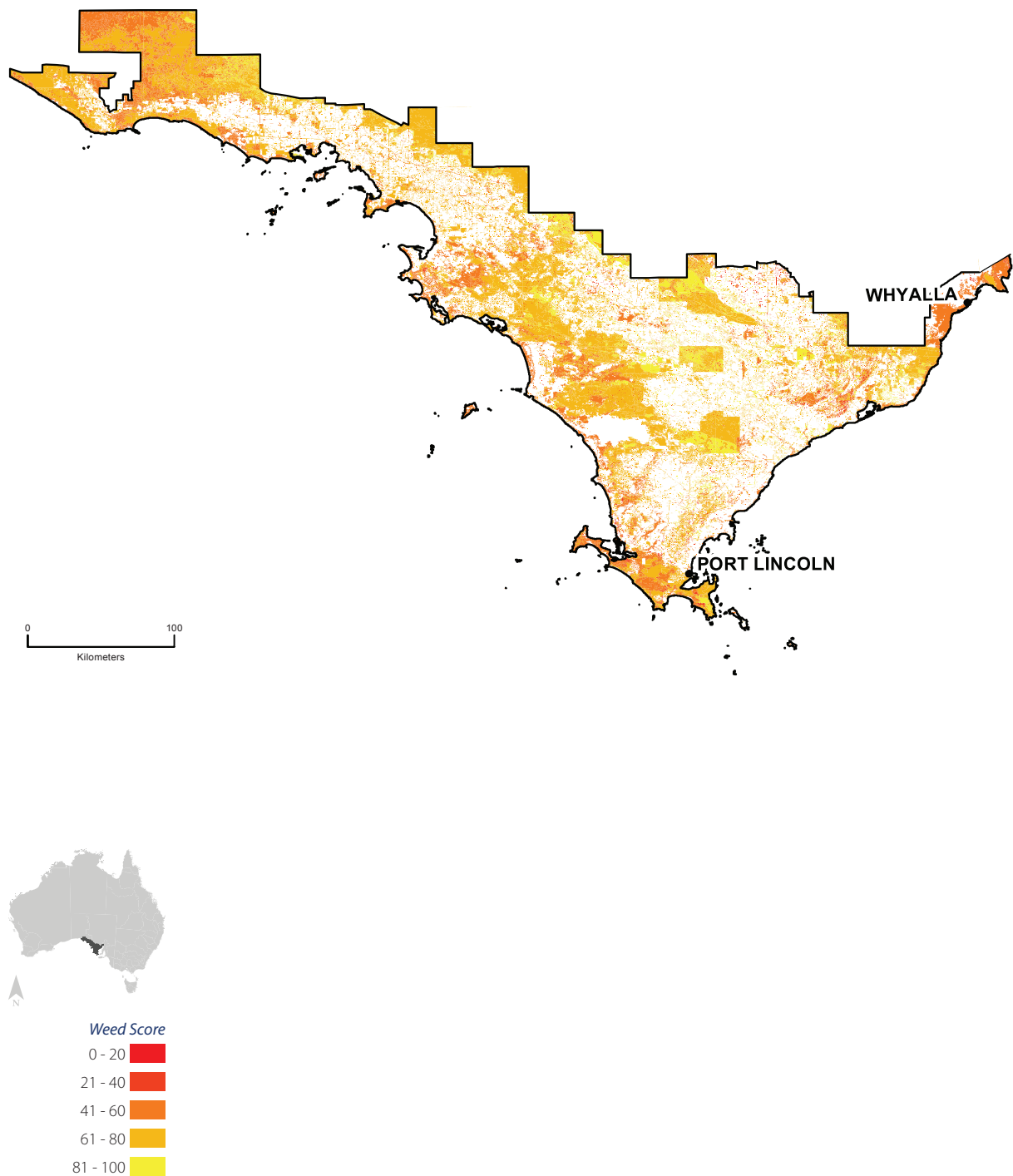


Figure 7: Map of the impact of weeds on the condition of native vegetation in Eyre Peninsula, South Australia. The darker the colour the more severe the weed infestation. This information is contained in the native vegetation asset account because weed severity is one indicator of native vegetation condition in this region. Adapted from Poole, E. and Weibkin, A. (2013). Eyre Peninsula Natural Resources Management Board Regional Environmental Account Trial, Proof of Concept Account 2013. Adapted with permission.



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