Natural capital accounting for the prawn-fishing industry

CSIRO is leading research into the application of natural capital accounting to primary industries, to help them measure and report their environmental performance and improve decision making.

Natural capital is the stock of renewable and non-renewable resources – such as soil, water, plants, animals, minerals and air – on which primary industries rely to produce food and fibre for society.

The *Lifting farm gate profits: the role of natural capital accounts* project sought to determine whether natural capital accounting could support decision making and drive better productivity of primary industries, which depend on natural capital.

CSIRO and University of Newcastle researchers have worked with stakeholders to identify the natural capital associated with a prawn fishery. This report summarises the natural capital accounts that resulted from this pilot study for commercial fisheries in Australia.

Natural capital accounting brings together environmental and economic information, so that businesses and stakeholders can assess the risks and opportunities associated with natural capital. This linkage with economic accounts offers benefits beyond certification.

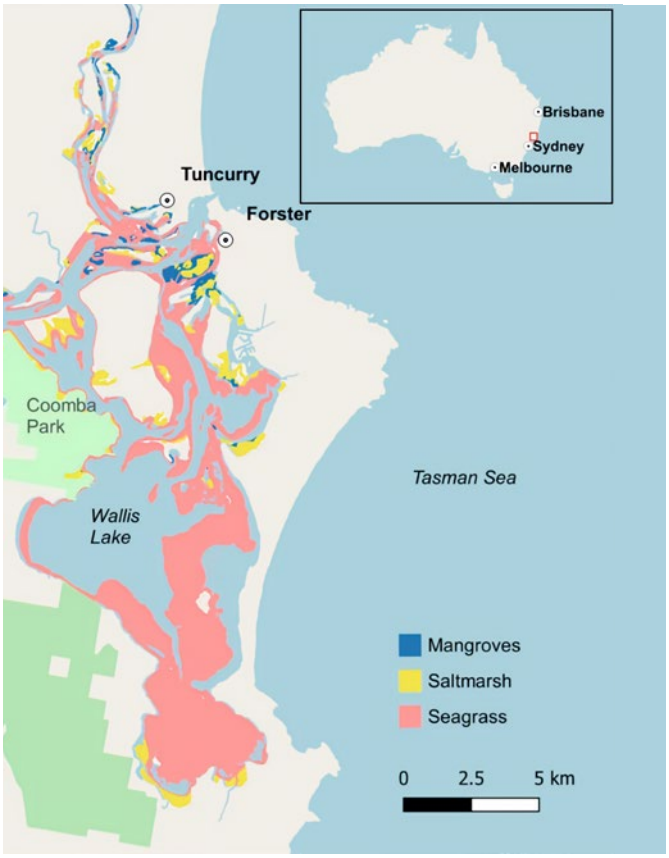

Figure 1 The Wallis Lake estuary in NSW, Australia.

Businesses rely on natural capital

The prawn-fishing industry is inherently linked to ecosystems and other natural capital in the estuary (Figure 2). One of the principal drivers of fisheries productivity is the biological primary production by estuarine habitats (mangroves, saltmarsh, seagrass).

In any estuary, fishers are not the only users, or beneficiaries, of the system. A range of people use and impact the natural capital in the estuary. In addition, events and processes such as rainfall or climate change also affect natural capital.

Stakeholder priorities

The project interviewed stakeholders to better understand the value proposition for natural capital accounting in the prawn-fishing industry. While the individual information needs of stakeholders differed, all recognised the benefits of reliable knowledge of ecosystem function and processes. Stakeholders prioritised the following major activities and events for natural capital accounting:

- freshwater pulses
- agriculture
- commercial fisheries.

These priorities guided the selection of the following accounts to compile:

- precipitation in the catchment
- freshwater pulses in the catchment
- land use in the catchment (Figure 3)
- terrestrial and riparian vegetation in the catchment
- aquatic prawn habitat
- water quality in the prawn habitat
- landed prawn biomass in the fishable area (Table 1).

More details and all accounts are found in Ware et al. (2020).

Experimental natural capital accounts

The seven natural capital accounts that we compiled (Ware et al., 2020) provide a framework for monitoring key aspects of the environment that impact on the prawn fishery in Wallis Lake. No single account stands alone as being directly correlated to prawn productivity, but together they form a 'picture' of the overall health of the ecosystem upon which prawns depend.

Through identifying key drivers that affect the habitat condition for prawns, we have simplified the information needed by estuary managers, prawn fishers and the general community for future decision-making.

The accounts are provided to encourage informed debate about which natural capital assets are most important to protect to maintain ecosystem services. They do not prescribe any specific management action, but rather are designed to build understanding between catchment and estuary users on what system might be maintained into the future.

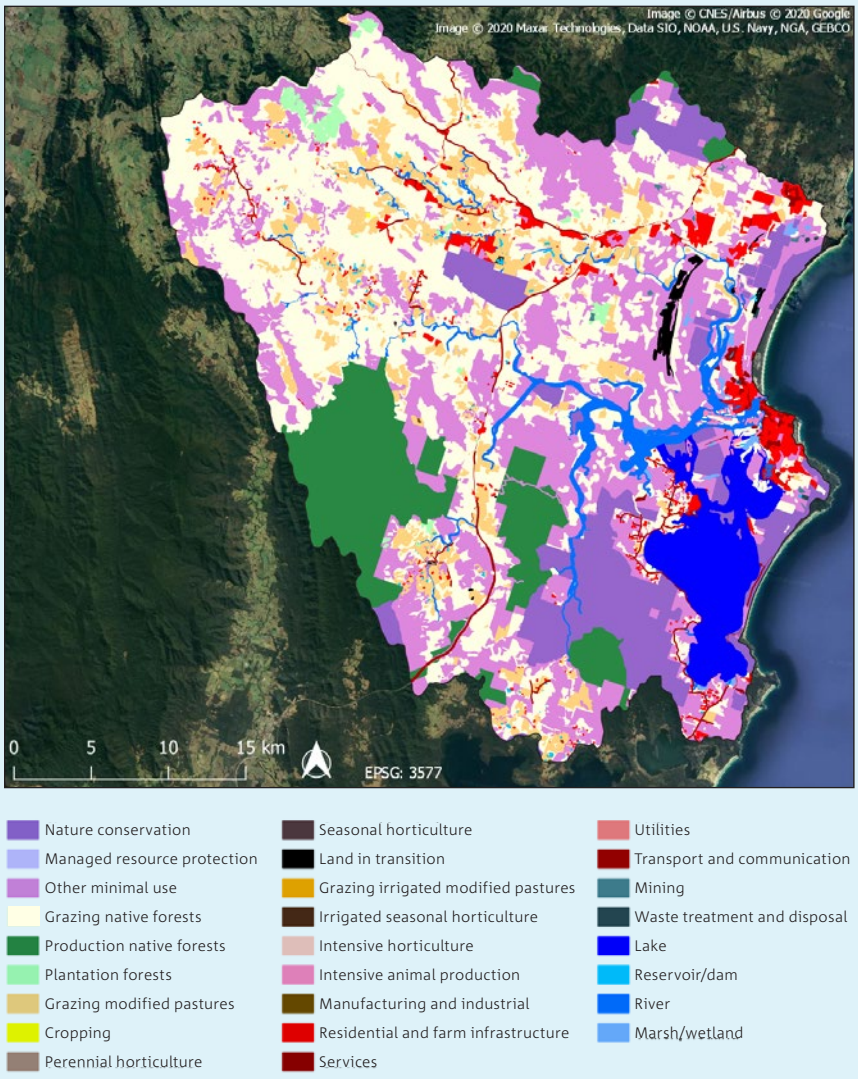

Figure 3 Major land uses across the Wallis Lake catchment, June 2017.
Data: https://data.nsw.gov.au/data/dataset/nsw-landuse-2017

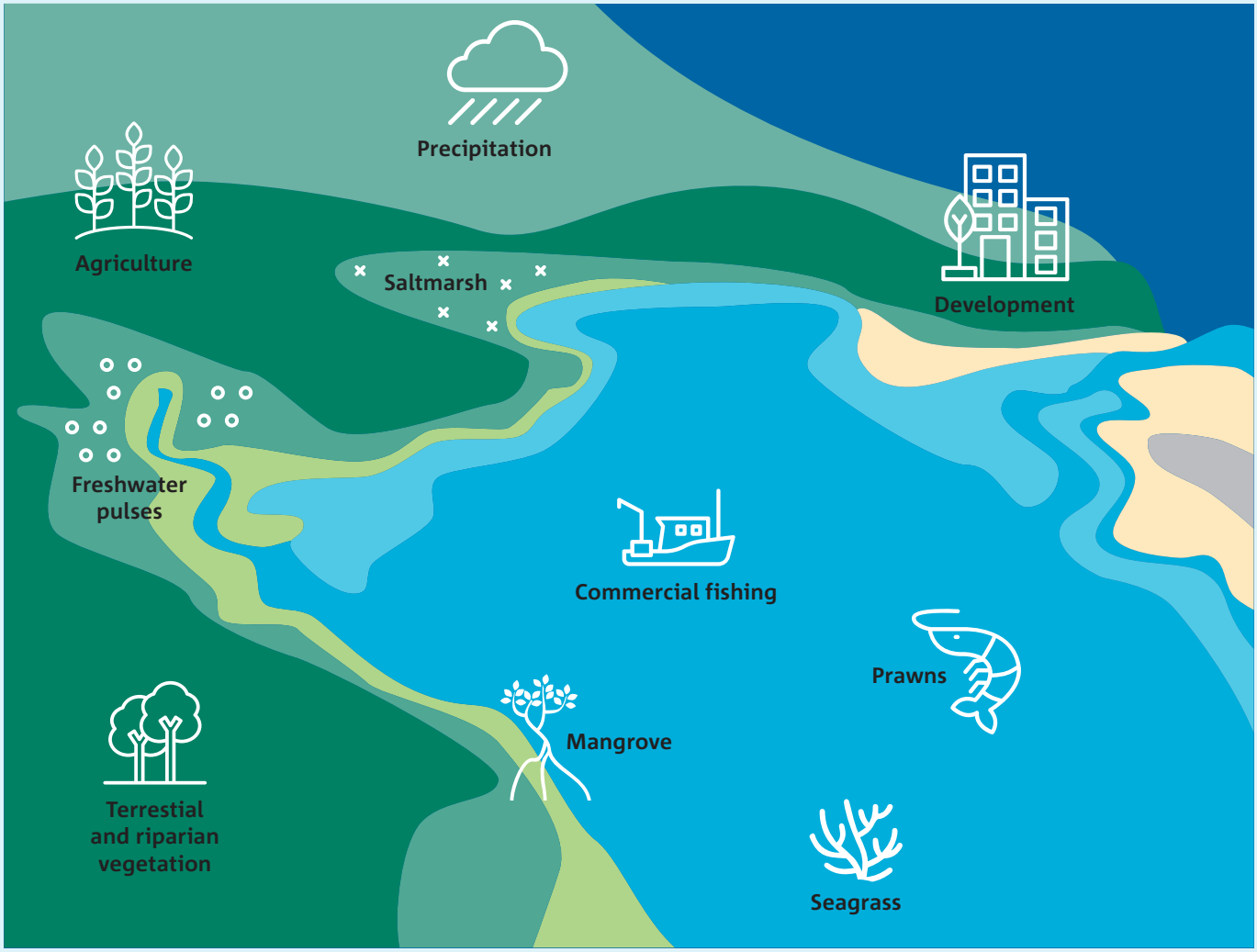

Figure 2 How the prawn-fishing industry interacts with the estuarine environment (Schmidt et al., 2020). Natural capital assets include water suitable for prawns, prawn-producing habitat, biodiversity and renewable prawn population. Dependencies and impacts are related to the priority activities and events: agriculture, freshwater pulses and commercial fisheries.

Table 1 Ecosystem service account: landed biomass of School Prawn in the fishable area, disaggregated by the contribution of estuarine habitats, in 1971/1972, 1985/1986 and 2017/2018.

Year	Saltmarsh		Mangrove		Seagrass		Total (all habitats in Wallis Lake)	
	Areal extent of saltmarsh habitat (ha)	Value of contribution of saltmarsh to prawn diet ($/ha) (mean ± SD)	Areal extent of mangrove habitat (ha)	Value of contribution of mangrove to prawn diet ($/ha), (mean ± SD)	Areal extent of seagrass habitat (ha)	Value of contribution of seagrass to prawn diet ($/ha) (mean ± SD)	Landings (tonnes), mean ± SD	Value ($1000s), mean ± SD
1971/1972	617	$52.79 ± 26.84	117	$97.90 ± 46.40	2790	$4.29 ± 2.76	20.73 ± 7.06	$56.00 ± 29.69
1985/1986	400	$81.33 ± 41.34	79	$145.74 ± 69.07	3079	$3.89 ± 2.50	28.55 ± 11.53	$91.00 ± 69.01
2017/2018	472	$69.01 ± 35.08	251	$45.64 ± 21.63	3480	$3.44 ± 2.21	20.73 ± 7.06	$56.00 ± 29.69

The contribution of each habitat is expressed monetarily, with values derived using a model similar to Taylor and Creighton (2018). Note that per-species data on School Prawns were not available before 1985. As a result, the value of habitats for 1971/1972 was calculated from the landings and value of prawns in the 2017/2018 dataset. SD = standard deviation.

Filling data gaps

This set of accounts could be improved and refined, through improving our information base.

This project filled one key data gap by estimating the economic value of habitats that support the diets of economically important species of fish and prawns. Understanding the ecosystem services of these prawn-producing habitats is important for prioritising management, conservation and potential restoration activities.

We used stable isotope analysis to link the extent of these habitats to the value of fisheries that occur within the estuary. Table 1 shows the results for the gross value of production for landed biomass of School Prawns. Habitat valuation using this approach is greatly influenced by the areal extent of habitats within an estuary. Thus, habitats of lesser areal extent but with a higher proportional contribution to fished species may have higher priority for conservation or repair.

We are also trialling a broader model that could be used to estimate the value of habitat restoration for any estuary in NSW. Such information could be useful for managers by improving understanding of the link between areal extent of habitats and fisheries productivity.

Implementing accounts

Our stakeholder engagement revealed that small-scale fishery enterprises are unlikely to develop natural capital accounts by themselves. These enterprises share a common resource with other users (in contrast to land-based enterprises who usually fully control their land).

For fisheries, natural capital accounts provide a common set of data to assist government, industry and the community to better manage the activities of multiple users of the estuary. By all users sharing a common vision for catchment, water and estuary management, it is possible to work together to maintain healthy ecosystems that support production.

Next steps

Next steps will be to interpret and validate these results by engaging with the community and the fishing industry to refine the accounts and fill data gaps. If the accounts are considered useful, we would also test this method in other estuaries and with other fisheries and other coastal or marine environments.

Learn more

Raoult V, Taylor MD, Schmidt RK, Cresswell ID, Ware C and Gaston TF (in prep.) The value of estuarine habitats for commercial fisheries in a seagrass-dominated estuary.

Ware C, Stewart SB, Cresswell ID, Schmidt RK, Raoult V, Taylor MD, Mount RE, Pinkard EA, Gaston TF and O'Grady AP (2020) Experimental natural capital accounts for the prawn-fishing industry in the Wallis Lake estuary. CSIRO, Australia.

Schmidt RK, Raoult V, Cresswell ID, Ware C, Taylor MD, Mount RE, Stewart SB, O'Grady AP, Pinkard E and Gaston TF (2020) Designing natural capital accounts for the prawn-fishing industry. CSIRO, Australia.

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