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Private sector trials of *Accounting for Nature*, and links with national environmental economic accounts

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Introduction

In 2008, the Wentworth Group of Concerned Scientists published the *Accounting for Nature* model. This model was designed with the objective of establishing a practical, affordable and scientifically robust method for applying scientific information about the biophysical condition of environmental assets (e.g. native vegetation, soil, rivers, estuaries, fauna) into an accounting framework. Environmental condition accounts are critical to the success of the UN System of Environmental Economic Accounting (SEEA) because they provide the foundation for measuring the flow of ecosystem services that those assets provide to society, and valuing the benefits they provide.[1, 2]

In 2015, Australia's Regional Natural Resource Management authorities, in cooperation with scientists, economists and statisticians in universities and Commonwealth and state government agencies, completed a 5-year continental scale landscape (ecosystem) scale trial to test the practical application of the *Accounting for Nature* model.[3] This trial formed the basis of a revised methodology published in 2016.[4]

The next step was to examine the feasibility of developing private sector environmental condition accounts using the *Accounting for Nature* methodology. Condition accounting at the enterprise scale is essential for understanding the cumulative impacts of management and investment decisions which drive ecosystem degradation at a landscape scale. The goal of the private sector trials is to evaluate how the *Accounting for Nature* model can be used as a cost effective pathway for industry, farmers and conservation managers to measure the condition of environmental assets that underpin the sustainability of their businesses.

The Wentworth Group collaborated with three private sector enterprises as part of a new trial: Kilter Rural, a $A250 million agri-business who manage mixed irrigated cropping and environmental grazing across aggregated farms in northern Victoria; Austral Fisheries who operate a Marine Stewardship Council certified Patagonian toothfish fishery in the World Heritage Heard Island and McDonald Islands region in the Southern Ocean; and the Tasmanian Land Conservancy for their 11,100 ha Five Rivers Reserve located within the Tasmanian Wilderness World Heritage Area.

This paper describes the outcomes of these trials using case studies, describes new condition accounting concepts that arose from the trials, and discusses the benefits of linking landscape (ecosystem) scale and enterprise (property) scale environmental condition accounts to inform policy settings, underpin ecosystems services markets, and support investment and management decisions.

Application of *Accounting for Nature* at landscape and enterprise scales

Accounting for Nature is a method for building biophysical condition accounts using a common unit of measure (an *Econd*). An *Econd* is an index that describes the condition of any environmental asset at any scale, enabling scientific information to be placed into an accounting framework. Asset-based condition accounting approaches are used in international standards and agreements such as the UN System of Environmental Economic Accounts (SEEA),[5] and the Convention on Biological Diversity.[6] This section documents case studies showing the application of the asset-based *Accounting for Nature* condition accounting model at a landscape (ecosystem) scale and enterprise (property) scales as consistent with the SEEA.

Landscape (ecosystem) scale asset condition accounts

In 2010, ten of Australia's 54 Natural Resource Management regions piloted the *Accounting for Nature* method. By 2015, regional environmental asset condition accounts were completed for native vegetation, native fauna, soil, rivers, wetlands, estuaries, and marine fauna (e.g. Figure 1). Accounts were accredited by an appropriate scientific body against draft accounting standards. The trial made progress in demonstrating that it is practical to establish a robust and on-going national program to measure the condition of Australia's environmental assets. The trial also demonstrated the multiple benefits of environmental accounting at a landscape scale, including improved understanding of the environment, informed policy and investment decisions, and greater understanding of the impact and effectiveness of policies and investments on environmental assets over time. The accounts, information statements and technical reports including draft standards are available online (www.wentworthgroup.org/programs/environmental-accounts/).[7]

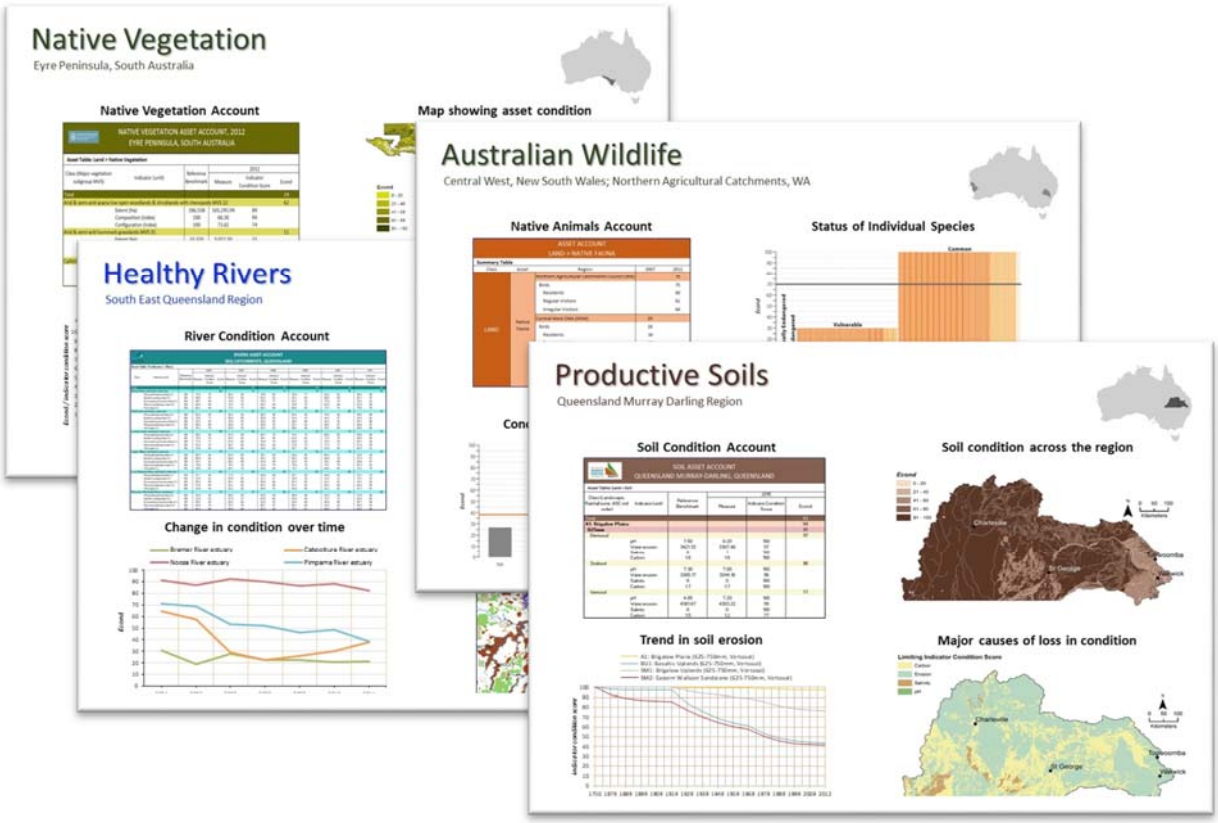

Figure 1. A selection of report cards from the regional environmental accounts trial, showing the condition of four assets across Natural Resource Management regions in Australia: (1) native vegetation in Eyre Peninsula, South Australia, (2) rivers in South East Queensland, (3) native fauna in Central West in New South Wales and Northern Agricultural Catchments in Western Australia and (4) soil account in the Queensland Murray-Darling Basin region.

Enterprise (property) scale asset condition accounts

In 2017, three case studies were undertaken to test the applicability of the *Accounting for Nature* model at enterprise scales. The Wentworth Group collaborated with (1) Kilter Rural, who manage 9,000 ha of farmland in northern Victoria spanning 35 farms (www.kilterrural.com); (2) the Tasmanian Land Conservancy, for their Five Rivers private conservation reserve located in Tasmania's Central Highlands (www.tasland.org.au); and (3) Austral Fisheries, to develop an environmental account for the Patagonian toothfish fishery in the Heard Island and McDonald Islands region (www.australfisheries.com.au)

Winlaton Future Farming Landscape (FFL) in northern Victoria, managed by Kilter Rural

Kilter Rural is a specialist rural land fund manager, founded in 2004 to provide returns to investors through Australian farmland, water and ecosystem investments. Kilter Rural's Winlaton properties in the Kerang - Lake Boga region of Northern Victoria span 35 farms covering nearly 9,000 hectares (Figure 2). The properties comprise agricultural land (irrigated summer cropping and winter cereals); low impact grazing on native forage; and protected biodiversity. Situated on an ephemeral floodplain, the Winlaton properties were in a denuded and low production state prior to acquisition by Kilter Rural during the period 2007 to 2012.

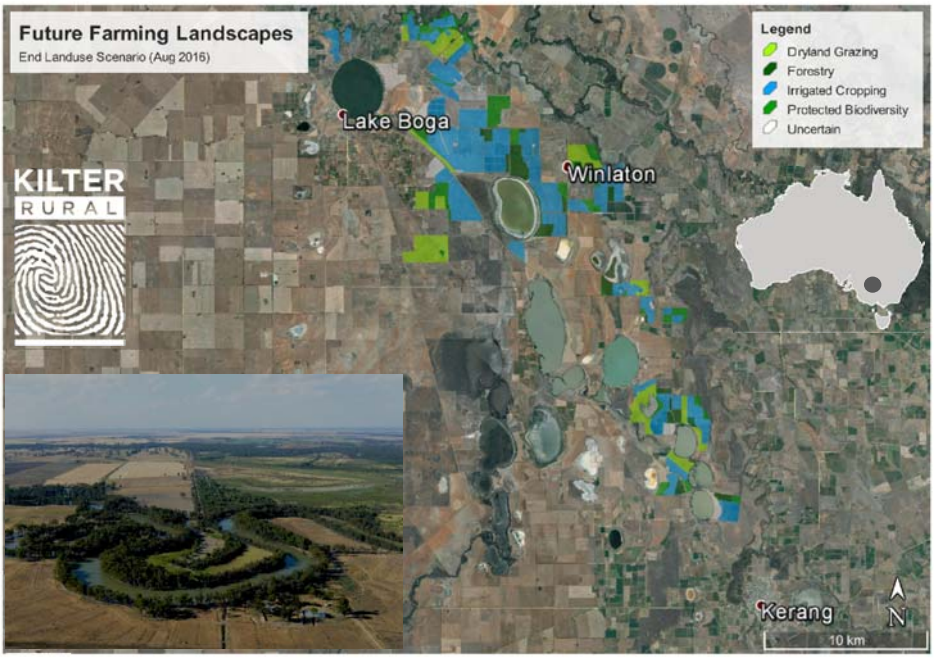

Figure 2. Map showing generalised land use across Kilter Rural's Winlaton properties in northern Victoria.

Since 2017, Kilter Rural has trialed the implementation of the *Accounting for Nature* model to underpin a regular assessment of environmental asset condition across the Winlaton farms. Their objective is to account for changes in condition of four environmental assets over time (native vegetation, soil, water, native fauna) and report publicly on how their practices are affecting the condition of the environment for agriculture production and ecosystem health.

In 2018, Kilter Rural compiled accounts for native vegetation assets and soil assets of the Winlaton farms for the years 2007 and 2018. A third account encompassing the water asset is currently in

development, while a fauna account has not yet been developed. For the native vegetation account, the asset was classified into 10 ecological vegetation classes of the Victoria Riverina and Murray Fans bioregions. For the soil account, the asset was grouped into three classes: black cracking clays (vertosols) on the lower floodplain; grey cracking clay on the higher floodplain; and loam on medium clays (sodosols) on isolated low rises.

For each asset, indicators were agreed by scientists in consultation with land managers at an expert workshop in September 2017. Indicators for native vegetation condition were based on the protocol that was developed and used in the continental-wide landscape scale trial: extent (quantity), composition (structure and diversity), and configuration (placement).[8] Four out of a possible seven indicators of soil condition were agreed for the trial account: physical integrity (structure), soil carbon, salinity, soil acidification.[3] A further three indicators of soil condition (erosion, nutrients, biology) were not included in the account because of low relevance (erosion) and lack of readily available data (nutrients, biology). The erosion is of low relevance because the properties are located on a floodplain which is classified as a depositional landscape.

Information in this account was sourced from a combination of remote sensed (satellite) data and on-ground sampling, either routinely collected as part of normal farm operations (such as soil condition) or readily collected by farm personnel (e.g. paddock vegetation). Quality assurance scores were ascribed to each indicator. Methods for developing the accounts are detailed in the information statement.[9]

A summary of results for the condition account are shown in Figure 3 to Figure 6. The condition of vegetation across Kilter Rural's Winlaton properties increased by 15.6 *Econds*, from 4.6 in 2007 to 20.4 in 2018 – an average improvement in condition of 1.6% per annum. Active management to restore native vegetation has contributed to an increase in the *Econd* from an estimated 50 in 2007 to 59.7 in 2018 – an average improvement in soil condition of 1.0% per annum. This was likely to be largely driven by management actions by Kilter Rural to improve soil function on cropping lands, as well as climate-driven improvement in soil salinity due to the flushing of accumulated salts by the 2011 Lower Loddon flood following the Millennium Drought. The account and information statement are currently being reviewed by a scientific accreditation panel.[9]

Vegetation type (ecological vegetation community)	Pre-1750			2018					
	Extent Ha	% Farm	Econd	Extent Ha	% Farm	Extent ICS	Composition ICS	Configuration ICS	Econd
Total	8,959	100.0%	100	4,781	53.4%	53.4	17.0	30.8	20.4
Chenopod Grassland	1807	20.2%	100	1,103	12.3%	61.0	15.9	36.1	21.0
Grassy Riverine Forest/Riverine Swamp Forest Comp	124	1.4%	100	61	0.7%	49.3	17.2	26.8	19.6
Lake Bed Herbland	3	0.0%	100	3	0.0%	100.0	33.3	50.0	37.5
Lignum Swampy Woodland	368	4.1%	100	173	1.9%	47.0	14.6	30.7	18.6
Lignum Wetland	25	0.3%	100	25	0.3%	100.0	44.4	50.0	45.8
Plains Savannah	137	1.5%	100	132	1.5%	96.2	27.7	64.4	36.9
Ridged Plains Mallee/Woorinen Mallee	61	0.7%	100	61	0.7%	99.2	27.6	50.0	33.2
Riverine Chenopod Woodland	5392	60.2%	100	2,425	27.1%	45.0	16.0	25.9	18.5
Semi-arid Chenopod Woodland	915	10.2%	100	687	7.7%	75.0	21.3	41.0	26.2
Semi-arid Woodland	127	1.4%	100	112	1.2%	88.1	25.2	42.1	29.4

Figure 3. Asset table from Kilter Rural's native vegetation account showing *Econds* and indicator condition scores (ICS) for assets across the 35 Winlaton properties.

Soil	ICS	*Econd*
Total		60.3
Physical Integrity	66.64	
Carbon	60.17	
Salinity	47.77	
Acidification	66.68	

Figure 4. Asset table from Kilter Rural's soil account showing the *Econd* and indicator condition scores (ICS) for assets across the 35 Winlaton properties.

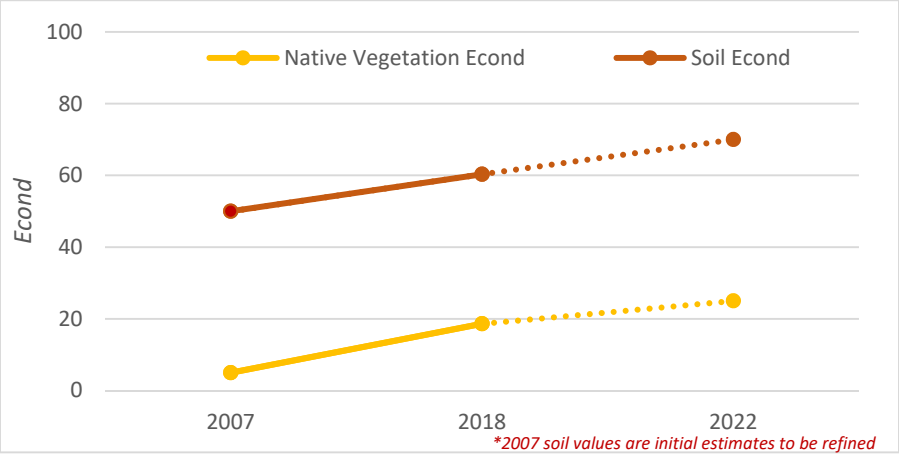

Figure 5. Trend in native vegetation and soil *Econds* between 2007 and 2018, with 2022 management targets.

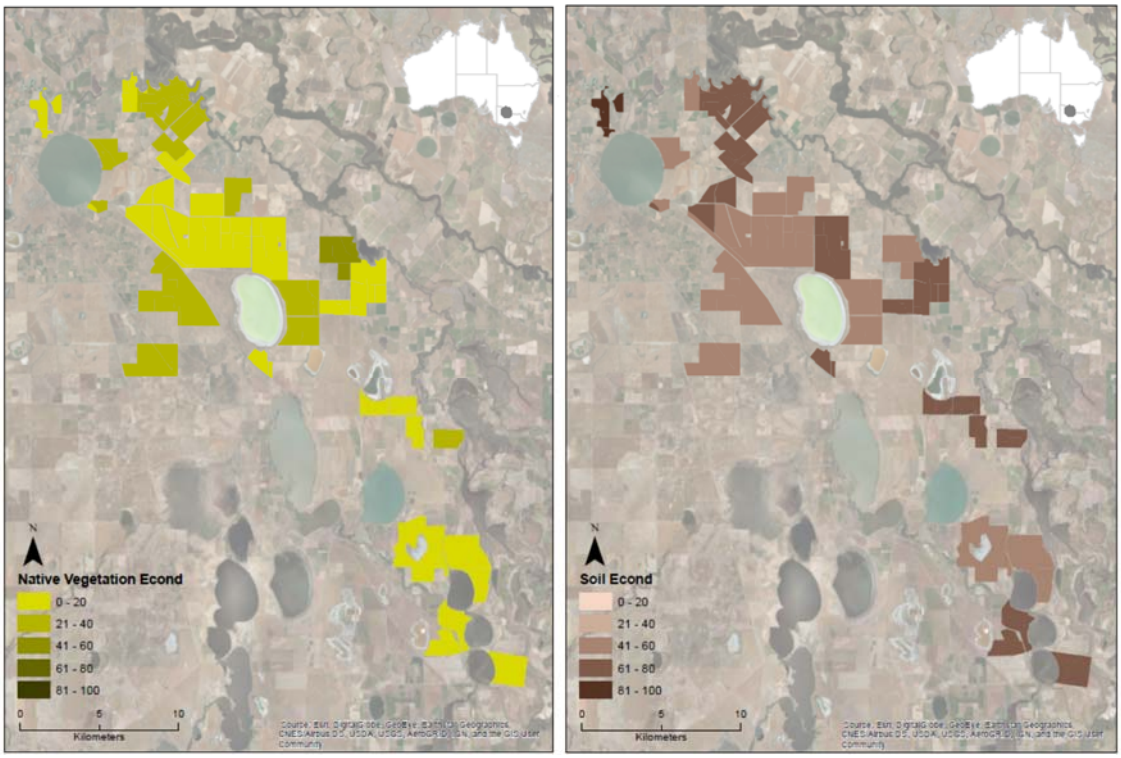

Figure 6. Maps showing condition of native vegetation (left) and soil (right) across Kilter Rural's Winlaton properties (in *Econds*) based on the 2018 environmental account.

Five Rivers Reserve in Tasmania's Central Highlands, Tasmanian Land Conservancy

The Five Rivers Reserve located in Tasmania's Central Highlands covers an area of 11,113 hectares (Figure 7). The reserve is situated at elevations ranging from 600 metres to over 1,100 metres, receives an average of 2,500 mm of rainfall per year and experiences prolonged frost and heavy snowfalls in winter. The Five Rivers Reserve was acquired by the Tasmanian Land Conservancy (TLC) in 2011 as private freehold land and is now managed as a permanent conservation reserve. Part of the reserve - 'Skullbone Plains' - has World Heritage status and is included within the Tasmanian Wilderness World Heritage Area. The remainder of the reserve adjoins the World Heritage boundary. The Reserve has a range of other neighbouring land tenures including State and private conservation reserves, State and privately managed forests, pastoral land, private shacks, hydro-electricity impoundments and lagoons.

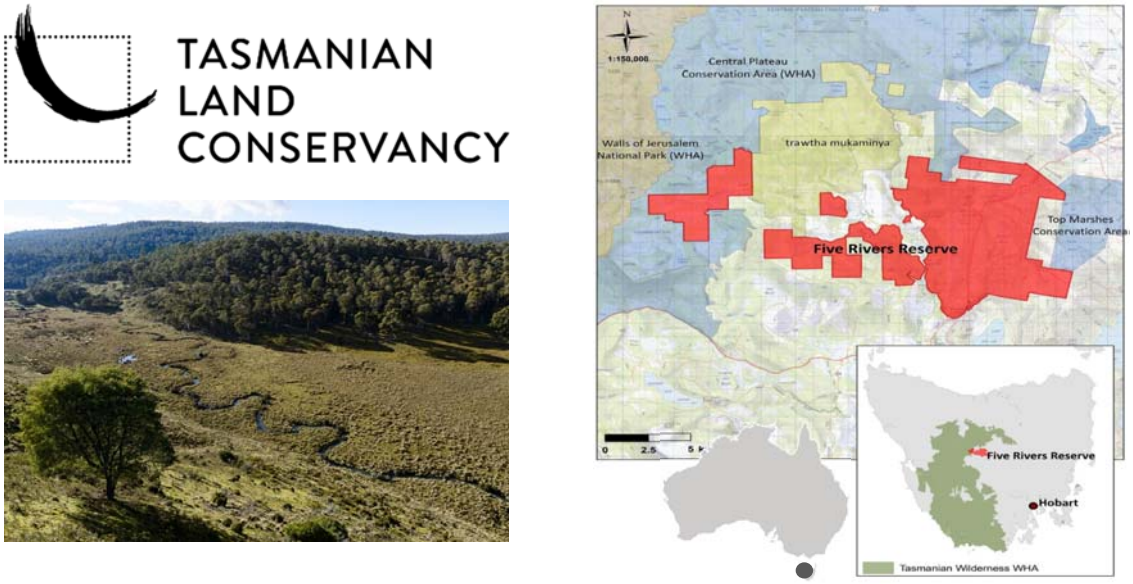

Figure 7. Location of the Five Rivers Reserve in Tasmania's Central Highlands, Australia.

The TLC applied the Wentworth Group's *Accounting for* Nature model to the Five Rivers Reserve ecological monitoring data to help inform their management priorities[10] and to more easily communicate this information to their supporters. The Five Rivers Management Plan was approved by the TLC's Conservation Science and Planning Advisory Council in 2014. It describes the conservation values ("assets") of the reserve and guides the management actions needed for their protection. An ecosystem monitoring program was installed in 2014 to provide reserve managers with information about the changing condition of ecosystems of the Five Rivers Reserve, the threats they face, and the effectiveness of conservation management actions.

Environmental assets presented in TLC's environmental account sourced from the priorities set in the reserve management plan: native vegetation, native mammals, and rivers and wetlands. Three classes of native vegetation assets were identified for the account: highland forests, highland marshes and riparian zones. Three groupings of native mammal were identified: carnivores, herbivores and omnivores. Five types of rivers were identified: Clarence River, Kenneth Creek, Nive River, Pine River and the Serpentine Rivulet.

Indicators of condition were selected during a workshop with scientists from the Wentworth Group in consultation with TLC's scientists. For native vegetation, indicators were extent (hectares), diversity, structural complexity, recruitment and carbon storage. For native mammals, indicators were richness, abundance and occupancy. For rivers, indicators were water quality, native fish and hydrology.

Most of the data used to populate the environmental account were derived from the TLC's ecological monitoring program. For native vegetation, 100 permanent photo sites were established and assessed in 2014, 2016 and 2018, and will be assessed at three yearly intervals thereafter. For native mammals, 46 motion sensor camera sites were established in 2014 to measure terrestrial vertebrates and these are assessed annually. Water quality was assessed every 2 to 5 years. The method used to populate the accounts is described fully in the TLC's information statement.[11] The account was accredited by the TLC's Conservation Science and Planning Advisory Council in 2018, and information in the account will be summarised in the TLC annual report.

TLC's spreadsheet accounts show the condition of native vegetation on the Five Rivers Reserve has remained at almost pristine levels (*Econd* = 98 in 2014 and 2016 accounts; Figure 8).[12] This *Econd* reflects the high scores for all indicators, except for carbon storage (*Econd = 75*), as a consequence of the heavy logging in highland forests prior to acquisition by the TLC.

CLASS	Asset	Sub-asset	2014	2015	2016	2017
LAND	Native Vegetation	**Econd**	**98**		**98**	
		Highland Forests	95		94	
		Highland Marshes	100		100	
		Riparian Zone	100		100	
	Native Mammals	**Econd**	**85**	**88**	**89**	**89**
		Carnivores	65	71	70	71
		Herbivores	100	100	100	100
		Omnivores	90	93	98	96
FRESHWATER	Rivers & Wetlands	**Econd**		**78**		
		Clarence River		78		
		Kenneth Lagoon		78		
		Nive River		83		
		Pine River		69		
		Serpentine Rivulet		83		

Figure 8. Summary table from TLC's environmental account showing the condition of native vegetation, native mammals and rivers and wetlands on the Five Rivers Reserve.

The condition of native mammals in the Five Rivers Reserve increased from an *Econd* of 85 in 2014 to an *Econd* of 89 in 2017, reflecting the improved status of the Tasmanian devil recovering from devil facial tumour disease. The account also showed that herbivores (wombats, pademelons, wallabies) were in a pristine (undegraded) condition, the condition of omnivores (bettongs, bandicoots, possums, echidnas, potoroos) improved by 6% over 3 years to near-pristine, and the condition of carnivores (quolls, devils) has improved mainly due to the improved status of the Tasmanian devil. The condition of rivers and wetlands in the Five Rivers Reserve was an *Econd* of 78.5, primarily as a consequence of the infestation of brown trout (an introduced species in Australia) in nearly all rivers in the reserve. TLC is now investigating the feasibility of removing these exotic species from some of the areas where they threaten endangered fish populations.

Patagonian toothfish fishery of the Heard Island and McDonald Islands, Austral Fisheries

The Heard Island and McDonald Islands Toothfish Fishery targets the Patagonian toothfish (*Dissostichus eleginoides*), and operates in the vicinity of Heard Island and the McDonald Islands in the Southern Ocean (Figure 9). The fishery extends from 13 nautical miles offshore to the edge of the 200 nautical mile Australian Exclusive Economic Zone around the islands. The islands and the 12 nautical mile territorial sea is listed on the World Heritage List and forms part of the Heard Island and McDonald Islands Marine Reserve, which is closed to fishing.

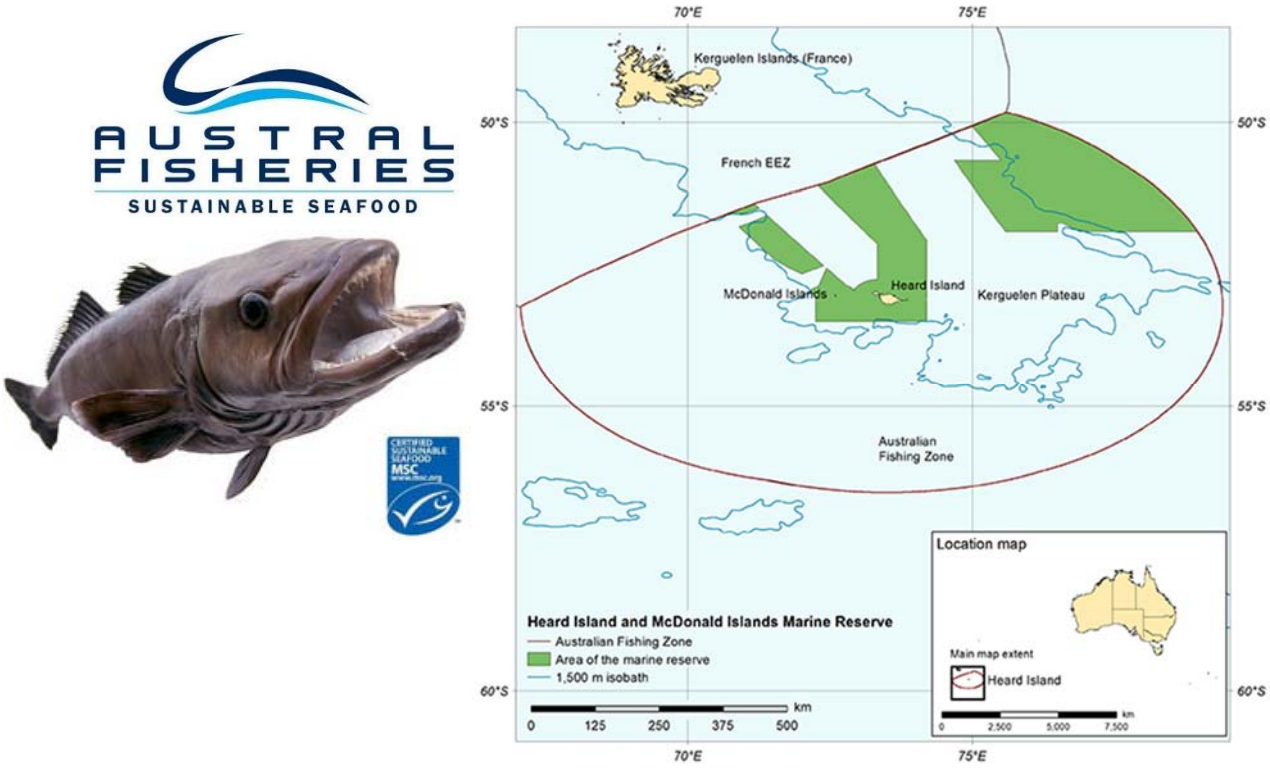

Figure 9. Location of the Heard Island and McDonald Islands showing the fishing zone (red line) and the marine reserve (green) (Source: www.agriculture.gov.au/abares/research-topics/fisheries/fishery-status/antarctic-sub-antarctic).

The Toothfish Fishery is a Commonwealth-managed fishery under the jurisdiction of the Commission on the Conservation of Antarctic Marine Living Resources, the Australian Fisheries Management Authority and the Australian Antarctic Division in accordance with the Australian Antarctic Marine Resources Conservation Act 1981. The fishery has been certified as sustainable and well managed under the Marine Stewardship Council's (MSC) standards since March 2012. Due to its location, Statutory Fishing Rights govern access to the fishery. The fishing season is year-round for trawl (from 1 December to 30 November each year), and seasonal for longline (core season of 1 May to 14 September with season extension periods available from 1 April to 30 November). A total allowable catch is in place for toothfish. There are also catch limits on all bycatch species. Until recently fishing in the region had been limited to a maximum of three Australian boats at any one time and is subject to stringent management arrangements. The only operators in the fishery are Austral Fisheries Pty Ltd and Australian Longline Pty Ltd. The permitted fishing methods are demersal longlining, demersal trawling and traps, and trapping has taken place on a trial basis.

Austral Fisheries applied the *Accounting for Nature* method in an effort to standardise the vast amount of scientific information available, and to enable a non-scientific audience to understand the condition of the fishery and how it has changed over time. The Patagonian toothfish fishery account combines scientific information about the condition of the fishery for the target species (Patagonian toothfish) as well as those assets potentially impacted by the fishery (bycatch, benthic habitat, bait) based on data already produced as part of MSC certification and environmental risk assessments.

Indicators of condition for the fishery account were derived from the scientific monitoring reports produced as part of the AFMA and MSC accreditation processes in consultation with managers from Austral Fisheries. For the Patagonian toothfish, the spawning stock biomass indicator was measured using modelled data (1982 - 2017) from stock assessments performed by the Australian Antarctic Division. For bycatch, the indicator was weight in tonnes of major and minor bycatch based on records from the Convention for the Conservation of Antarctic Marine Living Resources Statistical Bulletin since 1997. For benthic habitat, the indicators were biomass (tonnes) and extent (hectares) of benthic zone impacted by fishing, based on data available from the Commonwealth Scientific and Industrial Research Organisation's (CSIRO) ecological risk assessments for the period between 1997 and 2013. For bait, the indicator was weight of bait (squid) used by the fishery which was qualitatively assessed through the MSC assessment process.

The condition of the Heard Island and McDonald Islands Toothfish fishery is documented in the spreadsheet account.[13] The condition of the Patagonian toothfish stock has declined from 1996 (*Econd* = 100) to 2017 (*Econd* = 61) as a result of fishing undertaken by Austral Fisheries, Australian Longline and previous illegal, unreported and unregulated (IUU) fishing, as well as other environmental changes (Figure 10). During this period, the toothfish stock remained above the target level of 50, the benchmark that satisfies the CCAMLR harvest control rules to ensure the long term security of the fish stock.[14] The condition of benthic habitat was nearly intact (*Econd* > 90) as a result of changes in harvesting technology and the small spatial extent of trawling relative to the size of the Exclusive Economic Zone. Accounts for the condition of bycatch and bait are still in development.

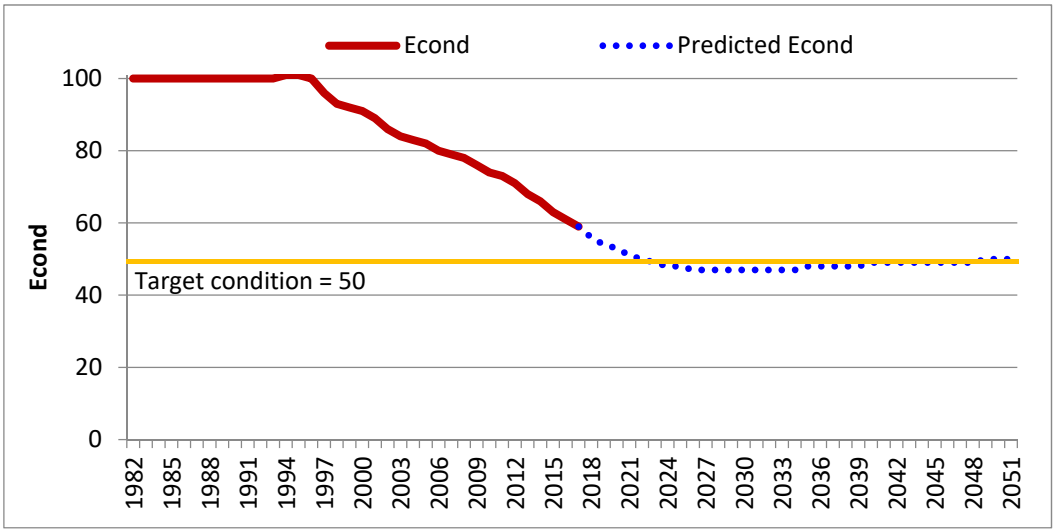

Figure 10. *Econd* for the Patagonian toothfish from 1982 to 2017, and predicted *Econd* from 2018 to 2050.

New concepts in *Accounting for Nature*

The private sector trials have prompted the development of new concepts which have the potential to extend the utility of the *Accounting for Nature* method at the enterprise scale. The first concept is linking environmental and production information. The second concept is attributing changes in the *Econd* at an enterprise scale to management actions. These concepts are still in development and further results will be published as new information becomes available.

1. Pcond: Linking environmental and production information

A major challenge for sustainable resource management is ensuring primary producers can maintain production without degrading the environmental assets upon which society depends. The United Nations Food and Agriculture Organization projected that feeding a world population of 9.1 billion people in 2050 would require raising overall food production by some 70 percent between 2005/07 and 2050.[15] To do so, producers require the ability to measure and report on the capacity of their biophysical assets to maintain or improve production outcomes without degrading environmental condition.

The Wentworth Group with the assistance of Kilter Rural has adapted the *Accounting for Nature* model to enable information about the condition of biophysical assets used for production to be placed in an accounting framework alongside environmental accounts. Production condition accounts could be used, for example, to measure the condition of soils for growing crops, the condition of rivers for irrigation water, the condition of fish stocks for fish and the condition of forests for timber. In the same way environmental accounts can use an index of condition (*Econd*), production condition accounts can use a production index, or *Pcond*, a measure of the condition of a biophysical asset to generate market goods and services. As the *Econd* and *Pcond* are indices, it is possible to observe changes in the condition of one index relative to changes in the other. The difference being a *Pcond* of 100 represents the maximum biophysical potential of a biophysical asset to produce a defined set of goods or services (e.g. stocking density, agriculture output), whereas an *Econd* of 100 is a measure of an asset in its natural (reference) state.

In the private sector trial, Kilter Rural applied the *Pcond* to the soil asset on their Winlaton properties to better understand trends in the condition of soils for improving crop yield (mainly tomatoes, cotton, lucerne and organic cereals), and to understand the impact of changes in the *Pcond* on environmental condition. They followed the same Seven Step method for developing the *Econd*,[16] but instead of using environmental reference condition benchmarks, they selected benchmarks which reflected ideal conditions for agricultural production based on knowledge of crop requirements. For example in loamy clay soils in the Kerang – Lake Boga Region, maximum crop production is achieved when total soil carbon levels are above 4% (i.e. 4% gives an indicator condition score of 100). By contrast, for the environmental account, the reference benchmark for soil condition (*Econd* = 100) is achieved when total soil carbon levels are above 2.5% due to the naturally occurring lower levels of soil carbon in these soils.

For Kilter Rural's Winlaton properties, condition accounting revealed that soils were in better environmental condition than they were for agricultural production (*Econd* = 60*, Pcond* = 52; Figure

11). This is mainly due to the higher level of carbon and lower soil acidification levels (pH) for agricultural production benefit compared to that of natural, pristine soils. Such information is important for managing farm landscapes for environmental and production outcomes. An area of exploration for Kilter Rural is whether it is possible to improve the *Pcond* while achieving the target *Econd* of 70 by 2022.

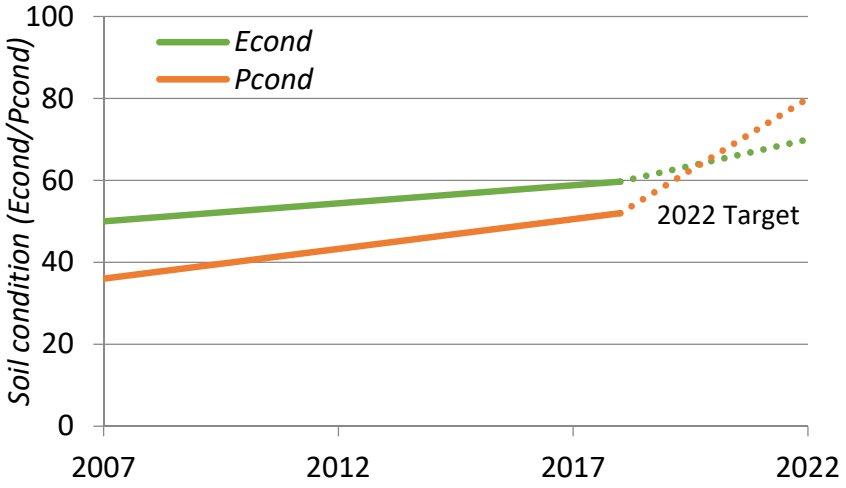

Figure 11. Trend in the environmental condition (left) for native vegetation and soil, and trend in the condition of soils for production (right) of soil for Kilter Rural's Winlaton properties in northern Victoria, Australia.

In this case study, we found that an improvement in the *Pcond* also resulted in an improvement in the *Econd* between 2007 and 2018, because of the improvement in soil condition that had been badly degraded by past land management practices. Such relationship will not always be the case. For example, in a native grassland, the *Pcond* is likely to increase when fertiliser is applied to improve agricultural production, but the *Econd* is likely to decrease because the application of fertiliser could result in the loss of native grassland species.

2. Icond: Attributing changes in the Econd

Changes in the *Econd* are driven by a range of interacting pressures operating at multiple scales which can often be lagged in time (e.g. changes in climate, upstream water pollution, invasive species management, historical land use). Primary producers and policy makers need to be able to understand how direct management actions influence the condition of assets within and outside their enterprise, so that they can manage the impacts of their activities accordingly. Understanding the factors driving changes in the *Econd* is particularly important where the activities of a producer have a relatively small or variable influence on asset condition (e.g. runoff from an irrigation property into a river system). The impact score, or *Icond*, can be measured as the relative impact of a specific activity on the *Econd* of an asset from one accounting period to the next. An *Icond* of 100 shows the impact of a specific activity contributed to all of the change in the *Econd,* while an *Icond* of 50 shows that the impact of an activity explains only half of the change in the *Econd*.

The Austral Fisheries case study was an opportunity test the disaggregation of the *Econd* to distinguish which changes are due to the direct interventions or activities of primary producers and which changes are driven by other factors. The goal was to assist Austral Fisheries in understanding

the relative impacts of their own fishing activities against the impacts of a range of other stock pressures (e.g. other regulated fishing boats, illegal, unreported and unregulated fishing, environmental changes driving population). For the Toothfish Fishery account, the *Icond* score was based on the tonnes of toothfish harvested by Austral Fisheries alone, against the overall change in the toothfish biomass of the fishery. The results of the *Icond* study are still in development.

Benefits of multi-scale, public-private environmental accounting

Measuring condition at a landscape scale is essential for decision makers to understand environmental degradation at scales at which ecosystems function. This enables governments to monitor and communicate changes, evaluate management actions, set policies and make investment decisions. However, many management and investment decisions that impact on the environment are also made at an enterprise scale. It is the cumulative impact of decisions at multiple scales that drives degradation of ecosystems.

The benefits of using a common unit of measure of environmental condition is that it can be applied at multiple scales, enabling changes in condition at the enterprise level to benchmarked against changes in condition at the ecosystem scale. This should provide important insights for private sector managers and investors, in the same way as indices for specific financial stocks (e.g. All Ords, Small Ords and Finance) can be compared against overall market indices to assess the performance of active fund managers. There are potentially diverse applications of this information. For example, farmers may attract a premium rating for financing or asset values if they can demonstrate their environmental assets are maintained in better condition than the regional average.

Another benefit of a common unit of measure of environmental condition is the ability to better coordinate the development of environmental accounts at multiple scales. For example, development of the Kilter Rural account was supported by the regional North Central Natural Resource Management Body through provision of data and geographic information system capacity. There is also the potential for the exchange of local scale data (e.g. pH, salinity measures, vegetation classifications) to improve the quality of data in public accounts at regional and national scales. Such exchanges are mutually important for enhancing the value of the accounts, and improving their accuracy and affordability.

Acknowledgements

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